TRUSTEE

FUTURE PROOF EFFICIENT AND SUSTAINABLE DEPLOYMENT OF ZEWT

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Authors

Name	Affiliation
Michela Scotto di Minico	RINA
Patrizio di Francesco	RINA
Gabriella Duca	ISSNOVA
Daniele Palma Esposito	ISSNOVA
Holger Kramer	ISL
Flóra Gulyás	ISL
Rafael Company Peris	VPF
Roberto ARZO	VPF
Elisa Van Engelenhoven	FORMARE
Lidia Rossi	FORMARE
Jana Kudlacek	AGSKK
Dominic Kudlacek	AGSKK
Simone Panfiglio	NAVTEC

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4 - FORMARE	Elisa Van Engelenhoven	FORMARE appointed representative	01/12/2025
5 – AGSKK	Jana Kudlacek	AGSKK appointed representative	01/12/2025
6 – NAVTEC	Simone Panfiglio	NAVTEC appointed representative	01/12/2025
7 - RINA GE	Patrizio Di Francesco	RINA GE appointed representative	01/12/2025

Abstract

Deliverable D1.1 "ZEWT Foresight Scenarios” provides a comprehensive and structured analysis of the European waterborne transport sector, establishing a baseline analysis of the current fleet, navigation services, and prevailing business models. By integrating data from scientific and technical sources, the report evaluates the sector's readiness for decarbonization against the backdrop of the "Fit for 55" legislative package and the broader European Green Deal.

The study adopts a strategic foresight methodology to explore the transformation pathways toward 2030 and 2050. It dissects the complex interplay of technological evolution—specifically regarding alternative fuels (hydrogen, ammonia, methanol), electrification, and energy efficiency—with the critical enablers of digitalization and automation. Furthermore, the analysis incorporates a holistic review of drivers, including geopolitical trends, demographic shifts within the maritime workforce, and the intensifying physical risks posed by climate change to port infrastructure and global shipping routes.

Synthesizing these multidimensional factors, the report outlines three plausible foresight scenarios: a "Regulated Transition" driven by gradual policy enforcement; an "Accelerated Transition" characterized by rapid innovation and coordinated investment; and a "Fragmentation and Delays" scenario marked by geopolitical instability and policy incoherence. These scenarios serve as a strategic tool for stakeholders, identifying the risks, opportunities, and necessary interventions required to ensure the resilience and competitiveness of the European maritime ecosystem in its transition toward climate neutrality.

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LIST OF ACRONYMS

AFIF	Alternative Fuels Infrastructure Facility
AFIR	Alternative Fuels Infrastructure Regulation
AHTS	Anchor Handling Tug Supply
BIMCO	Baltic and International Maritime Council
CAPEX	Capital Expenditure
CfD	Contracts for Difference
CCNR	Central Commission for the Navigation of the Rhine
CDM	Collaborative Decision-Making
CEF	Connecting Europe Facility
CEU	Car-Equivalent Unit
CFP	Common Fisheries Policy
CII	Carbon Intensity Indicator
CINEA	European Climate, Infrastructure and Environment Executive Agency
CoC	Certificate of Competency
COLREG	Convention on the International Regulations for Preventing Collisions at Sea
CSDDD	Corporate Sustainability Due Diligence Directive
CSRD	Corporate Sustainability Reporting Directive
DoC	Document of Compliance
DPS	Dynamic Positioning System
DT4GS	Digital Twin for Green Shipping
DWT	Deadweight Tonnage
ECDIS	Electronic Chart Display and Information System
ECSA	European Community Shipowners' Associations
EEA	European Economic Area
EED	Energy Efficiency Directive
EEDI	Energy Efficiency Design Index
EEZ	Exclusive Economic Zone
EIB	European Investment Bank
EMAS	Eco-Management and Audit Scheme
EMFAF	European Maritime, Fisheries and Aquaculture Fund
EMS	Energy Management System
EMSA	European Maritime Safety Agency
EMSN	European Maritime Simulator Network
EMSWe	European Maritime Single Window environment
EnB	Energy Baseline
EnMS	Energy Management System (ISO context)
EnPI	Energy Performance Indicators
ESG	Environmental, Social, and Governance
ETA	Estimated Time of Arrival
ETD	Estimated Time of Departure
ETO	Electro-Technical Officer
ETR	Electro-Technical Rating
ETS	Emissions Trading System
EU	European Union

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EURATOM	European Atomic Energy Community
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GIA	Global Industry Alliance
GT	Gross Tonnage
HVAC	Heating, Ventilation, and Air Conditioning
IAEA	International Atomic Energy Agency
IBC Code	International Bulk Chemical Code
ICS	International Chamber of Shipping
ICT	Information and Communication Technologies
IEC	International Electrotechnical Commission
IGC Code	International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk
IGF Code	International Code of Safety for Ships Using Gases or Other Low-flashpoint Fuels
IGU	International Gas Union
ILO	International Labour Organization
IMO	International Maritime Organization
IoT	Internet of Things
IPCC	Intergovernmental Panel on Climate Change
ISM Code	International Safety Management Code
ISO	International Organization for Standardization
JIT	Just-in-Time
LBCC	Land-Based Control Centers
LCA	Life Cycle Assessment
LNG	Liquefied Natural Gas
LPG	Liquefied Petroleum Gas
MARPOL	International Convention for the Prevention of Pollution from Ships
MASS	Maritime Autonomous Surface Ships
MCP	Maritime Connectivity Platform
MRV	Monitoring, Reporting and Verification
MSC	Maritime Safety Committee (IMO)
NSR	Northern Sea Route
OECD	Organisation for Economic Co-operation and Development
OPEX	Operational Expenditure
OPS	Onshore Power Supply
OSV	Offshore Support Vessel
PCC	Pure Car Carrier
PCS	Port Community Systems
PCTC	Pure Car and Truck Carrier
PDCA	Plan-Do-Check-Act
PMS	Power Management System
PNRR	Piano Nazionale di Ripresa e Resilienza - Italy's National Recovery and Resilience Plan

PortCDM	Port Collaborative Decision-Making
PPP	Public-Private Partnership
PSV	Platform Supply Vessel
RCP	Representative Concentration Pathway
RFNBO	Renewable Fuels of Non-Biological Origin
RIS	River Information Services
RLF	Renewable and Low-Carbon Fuels
Ro-Pax	Roll-on/Roll-off Passenger
Ro-Ro	Roll-on/Roll-off
ROV	Remotely Operated Vehicle
SASO	Saudi Standards, Metrology and Quality Organization
SEMS	Smart Energy Management Systems
SFDR	Sustainable Finance Disclosure Regulation
SFOC	Specific Fuel Oil Consumption
SIDS	Small Island Developing States
SIGTTO	Society of International Gas Tanker and Terminal Operators
SMR	Small Modular Reactor
SMS	Safety Management System
SOLAS	Safety of Life at Sea
SRIA	Strategic Research and Innovation Agenda
SSMS	Sustainable and Smart Mobility Strategy
SSN	SafeSeaNet
SSP	Shared Socioeconomic Pathway
STCW	Standards of Training, Certification and Watchkeeping
STM	Sea Traffic Management
TEN-T	Trans-European Transport Network
TEU	Twenty-foot Equivalent Unit
TRL	Technology Readiness Level
TRUSTEE	Project Title (come da frontespizio)
ULCV	Ultra-Large Container Vessel
UNCTAD	United Nations Conference on Trade and Development
VLCC	Very Large Crude Carrier
VLGC	Very Large Gas Carrier
VLOC	Very Large Ore Carrier
VMS	Vessel Monitoring System
VTMIS	Vessel Traffic Monitoring and Information System
WAPS	Wind-Assisted Propulsion Systems
WENRA	Western European Nuclear Regulators' Association
ZEWT	Zero Emission Waterborne Transport

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Introduction

This report outlines the results of Tasks T1.1, T1.3, and T1.4 executed for the implementation of the TRUSTEE project. It provides a structured and comprehensive analysis of the European waterborne transport fleet and of navigation services, technologies, business models and external conditions, to build insights into European waterborne transports current status and transformation pathways towards the Zero Emissions goal, based on a foresight scenarios analysis. The foresight scenarios refers to a structured and systematic approach aimed at exploring, describing, and analysing possible alternative futures in order to inform strategic decision-making in the present. [1] In TRUSTEE project, it has been adopted within the broader scope of strategic foresight, which does not seek to predict the future with certainty, but rather to construct plausible representations of how the future might evolve in light of economic, social, technological, environmental, and political variables.. In the context of maritime sustainability, foresight scenarios represent a particularly valuable tool. They can help stakeholders anticipate the long-term implications of decarbonization policies, digitalization, evolving maritime regulations, geopolitical developments, and climate change.

The document integrates data from the Fourth IMO Greenhouse Gas Study and other relevant sources, applying foresight techniques to assess how socio-political, technological, and economic trends are reshaping maritime transport. It highlights the implications of these changes in the short- (2030) and long-term (2050) time horizons, considering regulatory, environmental, and operational challenges, and setting the foundation for the following project activities.

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SECTION 1
CURRENT STATUS OF THE EUROPEAN WATER TRANSPORT FLEET AND SECTOR

1. OVERVIEW OF THE CURRENT EUROPEAN FLEET

The European civil maritime fleet represents a critical component of both regional and global transport infrastructure. As a key facilitator of international trade, energy distribution, passenger mobility, and offshore operations, the fleet spans a diverse array of vessel types—from bulk carriers and tankers to container ships, Ro-Ro vessels, passenger ferries, and specialized service ships. Each of these plays a distinct role in supporting Europe's economic resilience, industrial competitiveness, and environmental transition.

Inside this report a data-driven overview of the current European fleet is provided, leveraging the most recent publicly available sources and statistical records. The analysis is initially structured by vessel category, offering insight into the scale, distribution, and technology level within each segment—including oil and gas transport, dry cargo, refrigerated logistics, vehicle shipping, cruise and ferry services, offshore support, fishing, and inland navigation.

When examining the European merchant fleet as a whole it becomes clear that Europe remains one of the dominant actors on the global maritime stage. According to recent data available, Europe (including EU member states, Norway, and other associated countries) controls close to **20% of the global merchant fleet**, whether measured by gross tonnage or by the number of vessels, while accounting for the 5% of the total world population [2] and 15,2% of the world GDP [3]. This figure reflects not only the scale of Europe's involvement in global shipping, but also the breadth of its fleet capabilities. [4]

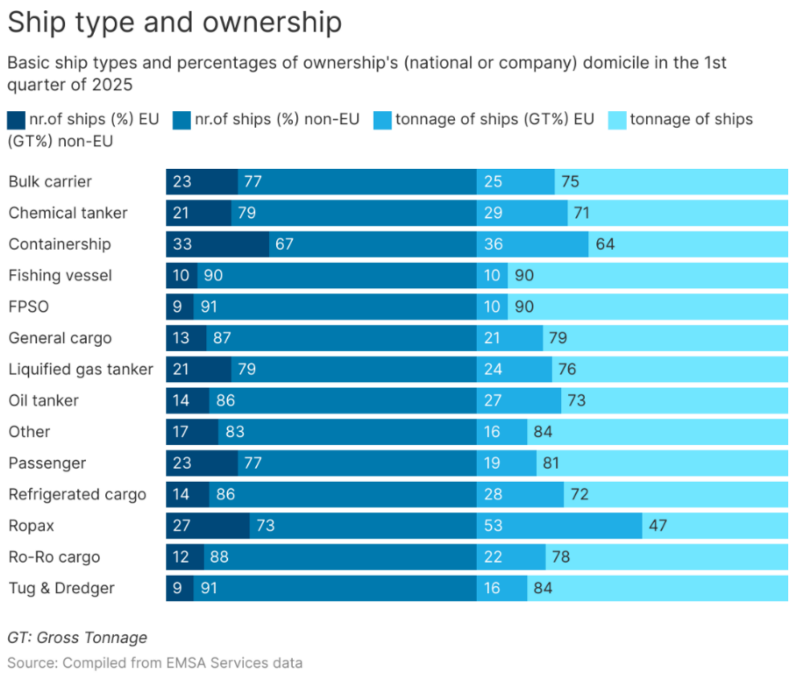

Figure 1 - Composition of the European-controlled fleet

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Looking more closely at the composition of the European-controlled fleet (Figure 1) in relation to the global fleet, the numbers are striking. Europe owns approximately **33% of the world's container ships**, by number—a clear indication of its strategic position in international trade routes. Its share in oil tankers reaches 27**% of global gross tonnage**, and its control of LNG carriers stands at around 2**4%**, confirming Europe's critical role in global energy flows, especially in light of recent diversification efforts in gas sourcing.

Other key segments follow similar patterns. Europe accounts for about **20% of all general cargo vessel tonnage**, **22% of vehicle carriers (Ro-Ro)**, and a nearly identical share of the world's passenger ferry and cruise ship tonnage. Moreover the EU has more than half of the tonnage of Ro-pax vessels. These figures are particularly significant in the context of Europe's vast ferry networks and its strong position in the global automotive sector. Even in specialized ship types like chemical tankers and offshore support vessels, European ownership ranges from **20% to 29%**, indicating robust participation across all major maritime functions.

In sum, the European merchant fleet stands out not just for its size, but for its **comprehensive and balanced composition**. Europe is not overly dependent on a single vessel type or operational role—instead, it maintains a strong presence across energy, cargo, passenger, and offshore support segments. This makes the fleet resilient to fluctuations in global trade dynamics and regulatory shifts, and well-positioned to support both commercial and policy objectives, such as the transition to greener maritime operations.

These percentages and distribution patterns provide a valuable snapshot of where Europe stands today. In the next sections, we'll explore how this fleet is distributed geographically, how it is flagged and classified, and how its performance is evolving in terms of age, emissions, and operational efficiency.

1.1. Vessel types

The classification of vessel types serves as a foundational taxonomy in understanding the structure and function of the European maritime fleet. This categorization reflects the diversity of roles that ships play in the global and regional economy, from transporting raw materials and consumer goods to providing essential services and enabling human mobility. By dividing the fleet into distinct sections—such as bulk carriers, oil and gas tankers, container ships, and passenger vessels—the maritime industry can better monitor trends, allocate resources, enforce regulations, and assess environmental impacts. Each category corresponds to a specific design, operational profile, and regulatory framework, tailored to the nature of the cargo, the route of operation, and the service provided. This typological framework is essential not only for statistical and policy purposes but also for strategic planning in shipping, port infrastructure, and sustainability initiatives across the EU maritime cluster.

There are several methodologies available to categorize the fleet into different groups. In the introduction, the EMSA classification has already been used to provide a concise, "in a nutshell" overview of the EU fleet in comparison to the global one. However, for the purposes

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of this document, the vessel breakdown will follow, as closely as possible, the classification system adopted in the Fourth IMO Greenhouse Gas Study.

This approach offers a more detailed and analytically robust framework, enabling a deeper understanding of overall trends and a clearer assessment of the sector's potential to meet GHG reduction targets within the specified timeframes, while including a number of sectors and ships not considered in the EMSA classification, such as inland waterways, particularly significant for the EU context.

Where relevant and useful, data from alternative classification systems may also be incorporated. In such cases, every effort will be made to align this information with the categories defined in the Fourth IMO GHG Study.

In alignment with the classification adopted in the Fourth IMO Greenhouse Gas Study, the European fleet includes:

Container

- Container

Cruise/ Passenger fleet

- Cruise
- Ferries
- Ro-Ro

Tanker fleet

- Oil tanker
- Special tanker
- LNG tanker
- LPG tanker
- Product tanker
- Crude tanker
- Chemical tanker

General cargo

- General cargo
- MPP
- PCC
- Reefer
- Combos

Bulker fleet

- Bulker

Service ships

- Dredger
- Offshore

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Each category has different technical characteristics, emission profiles, and potential for incorporating new propulsion technologies and alternative fuels. The transformation of the fleet, particularly toward zero-emission configurations, depends on the vessel type's adaptability and operational role.

The current fleet analysis is based on the most up-to-date world fleet data available from Mid 2025. It includes general vessel information from the global fleet—such as IMO number, MMSI, ship name, type, speed (kn), gross tonnage (GT), deadweight (DWT), TEU, build year, and call sign—alongside main engine-related data from the ISL database. To identify which vessels from the global fleet have called at European—and are thus relevant to the objectives of the TRUSTEE project—data from EMSA will be incorporated. *(This dataset has been requested but has not yet been delivered!).* As shown in Figure 2, the integration of data from the World Fleet and EMSA will be used to identify the European fleet for further analysis. The flow of data from the global fleet into the European fleet dataset is illustrated in the visual, where the relevant vessels are selected based on their European activity.

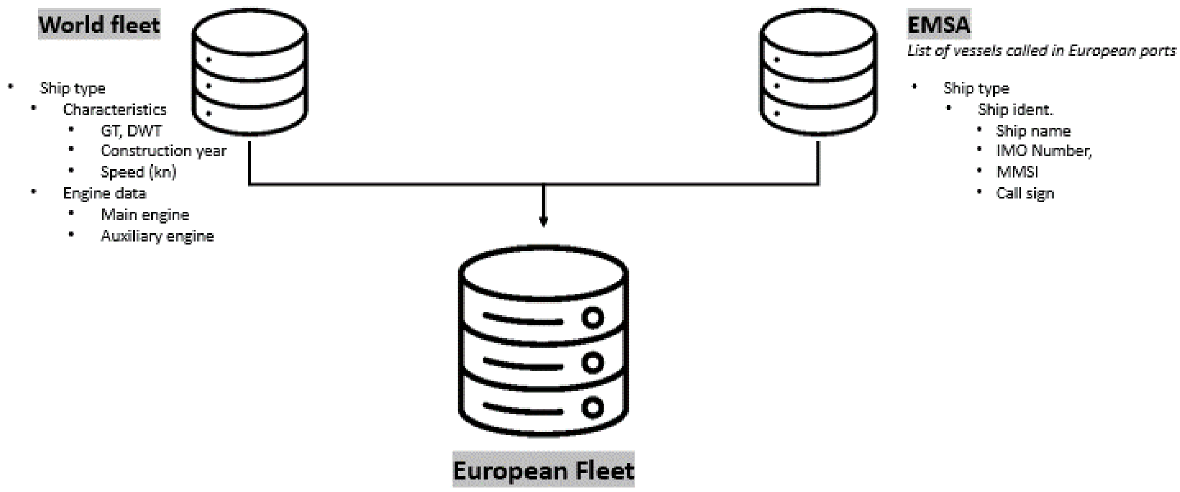

Figure 2 - Global and European fleet data integration for the TRUSTEE project: identifying the European fleet using world fleet and EMSA data.

Table 1 summarizes the ship categories as classified in the IMO 4th GHG Study[1] [5], along with the number of vessels in each category and the sample coverage (%) for speed (kn), engine power (main_kW), and Specific Fuel Oil Consumption (main_SFOC). The overview includes a total of 90691 vessels, grouped into the main categories of container ships, passenger vessels, tankers, general cargo ships, bulkers, and other specialized ship types.

[1] For the fleet analysis, vessel types are identified and grouped according to the classification methodology used in the IMO's Fourth GHG Study, published in 2020. As the IMO is currently preparing an updated version of this study, the classification approach may be revised accordingly once the new edition is released and, if relevant, required for the analysis.

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Table 1 - Overview of the data

Main Ship Type	Shiptype	4th GHG Study	Number of Fleets in operation	kn	main_ kW	main_ SFOC
Container	Container	x	6885	80%	95%	72%
Cruise/Passenger	Cruise	x	500	91%	96%	42%
	RoRo	x	740	93%	92%	42%
	Ferries	x	4099	71%	94%	...
Tanker	Tanker Oil Tanker	x	2271	85%	100%	89%
	Tanker Special Tanker	x	196	82%	96%	12%
	Tanker LNG	x	818	84%	100%	47%
	Tanker LPG	x	1579	87%	100%	67%
	Tanker Product	x	10920	79%	96%	32%
	Tanker Crude	x	2360	85%	100%	89%
	Tanker Chemical	x	3732	86%	97%	63%
General Cargo	General Cargo	x	15002	72%	90%	15%
	MPP	x	3354	86%	95%	37%
	PCC	x	846	90%	100%	86%
	Reefer	x	837	90%	95%	37%
	Combos	-	12	100%	100%	92%
Bulker	Bulker	x	13820	79%	98%	46%
Others	Dredger	-	824	80%	94%	17%
	Offshore	-	5722	71%	89%	N/A
	Tugs	-	24687	N/A	N/A	N/A
	Other Non Cargo	-	3711	N/A	N/A	N/A
		Total:	90691			

Container ships account for 6885 vessels, with relatively high data completeness across parameters (80–95%). Among passenger vessels, the cruise and RoRo segments show strong coverage (above 90% for most variables), while ferries have slightly lower availability for speed and SFOC data. The tanker category, which is divided into several subtypes (oil, product, chemical, LNG, LPG, and special tankers), represents a large share of the dataset, with generally excellent coverage—most notably 100% for main engine power.

General cargo vessels form the largest group in the sample with over 22000 vessels, though their data completeness is somewhat lower for speed and SFOC compared to tankers. Bulk carriers are also well represented, with 13820 vessels and consistent data coverage around 80–98%. Service ships include dredgers, offshore vessels, tugs, and non-cargo ships, which together make up a substantial number of smaller or auxiliary craft, though some of these subtypes have limited or missing data for certain variables.

The fleet analysis is based on five core statistical indicators—minimum, maximum, mean, mode, and median [6]—applied to key vessel parameters including speed (in knots), main engine power (in MW) and main engine specific fuel oil consumption (SFOC, in g/kWh):

- Minimum: The smallest value in a dataset, indicating the lowest observed measurement.

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- Maximum: The largest value in a dataset, showing the highest observed measurement.
- Mean: Also known as the average, calculated by summing all values and dividing by the number of observations. It reflects the overall tendency of the data.
- Mode: The most frequently occurring value in a dataset. It helps identify common or repeated measurements.
- Median: The middle value when all observations are ordered from lowest to highest. It divides the dataset into two equal halves and is less sensitive to outliers than the mean.

The detailed results for these five core statistical indicators, broken down by ship type, are provided in the Annex – Detailed figures on current fleet .

In our analysis of the current fleet, vessels with the following status have been excluded, as they are not part of the active fleet:

- Dead/Demolished
- Miscellaneous removal
- Scrapped
- Sunk
- Total loss

1.1.1. Bulker Fleet

The global bulker fleet comprises a total of 13820 vessels as of mid-2025. The vast majority of these vessels — 12822 units (93%) — are currently in service. Around 929 vessels (7%) are idle, while only a very small number are damaged, laid up, under repair, or designated for storage, together accounting for less than one percent of the total fleet (Annex - Table 12.1 1). Bulker vessels account for a total GT of 555657318 (Annex - Table 12.1 8) and a total DWT of 1009411864 (Annex - Table 12.1 9).

The fleet is predominantly composed of bulk carriers, representing 12566 vessels (91%) of the total. The next largest segments include cement carriers (3%) and aggregates carriers (2%), followed by ore carriers (2%). All remaining vessel types, such as chip, limestone, and other specialized carriers, together contribute less than two percent of the fleet, underlining the overwhelming dominance of conventional bulk carriers (Annex - Table 12.1 2).

When considering the age distribution of the fleet, it is evident that the bulker fleet is relatively young. The largest share, 32%, consists of vessels built between 2011 and 2015, followed by 21% constructed between 2006 and 2010. Another 14% were delivered between 2021 and 2025, indicating a steady renewal of tonnage in recent years. Older ships built before 1980 account for only about one percent of the total fleet, highlighting the limited presence of outdated tonnage (Annex - Table 12.1 3).

Fleet size distribution also reflects the dominance of medium to large vessels. The majority fall within the 60,000–99,999 GT range (35%) and the 35,000–59,999 GT class (25%). Together, these two categories make up roughly 60% of the global bulker fleet. Smaller vessels below 35,000 GT represent about a quarter of the total, while very large bulkers above 100,000 GT make up only around 15%. This indicates a clear focus on ships optimized for major trade routes and global bulk commodity transport (Annex - Table 12.1 4).

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Propulsion technology in the bulker segment remains almost entirely diesel-based. Approximately 88% of vessels are powered by two-stroke diesel engines, while the remaining 12% use four-stroke diesel engines. Alternative power systems — such as diesel-electric or hybrid battery-assisted propulsion — are present only in isolated cases, making up less than one-tenth of one percent of the total fleet (Annex - Table 12.1 5).

The top three main engine designers in the bulker fleet are Everllence B. & W [7] ., Mitsubishi, and Wartsila 2-stroke. Everllence B. & W. is the dominant player, with 10,620 main engines installed in bulker vessels, making up 77% of the total fleet. Mitsubishi comes in second, with 549 engines, representing 4% of the total. Wartsila 2-stroke ranks third, with 458 engines, which accounts for 3% of the fleet. Other notable contributors include Pielstick and Sulzer, each with 1.5% of the fleet (211 and 214 engines, respectively). J-ENG follows with 176 engines, representing 1.3%, and Hanshin has 88 engines, contributing 0.6% (Annex - Table 12.1 6). The top three main engine series in the bulker fleet are all from Everllence B. & W. The S50 series leads with 3938 engines, representing 28% of the total fleet. The S60 series follows with 2851 engines, making up 21% of the fleet. In third place is the S70 series, with 989 engines, accounting for 7% of the fleet. These three engine series from Everllence B. & W. make up a significant portion of 56% of the bulker market.

Detailed statistical data on vessel speed (ranging from 5 to 20 knots), main engine power (from 198 to 39800 kW), and main engine specific fuel oil consumption SFOC (ranging from 161 to 200 g/kWh) based on average values can be found in Section 12.1 Bulker Fleet.

Bulk carriers (Figure 3) are a class of cargo vessels specifically designed to transport unpackaged bulk commodities such as coal, grain, ore, and cement in their cargo holds. Technically, these vessels are characterized by large, box-shaped cargo holds, single-deck hulls, and a robust structural design that allows for heavy loading and unloading operations, often without the need for shore-based infrastructure.

Figure 3 - Bulk Carrier

Bulk carriers are traditionally classified into a range of types according to their deadweight tonnage (DWT) and design constraints. The most common categories include:

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- **Mini Bulk Carriers (<10,000 DWT)**,
- **Handysize and Handymax (10,000–49,999 DWT)**,
- **Supramax (50,000–59,999 DWT)**,
- **Ultramax (60,000–65,000 DWT)**,
- **Panamax (60,000–79,999 DWT) - with beam limitation**
- **Capesize (100,000–199,999 DWT)**,
- **Very Large Ore Carriers (VLOCs, 200,000–400,000+ DWT)**.

At the smallest end of the spectrum, Mini Bulk Carriers are used primarily for coastal or inland navigation and often access ports that lack significant infrastructure. Their small size and flexibility make them well-suited for regional operations. Handysize vessels, slightly larger, are common in global trade precisely because they can access smaller ports and are often equipped with onboard cranes, making them self-sufficient in loading and unloading.

As we move up in size, Handymax and its subclass Supramax represent workhorses of medium-range trade, often transporting a broad array of dry commodities. Supramax vessels, typically more modern, are optimized for fuel efficiency and cargo versatility. Ultramax vessels continue this trend, pushing the boundary just above 60,000 DWT with more advanced hull designs and greater cargo capacity, while still retaining the ability to service smaller ports.

Panamax vessels, named after the maximum dimensions permissible in the original Panama Canal, have long been the backbone of international trade routes. With a beam limitation of about 32.31 meters, they represent the largest ships that could navigate the pre-2016 locks of the canal. However, following the expansion of the Panama Canal, Post-Panamax vessels, which exceed those limitations, have grown in number—particularly on long-haul bulk routes where larger cargo volumes reduce transport costs per ton.

Capesize vessels mark a significant jump in capacity, often exceeding 100,000 DWT. These ships are too large for the Panama and Suez Canals, requiring navigation around the Cape of Good Hope or Cape Horn—hence their name. Capesize ships are mainly used for long-haul routes transporting iron ore and coal, typically from Brazil or Australia to Asia. At the top of the size spectrum, Very Large Ore Carriers (VLOCs) can carry over 400,000 DWT and are built for specific high-volume routes, most notably iron ore trade between Brazil and China.

Each vessel type represents a trade-off between size, port access, operational flexibility, and fuel efficiency. As global environmental regulations tighten, especially within the IMO and EU frameworks, the role of vessel type and size becomes even more critical—not only in optimizing cargo flows but in minimizing carbon intensity per ton-mile.

The global bulk carrier fleet exhibits as seen a wide range of vessel sizes, with the average deadweight tonnage (DWT) estimated at approximately **73,100 DWT per vessel**, based on data from INTERCARGO's *Benchmarking Bulk Carriers 2018–2019* report, which accounts for a fleet of **11,718 vessels** totaling about **856 million DWT** [8]. This average reflects a highly heterogeneous fleet structure. The most numerous categories are the **Handymax and Supramax** classes (40,000–59,999 DWT), which collectively represent over **43% of the total number of bulk carriers**, with average tonnage typically ranging from **50,000 to 60,000 DWT**.

These are followed by **Panamax vessels** (60,000–79,999 DWT), which comprise roughly **30% of the fleet** and often average around **70,000 DWT**. While **Capesize and larger vessels** (80,000 DWT and above) constitute only about **6% of the fleet by number**, they account for a disproportionately large share of the total DWT due to their massive size—often exceeding **120,000 DWT**. This skewed distribution explains the relatively high global fleet average despite the numerical dominance of smaller vessels.

The EU bulk carrier fleet aligns with the global fleet in terms of composition, accounting for nearly 8 **% of global vessels by gross tonnage.**

The age profile of the bulk carrier fleet, both globally and within the EU, reflects the dual pressures of operational longevity and the growing demand for efficiency and compliance with environmental standards. As of recent analyses, the global average age of bulk carriers is around 12.9 years, with a noticeable share—over 13%—being more than 21 years old. [9]

Within the EU-flagged fleet, the average age of bulk carriers closely mirrors the global picture. Data from the EU Blue Economy Observatory indicates that the average year of construction for EU bulkers is approximately 2010–2011, translating to a fleet age of 12 to 13 years. The most common classes within the EU fleet, namely Handysize and Handymax/Supramax, are also among the oldest segments, with average ages now exceeding 12 years. [10]

The digital transformation of the bulk carrier fleet is still in its **nascent stage**, especially compared to more data-intensive sectors like container shipping. Most bulk carriers have adopted **basic digital tools**, such as electronic noon reports, voyage planning software, and Electronic Chart Display systems (ECDIS), which streamline operations but offer limited optimization benefits. Predictive maintenance—enabled by IoT sensors and analytics platforms—remains **patchy and inconsistent**. While some operators deploy condition-based monitoring, many fleets continue to rely on traditional, time-based maintenance schedules.

In the EU context, EMSA's digital infrastructure, including **THETIS**, **SafeSeaNet**, and **IMS**, provides extensive shore-side maritime awareness and reporting capabilities. However, **onboard digital adoption lags**, with limited integration of these platforms into bulk carriers' operational workflows—often due to cost barriers and the heterogeneous age of the fleet. [11]

1.1.2. Container Fleet

As of mid-2025, the global container fleet comprises 6,885 vessels, with the vast majority — 6,563 ships (95%)— currently in service. 250 vessels (4%) are idle, while a very small number are under repair, damaged, detained, laid up, or under arrest, collectively representing less than one percent of the fleet (Table 12.2 1). The container vessels account for a total GT of 335677989 (Annex - Table 12.2 8), a total DWT of 376182921 (Table 12.2 9), and a total TEU of 31939375 (Annex - Table 12.2 10).

The fleet is entirely composed of fully cellular container ships, reflecting a uniform carrier type across the segment (Annex - Table 12.2 2).

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In terms of age, the fleet is relatively modern, with the largest share, 1839 vessels (27%), built between 2006 and 2010. Ships constructed between 2011 and 2015 account for 16%, while another 20% of the fleet was delivered between 2021 and 2025. The period from 2001 to 2005 represents 13%, and ships built between 1996 and 2000 account for 8%. Older vessels, built before 1995, make up only about 2% of the fleet, highlighting the recent modernization of container shipping capacity (Annex - Table 12.2 3).

Vessel size distribution is concentrated in the small to medium classes. Ships between 1,000 and 1,999 TEU comprise the largest share, 24% of the fleet, followed by vessels below 1,000 TEU, which make up 20%. Ships in the 2,000–4,999 TEU range collectively account for about 26%, while larger ships above 5,000 TEU represent 31%, with only a small fraction (2%) exceeding 20,000 TEU. This indicates that the fleet is largely composed of medium-sized container ships optimized for regional and global trade routes, with fewer ultra-large vessels in operation (Annex - Table 12.2 4).

Regarding propulsion, the container fleet is predominantly diesel-powered. Around 5,435 vessels (79%) use diesel two-stroke engines, while 1,400 vessels (20%) are powered by diesel four-stroke engines. Alternative power systems such as hybrid, battery-assisted, or steam turbines are present in only a very small number of vessels, collectively accounting for about 1% of the fleet. This underscores the continuing reliance on conventional diesel technology within container shipping (Annex - Table 12.2 5).

The global container fleet is predominantly powered by Everllence B. & W. engines, which lead with 4,417 vessels, representing 64% of the total fleet. Wartsila 2-stroke engines are the second most common, with 470 ships (7%), followed by MaK engines, powering 330 vessels (5%). Together, these three engine designers account for approximately 76% of the fleet. Other notable contributors include Sulzer with 345 vessels (5%) and WinGD with 335 vessels (5%) (Annex - Table 12.2 6). The top three engine series in the container fleet are all from Everllence B. & W.: K90 with 426 units (6.2%), K98 with 644 units (9.4%), and S60 with 703 units (10.2%). Together, these three series account for 25.8% of the total.

Detailed statistical data on vessel speed (ranging from 8 to 29 knots), main engine power (from 360 to 94,860 kW), and main engine specific fuel oil consumption SFOC (ranging from 161 to 207 g/kWh) based on average values can be found in Section 12.2 Container Fleet.

Container ships are among the most vital assets in modern maritime transport, designed specifically to carry standardized intermodal containers that enable the seamless transfer of goods across ships, trucks, and trains. These vessels have revolutionized global trade by dramatically increasing efficiency, reducing cargo handling times, and lowering transport costs per unit. Unlike bulk carriers or tankers, container ships are constructed with large, open holds and reinforced decks that accommodate thousands of containers stacked in tiers. Their design prioritizes space utilization and speed, enabling regular, high-frequency services on fixed routes. As of early 2024, the global container ship fleet is composed of approximately 5,800 vessels, representing over 330 million gross tonnes. This segment accounts for roughly 14 percent of global deadweight capacity and has shown consistent growth, with fleet capacity

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expanding by 7.7 percent in 2023 alone, even amid a tightening regulatory landscape and volatile freight markets.

The composition of the global container fleet reflects a marked stratification by vessel size and function. The most capacity-intensive units are ultra-large container vessels (ULCVs), each capable of transporting more than 20,000 TEU (twenty-foot equivalent units), and in some cases exceeding 24,000 TEU. Although these ships make up only a small share of the total fleet in terms of numbers, they carry a disproportionately large volume of global containerized cargo. Panamax and neo-Panamax vessels, with capacities ranging between 3,000 and 5,000 TEU, remain numerous, particularly on routes where port infrastructure limits the use of ULCVs. Meanwhile, smaller feeder vessels, typically under 1,000 TEU, play a crucial role in short-sea shipping and regional logistics. This mix allows for a hierarchical global system, where large vessels connect major ports across continents, and smaller ones ensure distribution to secondary destinations. [12]

Container ships operate on a liner basis, following fixed schedules and established routes that link the world's key industrial and consumer regions. The major corridors include Asia–Europe, the transpacific (Asia–North America), and the transatlantic (Europe–North America) routes. Voyages on these lanes often span over 10,000 nautical miles, with vessels stopping at multiple hub ports en route. The high frequency and predictability of these services allow shippers to plan logistics with precision. Additionally, smaller feeder vessels extend this network by linking mainline hubs with smaller, less accessible ports. This interconnected system underpins global supply chains, ensuring timely delivery of manufactured goods, electronics, textiles, and consumables to markets worldwide. [12]

The age profile of the container ship fleet reflects a relatively young and continuously renewing segment of the global merchant fleet. The average age of container vessels is estimated at around 11 years, making them one of the newest categories in commercial shipping. Nevertheless, a significant portion—approximately 20 percent, or about 1,100 ships—are over 20 years old. These older vessels face increasing pressure under the International Maritime Organization's recent regulatory measures, particularly those introduced in 2023 related to the Energy Efficiency Existing Ship Index (EEXI) and the Carbon Intensity Indicator (CII). Shipowners must now decide between retrofitting aging tonnage with emissions-reducing technologies or replacing them altogether with more efficient newbuilds, many of which are being designed with alternative fuel capabilities and advanced digital monitoring systems. [13]

Driven by intense competition, globalized supply chains, and a high reliance on schedule reliability, container ship operators have also embraced digital solutions at a faster rate than most other vessel types. Large container lines have invested heavily in integrated fleet management platforms, real-time cargo tracking, predictive maintenance systems, and automated terminal operations. According to the European Maritime Safety Agency (EMSA), container vessels are at the forefront of adopting digital reporting interfaces such as **SafeSeaNet** and **THETIS**, and many are already equipped to comply with the EU's **Maritime Single Window** requirements for electronic data exchange. The International Maritime Organization (IMO) also highlights container ships as early adopters of digital navigation aids,

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including advanced voyage planning tools, electronic chart display systems (ECDIS), and digital condition monitoring for machinery. Automation at the terminal level—particularly in Northern Europe and East Asia—has further reinforced the digitization of the container trade, with fully automated port cranes, gate systems, and yard management software significantly improving cargo throughput and reducing vessel turnaround times. Nonetheless, while leading operators are pushing toward smart ship technologies and autonomous capabilities, EMSA notes that the level of digital maturity remains uneven, particularly among smaller feeder vessels and older tonnage, which may lack the infrastructure to support integrated digital systems. [14]

As EU regulations expand to include real-time emissions reporting and fuel traceability, digital readiness will become a strategic necessity rather than a competitive advantage within the container market.

When comparing the global container fleet with that owned or flagged by European Union member states, several distinctions become apparent. The EU's role in the container shipping sector is disproportionately influential. Although EU-flagged vessels represent approximately 19 percent of the global container ship count and over 20 percent of container ship tonnage, EU-based owners control more than one-third of the global fleet when ownership is considered irrespective of flag. This indicates that while many EU-owned vessels may be registered under flags of convenience, they remain integrated into the European maritime economy and are often subject to EU safety, environmental, and operational standards. Furthermore, EU-flagged container ships tend to be younger and more compliant with the latest environmental regulations. According to EMSA, more than half of the EU-flagged fleet is under 15 years old, reflecting targeted investment in modern, efficient, and low-emission vessels. [12]

1.1.3. Cruise/ Passenger Fleet – Cruise vessels

As of mid-2025, the global cruise fleet comprises 502 vessels, with the majority — 428 ships (85%) — currently in service. Around 35 vessels (7%) are idle, and 19 ships (4%) are under repair. Smaller numbers are laid up, under arrest, or out of service, collectively accounting for less than 5% of the fleet (Annex - Table 12.3 1). The cruise vessels account for a total GT of 29778111 (Table 12.3 8) and a total DWT of 2830403 (Annex - Table 12.3 9).

The fleet consists entirely of cruise ships, indicating a uniform carrier type across this segment (Annex -Table 12.3 2).

In terms of age, the fleet is relatively young and has been gradually modernized. The largest shares are represented by vessels built between 2016 and 2025, accounting for 33% of the fleet. Ships delivered between 2001 and 2010 make up 24%, while those built from 1996 to 2000 account for 12%. Older vessels, particularly those built before 1995, collectively make up about 20% of the fleet, highlighting the presence of some legacy ships alongside more modern tonnage (Annex -Table 12.3 3).

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Regarding size, the fleet is concentrated in medium-sized vessels. Ships in the 10,000–59,999 GT range form the largest segment, 25% of the fleet, followed by vessels between 60,000 and 99,999 GT (18%) and the smaller 0–9,999 GT and 100,000–149,999 GT classes, each around 16%. The largest vessels exceeding 150,000 GT represent about 9% of the fleet. This distribution shows that the majority of cruise ships are medium to large-sized, optimized for typical passenger capacity and amenities (Annex -Table 12.3 4).

The fleet's propulsion technology is diverse, with diesel-electric systems dominating (58%), followed by diesel 4-stroke engines (32%). Alternative propulsion, including hybrid battery-diesel, fuel cell, gas turbine, and wind-assisted systems, is present in smaller numbers, collectively representing around 10% of the fleet. This mix indicates that cruise shipping has begun adopting innovative power systems, though conventional diesel-electric technology remains the backbone of propulsion (Annex -Table 12.3 5).

The cruise fleet is primarily powered by Wartsila engines, with 192 vessels, accounting for 47.5% of the total. MaK and Sulzer engines each power 42 vessels (10.5% each), while Everllence B. & W. engines follow with 75 vessels (18.8%). Together, these four engine designers represent 62% of the fleet (Annex -Table 12.3 6). The cruise fleet is primarily driven by Wartsila VASA 46 engines, with 56 vessels, accounting for 11.1% of the total fleet. Everllence B. & W. 48/60 engines and Sulzer ZAV40 engines each power 31 vessels (6.2% each). Together, these three engine series represent 23.5% of the fleet.

Detailed statistical data on vessel speed (ranging from 9 to 29 knots), main engine power (from 426 to 105600 kW), and main engine SFOC (ranging from 167 to 227 g/kW) can be found in Section 12.3 Cruise/Passenger Fleet - Cruise.

1.1.4. Cruise/ Passenger Fleet – Ferries

As of mid-2025, the ferry fleet comprises 4,099 vessels, the vast majority of which (92%) are in service, with smaller shares idle (5%) or laid up or under repair (3% combined) (Table 12.4 1). The ferries account for a total GT of 21337079 (Table 12.4 8) and a total DWT of 5221049 (Table 12.4 9).

The dominant carrier types are passenger/car ferries (52%) and passenger vessels (28%), followed by passenger/cargo vessels (6%) and Ro-Ro freight/passenger ferries (6%) (Table 12.4 2).

The fleet is relatively modern, with the largest shares built between 2016–2020 (15%) and 2011–2015 (11%), while only 7% date from 1970 or earlier (Table 12.4 3). Smaller ferries dominate the size distribution, as 59% fall within the 0–1,999 GT range and 19% between 2,000–4,999 GT (Table 12.4 4).

From a propulsion perspective, the fleet is overwhelmingly diesel-powered, with 87% using 4-stroke diesel engines and another 4% using diesel-electric systems, while hybrid and battery configurations make up roughly 4% combined (Annex -Table 12.4 5).

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Regarding main engine designers, the ferry fleet is dominated by MTU, which powers 13% of vessels (544 ships), followed by Caterpillar with 8% (323 ships) and Yanmar with 7% (303 ships). Combined, the top three designers account for 29% of the total ferry fleet. Other significant contributors include Everllence B. & W. (7%) and Wärtsilä 4-stroke (6%), , as well as Daihatsu Infinearth and Pielstick, both representing 4–5% of the fleet. (Annex - Table 12.4 6). The top three engine series are all from MTU: MTU 396 with 182 units (4.4%), MTU 4000 with 141 units (3.4%), and MTU 2000 with 140 units (3.4%). Together, these three series account for approximately 11.2% of the total units in the dataset.

Detailed statistical data on vessel speed (ranging from 5 to 58 knots) and main engine power (from 95 to 71446 kW) based on average values can be found in Section 12.4 Cruise/Passenger Fleet - Ferries.

Passenger vessels are ships specifically designed to carry people rather than cargo, and are broadly classified into ferries and cruise ships. Ferries are typically used for short to medium-range transport across coastal or inland waters and often carry vehicles as well as passengers, operating on fixed routes and timetables. Cruise ships, by contrast, are purpose-built for leisure travel, offering accommodation, entertainment, dining, and recreational facilities. These vessels feature complex superstructures with multiple decks, and their design emphasizes safety, comfort, and onboard services. Both vessel types are subject to stringent safety standards under SOLAS (Safety of Life at Sea) regulations and are heavily regulated in terms of passenger capacity, stability, and evacuation procedures.

As of 2023, the global passenger vessel fleet comprises approximately 20,000 vessels, with ferries accounting for the majority in terms of number, and cruise ships dominating in terms of gross tonnage. The cruise ship fleet includes about 300 ocean-going cruise vessels, representing over 30 million GT, with the largest vessels exceeding 230,000 GT and carrying over 6,500 passengers. The ferry segment ranges from small regional vessels to large RoPax ferries operating internationally. According to UNCTAD and EMSA, passenger vessels account for approximately 12% of the global merchant fleet by number.

The passenger fleet is highly diverse. Ferries vary widely in size and design, from double-ended coastal ferries to high-speed catamarans and large RoPax ships capable of transporting both passengers and vehicles. Cruise ships are generally large, with fleets dominated by a few major operators such as Carnival Corporation, Royal Caribbean Group, and MSC Cruises. Recent fleet additions include LNG-powered cruise ships and hybrid-electric ferries, reflecting a shift toward low-emission propulsion systems.

Ferries serve a critical role in regional transport, particularly in archipelagic nations and areas with limited road or rail infrastructure. They operate on regular schedules and are integrated into public transport systems in many countries. Cruise ships, on the other hand, are used exclusively for tourism, sailing fixed or seasonal itineraries in regions like the Caribbean, Mediterranean, and Northern Europe. Cruise itineraries can range from short two-night trips to months-long global voyages. Both vessel types require frequent port calls, making port infrastructure and turnaround efficiency key operational concerns.

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The age distribution of passenger vessels varies between segments. Cruise ships tend to have a younger fleet, with an average age of 15 years and continuous investment in fleet renewal due to high service expectations and safety standards. Many leading cruise lines operate fleets with average ages below 10 years. Ferries, particularly smaller regional vessels, often remain in service for 25 years or more, especially where funding for renewal is limited. However, increasing environmental regulations in the EU and other regions are accelerating investment in newer, greener ferries.

The European Union plays a significant role in the passenger vessel market, especially in the ferry segment. According to EMSA, EU-flagged passenger ships represent a large portion of global ferry traffic, particularly in the Baltic Sea, North Sea, and Mediterranean. EU-flagged cruise vessels, while fewer in number, operate under some of the world's strictest safety and emissions regulations. EMSA data shows that passenger vessels make up 30% of all ships registered under EU flags, a higher proportion than in the global average. European operators are also leaders in hybrid and electric ferry adoption, supported by EU funding and innovation programs.

Passenger vessels are at the forefront of digitalization in shipping. Cruise ships, in particular, feature advanced navigation systems, real-time passenger tracking, digital concierge services, and comprehensive safety management systems. Ferries increasingly use digital ticketing, remote monitoring, and condition-based maintenance tools.

1.1.5. Cruise/ Passenger Fleet – Ro-Ro

As of mid-2025, the global Ro-Ro fleet consists of 745 vessels, with the vast majority, 640 ships (86%), currently in service. Only 84 vessels (11%) are idle, while those laid up, in repair, or damaged represent just 1% each of the total fleet (Annex - Table 12.5 1). Ro-Ro vessels account for a total GT of 14307399 (Annex - Table 12.5 8) and a total DWT of 7505106 (Annex - Table 12.5 9).

By carrier type, pure Ro-Ro ships dominate, accounting for 578 vessels (78%), followed by Ro-Ro/Container combinations with 88 units (12%), and Ro-Ro/Lo-Lo types with 79 vessels (11%) (Annex - Table 12.5 2).

Looking at the year of build, the fleet shows strong representation from ships built between 1996 and 2000, which form the largest share at 14%, followed by vessels constructed during 2011–2015 (12%) and 2006–2010 (12%)(Annex - Table 12.5 3).

In terms of size, the largest Ro-Ro vessels (15,000+ GHG class) make up the biggest portion of the fleet at 35%, followed by the 5,000–9,999 class at 29%, and the 10,000–14,999 class at 23%, indicating a clear trend toward larger-capacity ships (Annex - Table 12.5 4).

The fleet's propulsion is dominated by diesel 4-stroke engines, powering 470 ships (63%), while diesel 2-stroke engines account for 249 vessels (33%). Battery-hybrid or fully electric systems remain rare, together representing less than 3% of the total (Annex - Table 12.5 5).

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The Ro-Ro fleet is predominantly powered by Everllence B. & W. engines, with 267 vessels, representing 35.8% of the total fleet. MaK and Wartsila 4-stroke engines each power 100 vessels (13.4% each), while Sulzer engines follow with 37 vessels (5.0%). Together, these four engine designers represent 67.6% of the fleet (Annex - Table 12.5 6). The top engine series include Everllence B. & W. S50 with 73 vessels (10%), MaK M43 with 39 vessels (5%), and Everllence B. & W. 48/60 and MaK M453 each with 33 vessels (4%). Together, these top engine series represent 24% of the fleet.

Detailed statistical data on vessel speed (ranging from 7 to 30 knots), main engine power (from 405 to 47660 kW), and main engine SFOC (from 166 to 202 g/kW) based on average values can be found in Section 12.5 Cruise/Passenger Fleet - Ro-Ro.

Vehicle carriers—commonly known as Ro-Ro cargo ships, or more specifically as Pure Car Carriers (PCCs) and Pure Car and Truck Carriers (PCTCs)—are specialized vessels designed to serve the global automotive industry. Their primary function is to transport vehicles from manufacturing sites to markets around the world. The sector is largely dominated by a few major players, including NYK Line, Wallenius Wilhelmsen, MOL, and K-Line. However, emerging competitors from the chinese market like BYD are beginning to challenge this dominance, following the quick development of EV chinese market share.

The structural design of vehicle carriers is highly specialized to enable the efficient and secure transport of wheeled cargo. These vessels are equipped with multiple integrated ramps, typically located at the stern and side, allowing for rapid roll-on/roll-off operations without the need for external port equipment such as cranes. Internally, they feature between 10 and 14 enclosed decks, several of which are hoistable or height-adjustable to accommodate various cargo profiles, including high and heavy vehicles. The decks are reinforced where necessary to support concentrated axle loads, and lashing points are distributed throughout to ensure safe securing of cargo during transit. Due to this vertical deck configuration, vehicle carriers have a distinctly tall and box-like superstructure, making them easily recognizable compared to other cargo vessel types. This design maximizes car-equivalent unit (CEU) capacity while supporting fast port turnaround and self-sufficiency in loading operations.

As of 2022, the global fleet comprised approximately 750–800 large Ro-Ro cargo vessels, including PCTCs with capacities reaching 8,000 car-equivalent units (CEUs). The fleet is smaller in number compared to bulk or container ships, but it serves a crucial logistics function in automotive supply chains between Asia, Europe, and North America

Vehicle carriers typically run fixed liner services linking auto manufacturing hubs in Japan, South Korea, China, Germany, and the United States to consumer markets worldwide. Voyages may traverse intercontinental routes via the Suez or Panama Canal and involve ships sailing 10,000+ nautical miles. Within Europe and Asia, smaller Ro-Ros support short-sea shipping, delivering trucks, buses, and industrial vehicles across regional corridors.

EMSA's EU Maritime Profile shows that EU-flagged vehicle carriers account for over 20% of global Ro-Ro GT capacity, with EU owners controlling a dominant share of high-value PCTCs, even if some are flagged under non-EU jurisdictions3. EU-flagged vessels tend to be newer,

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better maintained, and aligned with stringent EU-ETS and FuelEU emissions standards. The EU short-sea Ro-Ro fleet—especially in the Baltic, North Sea, and Mediterranean—features smaller vessels (~3,500 lane meters) that exhibit strong second-hand values.

The age profile of the global vehicle carrier fleet reflects a sector undergoing gradual renewal after years of limited investment. As of 2023, the average age of Pure Car and Truck Carriers (PCTCs) stands at approximately 15 to 17 years, with a significant portion of vessels—particularly those built in the late 1990s and early 2000s—still in active service. This ageing fleet structure is the result of a long period of under-ordering between 2010 and 2020, during which high operating costs and uncertain regulatory developments discouraged large-scale fleet renewal. However, growing environmental pressure from IMO regulations and market demand for more efficient and compliant vessels have triggered a notable surge in newbuilding activity since 2021. Many of these new vessels are designed with dual-fuel engines (typically LNG-ready), improved hull efficiency, and digital monitoring systems. The transition to a younger, cleaner fleet is now underway, but delivery schedules and limited shipyard availability mean that older vessels will likely remain a core component of the fleet for several more years. [15]

Further detailed statistical data on speed, main engine power, and main engine SFOC can be found in Section 12.5 Cruise/Passenger Fleet - Ro-Ro.

1.1.6. Tanker – Oil Tanker Fleet

As of mid-2025, the global oil tanker fleet consists of 2,360 vessels, with the vast majority — 2,137 ships (91%) — actively in service. Around 144 vessels (6%) are idle, and another small portion, including ships in dedicated storage or temporary repairs, accounts for 3% of the fleet (Annex - Table 12.6 1). Crude oil tanker vessels account for a total GT of 238327901 (Annex - Table 12.6 8) and a total DWT of 452676059 (Annex - Table 12.6 9).

The fleet is overwhelmingly composed of conventional tankers (95%), with shuttle tankers (4%) and a handful of oil recovery or transfer vessels making up the remaining 1%. This indicates that most of the fleet is focused on standard oil transport, with specialized functions represented only marginally (Annex - Table 12.6 2).

In terms of age, the fleet is relatively modern. The largest shares are ships built between 2006 and 2020, accounting for 47% of the fleet, while vessels from 2001 to 2005 contribute another 16%, and the newest deliveries from 2021 to 2025 add 11%. Older vessels, built before 2001, make up less than 7% of the fleet, highlighting a predominantly young and efficient fleet profile (Annex - Table 12.6 3).

Looking at size, the fleet is dominated by large tankers. Vessels between 80,000 and 199,999 GT account for 54%, split almost equally between the 80,000–119,999 GT and 120,000–199,999 GT classes. The largest segment, above 200,000 GT, represents 37%, while smaller tankers below 80,000 GT collectively account for less than 5% of the fleet. This shows that the global tanker fleet is primarily structured for high-capacity crude transport (Annex - Table 12.6 4).

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Regarding propulsion, conventional diesel 2-stroke engines dominate (95%), with a smaller share of diesel 4-stroke engines (4%) and minimal adoption of diesel-electric or hybrid systems. Alternative propulsion remains negligible, underscoring the continued reliance on traditional engine technology for large-scale crude transport (Annex - Table 12.6 5).

The main engine market is highly concentrated, with Everllence B.&W. dominating at 1855 units (79%). The next largest contributors are Wärtsilä 2-stroke with 161 units (7%) and WinGD with 122 units (5%), together making up 94% of the fleet's installed engines. Sulzer (4%) and Mitsubishi (1%) follow at a distance, while all other manufacturers each represent less than 1% of the total (Annex - Table 12.6 6). The top engine series from Everllence B. & W. include G80 with 297 vessels (13%), S60 with 448 vessels (20%), and S70 with 362 vessels (16%). Together, these three series account for 49% of the total fleet.

Detailed statistical data on vessel speed (ranging from 8 to 22 knots), main engine power (from 8500 to 35090 kW), and main engine SFOC (from 163 to 184 g/kW) based on average values can be found in Section 12.6 Tanker – Crude Oil Tanker.

The global oil tanker fleet plays a central role in the transportation of crude oil and refined petroleum products, comprising a substantial portion of the world's maritime capacity. As of 2024, the fleet consists of approximately **4,300 vessels** over 1,000 deadweight tons (DWT), with a **combined carrying capacity of nearly 960 million DWT**. This represents around **28–29% of the world's merchant fleet** by tonnage. [16] [17]

The fleet includes both **crude oil tankers**—such as VLCCs, Suezmax, and Aframax—and **product tankers**, which tend to be smaller and are used to transport refined fuels. Crude tankers dominate in terms of tonnage, but product tankers are more numerous, especially in regional and short-haul trades.

Figure 4 - Oil Tanker

The **average size** of an oil tanker (Figure 4) globally is estimated at around **85,000–90,000 DWT**, a weighted average reflecting the balance between massive VLCCs (typically 200,000+ DWT) and smaller product tankers (10,000–60,000 DWT) [18]

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In terms of **age**, the global oil tanker fleet has an average age of about **13 years**, though this varies across sub-segments. Notably, around **18% of all tankers** are **more than 20 years old**. Within the EU, the fleet is comparatively younger, with **more than half of EU-flagged tankers under 15 years old**.

Regarding operational characteristics, **average voyage distances** vary significantly depending on vessel type. **Crude oil tankers**, which often service long-haul intercontinental routes—such as the Middle East to Asia or West Africa to Europe—routinely travel **6,000 to 12,000 nautical miles** per trip. **Product tankers**, on the other hand, tend to operate on **shorter routes**, often between **1,500 and 5,000 nautical miles**, particularly in regional markets such as intra-European, intra-Asian, or North American coastal trades. When averaged across all oil tanker types, the **global average voyage distance** falls between **4,500 and 6,500 nautical miles.** [19]

The **average speed** of oil tankers also reflects operational priorities and vessel type. **Crude carriers** generally operate at **11.5 to 12.5 knots**, often using slow steaming to reduce fuel consumption and emissions over long distances. **Product tankers**, which may face tighter scheduling demands, operate slightly faster, at around **12.5 to 14 knots**. Overall, the **global average speed** of oil tankers is estimated at **12.2–12.5 knots**, consistent with data from the Fourth IMO GHG Study and EMSA MRV reporting. Tankers operating within or near the EU tend to report similar speeds, though may reduce velocity further in Emission Control Areas (ECAs) or congested maritime zones.

The digitalization of the oil tanker sector mirrors the trends observed in the bulk carrier market—characterized by gradual progress, uneven adoption, and a clear divide between basic digital compliance tools and advanced operational technologies. Much like in the bulk segment, the majority of oil tankers today are equipped with fundamental systems such as **ECDIS**, **electronic logbooks**, and **automated reporting software**, primarily to meet regulatory requirements. However, the uptake of more sophisticated digital solutions—such as **real-time performance analytics**, **voyage optimization platforms**, and **predictive maintenance using IoT sensors**—remains limited to a subset of newer or better-funded vessels.

1.1.7. Gas Carriers (LNG)

Gas carriers (Figure 5), often referred to as gas tankers, represent one of the most technologically advanced segments of the maritime sector. These vessels are purpose-built for the transport of liquefied gases—most notably Liquefied Natural Gas (LNG) and Liquefied Petroleum Gas (LPG)—under conditions of high pressure and/or cryogenic temperatures. The design and operation of gas carriers are governed by the International Maritime Organization's IGC Code, which sets strict requirements for cargo containment systems, structural safety, and onboard monitoring1. Containment systems typically fall into two main categories: independent tanks, such as the spherical Moss-type or prismatic Type B/C tanks, and membrane systems like those developed by GTT, which are integrated into the hull. These technologies ensure that volatile cargoes like methane or propane are transported safely over long distances. As of 2024, according to data from SIGTTO and the International Gas Union (IGU), the global fleet includes over 580 LNG carriers and approximately 320 Very Large Gas Carriers (VLGCs) dedicated to LPG, with an additional 200+ units on order. [20]

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Figure 5 - Gas Carrier

The composition of the gas carrier fleet reveals a clear division between large-scale intercontinental vessels and smaller, regionally operated units. LNG carriers dominate in terms of cargo capacity, with individual ships ranging from 125,000 to over 260,000 cubic meters, while VLGCs typically carry 70,000 to 90,000 cubic meters of LPG. A smaller but significant segment of the fleet is made up of pressurized LPG carriers, medium gas carriers, ethylene-capable ships, and more recently, LNG bunkering vessels, which are critical for supporting the use of LNG as a marine fuel3. The fleet is increasingly diversified in terms of propulsion and onboard systems, with a growing share of new deliveries featuring dual-fuel engines that allow vessels to use their own boil-off gas, enhancing both efficiency and environmental performance. This trend aligns with guidance from IMO and SIGTTO, both of which support integrated environmental and safety standards as the fleet adapts to carry new fuels such as ammonia and hydrogen. [21] [22] [23]

In terms of operation, gas carriers typically follow long-distance mission profiles, connecting major exporters such as Qatar, the United States, and Australia to markets in Europe and Asia. LNG carriers routinely sail routes of 10,000 nautical miles or more, while VLGCs transport LPG across similar distances or via regional hubs like the Panama Canal. Smaller gas tankers and LNG bunkering vessels operate shorter loops, delivering to local terminals and refueling facilities. These mission profiles are supported by the port inspection and monitoring systems of EMSA, which also plays a role in certifying LNG bunkering safety standards across the EU.

The age profile of the gas carrier fleet reflects a sector in steady renewal. According to the IGU and SIGTTO, most large LNG and LPG carriers currently in operation were delivered after 2010, with the average age of the LNG fleet estimated at 8–12 years, depending on vessel type. The relatively young age of the fleet correlates with the need to comply with strict safety protocols under the IGC Code and with increasing pressure to decarbonize. A large orderbook—particularly for LNG carriers—suggests that this modernization will continue, with newbuilds increasingly being delivered with ammonia-ready propulsion systems and advanced containment technology.

This particular age profile has a direct impact on the level of modern and digital technologies found on board, especially when it comes to monitoring and safety systems. The digitalization of gas tanker ships is progressing steadily, pushed forward by both regulatory pressures and the inherently complex nature of transporting liquefied gases. Compared to conventional cargo vessels, gas carriers already depend heavily on systems that ensure precise environmental control, continuous cargo monitoring, and real-time safety oversight. These operational demands make gas tankers especially well-suited to benefit from deeper digital integration. New-generation LNG and LPG carriers are increasingly equipped with integrated digital monitoring systems for cargo pressure, temperature, and boil-off gas management, as well as electronic control units for dual-fuel propulsion systems. Digitalization also supports enhanced voyage planning, remote diagnostics, and condition-based maintenance, enabling operators to improve fuel efficiency and safety while reducing unplanned downtime. The IGC Code, in its 2022 consolidated edition, encourages the use of digital solutions for alarm and control systems, especially in vessels designed for alternative fuels like ammonia and hydrogen. Within the European context, EMSA facilitates digital oversight through platforms such as SafeSeaNet, which tracks gas carrier movements and port state control inspections and is actively working on integrating real-time emissions reporting for gas-fueled vessels. [24]

When comparing the global fleet with the EU-owned fleet, several distinctions emerge. While the majority of gas carriers are flagged outside the EU, European shipowners and operators control a large share of the technologically advanced LNG fleet, including numerous dual-fuel ships and LNG bunkering vessels. These carriers typically exceed international safety and environmental requirements and benefit from EMSA's regulatory oversight, particularly in digital reporting and bunkering operations. The EU's leadership is further reinforced by its proactive stance on shipping decarbonization, with instruments like the EU ETS and FuelEU Maritime poised to accelerate investment in cleaner gas-fueled ships. As a result, EU-controlled gas carriers often represent the cutting edge of global fleet capabilities, even if they are not always EU-flagged. 16

1.1.8. Tanker – Special Tanker Fleet

As of mid-2025, the special tanker fleet comprises 204 vessels, with the vast majority —196 ships (96%) — actively in service. Only a few vessels are idle, laid up, or under repairs, collectively representing about 4% of the fleet (Annex - Table 12.7 1). Special tanker vessels account for a total GT of 699017 (Annex - Table 12.7 8) and a total DWT of 957072 (Annex - Table 12.7 9).

The fleet is diverse in terms of cargo type, but the top categories dominate. Edible oil carriers (27%) and waste disposal carriers (26%) together account for more than half of all vessels. Other significant categories include water carriers (16%) and molten sulphur carriers (15%), while the remaining types — including fruit juice, wine, sulphuric acid, and product/Ro-Ro carriers — collectively make up less than 10% of the fleet (Annex - Table 12.7 2).

In terms of age, the fleet shows a mix of older and newer vessels. Ships built between 1970 and 1980 account for 34% of the fleet, while more recent vessels built between 2011 and 2020 represent 27%. The newest deliveries from 2021 to 2025 contribute only 2%, reflecting a slow renewal of this specialized fleet (Annex - Table 12.7 3).

Most of the fleet consists of smaller vessels, with vessels under 5,000 GT making up 83% of the fleet. Medium-sized ships in the 5,000–19,999 GT range account for 11%, and larger

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vessels above 20,000 GT are rare, representing only about 5% of the fleet (Annex - Table 12.7 4).

Regarding propulsion, the fleet is overwhelmingly powered by diesel 4-stroke engines (88%), with a small share using diesel 2-stroke engines (11%) and a minimal number of diesel-electric vessels (Annex - Table 12.7 5).

The main engine propulsion is dominated by a handful of key engine makers. The top three main engine designers in the fleet are Hanshin, with 27 vessels (13.2%), followed closely by Everllence B. & W., powering 19 vessels (9.3%), and Akasaka with 18 vessels (8.8%). Together, these three engine designers represent 31.4% of the total fleet (Annex - Table 12.7 6). The top main engine designers and their corresponding series in the special tanker fleet are Hanshin with the LH (11 vessels, 5%) and LU (7 vessels, 3%), Everllence B. & W. with the S50 series (6 vessels, 3%), as well as Caterpillar with the C32 series and Yanmar with the AYM series powers both 6-6 vessels (3%). Together, these engine designers and series account for 17.8% of the total fleet.

Detailed statistical data on vessel speed (ranging from 7 to 22 knots), main engine power (from 184 to 28501 kW), and main engine SFOC (from 167 to 196 g/kW) based on average values can be found in Section 12.7 Tanker Special Tanker.

1.1.9. Tanker – LNG Tanker Fleet

As of mid-2025, the LNG tanker fleet consists of 819 vessels, with the majority — 741 ships (90%) — actively in service. A smaller portion of the fleet is idle, laid up, under repairs, or in storage, collectively representing around 10% of vessels (Annex - Table 12.8 1). The LNG tanker fleet accounts for a total GT of 85245461 (Annex - Table 12.8 8) and a total DWT of 67391551 (Annex - Table 12.8 9).

The fleet is heavily dominated by LNG carriers, which make up 89% of the total. Other vessel types, such as LNG regasification vessels (5%), LNG bunkering vessels (3%), and LNG/ethylene/LPG carriers (2%) collectively make up the remaining 10%, while a minimal number of specialized carriers, including CNG and LNG & oil bunkering vessels, are rare (Annex - Table 12.8 2).

The LNG fleet is relatively modern, with the largest share of vessels built between 2021 and 2025 (28%) and 2016 to 2020 (25%), reflecting ongoing fleet expansion and renewal. Older vessels from 2006 to 2010 account for 22%, while ships built before 2006 represent only 12% of the fleet, indicating a generally young and technologically up-to-date composition (Annex - Table 12.8 3).

Most vessels are in the 100,000–199,999 GT range, comprising 83% of the fleet. Smaller LNG vessels under 50,000 GT account for 9%, while very large ships above 200,000 GT make up 7% of the fleet (Annex - Table 12.8 4).

The LNG fleet employs a variety of propulsion systems. While diesel 2-stroke engines power 42% of the fleet, a significant portion uses diesel-electric (27%) and steam turbines (26%),

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reflecting the specialized requirements of LNG transportation. Combined systems account for the remaining 1% (Annex - Table 12.8 5).

The LNG carrier fleet is dominated by Everllence B. & W., Wartsila, and WinGD, which together power 72% of the global fleet. Everllence B. & W. leads with 220 vessels (27%), followed closely by Wartsila with 209 ships (26%) and WinGD with 154 (19%). Other notable designers include Kawasaki with 123 vessels (15%) and Mitsubishi with 89 (11%), while all remaining manufacturers individually represent 1% or less of the total (Annex - Table 12.8 6). Focusing on main engine designers and series, Wärtsilä dominates the market with its 50 series, which accounts for 23.2% of all installed engines (190 units). This makes it the single most prevalent engine series among LNG carriers. Following closely, Everllence B&W's G70ME series represents 17.2% of the total (141 units), securing the second position. WinGD's X72DF ranks third with 137 units or 16.7%, reflecting the growing adoption of dual-fuel, high-efficiency engines. Kawasaki's UA series holds 14.4% of the share (118 units), while Mitsubishi's MS-2 series follows with 8.5% (70 units). Together, these top five engine series account for nearly 80% of the total LNG carrier main engine installations.

Detailed statistical data on vessel speed (ranging from 6 to 22 knots), main engine power (from 960 to 64350 kW), and main engine SFOC (from 166 to 199 g/kW) based on average values can be found in Section 12.8 Tanker LNG.

1.1.10. Tanker – LPG Tanker Fleet

As of mid-2025, the LPG tanker fleet consists of 1,586 vessels, with the vast majority — 1,482 ships (93%) — actively in service. A smaller portion of the fleet is idle, laid up, under repairs, or otherwise out of service, collectively representing around 7% of vessels (Annex - Table 12.9 1). The LPG tanker fleet accounts for a total GT of 31398866 (Annex - Table 12.9 8) and a total DWT of 35321556 (Annex - Table 12.9 9).

The fleet is predominantly composed of LPG carriers, which account for 87% of the total. Other vessel types include ethylene/LPG carriers (11%) and ethane/LPG carriers (2%), while specialized carriers such as liquid hydrogen and LCO2 vessels make up a negligible share (Annex - Table 12.9 2).

The fleet is relatively modern, with a strong concentration of vessels built between 2006 and 2020, representing 54% of the fleet. Ships built in the most recent period, 2021–2025, account for 16%, while older vessels from 1996 to 2005 contribute around 17%. Only a small fraction of vessels date back to before 1995 (Annex - Table 12.9 3).

In terms of size, the majority of LPG tankers are smaller vessels under 50,000 GT, making up 71% of the fleet, while the remaining 29% are in the 50,000–99,999 GT range. There are very few extremely large LPG carriers, reflecting the operational focus on regional and medium-scale transport (Annex - Table 12.9 4).

The LPG fleet primarily relies on diesel 2-stroke engines, powering 72% of vessels, while diesel 4-stroke engines account for 28%. Diesel-electric and hybrid systems are extremely rare,

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highlighting the fleet's reliance on conventional propulsion technology for efficiency and reliability (Annex - Table 12.9 5).

In the LPG fleet, Everllence B. & W. is by far the dominant engine designer, supplying 1003 engines, which accounts for 63.2% of the total fleet. Mitsubishi follows with 140 engines, making up 8.8%, while Akasaka contributes 116 engines, representing 7.3% of the fleet. These three together account for 79.3% of the total fleet. Other notable designers include Hanshin with 72 engines (4.5%) and MaK with 44 engines (2.8%) (Annex - Table 12.9 6). The top three main engine series in the LPG tanker fleet are all from Everllence B. & W.. The G60 series leads with 230 engines, accounting for 14.5% of the fleet. The S50 series follows closely with 143 engines, representing 9.0%, while the S60 series has 141 engines, making up 8.9%. Together, these three engine series from Everllence B. & W. make up a substantial portion of 32,4% of the LPG tanker fleet

Detailed statistical data on vessel speed (ranging from 8 to 23 knots), main engine power (from 216 to 18050 kW), and main engine SFOC (from 164 to 199 g/kW) based on average values can be found in Section 12.9 Tanker LPG.

1.1.11. Tanker – Product Tanker Fleet

The product tanker fleet comprises 11,123 vessels, with the vast majority — 10,563 ships (95%) — actively in service. Smaller portions of the fleet are idle, laid up, under repairs, or in storage, collectively accounting for roughly 5% of the total (Annex - Table 12.10 1). The product tanker fleet accounts for a total GT of 155577517 (Annex - Table 12.10 8) and a total DWT of 256690957 (Annex - Table 12.10 9).

In terms of vessel types, the fleet is dominated by chemical & oil carriers, which make up 50% of the total. Product carriers represent another 42%, while smaller shares consist of asphalt & bitumen carriers (2%), oil bunkering tankers (3%), and other specialized vessels including methanol carriers and mixed-purpose tankers (Annex - Table 12.10 2).

The fleet has a strong concentration of relatively modern ships. The largest groups were built between 2006 and 2015, representing 43% of the fleet. Ships from 2016–2025 account for 22%, while older vessels built before 2000 make up only 20%, reflecting ongoing fleet renewal (Annex - Table 12.10 3).

Regarding size, the fleet is heavily weighted toward smaller and medium-sized vessels. Ships under 5,000 GT account for 34%, while those in the 20,000–59,999 GT range make up 26%. Medium-large vessels of 5,000–19,999 GT collectively contribute 31%, and very large ships over 80,000 GT are minimal, reflecting the fleet's focus on regional and coastal product transport rather than ultra-large crude oil shipments (Annex - Table 12.10 4).

The fleet's propulsion is nearly evenly split between diesel 2-stroke engines (47%) and diesel 4-stroke engines (52%), with very few vessels using diesel-electric or hybrid systems (Annex - Table 12.10 5).

The largest share of main engines is supplied by Everllence B. & W. is the dominant engine designer, with 4,877 engines, which account for 43.8% of the total fleet. Following in second

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place is Hanshin, providing 684 engines, representing 6.1% of the fleet. Wartsila 4-stroke comes in third with 529 engines, making up 4.8%. These three designers account together for 54,8% of the fleet (Annex - Table 12.10 6). The top three engine series in the product tanker fleet belong to the engine designer Everllence B. & W. The S50 series leads with 1561 engines, making up 14.0% of the fleet. The S35 series follows with 602 engines, representing 5.4%, while the G50 series has 591 engines, accounting for 5.3%. Together, these three engine series account for 24,8% of the fleet.

Detailed statistical data on vessel speed (ranging from 5 to 24 knots), main engine power (from 63 to 32928 kW), and main engine SFOC (from 164 to 212 g/kW) based on average values can be found in Section 12.10 Tanker Product.

1.1.12. Tanker – Crude Tanker Fleet

The crude oil tanker fleet consists of 2271 vessels, with the vast majority — 2042 ships (90%) — actively in service. Smaller portions are idle (159 vessels, or 7%), in storage (38 vessels, or 2%), under repairs (10 vessels, or 0%), or detained (2 vessels, or 0%), collectively accounting for approximately 10% of the fleet (Annex - Table 12.11 1). The fleet has a total GT of 238327901 (Annex - Table 12.11 8) and a total DWT of 452676059 (Annex - Table 12.11 9).

The fleet is relatively specialized, with most ships classified as tanker vessels (96%), while a smaller number are shuttle tankers (4%) and oil recovery tankers (<1%) (Annex - Table 12.11 2).

In terms of age, the fleet is a mix of modern and older vessels. The largest share of vessels were built between 2006 and 2010, representing 24% of the fleet, followed by ships built between 2016 and 2020 at 24%, and ships built between 2001 and 2005 accounting for 18%. Older vessels, built before 2000, make up 4% of the fleet, reflecting a steady renewal of the fleet (Annex - Table 12.11 3).

In terms of size, the fleet is concentrated in large and super-large vessels. Ships in the 80,000–119,999 DWT class make up 29%, while 120,000–199,999 DWT vessels represent 29%, and 200,000+ DWT vessels make up the largest share, at 39% of the fleet (Annex - Table 12.11 4).

Regarding propulsion, the fleet overwhelmingly relies on diesel 2-stroke engines, with 99% of the fleet powered by these engines. A very small portion of vessels uses diesel-electric systems (<1%), while combined power systems and batteries represent an even smaller share (Annex - Table 12.11 5).

In the crude oil tanker fleet, Everllence B. & W. is the dominant engine designer, supplying 1855 engines, which account for 82% of the total fleet. Wartsila 2-stroke comes second with 161 engines, representing 7%, while WinGD supplies 122 engines, making up 5%. Together, these three designers account for 94% of the fleet (Annex - Table 12.11 6). The top three main engine series in the crude oil tanker fleet are all designed by Everllence B. & W. The S60 series is the most common, powering 448 vessels and accounting for 20% of the fleet. It is followed by the S70 series, installed in 362 vessels (16%), and the G80 series, which powers 297 vessels

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(13%). Collectively, these three engine series make up nearly half of the crude oil tanker fleet (49%).

Detailed statistical data on vessel speed (ranging from 8 to 22 knots), main engine power (from 8500 to 35090 kW), and main engine SFOC (from 163 to 184 g/kW) based on average values can be found in Section 12.6 Tanker – Crude Oil Tanker.

1.1.13. Tanker – Chemical Tanker Fleet

The chemical tanker fleet consists of 3705 vessels, with the vast majority — 3,498 ships (94%) — actively in service. Smaller portions are idle, laid up, under repairs, or detained, collectively accounting for roughly 6% of the fleet (Annex - Table 12.12 1). The chemical tanker fleet accounts for a total GT of 34098032 (Annex - Table 12.12 8) and a total DWT of 53102902 (Annex - Table 12.12 9).

The fleet is highly specialized, with almost all ships classified as chemical & oil carriers (99.9%), while a negligible number are chemical & LPG carriers or slop reception vessels (Annex - Table 12.12 2).

In terms of age, the fleet is largely modern, with the largest share of vessels built between 2006 and 2010, representing 33%. Ships from 2016–2025 account for 25%, while older vessels built before 2000 make up only about 16%, indicating ongoing fleet renewal and replacement of older units (Annex - Table 12.12 3).

The fleet is concentrated in small to medium sizes. Ships under 10,000 GT make up 48%, with 10,000–19,999 GT vessels contributing another 33%. Larger vessels over 20,000 GT are limited to 19%, reflecting the chemical tanker sector's focus on smaller, flexible vessels suitable for varied cargoes (Annex - Table 12.12 4).

Regarding propulsion, the fleet is almost evenly split between diesel 2-stroke engines (50%) and diesel 4-stroke engines (48%), with minor use of diesel-electric or hybrid systems. This demonstrates a preference for conventional diesel technologies for reliability and efficiency in chemical transport (Annex - Table 12.12 5).

In the chemical tanker fleet, Everllence B. & W. is the leading engine designer, supplying 1,777 engines, which account for 48.0% of the total fleet. MaK follows with 352 engines, representing 9.5%, while Wartsila 4-stroke comes in third with 285 engines, making up 7.7%. These three designers account for 65% of the fleet (Annex - Table 12.12 6). The top three main engine series in the chemical tanker fleet belong all to Everllence B. & W. The S35 series leads with 520 engines, accounting for 14.0% of the fleet. The L35 series follows with 225 engines, representing 6.1%, while the S50 series has 214 engines, making up 5.8%. Together, these three engine series account for 25.9% of the chemical tanker fleet.

Detailed statistical data on vessel speed (ranging from 8 to 24 knots), main engine power (from 216 to 13085 kW), and main engine SFOC (from 163 to 210 g/kW) based on average values can be found in Section 12.12 Tanker - Chemical.

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1.1.14. General Cargo – General Cargo

The global general cargo fleet consists of 15,002 vessels, with a dominant 95% (14,251 ships) actively in service. Only a small fraction is idle, under repairs, or otherwise unavailable (Annex - Table 12.13 1. The general cargo fleet accounts for a total GT of 34098032 (Annex - Table 12.13 8) and a total DWT of 119277413 (Annex - Table 12.13 9).

The fleet is diverse in vessel type. The majority are general cargo ships (54%), followed by multi-purpose vessels (19%), open hatch carriers (7%), and landing craft (6%). Other specialized vessels like Ro-Ro, livestock carriers, and deck cargo carriers make up smaller percentages, reflecting the variety of cargo types served (Annex - Table 12.13 2).

The fleet shows a wide age range. Around 33% of vessels were built between 2006–2015, making them relatively modern, while older ships built before 2000 still account for roughly 42%, suggesting ongoing fleet renewal but with a significant legacy fleet still in operation (Annex - Table 12.13 3).

Most vessels are small to medium in size. Ships under 5,000 GT comprise 56%, and those between 5,000–9,999 GT add another 25%. Medium-large vessels over 10,000 GT account for about 19%, showing that general cargo operations rely heavily on smaller, versatile ships (Annex - Table 12.13 4).

Regarding propulsion, diesel 4-stroke engines dominate (80%), while diesel 2-stroke engines account for 19%. Other technologies such as diesel-electric, hybrid, batteries, steam, or wind-assisted propulsion are minimal, highlighting conventional diesel as the mainstay for cargo operations (Annex - Table 12.13 5).

The general cargo fleet is highly diverse in terms of main engine designers, but three players dominate the segment. Everllence B. & W. is the leading engine designer, providing 2,566 engines, which account for 17.1% of the total fleet. MaK follows with 1,602 engines, representing 10.7%, while Hanshin comes in third with 872 engines, making up 5.8%. Together, they account for 38% of the total fleet engine (Annex - Table 12.13 6). When looking at the top main engine series, 10% of the fleet is made up of engines with unidentified series (1,495 engines). The Everllence B. & W. S50 series follows, with 504 engines, representing 3.4% of the fleet. The SKL 48 series ranks third, with 470 engines, contributing 3.1%, while the MaK M25 series is fourth, with 433 engines, accounting for 2.9%. In total, these four engine series represent 19% of the general cargo fleet.

Detailed statistical data on vessel speed (ranging from 6 to 30 knots), main engine power (from 16 to 49291 kW), and main engine SFOC (from 163 to 221 g/kW) based on average values can be found in Section 12.13 General Cargo - General Cargo.

A general cargo ship is a versatile merchant vessel designed to carry various packaged goods—such as machinery, steel products, vehicles, and bagged commodities—using onboard cranes or derricks. Unlike container, bulk, or gas carriers, and refrigerated (reefer) ships, general cargo vessels cater to cargo that isn't containerized but still requires protected stowage and flexible port access. According to Equasis and EMSA, the global fleet includes approximately 126,900 general cargo ships of over 100 GT, comprising around 450 million GT in total tonnage, making them one of the largest non-container vessel categories by number and significant by tonnage.

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Figure 6 Containership

General cargo ships predominantly fall into **small and medium size categories**—from coastal coasters (<500 GT) to multipurpose vessels up to 25,000 GT. Equasis data from 2022 reveals that **small (<500 GT)** and **medium (500–25,000 GT)** vessels account for over **84% of all ships** by number in the world merchant fleet, and general cargo represents around **13% of that** segment. In contrast, large general cargo vessels (25,000–60,000 GT) and very large (>60,000 GT) variants are rarer. This reflects the flexible, regional role that general cargo ships typically play in global shipping.

General cargo ships serve **diverse inter-regional and short-sea routes**, linking smaller ports and carrying break-bulk goods not suited to standard containerization. They are a crucial part of supply chains, supplying regional hubs and transporting specialized cargoes—e.g. wind turbine components, heavy machinery, or project cargo. These vessels often travel on irregular tramp or liner schedules, allowing charters to dictate routes based on need. Their onboard gear makes them ideal for ports without shore-based cranes or infrastructure.

The age distribution within the global merchant fleet shows a **bimodal pattern**, particularly among small and medium vessels. Equasis data indicates that around **57% of small vessels are over 25 years old**, and **39% of medium vessels are in that age bracket**, while only about **9%** of the total fleet comprises ships aged 0–4 years. As general cargo vessels are mostly small or medium-sized, the segment is notably aged. Most newbuild activity is focused elsewhere—such as in containers or tankers—leaving general cargo less modernized and more exposed to evolving environmental regulation.

The digitalization and automation of the general cargo ship market remain limited in scope compared to more specialized and higher-revenue segments such as container, gas, or tanker shipping. General cargo vessels are typically smaller, more versatile ships operating on short-sea or regional trades, where margins are tighter and investment in advanced technology is slower. According to the **European Maritime Safety Agency (EMSA)**, general cargo ships

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exhibit the lowest uptake of digital and automated systems across all cargo ship categories, with many older vessels still relying on manual reporting and conventional bridge instrumentation.

Globally, the general cargo sector is defined by high vessel counts and an ageing profile, but comparatively lower average tonnage per ship. Within the European Union, general cargo vessels represent a substantial part of the EU-flagged merchant fleet, especially in countries with significant coastal trade such as the Netherlands, Germany, and Greece. According to EMSA's EU Maritime Profile and fleet data dashboards, the EU-flagged fleet includes over 2,500 general cargo vessels, most of which operate below 25,000 GT and are active in short-sea shipping within the EEA1. These vessels tend to be slightly newer than the global average, as EU regulations—including the EU MRV and ETS—place growing pressure on shipowners to upgrade to more efficient, compliant vessels. Nevertheless, EMSA also notes that a large portion of general cargo ships in the EU still fall into the 20+ years category, especially those operating in secondary or seasonal trades1.

When ownership is considered rather than flag, EU-based owners control a larger share of the general cargo fleet, including ships flagged outside the EU. This broader economic footprint supports the EU's influential position in regional trade and its alignment with IMO and EU environmental targets. However, the sector still faces challenges in fleet renewal, digital integration, and emissions performance—partly due to the operational diversity and lower revenue potential compared to large-volume carriers.

1.1.15. General Cargo – Multipurpose (MPP) Fleet

The global multipurpose (MPP) cargo fleet counts 3,354 vessels, with 94% (3,155 ships) actively in service, indicating a very high operational rate. Only a small fraction is idle (4%) or under repair (1%), showing stable utilization across the segment (Annex - Table 12.14 1). The MPP fleet accounts for a total GT of 23562920 (Annex - Table 12.14 8) and a total DWT of 31982744 (Annex - Table 12.14 9).

In terms of vessel type, multi-purpose ships dominate with 86% of the fleet, while multi-purpose/heavy-lift vessels make up the remaining 14%. This balance reflects the dual focus of the segment — flexible cargo operations and specialized heavy-lift capabilities (Annex - Table 12.14 2).

The age profile reveals a mature but modernizing fleet. Roughly 42% of the vessels were built between 2001 and 2015, while 19% are from 2016–2025, suggesting ongoing renewal. Older ships (built before 2000) still represent about 39%, indicating that many MPPs remain in service well beyond two decades due to their versatile roles (Annex - Table 12.14 3).

Size-wise, the fleet is centered on medium-tonnage vessels: 71% fall within the 0–9,999 GT range, while another 20% lie between 10,000–19,999 GT. Only 9% exceed 20,000 GT,

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underscoring that the MPP segment primarily serves regional and specialized global trades rather than bulk long-haul operations (Annex - Table 12.14 4).

Propulsion remains overwhelmingly conventional. Diesel 4-stroke engines power 81% of the fleet, while diesel 2-stroke engines account for 19%. Diesel-electric systems are marginal (0,4%), confirming limited penetration of alternative propulsion technologies in this sector (Annex - Table 12.14 5).

The MPP fleet is dominated by MaK, which accounts for 1,055 vessels (31%), followed by Everllence B. & W. with 614 ships (18%) and Wartsila 4-stroke with 464 units (14%). Together, these top three make up 63% of the total fleet. Other notable contributors include Deutz (5%), Daihatsu Infinearth, Guangzhou Diesel, Hanshin, SKL, Ningbo C.S.I. Power, and Wartsila 2-stroke, each representing around 2% of the total (Annex - Table 12.14 6). The top three engine series are MaK M32 with 316 units (9.4% of the total 3,354 engines), MaK M25 with 306 units (9.1%), and Wartsila 4-stroke 20 series with 144 units (4.3%). These three series alone account for over 22% of the fleet.

Detailed statistical data on vessel speed (ranging from 5 to 21 knots), main engine power (from426 to 26010 kW), and main engine SFOC (from 164 to 202 g/kW) based on average values can be found in Section 12.14 General Cargo – MPP.

1.1.16. General Cargo – Vehicle Carriers (PCCs)

The Pure Car Carrier (PCC) fleet consists of 847 vessels, with an impressive 96% currently in service, indicating a highly active segment that operates with minimal downtime. Only 3% of ships are idle, while the remainder are under repair or temporarily inactive (Annex - Table 12.15 1). The PCC fleet accounts for a total GT of 44017107 (Annex - Table 12.15 8), a total DWT of 44017107 (Annex - Table 12.15 9), and a total cargo load capacity of 4620908 (Annex - Table 12.15 10).

The entire fleet is composed of Pure Car Carriers, emphasizing the sector's specialization in automobile and vehicle transport (Annex - Table 12.15 2).

The age profile reveals a relatively modern fleet: the major expansion period occurred between 2006 and 2015, when nearly 50% of today's PCCs were built. More recently, 22% of the fleet was constructed between 2016 and 2025, signaling continued renewal to meet stricter environmental standards and capacity growth. Only a small minority (around 17%) predate the year 2000 (Annex - Table 12.15 3).

In terms of size, PCCs are dominated by larger vessels — 70% belong to the 15,000 GT and above category, underscoring the industry's focus on economies of scale and global deep-sea operations. Medium-sized carriers (10,000–14,999 GT) account for 15%, while smaller classes below 10,000 GT make up less than 15% combined (Annex - Table 12.15 4).

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The propulsion profile remains largely conventional: diesel 2-stroke engines power 92% of the fleet, while diesel 4-stroke units make up 5%. Notably, 3% already feature battery-assisted diesel hybrid systems (Annex - Table 12.15 5).

The PCC fleet is primarily powered by three engine designers: MaK, Everllence B. & W., and Wartsila 4-stroke. MaK leads with 31.5% of the engines in the fleet, followed by Everllence B. & W. at 19.4%, and Wartsila 4-stroke with 13.8%. They account for 64,7% of the total MPP fleet (Annex - Table 12.15 6). The top three main engine series in the fleet are from Everllence B. & W. and Mitsubishi. The leading series is the Everllence B. & W. S60, with 317 units, representing 37.5% of the total. Following closely is the Mitsubishi UEC60, with 180 units, accounting for 21.3%, and the Everllence B. & W. S50, which has 104 units, making up 12.3%.

Detailed statistical data on vessel speed (ranging from 10 to 25 knots), main engine power (from 662 to 19125 kW), and main engine SFOC (from 166 to 189 g/kW) based on average values can be found in Section 12.15 General Cargo – PCC.

1.1.17. General Cargo - Refrigerated Cargo (Reefer)

The reefer fleet comprises 911 vessels, with the overwhelming majority—98%—currently in service, underscoring the sector's high operational utilization. Only a small fraction of vessels are laid up or under repair (Annex - Table 12.16 1). The reefer fleet accounts for a total GT of 4214565 (Annex - Table 12.16 8) and a total DWT of 4386676 (Annex - Table 12.16 9).

The fleet is primarily composed of reefer ships (67%), while reefer fish carriers make up another 30%, reflecting the segment's strong role in the global trade of perishable and seafood products. Other specialized vessel types, such as reefer/general cargo or pallet carriers, each represent less than 2% of the total fleet (Annex - Table 12.16 2).

In terms of age, the reefer fleet is notably older compared to many other cargo sectors. The largest shares were built between 1981 and 1995, accounting for nearly half of the fleet. Only 19% of vessels were constructed after 2010, with a small renewal wave visible in the 2016–2025 period (Annex - Table 12.16 3).

From a size perspective, most reefers are relatively small to medium-sized: 37% fall in the 0–1,999 GT class, while 47% lie between 2,000 and 9,999 GT. Larger vessels above 10,000 GT make up just 16%, underscoring the fleet's focus on regional and niche refrigerated trades rather than large-scale liner operations (Annex - Table 12.16 4).

Regarding propulsion, the fleet is evenly split between diesel 2-stroke (46%) and diesel 4-stroke (54%) engines. Hybrid systems remain rare, with only a handful of vessels (<1%) using battery-assisted diesel configurations, reflecting a slow uptake of alternative technologies in this mature segment (Annex - Table 12.16 5).

The leading main engine designers in the reefer fleet are Everllence B. & W., with 254 ships (28%), Mitsubishi with 155 ships (17%), and Akasaka with 78 ships (9%). Other notable players

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include SKL with 69 ships (8%) and MaK with 40 ships (4%), while the remaining engines, including 96 ships (11%) of unknown origin, account for the rest of the fleet (Annex - Table 12.16 6). The Mitsubishi UEC45 series leads with 55 units, making up 6.0% of the fleet. In second place is the SKL 48 series, with 54 units, accounting for 5.9%. The third most common engine series is the Everllence B. & W. S60, which has 44 units, representing 4.8% of the fleet. Together they account for 22,5% of the fleet.

Detailed statistical data on vessel speed (ranging from 6 to 23 knots), main engine power (from 165 to 18760 kW), and main engine SFOC (from 164 to 210 g/kW) based on average values can be found in Section 12.16 General Cargo – Reefer.

Refrigerated cargo ships—known as **reefer ships**—are purpose-built for transporting perishable goods such as fruits, vegetables, meat, dairy, and pharmaceuticals that require controlled temperature environments. Unlike standardized reefer containers carried on all container vessels, these ships feature built-in refrigerated holds and dedicated climate-control systems embedded in their design. According to **UNCTAD**, as of 2021, there were approximately **920 dedicated refrigerated cargo vessels**, representing a small but vital portion of the world fleet and contributing roughly **9% of global merchant fleet deadweight tonnage** on a per-ship basis.

Reefer ships primarily operate between producing regions—Latin America, Africa, Oceania—and consumption markets—Europe, North America, and Asia. Voyages typically span 5,000–10,000 nautical miles and require robust logistical coordination to maintain cold chain integrity. Unlike containerized reefers, dedicated reefer vessels often service niche trades, such as fresh fruit runs from Chile to Europe or fish from Alaska to Asia. They rely on temperature monitoring, backup refrigeration, and walkthrough access to ensure safe transit. The refrigerated cargo fleet tends to be **older than container or gas ship fleets**, with average ages often exceeding **15–20 years**. This is partly due to the extended service life of insulated vessels and the limited replacement rate. Many units entering scrappage are replaced by container ships carrying refrigerated boxes—a trend that underscores the technological shift toward modular refrigeration over dedicated ships.

1.1.18. General Cargo – Combination Carriers (Combos)

The combination carrier fleet (commonly referred to as combo carriers) remains a niche segment within the global shipping market, consisting of only 12 vessels as of mid-2025. Despite its small size, the majority of the fleet—75%—is currently in service, with the remainder distributed among vessels in repair, storage, or dedicated storage operations (Annex - Table 12.17 1). The combo fleet accounts for a total DWT of 1146451 (Annex - Table 12.17 8).

The fleet is primarily composed of bulk/chemical & oil carriers (67%), complemented by bulk/oil carriers (33%), underscoring the dual-cargo flexibility that defines this vessel type. This configuration allows operators to switch between dry bulk and liquid cargoes, offering adaptability in volatile freight markets (Annex - Table 12.17 2).

In terms of age, the combo fleet is relatively modern: 67% of vessels were built after 2015, with a particularly strong concentration between 2016 and 2020 (42%). Only a small share

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dates back before 2000, indicating a selective but ongoing renewal trend in this specialized segment (Annex - Table 12.17 3).

The size profile is uniform and geared toward the upper tonnage classes—two-thirds of the vessels fall in the 60,000–99,999 GT range, while the remaining 33% exceed 100,000 GT. This reflects the fleet's focus on large, deep-sea trades where versatility between cargo types can yield commercial advantages (Annex - Table 12.17 4).

From a propulsion standpoint, the entire combo fleet is powered by diesel 2-stroke engines, typical for large oceangoing tonnage. No hybrid, dual-fuel, or alternative propulsion systems are yet represented, highlighting the conservative technological profile of this small but operationally flexible sector (Annex - Table 12.17 5).The combo fleet is overwhelmingly dominated by WinGD, which powers 8 vessels (67%), followed by Everllence B. & W. with 4 ships (33%). Together, these two designers account for the entire fleet (Annex - Table 12.17 6). The most common engine series are WinGD X62 with 8 units (67%), Everllence B. & W. S70 with 3 units (25%), and Everllence B.&W. 90/160 with 1 unit (8%).

Detailed statistical data on vessel speed (ranging from 14 to 16 knots), main engine power (from 9600 to 15550 kW), and main engine SFOC (from 168 to 174 g/kW) based on average values can be found in Section 12.17 General Cargo – Combos.

1.1.19. Service Ships – Offshore Support

The offshore fleet, a diverse and multifunctional segment of the global maritime industry, comprises 5,393 vessels as of mid-2025. The majority of these—approximately 75%—are in active service, while a notable 16% are laid up, reflecting cyclical utilization patterns typical of offshore energy markets. Another 8% of the fleet is currently idle, and only a very small fraction is under repair or otherwise inactive (Annex - Table 12.19 1). The offshore fleet accounts for a total GT of 61455234 (Annex - Table 12.19 8) and a total DWT of 81306025 (Annex - Table 12.19 9).

The composition of the fleet reveals the sector's operational complexity. Platform supply vessels (22%) form the backbone of the offshore fleet, supporting drilling and production operations. This is followed by anchor handling tugs (9%) and utility/workboats (12%), which provide crucial logistical and support services. Multi-purpose support vessels (5%), transport and heavy-lift units (6%), and specialized vessels such as FPSOs (4%), ERRVs (4%), and survey vessels (collectively around 4%) underscore the technical diversity required to sustain offshore oil, gas, and renewable operations (Annex - Table 12.19 2).

From an age perspective, the offshore fleet displays a balanced distribution but with a clear modernization trend. Roughly 55% of vessels were built after 2006, with peaks in construction between 2006–2015 when offshore investments surged. Newer units built between 2016 and 2025 already account for 19% of the total, reflecting gradual fleet renewal driven by both oil market recovery and the growing offshore wind sector (Annex - Table 12.19 3).

In terms of size, most offshore vessels are small to medium-tonnage assets, optimized for specialized operations rather than cargo transport. Nearly 45% of vessels fall below 2,000 GT,

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while another 39% are in the 2,000–9,999 GT class. Larger offshore assets—such as FPSOs, heavy-lift ships, and drillships—make up the remaining 16%, concentrated in higher tonnage brackets above 10,000 GT (Annex - Table 12.19 4).

When examining propulsion types, the offshore fleet shows a relatively advanced technological mix compared to most conventional shipping sectors. A majority (58%) are powered by diesel 4-stroke engines, reflecting the dominance of smaller and medium offshore vessels. Meanwhile, a substantial 27% use diesel-electric systems, highlighting the segment's early adoption of electric propulsion for dynamic positioning and efficiency. Hybridization is also emerging: 3% of vessels use battery-assisted diesel systems, and a small but growing number incorporate fuel cell, gas turbine, or hybrid mechanical/electric technologies (Annex - Table 12.19 5).

In terms of main engine design, the top three main engine designers are Caterpillar, Cummins Inc., and Everllence B. & W.. Caterpillar leads with an impressive 1549 units, representing 28.7% of the fleet. In second place is Cummins Inc., which has 600 units, accounting for 11.1% of the fleet. The third most prominent engine designer is Wartsila 4-stroke, with 503 units, making up 9% of the fleet. Together they account for almost 50% of the fleet (Annex - Table 12.19 6). The top main engine series in the offshore fleet are led by the Caterpillar 3500, with 1,047 units, making up 19.41% of the fleet. The Cummins Inc. QSK series follows in second place, with 211 units, representing 3.91%. In third place is the Cummins Inc. KTA50 series, with 205 units, accounting for 3.80% of the fleet. These three engine series. Together, these series make up 28% of all engines installed in offshore vessels.

Detailed statistical data on vessel speed (ranging from 4 to 46 knots) and main engine power (from 184 to 96000 kW) based on average values can be found in Section 12.19 Others - Offshore.

Service ships are a diverse group of vessels designed to support specific maritime operations rather than transport cargo or passengers. This category includes **offshore support vessels (OSVs)**, **tugboats**, **research vessels**, **supply ships**, **anchor handling tug supply (AHTS) vessels**, **platform supply vessels (PSVs)**, and **survey ships**. These vessels are equipped with specialized technologies for towing, offshore energy support, scientific exploration, firefighting, salvage, and subsea operations. Their construction emphasizes maneuverability, dynamic positioning capabilities, and operational versatility under challenging sea conditions.

As of 2023, the global fleet of service ships includes approximately **40,000 vessels**, with tugboats representing the largest share by number, followed by OSVs and research/special-purpose vessels. According to Equasis and UNCTAD, service ships collectively account for around **10% of the world merchant fleet** in terms of vessel count, though their total gross tonnage is relatively modest due to their smaller average size.

The composition of the service fleet reflects its functional diversity. Tugboats range from small harbor tugs to powerful ocean-going tugs with over 100 tonnes of bollard pull. Offshore support vessels include PSVs for supply runs to offshore platforms, AHTS vessels for towing and anchor handling, and multipurpose vessels for ROV deployment and subsea construction.

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Research and survey vessels are usually owned or operated by government agencies or private institutes and feature laboratories, sonar arrays, and dynamic positioning systems. Many of these vessels are equipped with modular mission systems and advanced communications for data sharing and coordination.

Service vessels play crucial roles in a wide range of operations. Tugboats assist in port maneuvering and towage of large vessels. Offshore support ships service oil and gas platforms, wind farms, and subsea infrastructure, often operating in harsh conditions with high operational availability. Research vessels conduct hydrographic, oceanographic, and environmental surveys, supporting marine science, coastal management, and defense activities. Their missions often require long periods at sea and the ability to operate independently in remote areas.

The age profile of service ships is highly varied. Many tugboats and small utility vessels have long service lives, often exceeding 30 years, particularly when maintained through regular overhauls. Offshore support vessels tend to have a shorter economic lifespan—typically around 20–25 years—due to technological obsolescence and high wear rates. The average age of research vessels falls within the same range, although new builds are increasingly being commissioned to meet environmental and scientific requirements.

The European Union maintains a strong presence in the service ship segment, particularly in tug operations and offshore energy support. EU-flagged vessels are active in both the North Sea offshore sector and in the port networks of Northern and Southern Europe. According to EMSA, service ships make up approximately **18% of the EU-flagged fleet**, a significantly higher proportion than the global average. European operators often lead in integrating environmental and digital standards, especially in offshore wind support vessels and modern harbor tugs. The EU fleet also benefits from stricter port state controls and access to innovation funding, contributing to higher technical standards across the board.

Digital technologies are playing an increasingly important role in the service vessel segment. Dynamic positioning systems (DPS), remote engine diagnostics, and real-time fuel monitoring are widely used, particularly on offshore support vessels. Tugboats and research ships are also being equipped with automated navigation systems and condition-based maintenance platforms.

1.1.20. Service Ships – Dredgers

The dredger fleet as of mid-2025 comprises 811 vessels, the vast majority of which—about 96%—are actively in service. Only a small number are laid up (3%) or under repair (1%) (Annex - Table 12.18 1). The dredger fleet accounts for a total GT of 61455234 (Annex - Table 12.18 8) and a total DWT of 81306025 (Annex - Table 12.18 9).

In terms of vessel type, the fleet is clearly dominated by trailing suction hopper dredgers, which account for 62% of all dredging vessels and form the backbone of global dredging operations due to their versatility and efficiency in large-scale coastal and port maintenance projects. The next largest groups include backhoe, dipper, and grab dredgers (10%), used for precise excavation tasks, and cutter suction or bucket wheel dredgers (7%), primarily deployed for harder soils or land reclamation works. Other specialized units—such as suction dredgers, gravel discharge, and fallpipe dredgers—together represent less than 20% of the total, underscoring the dominance of hopper-type technology (Annex - Table 12.18 2).

From an age perspective, the dredger fleet displays a relatively broad distribution, with many vessels having long operational lifespans. Roughly 46% of the fleet was built before the year 2000, while about 43% were constructed between 2001 and 2020. Newer units (built 2021–2025) represent 5% of the total, indicating moderate renewal but also the durability of older assets, many of which remain in active use thanks to frequent upgrades and maintenance (Annex - Table 12.18 3).

Looking at size distribution, most dredgers are relatively small to medium-sized vessels: about 66% fall below 5,000 GT, and another 20% are between 5,000 and 9,999 GT. Larger dredgers in the 10,000–19,999 GT class make up 10%, while only 4% exceed 20,000 GT—typically high-capacity hopper dredgers operated by leading global contractors (Annex - Table 12.18 4).

Regarding propulsion systems, the fleet is overwhelmingly powered by diesel 4-stroke engines (80%), which are well suited to variable dredging operations requiring flexible power output. A further 13% of vessels employ diesel-electric systems, reflecting a gradual shift toward higher efficiency and precision in power management. Early hybridization is visible as well, with 1% using battery-assisted diesel propulsion and a few experimental units incorporating fuel cells (Annex - Table 12.18 5).

The top three main engine designers for the offshore fleet are led by Everllence B. & W., with 107 units, making up 13.2% of the fleet. Caterpillar follows closely in second place, with 92 units, accounting for 11.3% of the fleet. In third place is Wartsila 4-stroke, with 76 units, representing 9.4% of the fleet. Together, these three designers make up a combined total of 34% of the offshore fleet. (Annex - Table 12.18 6). The top three main engine series in the offshore fleet are led by Caterpillar 3500, with 46 units, accounting for 5.7% of the fleet. In second place is Wartsila 4-stroke 32, with 25 units, representing 3.1%. The third spot is held by Everllence B. & W. 48/60, with 23 units, making up 2.8% of the fleet. Together, they make up 11.6% of all dredger engines.

Detailed statistical data on vessel speed (ranging from 3 to 18 knots), main engine power (from 221 to 41220 kW) and main engine SFOC (from 170 to 207 g/kW) based on average values can be found in Section 12.18 Others – Dredger.

1.1.21. Fishing Vessels

Although dedicated to a single purpose, fishing vessel include a wide range of vessel type, rom small coastal boats to large ocean-going factory trawlers. The main categories include **trawlers**, **purse seiners**, **longliners**, **gillnetters**, and **factory ships**, each tailored to specific fishing techniques and target species. Key features often include refrigerated storage, fish

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processing facilities, winches, nets, cranes, and in the case of larger vessels, integrated freezing and packaging lines. Their design emphasizes catch efficiency, operational endurance, and compliance with international fisheries regulations in continuous evolution to preserve the fishing stocks.

The global fishing fleet is the largest in terms of vessel count, with an estimated **4.1 million vessels** operating worldwide as of 2020, according to FAO. However, only a small fraction—approximately **64,000 vessels**—are 24 meters or longer and are therefore subject to global monitoring and port state controls. The vast majority are small-scale or artisanal vessels operating in coastal waters. In terms of tonnage, the fishing fleet accounts for a relatively modest share of global GT, but represents a critical sector for food security, livelihoods, and regional economies. [25]

In developed economies, fleets tend to include highly specialized industrial vessels such as freezer trawlers, pelagic purse seiners, and distant-water fishing vessels. These ships are generally equipped with satellite communication, advanced navigation, fish detection sonar, and onboard processing equipment. In contrast, developing nations rely heavily on artisanal fleets composed of small, manually operated boats with minimal equipment. The European fleet features a mix of industrial and coastal vessels, with specialization in species like tuna, cod, and sardines, depending on regional waters.

Fishing vessels operate across a spectrum of missions—from nearshore day trips to months-long voyages in distant waters. Coastal vessels typically conduct single-day fishing operations, while larger vessels can spend weeks or months at sea, targeting deep-sea species and operating in exclusive economic zones (EEZs) or international waters. Factory ships, in particular, are capable of catching, processing, freezing, and packaging large quantities of fish on board, enabling continuous operation without port calls.

The age of fishing vessels varies significantly by country and fleet size. Industrialized nations tend to have older fleets—many vessels over 25 years old—due to high capital costs and slow fleet renewal. In the EU, for instance, the average age of the fishing fleet is around **21 years**, with older vessels particularly prevalent in southern Europe. Although modernizations and retrofitting are common, especially for safety and environmental compliance, full fleet renewal remains limited by economic constraints and access to public subsidies.

The EU fishing fleet comprises approximately **75,000 vessels**, representing about **1.8%** of the global fleet by number, but a much larger share in terms of gross tonnage and economic output. EU fleets are among the most tightly regulated globally, operating under the Common Fisheries Policy (CFP), which enforces quotas, gear restrictions, and conservation measures. EMSA and Eurostat report that a majority of EU fishing vessels are below 12 meters in length and operate in coastal waters, but a significant minority of large, industrial fishing vessels contribute to distant-water fisheries. Compared to global averages, the EU fleet is older but better equipped in terms of safety, monitoring, and environmental standards.

Digitalization in the fishing sector remains uneven. Larger industrial vessels, especially in the EU and North America, have adopted vessel monitoring systems (VMS), electronic logbooks,

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and satellite-based catch reporting to comply with fisheries control regulations. Automation is also present in onboard processing and winch systems. However, small-scale fleets in many regions still rely on manual practices.

1.1.22. Inland Waterway Vessels

Inland waterway vessels feature peculiar design features as they share, regardless the scope of work, lower air drafts, shallow draughts, and narrower beams to navigate bridges, locks, and confined waterways. This fleet includes **cargo barges**, **tankers**, **push boats**, **passenger ferries**, and **container carriers**, adapted to varying channel depths and infrastructure. Their hulls are optimized for energy efficiency at lower speeds and they often feature modular loading systems for flexibility

The European Union maintains one of the largest and most integrated inland waterway fleets in the world. As of 2023, the EU inland fleet included approximately **10,600 cargo-carrying vessels** and over **850 passenger vessels**, with the highest concentrations in the Rhine and Danube corridors. According to EMSA and Eurostat, inland waterway transport accounts for roughly **6% of total EU inland freight transport**, but this share is significantly higher in countries like the Netherlands, Belgium, and Germany, where inland shipping is a core logistical mode

Most cargo vessels range in size from 1,000 to 3,000 tonnes deadweight, with high specialization in container and dry bulk segments.

They are heavily used for transporting bulk commodities such as coal, iron ore, grain, and petroleum products. Passenger vessels, including river cruise ships, play a significant role in European tourism, especially along the Rhine, Danube, and Seine rivers. Inland vessels operate under tight navigational and scheduling constraints, often in variable water conditions and in coordination with locks and terminals.

The EU inland fleet includes a large share of older tonnage, with many vessels exceeding 30 years of age. However, longevity is common due to freshwater operations, which reduce hull wear. The average age varies by segment: tankers and dry cargo vessels often exceed 20 years, while the passenger cruise segment is comparatively younger due to higher service expectations. Incentives for scrapping older units and investing in clean technology are part of ongoing fleet renewal strategies in countries like the Netherlands and Germany.

The EU inland fleet is unique in its scale, regulatory coherence, and integration into broader EU transport policy. Compared to inland fleets in Asia or North America, the EU system benefits from extensive cross-border infrastructure and harmonized technical standards through the Central Commission for the Navigation of the Rhine (CCNR) and EU directives. The European fleet is particularly advanced in energy efficiency and emissions control, thanks to initiatives such as NAIADES and Connecting Europe Facility (CEF) investments.

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Digitalization is advancing steadily in the EU inland fleet, particularly in traffic management, voyage planning, and emissions reporting. River Information Services (RIS) provide real-time data on navigation, water levels, and port availability. Automation is being piloted on selected routes, especially for barge convoys and port approaches.

1.2. Navigation types and services

In the European Union, maritime transport services are classified into three broad categories based on their operational reach and geographical scope: inland navigation, short sea navigation, and deep sea navigation. Each type plays a distinct role within the logistics and transport ecosystem of the EU, responding to specific infrastructural, economic, and regulatory conditions.

1.2.1. Inland navigation

Inland waterway transport in Europe includes both cargo vessels (e.g., barges and tankers transporting bulk goods) and passenger vessels (e.g., river cruises and ferries). These vessels generally operate in constrained environments and are increasingly adopting electric or hybrid propulsion systems due to their compatibility with shore-based energy infrastructure.

1.2.2. Short sea navigation

Short sea shipping encompasses:

- **Cargo transport**, such as Ro-Ro vessels, small container ships, and feeders operating between European ports.
- **Passenger transport**, including regional and cross-border ferries.

Both segments are central to EU mobility and logistics strategies. They are at the forefront of adopting LNG, biofuels, electrification solutions, and pilot projects for nuclear micro-reactors, driven by proximity to coastal infrastructure and regulatory zones.

1.2.3. Deep sea navigation

Deep sea operations include:

- Cruise ships, which present high energy demand and emissions per passenger. These vessels are adopting exhaust gas cleaning systems, shore power, and exploring LNG, methanol, and nuclear propulsion options.
- Other services, such as offshore vessels and large ocean-going cargo ships, face longer upgrade cycles and infrastructure dependencies but are essential to international trade. Fuel transition in this segment is closely linked to the global availability of alternative fuels and retrofit feasibility.

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2. Current business models, investment and financing mechanisms for waterborne transport greening

The transition towards greener waterborne transport requires not only technological innovation but also robust business models and financing frameworks that enable large-scale adoption. Traditional shipping has relied heavily on market-driven operations with limited incentives to internalize environmental externalities. The green transition demands a shift in both operational strategies and financial instruments.

2.1. Emerging Business Models

The decarbonisation of the waterborne transport sector requires a profound transformation of traditional business models. Maritime transport has historically been characterised by long investment cycles, fragmented ownership structures and a focus on cost-efficiency rather than sustainability. The transition towards zero-emission solutions – encompassing alternative fuels, energy-efficient vessel design and digital optimisation – is reshaping how economic value is created and shared across the sector. [26]

Emerging business models increasingly reflect new roles, partnerships and revenue streams. One central trend is the servitisation of technology, where ship operators no longer purchase propulsion or energy systems outright, but rather access them through Power- or Fuel-as-a-Service models. This approach shifts the financial risk from the operator to technology providers or energy suppliers and encourages lifecycle efficiency through performance-based contracts. [27]

Another development concerns collaborative innovation networks. Shipowners, ports, fuel suppliers, classification societies and digital solution providers increasingly form Green Shipping Clusters or Innovation Partnerships to jointly develop pilot projects for hydrogen, ammonia or methanol propulsion. [28] These ecosystems enable knowledge sharing, risk-sharing and accelerated technology validation.

Digitalisation and platform economy principles further enable new business logic. Smart-shipping platforms collect and monetise operational data for predictive maintenance, emission monitoring and carbon-accounting services. Such platforms create secondary value chains around data governance and compliance with emerging carbon-intensity indicators (CII) and EU ETS requirements. [11]

Finally, sustainability-linked chartering and financing is gaining importance. Cargo owners and logistics providers demand low-emission transport services and are increasingly willing to pay premiums for verified reductions. This leads to new contractual arrangements that integrate emission performance into freight rates or leasing conditions. Green chartering markets and emissions-indexed freight agreements are thus evolving as part of the business ecosystem. [29]

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2.2. Investment Mechanisms

The greening of waterborne transport entails substantial capital requirements. New vessels, retrofits, fuel supply infrastructure and port adaptations represent multibillion-euro investments over the coming decades. To mobilise these resources, innovative investment mechanisms that combine private and public finance are emerging. [30]

Traditional corporate and project finance structures remain relevant but are being adapted to accommodate higher technological risk and uncertain regulatory trajectories. Large shipping companies increasingly use blended finance schemes that mix equity, debt and public support instruments to de-risk early investments in novel propulsion technologies. Public banks such as the European Investment Bank (EIB) and national promotional institutions (e.g. KfW) play a catalytic role by offering favourable credit conditions and guarantees. [31]

Private-sector investment is diversifying. Institutional investors and infrastructure funds are showing growing interest in green maritime assets, particularly through ESG-oriented portfolios and green bond frameworks. Venture capital is entering niche markets such as maritime digitalisation, energy-storage systems or alternative fuel production. [32] Corporate venturing from energy majors and shipyards supports the scaling of start-ups developing hydrogen technologies or synthetic fuels.

Public-private partnerships (PPPs) are increasingly used to share financial and operational risks in port infrastructure and fuel supply projects. PPPs facilitate long-term alignment between public decarbonisation goals and private sector return expectations. Furthermore, innovative mechanisms such as Contracts for Difference (CfDs) are being discussed at the EU level to guarantee minimum carbon prices or green fuel premiums. [33]

The European Union Emission Trading System (EU ETS) extension to maritime transport will introduce both an investment cost and a market signal. Revenues generated from auctioning allowances are expected to feed back into maritime decarbonisation funds, further stimulating green investment. [34]

2.3. Financing Frameworks and EU Support

Financing the transition to zero-emission waterborne transport requires an integrated framework combining regulatory incentives, dedicated funding programmes and sustainable finance standards.

At the European level, several key instruments provide support: [35]

- Horizon Europe funds research and innovation projects developing new propulsion technologies, digital tools and systemic approaches for decarbonisation (such as TRUSTEE).
- The Connecting Europe Facility (CEF) supports infrastructure investments in ports and trans-European transport networks, including shore-side power, bunkering facilities and digital traffic management.

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- The European Maritime, Fisheries and Aquaculture Fund (EMFAF) provides financial support to sustainable shipping practices, vessel modernisation and alternative fuel uptake.
- The LIFE Programme complements these by funding environmental and climate-action pilot initiatives.

Within this spectrum of financial instruments, the European Union's Innovation Fund represents a pivotal investment mechanism. Functioning as one of the world's largest funding programmes for the demonstration of innovative low-carbon technologies, the Fund is structurally linked to the European Union Emissions Trading System (EU ETS), as it is financed through revenues generated from the auctioning of allowances (as will be seen better in section 4.2.2).

This mechanism effectively recirculates capital costs incurred by polluters back into the sector to foster decarbonisation, bridging the financial gap for projects that are technically viable but not yet commercially mature. With an estimated budget of approximately €40 billion for the 2020–2030 period, the Innovation Fund plays a catalytic role in de-risking early-stage investments. Designed to operate in synergy with research instruments such as Horizon Europe, it supports up to 60% of eligible costs for high-innovation, pre-commercial projects, thereby mitigating the substantial risks associated with first-of-a-kind deployments. Following the formal extension of the EU ETS to maritime transport, the strategic importance of this mechanism has been reinforced, with regulatory provisions mandating dedicated calls for maritime decarbonisation by 2027 to target emerging technologies such as electrification and hydrogen-based propulsion.

Beyond funding programs, the European Investment Bank (EIB) and the European Bank for Reconstruction and Development (EBRD) offer long-term loans, guarantees and equity participation under their Green Shipping and Sustainable Blue Economy initiatives. [36] Their involvement often acts as a seal of credibility, attracting additional private investment.

EU regulatory initiatives also shape the financing environment. The EU Taxonomy for Sustainable Activities defines which maritime investments qualify as environmentally sustainable, guiding banks and investors. [37] The Sustainable Finance Disclosure Regulation (SFDR) enhances transparency on ESG risks and impacts in financial markets. Furthermore, the planned European Green Bond Standard aims to ensure integrity and comparability across green financing instruments.

National frameworks complement these efforts through subsidies, tax incentives and guarantee schemes. Several member states have introduced Green Shipping Funds or specific hydrogen strategies with maritime components. Coordination between EU- and national-level instruments remains essential to avoid fragmentation and ensure coherence in achieving the Fit-for-55 and ZEWT targets. Collectively, these frameworks create an enabling environment that blends policy, finance and innovation to accelerate the maritime sector's transition towards climate neutrality.

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2.4. Challenges and Opportunities

While significant progress has been made, major challenges persist in aligning economic viability with decarbonisation ambitions.

Financial and technological uncertainty remains the most critical barrier. Many zero-emission technologies are at an early stage of maturity, and their long-term operational costs are not yet fully predictable. Investors face difficulties assessing residual value and compliance risks over vessels' 20- to 30-year lifespans.

Infrastructure readiness is another limiting factor. The deployment of hydrogen, ammonia and methanol requires new port facilities, safety standards and supply chains, often beyond the control of individual shipowners. Coordinated investment along the entire value chain is thus indispensable. [38]

Regulatory complexity and policy fragmentation across jurisdictions can slow investment decisions. Differences in national subsidy schemes, certification standards and tax regimes create uncertainty for international operators. Harmonisation of standards and predictable long-term regulation are vital to attract sustained capital flows.

Market incentives are still insufficient. The current price gap between conventional fuels and zero-emission alternatives limits commercial uptake. Carbon pricing and emissions-based levies will gradually close this gap but need to be complemented by direct support mechanisms in the short term.

However, the transition also brings unprecedented opportunities. The green transformation opens new markets for shipbuilding, renewable energy, digital services and port operations. Early adopters can strengthen competitiveness and brand value by aligning with customers' decarbonisation targets. Moreover, sustainable finance instruments – such as green bonds and sustainability-linked loans – provide new access to capital for compliant actors.

Finally, the maritime sector's contribution to climate neutrality enhances Europe's strategic autonomy. Reducing dependence on imported fossil fuels and fostering a circular, innovation-driven blue economy supports both environmental and geopolitical resilience. [39]

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SECTION 2
TRENDS AND EVOLUTION MECHANISMS

3. TRENDS EVOLUTION

3.1. New Builds, retrofitting, and the impact of new technologies in 2030 fleet

Between 2030 and 2050, the European Union's fleet will be reshaped by environmental policy, capital turnover, and supply-chain modernization. The years to 2030 matter because they establish the technical and operational baselines that later decades will scale. The EU's Strategic Research and Innovation Agenda frames six practical priorities—alternative fuels, electrification, energy efficiency, design and retrofitting, digital–green integration, and port innovations—which, taken together, form a coherent engineering and investment logic rather than a set of isolated workstreams. The emphasis is on reducing fuel cost and exposure to carbon pricing, maintaining compliance under tightening environmental rules, standardizing interfaces for future fuels, and integrating operational data so that ships, ports, and logistics partners make coordinated decisions.

This chapter translates that agenda into a professional, practice-oriented view of what gets built, what gets retrofitted, and how ports and operators synchronize change. It integrates the evidence base contained in the uploaded EU project portfolio (77 entries). When the topics in that file are mapped to the six SRIA pillars, the distribution is balanced: 29 projects relate to energy efficiency, 29 to alternative fuels, 8 to electrification, 6 to digital–green integration, 2 to port innovations, and 1 to design and retrofitting. Timelines in the same dataset indicate 46 initiatives with outcomes relevant by or before 2030, 28 maturing beyond 2030, and 3 unspecified. Reported end-of-project TRLs cluster around a median of 7 across the portfolio (37 entries provide a numeric TRL, with several at TRL 8 and a small number at TRL 9). Most projects declare broad applicability, with 57 marking "All" as target market; early adoption remains strongest in ferries, cruise, inland, offshore and research segments where schedules, port interfaces and duty cycles are predictable.

What follows is a structured view, grounded in those results, of how new builds and retrofits should look in 2030, what operators can expect from port infrastructure, and how to stage decisions in a way that preserves future flexibility.

3.1.1. New builds in 2030

Fuel-ready architectures

Fuel choice is no longer a one-time bet at the contract stage. 2030-vintage designs prioritize a standardized integration envelope—space, structural reinforcement, segregation, venting, safety systems and power-conversion interfaces—so that the ship can adopt ammonia,

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methanol, hydrogen or advanced biofuels when routes, prices and bunkering options justify the switch. Demonstrations of ammonia internal-combustion systems and related conditioning equipment (for example Ammonia2-4, Apollo and Apolo) inform arrangements for tanks, fuel supply, and hazard management.

Hydrogen architectures for ferries and short-sea ships (HySeas III, HyShip, e-SHyIPS, ENGIMMONIA) validate cryogenic handling, ventilation and detection, paving the way for auxiliary and, in some cases, main-propulsion roles.

Methanol-capable engines continue to gain ground because of simpler storage and growing green methanol production pathways, while LNG's residual role is constrained by methane slip mitigation obligations; work such as GREEN RAY's informs how transitional gas assets can be made compliant across their economic life. The practical outcome for 2030 designs is a "fuel-ready" envelope and documented conversion path, reflected not only in general arrangement drawings but in class notations and contract schedules.

Hybrid propulsion plants

The propulsion plant evolves from a dominant prime mover to an orchestrated set of devices managed by an energy and power management system (EMS/PMS). Engine technologies are specified for fuel flexibility and for reduced slip and NOx; fuel cells reach route-specific deployment for ferries and auxiliaries (MARANDA, HELENUS, FLAGSHIPS), and battery modules are sized both for all-electric duty on short legs and for peak shaving and dynamic support on larger vessels (E-FERRY, FLEXSHIP, Current Direct, SEABAT). The technical center of gravity is the supervisory control layer—often validated in projects like HEMOS—which keeps each device operating near its optimal efficiency, limits transients, and exposes standardized data to voyage planners and fleet optimization tools. Procurement specifications in 2030 reflect this shift: functional requirements are written for the plant as a system rather than for individual components in isolation.

Hydrodynamics, surface performance and wind assistance

Low-risk efficiency measures are embedded in baseline specifications because their savings compound irrespective of fuel pathway. Proven hull coatings (eSHaRk) and boundary-layer manipulation concepts (Aircoat) reduce friction reliably and are backed by multi-year trials at high TRL. Where stability margins and deck layouts allow, wind-assist devices (RotorDEMO and other WAPS developments) supply additional thrust on suitable routes. These measures are planned as part of the initial hydrodynamic optimization and control integration, not as late extras, with the EMS configured to exploit their contribution through speed–power optimization.

Electrical backbones and storage

Direct-current distribution and modular storage architectures are increasingly common because they reduce conversion losses, simplify integration of heterogeneous sources and loads, and support fault management (HARPOONERS, FLEXSHIP). Battery projects focused on modularity and lifecycle cost (AENEAS, SEABAT, Current Direct) improve maintainability and

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future upgrade options. New builds also account for shore-side interfaces from the outset. Fast charging schemes (HYPOBATT) and standardized shore power (LoCOPS) influence cableways, switchboard design and thermal management, minimizing rework when ports catch up. The resulting electrical architecture is designed with both operational optimization and future conversion in mind.

Digital-by-design

Digitalization is treated as a core system layer. Open and interoperable digital twin approaches for green shipping (DT4GS), voyage planning and performance management (EcoSail, EONav), fleet-level simulation and decision support (SuPREmE), and emissions monitoring (EMERGE) inform how sensor suites, data models and control interfaces are specified. In 2030 designs, the "software stack" is versioned, maintainable and secured, with explicit provisions for over-the-air updates, cybersecurity controls and data sharing with ports and charterers under agreed governance.

3.1.2. Retrofitting by 2030

Immediate energy savings

For existing ships that will remain in service well into the 2030s, the first tranche of interventions is chosen for short dry-dock windows and predictable returns. Advanced hull coatings and friction-reducing surfaces are applied; wind-assist is added where operationally justified; energy-saving appendages and propeller upgrades are implemented where payback supports the capex. These measures deliver fuel savings immediately and reduce the installed power required for any later fuel conversion.

Engine and fuel-system upgrades

Where fuel switching is not feasible before 2030, engines and auxiliaries are upgraded to cleaner baselines. Projects focused on improving combustion and reducing emissions within current platforms (AQUASONIC DIESEL for combustion enhancement; GREEN RAY for methane-slip mitigation) offer practical paths with minimal disruption. Hydrogen-assisted combustion kits (FS MARINE+) and similar modular packages can deliver incremental abatement and operational learning without structural changes. For certain ships, fuel-cell auxiliaries are retrofitted to displace diesel gensets during hoteling and low-load operations (HyEkoTank), cutting port-side emissions and building crew competence with new systems.

Electrification retrofits

Modular storage and hybridization allow existing vessels to capture a large share of electrification benefits without full conversion. Battery racks are installed for peak shaving, spinning-reserve support and silent operations; DC links and new converters simplify integration with existing switchboards. The business case strengthens when combined with shore-side improvements: standardized shore power (LoCOPS) reduces auxiliary engine hours in port, and high-rate charging where available (HYPOBATT) enables deeper cycling profiles on

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predictable routes. Maintenance savings and improved schedule reliability add to fuel and emissions benefits.

Noise and environmental externalities

Underwater radiated noise is entering the compliance mainstream for sensitive areas. The SATURN project demonstrates how propeller selection, shaftline damping, isolation and operating guidance can be integrated into refit scopes alongside emissions measures. Owners are bundling these actions to reduce dry-dock time and capitalize on interdependencies between hydrodynamics, vibration, and energy use.

Digital optimization of existing tonnage

Digital tools amplify the value of physical upgrades. Voyage optimization that fuses forecast data and earth observation (EONav), performance analytics and decision support (SuPREmE), and emissions assessment (EMERGE) are deployed across heterogeneous fleets because their capex is low and their data demands align with modern sensor packages. Operators that pair software with disciplined hull and propeller maintenance schedules realize measurable gains without waiting for fuel conversions.

3.1.3. Ports and the logistics chain

Shore power and charging

Onshore power supply is moving from pilot to standard practice across European ports. Projects deliberately targeting cost reduction and interoperability (LoCOPS) lower the barrier for terminals and municipal authorities. High-power, fast-charging concepts (HYPOBATT) drive standardization of connectors, protection schemes and operating procedures for battery-centric vessels. For shipowners, the implication is clear: include shore power provisions in new builds and budget the retrofit of high-utilization ships where port access is predictable; the local air-quality and noise benefits in port communities often accelerate permitting and strengthen relationships with terminal operators.

Fuel logistics

Ammonia, hydrogen and methanol require new or adapted bunkering infrastructure, safety cases, and crew training. Apollo and NH3CRAFT inform safe handling and conversion of ammonia, including boil-off and vent management. HyShip and HySeas III demonstrate how liquid-hydrogen supply chains can be built for specific routes. Methanol's simpler storage and growing green supply make it an attractive bridge fuel, supported by conversion experience and by projects exploring flexible fuel production (FLEXI-GREEN FUELS). LNG remains a transitional option on some corridors, with compliance tied to effective slip control. CNG logistics innovations (GASVESSEL) broaden options for regional gas markets where pipeline capacity is constrained. These developments guide port investment, risk assessment, and the sequencing of bunkering capability expansions.

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Digital synchronization

Maritime operations suffer unnecessary emissions and cost when ship and port schedules are misaligned. Interoperable data frameworks (MISSION) and open twin concepts (DT4GS) enable berth allocation, tug dispatch, pilotage and cargo operations to be synchronized with shipboard energy management and voyage plans. Operators are embedding data-sharing clauses into charter parties and terminal agreements to ensure that onboard efficiency measures translate into real reductions instead of idle time at anchor.

3.1.4. Technology readiness and timing

The uploaded project portfolio provides a realistic view of maturity. Aggregated across the six pillars, reported end-of-project TRLs have a median of 7 among entries that specify a number, with energy-efficiency and digital solutions skewing to TRL 8 and some ferry-electrification use cases reaching TRL 8–9. Alternative fuels show the expected spread: methanol engines and hydrogen fuel cells for targeted segments trending toward late-stage demonstration, ammonia engines and systems following closely but requiring careful integration and crew training. Electrification readiness depends on duty cycle; short-sea and inland segments are mature enough for full-electric operation, while deep-sea ships adopt hybridization patterns with proven components. Timelines in the dataset indicate that most building-block capabilities for the 2025–2030 window are available to specify in tenders and refit packages today. Reference to D1.2

3.1.5. Illustrative applications from the EU project set

A regional ferry operator commissioning a newbuild in 2027–2028 specifies a battery-centric propulsion system validated by E-FERRY, with fuel-cell auxiliaries for low-emission port approaches based on MARANDA. The electrical design accommodates fast charging compatible with HYPOBATT concepts and standardized shore power from LoCOPS. Coatings derived from eSHaRk and route-aware voyage optimization informed by EcoSail and EONav are included in the base scope. The design documentation reserves volume and safety systems for a later ammonia or methanol conversion, using integration lessons consolidated through Ammonia2-4 and Apollo.

A product tanker scheduled for a 2026 refit begins with hydrodynamic improvements and rotor sails using RotorDEMO knowledge. Engine-side measures apply methane-slip mitigation from GREEN RAY and combustion improvement from AQUASONIC DIESEL. A modular battery rack from SEABAT supports peak shaving and improves generator loading, while shore power provisions from LoCOPS eliminate auxiliary engine use in port. SuPREmE's performance analytics quantify savings and inform a second-stage investment case for auxiliary fuel cells (HyEkoTank) tied to specific trades.

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A coastal research vessel at mid-life adopts hydrogen fuel-cell auxiliaries based on HyShip experience, retains methanol-ready engines for endurance, and installs modular storage (AENEAS/SEABAT) for silent operation in sensitive waters. SATURN's guidance on underwater radiated noise shapes propeller and shaftline work. A DT4GS-style digital twin supports planning, maintenance and regulatory reporting.

A cruise operator developing a 2030-entry class centers the plant around energy management akin to HEMOS, partitions hotel loads with high-efficiency HVAC improvements from EEECSM-2, and integrates a tri-energy mix: methanol-capable engines for ocean legs, fuel-cell clusters for port areas, and batteries for peak loads and port-time zero-emission operation. Port calls are synchronized over a MISSION-style data backbone. Underwater noise objectives in sensitive habitats are met through SATURN-informed design and operating guidance.

These are not speculative "moonshots." They are direct compositions of outcomes and integration lessons documented in the EU portfolio, selected because they align with the maturity and timelines reflected in the spreadsheet.

4. Regulatory and Voluntary Frameworks

4.1. Political Targets

The political framework underpinning fleet evolution is defined by:

- The **EU Green Deal** and **Climate Law**, setting climate neutrality by 2050.
- The **Sustainable and Smart Mobility Strategy**, which aims to double inland and short sea shipping by 2050.
- National maritime strategies aligned with European and international climate goals.
- Strategic investments in advanced fuels, including nuclear R&D. These targets direct funding, infrastructure development, and R&D priorities.

The sustainable development currently observed in maritime navigation is not solely the result of a growing environmental awareness among all actors in the maritime sector, but is primarily driven by an increasingly dense and interconnected web of political targets. These targets (articulated at the international, regional, and national levels) are not merely aspirational or declarative in nature. Rather, they constitute structured instruments of governance and influence that actively shape regulatory ecosystems, steer financial capital, and catalyse technological and infrastructural innovation. This framework is defined by two primary spheres of influence: the global baseline established by the International Maritime Organization (IMO) and the more aggressive, legally binding regulations enacted by the European Union (EU). While the IMO sets the overarching direction for the entire international shipping industry, the EU's comprehensive and already-implemented legislative package acts as the de facto pace-setter, creating a powerful regulatory gravity that pulls the global fleet towards its more ambitious targets. This dynamic establishes a complex but clear political imperative for shipowners, operators, and investors, dictating the technological pathways and investment decisions that will define the fleet of the future.

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4.1.1. IMO Strategy

The foundational global political target for maritime decarbonisation is the 2023 IMO Strategy on Reduction of Greenhouse Gas (GHG) Emissions from Ships. Adopted in July 2023, this revised strategy significantly elevated the industry's climate ambitions, replacing the initial 2018 framework with a more urgent and demanding set of goals. [40] The headline ambition is to achieve net-zero GHG emissions from international shipping "by or around, i.e. close to, 2050," a landmark commitment that aligns the sector with the long-term temperature goals of the Paris Agreement.

To ensure progress towards this 2050 goal, the strategy introduces a series of indicative checkpoints based on 2008 emission levels, which serve as crucial benchmarks for the industry:

- By 2030: A reduction in total annual GHG emissions of at least 20%, with a stretch goal of 30%.
- By 2040: A reduction in total annual GHG emissions of at least 70%, striving for an 80% reduction.

A particularly impactful element of the 2023 strategy is the mandate for the uptake of zero or near-zero GHG emission technologies, fuels, and energy sources. These must represent at least 5%, and strive for 10%, of the energy used by international shipping by 2030.[3] This target is designed to overcome market inertia and create a definitive, early-stage demand signal for alternative fuels, compelling investment in their production and supply chains well before the 2040 and 2050 deadlines.

However, while the IMO has set these ambitious targets, the "basket of measures" required to enforce them, comprising a technical element in the form of a goal-based marine fuel standard and an economic element, such as a GHG emissions pricing mechanism,is still under development. These legally binding regulations are scheduled for adoption in 2025, with entry into force anticipated around 2027. From a mandatory requirements perspective, the IMO mandates compliance only with the requirements set out in Annex VI of the MARPOL Convention. These legally binding regulations are scheduled for adoption in 2025 (January 2026 at the latest), with entry into force anticipated around 2027. [41]

Two key parameters in this context are the Energy Efficiency Existing Ship Index (EEXI) and the annual operational Carbon Intensity Indicator (CII) along with its corresponding rating system. These measures officially entered into force on 1 November 2022, with the certification requirements becoming applicable as of 1 January 2023. The first cycle of annual reporting was conducted in 2023, with initial performance ratings issued in 2024.

Each ship must demonstrate that its calculated attained EEXI is below the required threshold in order to meet the minimum prescribed energy efficiency standard.

The CII, on the other hand, defines the annual reduction factor necessary to ensure continuous improvement in a vessel’s operational carbon intensity within a defined performance band. Based on the CII score, ships are rated on a scale from A to E, where A indicates superior performance and E reflects the poorest performance. These ratings correspond to the following classifications: major superior (A), minor superior (B), moderate (C), minor inferior (D), and inferior (E).

Where vessels receive a D rating for three consecutive years, or an E rating for a single year, the implementation of reinforced corrective measures becomes mandatory. This may include the adoption of further remedial actions, such as enhanced operational adjustments, additional technical upgrades, or the imposition of stricter EEXI-related requirements. Moreover, there is an increasing emphasis on strengthening the associated enforcement mechanisms to ensure compliance and continuous performance improvement. [42]

This temporal gap between target-setting and enforcement creates a policy vacuum. For shipowners making investment decisions today for vessels with a 25-year lifespan, this uncertainty is a significant risk. It is precisely this vacuum that the European Union's legislative framework has filled, providing the regulatory certainty that the global market currently lacks and, in doing so, assuming a leading role in directing the industry's immediate technological evolution.

4.1.2. European Union Strategy

At the regional level, the European Union has emerged as a normative frontrunner in maritime climate governance, translating political ambition into binding legal mandates. The EU has promulgated political objectives of a more ambitious nature than those outlined by the IMO. The 2019 European Green Deal, for example, frames the Union's transition to a climate-neutral economy by 2050 as a core objective integrating environmental, economic, and social dimensions. This vision was enshrined into law through the European Climate Law [43], which establishes a legally binding target of at least a 55 percent reduction in GHG emissions by 2030 relative to 1990 levels. Following the publication of the European Green Deal, the Sustainable and Smart Mobility Strategy (SSMS) was introduced as a roadmap to support the achievement of the EU's ambitious emission reduction targets and to guide the transport sector towards a smarter and more resilient future.

The EU's SSMS, published in 2020, further reinforces maritime decarbonisation as part of a broader modal shift in freight transport. It sets forth an ambitious target to double inland waterway and short-sea shipping volumes by 2050, thereby reducing dependency on road transport, lowering emissions, and enhancing multimodal logistics efficiency [44]. To achieve this, the strategy calls for investments in port modernisation, the deployment of shore-side electricity systems, and the renewal of ageing fleets with energy-efficient vessels. It also supports digitalisation and automation in the logistics chain, facilitating real-time data exchange and optimised route planning, both of which contribute to lowering overall emissions. By embedding maritime transport within an integrated and intelligent transport ecosystem, the SSMS promotes synergies that extend beyond the shipping sector, fostering intermodal solutions that align environmental objectives with operational performance.

Among the various initiatives launched under the SSMS, the maritime sector plays a key role in the green transition through the "Fit for 55" legislative package. [45] For the first time, this package integrated shipping into the EU's climate policy framework by introducing two key and complementary measures: the extension of the EU Emissions Trading System (EU ETS) to the maritime sector, and the adoption of the FuelEU Maritime Regulation.

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The EU ETS is a market-based instrument that internalises the cost of carbon by requiring companies to surrender allowances corresponding to their verified emissions. This mechanism is complemented by the FuelEU Maritime Regulation [46] which introduces progressively stricter limits on the greenhouse gas (GHG) intensity of the energy used by ships calling at EU ports. These limits commence with a 2 percent reduction in 2025 and increase incrementally to reach an 80 percent reduction by 2050. Together, these measures generate strong demand-side incentives for the uptake of renewable and low-carbon fuels (RLFs), such as green hydrogen, ammonia, and advanced biofuels.

Moreover, the EU ETS is not only an incentive for more sustainable navigation, but also serves as a financing mechanism for research and innovation.
The EU ETS revenue primarily flows to national budgets and Member States must use it to support investments in renewable energy, energy efficiency improvements and low-carbon technologies that help reduce emissions and, with this, companies' carbon costs. Furthermore, a share of the EU ETS revenue supports low-carbon innovation and the EU's energy transition via the Innovation Fund and the Modernisation Fund(Chapter 2.3- Financing Frameworks and EU Support). [47]

In order to ensure the effective dissemination and uptake of maritime transport powered by alternative fuels, it is not sufficient to design such vessels and regulate their operation. Equally essential is the establishment of adequate infrastructure capable of supporting this new mode of navigation.

To this end, within the framework of the 'Fit for 55' package, the Alternative Fuels Infrastructure Regulation (AFIR) has been introduced.

This Regulation pursues the following specific objectives:

- to guarantee a minimum level of infrastructure to facilitate the adoption of alternative fuel vehicles across all modes of transport and in all EU Member States, in line with the Union's climate targets;
- to ensure full interoperability of alternative fuels infrastructure throughout the EU; and
- to provide comprehensive user information and appropriate payment solutions at points of access to such infrastructure.

The Regulation sets binding national targets for the deployment of alternative fuels infrastructure, covering road transport, maritime and inland navigation, and stationary aircraft. [48]

Specifically, several provisions within the Regulation address the needs of maritime transport, including:

- Article 9, which sets targets for the provision of shore-side electricity in maritime ports;
- Article 10, which establishes targets for shore-side electricity in inland waterway ports;
- Article 11, which outlines targets for the supply of liquefied methane in maritime ports;

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- Article 14, which requires Member States to provide, by 2025, an overview of the current status and future plans for the deployment of alternative fuels infrastructure in maritime ports, including hydrogen;
- Annex I, which mandates the submission of a progress report by 31 December 2027, detailing the capacity and geographic distribution of shore-side electricity and liquefied methane refuelling infrastructure in the Member States. [49]

4.2. Mandatory Mechanisms

Forthcoming legislation will be central to enabling fleet transformation. Key instruments include:

- **FuelEU Maritime Regulation** (2025), mandating GHG intensity reduction.
- **EU ETS Extension to Maritime** (2024 onward), integrating shipping into carbon markets.
- **Revised MRV Regulation**, expanding reporting obligations and transparency.
- **Zero Emission Port Guidelines** and standards for shore power adoption.
- **Nuclear safety and licensing frameworks** under EU Atomic Energy Community (EURATOM), in anticipation of emerging nuclear maritime applications. These measures are designed to support the shift toward clean fuels and technologies in response to fleet evolution.

The transformation of the maritime sector represents one of the most complex challenges within the European Union's ecological and digital transition. Traditionally regarded as a hard-to-abate sector, maritime transport is now at the core of a new regulatory and technological trajectory. This transition is driven by the urgent need to drastically reduce greenhouse gas (GHG) emissions, enhance fleet energy efficiency, and promote the adoption of zero-emission fuels and technologies, in line with the objectives of the European Green Deal, the Fit for 55 package, and the EU's international commitments under the International Maritime Organization (IMO) framework.

As of 2024, the maritime sector has been systematically integrated into the EU's climate strategy through a series of next-generation legislative instruments. These instruments do not operate in isolation; rather, they are designed to mutually reinforce one another through a regulatory integration approach, guiding shipowners, port authorities, and energy operators toward a structural transformation of the maritime ecosystem.

Maritime transport is at the core of both European and global logistics: over **75% of the EU's external trade** and approximately **30% of intra-European freight** is carried by sea. However, the sector remains heavily reliant on fossil fuels and was responsible for approximately **144 million tonnes of CO_2** within the European Economic Area in 2018.

Until recently, maritime transport had largely been excluded from the scope of EU climate policies. The adoption of the **European Green Deal** in 2019 marked a pivotal shift: the objective of achieving **climate neutrality by 2050** required the expansion of climate legislation to encompass **all emitting sectors**, including shipping.

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In this context, the **Fit for 55 package** (July 2021) introduced a **comprehensive set of legislative instruments**, including:

- **FuelEU Maritime Regulation** – to regulate the **carbon intensity of fuels** used onboard ships;
- **Revision of the EU ETS** – to extend the **EU Emissions Trading System** to the maritime sector;
- **Revision of the MRV Regulation** – to strengthen **emission monitoring, reporting and verification** requirements;
- **AFIR Regulation and TEN-T revision** – to equip EU ports with **zero-emission infrastructure**;
- **EURATOM Guidelines** – to explore the **long-term potential of nuclear solutions** for maritime propulsion.

4.2.1. FuelEU Maritime Regulation

Regulation (EU) 2023/1805, known as FuelEU Maritime, marks a milestone in the European maritime sector's decarbonisation strategy. Adopted on 13 September 2023 and entering into force in July 2024, this regulatory instrument sets progressive limits on the greenhouse gas (GHG) intensity of fuels used by ships with a gross tonnage (GT) of ≥ 5,000 conducting voyages to, from, or between EU ports.

The reduction trajectory defined in Article 4 of the Regulation requires a 2% GHG intensity cut by 2025, ramping up to an 80% reduction by 2050 compared to the 2020 baseline (Regulation (EU) 2023/1805, Art. 4). [50] The Regulation adopts a well-to-wake approach, covering emissions from the production, transportation, and combustion phases of fuel life cycles.

The framework is technology-neutral, allowing operators to use any type of low-carbon fuel, provided it complies with the prescribed thresholds. This is expected to promote the uptake of fuels such as green methanol, synthetic ammonia, and RFNBOs (Renewable Fuels of Non-Biological Origin), in alignment with Directive (EU) 2023/2413 [51].

A key regulatory innovation is the mandatory use of Onshore Power Supply (OPS) from 2030 onwards for passenger and container vessels at core TEN-T ports, as stipulated in Article 6, in coherence with the Alternative Fuels Infrastructure Regulation [52]. This entails significant infrastructure upgrades in EU ports, which must deploy high-voltage power networks compatible with large vessel requirements.

The Regulation not only imposes annual “well-to-wake” GHG intensity limits but also introduces a **dynamic compliance system** based on three flexibility mechanisms: **banking**, **borrowing**, and **pooling**. Rooted in principles of fairness and the internal market, these mechanisms enable shipping companies to manage emission surpluses and deficits through an integrated and coordinated approach.

- **Banking** allows a vessel that exceeds compliance thresholds in a given year to carry forward the surplus to future years. Such credits, recorded in the FuelEU database

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prior to the issuance of the **FuelEU Document of Compliance**, do not expire and may be utilised in future pooling arrangements.

- **Borrowing**, by contrast, permits an operator to anticipate surplus from the subsequent year to offset a compliance shortfall, with a cap of **2% of the GHG limit** relative to annual fuel consumption, and incurs a **10% interest rate** on the borrowed credit. However, borrowing is restricted to non-consecutive years, and critically, a vessel using this mechanism **is not eligible for pooling** during the same compliance period. It is therefore considered a stopgap measure—useful but costly [53].
- The most innovative mechanism is pooling, which enables the redistribution of compliance balances among vessels, even across different ownerships, provided that the pool remains in net compliance and no vessel is disadvantaged or ends up in deficit after reallocation. The Regulation grants the parties freedom to define internal allocation rules, provided that the system and distribution are clearly recorded in the FuelEU database and validated by a single authorised verifier [54].

Operationally, by 30 April following the reporting year, the pool must be formally constituted, including the structure configuration, verifier designation, list of vessels, and credit distribution criteria. Only after verifier validation and database registration can the Document of Compliance be issued, assuming the pool is in surplus or the shortfall has been compensated by payment of penalties [55].

From a contractual perspective, pooling arrangements require tailored agreements, ranging from internal undertakings between shipowners to complex inter-company contracts. These are expected to incorporate BIMCO FuelEU Clauses in SHIPMAN or time-charter agreements to ensure clarity on responsibilities, economic distribution of credits, and obligations in the event of vessel transfer or management change. Such contracts must provide both payout mechanisms for surplus holders and risk-mitigation guarantees [56].

It is crucial to note that pooling is compatible with banking—unused surplus may be saved for future use. Conversely, borrowing is incompatible with pooling: vessels applying borrowing are barred from participating in any compliance group. This integrated compliance system offers operational flexibility—encouraging economies of scale and collaborative strategies—but demands strict regulatory diligence: each credit must be traceable, all procedures must be verified by a single third party, and contractual frameworks must account for all contingencies and liabilities. The implementation of digital MRV (Monitoring, Reporting and Verification) tools and updated contractual instruments (e.g. BIMCO FuelEU Clauses, revised time-charters) is therefore indispensable.

4.2.2. Revision of the EU ETS

The inclusion of maritime transport in the European Union Emissions Trading System (EU ETS), formalised through Directive (EU) 2023/959 of 10 May 2023, marks a pivotal milestone in the EU's decarbonisation strategy. This new legislative chapter extends the "cap-and-trade" principle—historically applied to sectors such as energy and industry—to commercial vessels

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with a gross tonnage (GT) equal to or above 5,000, regardless of flag. The Directive entered into force on 5 June 2023, with application starting on 1 January 2024 [57].

In practical terms, shipping companies are now obliged to monitor, report, and verify (MRV) their emissions and subsequently purchase and surrender emission allowances (EUAs) proportionate to the CO_2 emitted. This obligation is phased in gradually:

- 40% of 2024 emissions must be offset by EUAs surrendered in 2025;
- 70% of 2025 emissions by 2026;
- From 2027 onwards, 100% of verified emissions must be covered annually.

The Directive also defines the geographical scope:

- 100% of emissions from intra-EU voyages and while at berth in EU ports are covered;
- 50% of emissions from voyages to or from non-EU ports must be compensated.

From 2026, the scope of the EU ETS will be expanded to also include methane (CH_4) and nitrous oxide (N_2O), thereby enhancing the environmental integrity of the system [58].

Operationally, compliance shifts from the current MRV framework (Regulation EU 2015/757) to the ETS regime, with national competent authorities designated to handle data collection, verification, and enforcement of penalties for non-compliance [59]. This transition reinforces the regulatory architecture, transferring what was once an administrative requirement into a market-based responsibility.

From a legislative perspective, the amendment of Directive 2003/87/EC through the insertion of Chapter IVa formally integrates maritime transport into the EU ETS, subjecting it to the same obligations on monitoring, reporting, compliance, and penalties that already apply to other sectors.

Furthermore, the Directive introduces a mechanism for scope expansion assessment:

- By 31 December 2024, the potential inclusion of smaller ships (400–5,000 GT) must be evaluated;
- By 2026, the possible extension to offshore vessels will also be reviewed.

This evolution aligns with the broader EU environmental policy framework. The maritime EU ETS complements the Fit for 55 package, working in conjunction with the MRV system and FuelEU Maritime Regulation. The system builds on the cap-tightening mechanism, targeting a 62% reduction in total emissions by 2030 compared to 2005 levels—thereby creating a systemic incentive to adopt low-carbon fuels and energy-efficient technologies [47].

Revenue generated from the maritime EU ETS—estimated at €4.5 billion by 2030—will be earmarked for decarbonisation measures within the sector itself. The Innovation Fund, financed through ETS revenues, has officially been extended to cover maritime activities. According to Article 10a(8), the European Commission is required to launch dedicated calls for maritime decarbonisation by 2027, with particular focus on emerging technologies such as electrification, hydrogen-based propulsion, and black carbon mitigation. The fund—amounting to approximately €40 billion for the 2020–2030 period—can support up to 60% of the eligible costs for high-innovation, pre-commercial projects [60].

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In parallel, Horizon Europe reinforces European synergies: the Directive mandates that the Commission promote collaboration between the Innovation Fund and Horizon Europe agendas, encouraging partnerships and knowledge sharing across the R&D value chain. This integration facilitates a seamless pathway from research and development to large-scale demonstration [61].

Finally, the Connecting Europe Facility (CEF) offers an infrastructure financing channel to support clean transport modes. The CEF Transport 2021–2027 programme, with a budget of €20.7 billion, includes a dedicated maritime chapter financing port infrastructure, TEN-T corridors, and alternative fuel refuelling stations—thus supporting the ETS transition. Specifically, the Motorways of the Sea projects and AFIF (Alternative Fuels Infrastructure Facility) infrastructures are key tools to integrate low- and zero-emission fuels and enhance the management of maritime traffic [62].

4.2.3. Revision of the MRV Regulation

The revision of the Monitoring, Reporting and Verification (MRV) system, introduced by Regulation (EU) 2023/957, adopted on 10 May 2023, marks a crucial step toward more robust, transparent, and accountable management of shipping emissions. This update firmly asserts that transparency is not optional, but a necessary condition to effectively drive decarbonisation in the maritime sector.

The scope of application has been significantly expanded compared to the original MRV Regulation (Regulation (EU) 2015/757). As of 1 January 2024, monitoring is no longer limited to CO_2, but also includes methane (CH_4) and nitrous oxide (N_2O)—greenhouse gases with high global warming potential. Furthermore, from 1 January 2025, the obligation will extend to general cargo ships between 400 and 5,000 GT and offshore ships of 400 GT and above. The entry into force of this expansion has been supported by a Commission Delegated Act (October 2024), aimed at clarifying the categories of offshore activities included, and ensuring that low-emission synthetic fuels are appropriately treated under the ETS—avoiding double taxation.

From a procedural standpoint, the Regulation establishes a strict timeline:

- By 1 April 2024, companies must submit an updated Monitoring Plan for each vessel (including all relevant gases and new ship categories), reviewed by an accredited verifier and approved via the THETIS MRV platform.
- From that point onward, operators must monitor and report annual emissions (CO_2, CH_4, N_2O), which must be independently verified and submitted by 31 March of the following year [63].

The extended MRV framework is closely aligned with the maritime ETS: MRV data serves as the foundational dataset for the obligation to purchase ETS allowances for CO_2 emissions—and, in the future, for CH_4 and N_2O. Consequently, the legislation imposes strict accuracy requirements for reported data, which must be validated by verifiers accredited under ISO 14065, thereby ensuring consistency and data quality across the single market.

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In terms of transparency and accountability, the revised MRV introduces several key enhancements:

- Mandatory designation by each Member State of a national administrative authority responsible for each shipping company, with biennial publication of the authority list by 1 February 2024;
- Consolidation of information at the company level (in addition to the vessel level), requiring annual aggregated reports;
- Stricter verification rules: Commission Delegated Regulation 2023/2917 establishes stringent criteria for verifiers, including on-site audits and harmonised credentials across Member States.

This regulatory revision addresses two complementary needs to increase public trust by delivering verified and accessible data and to create a solid legal framework capable of supporting ETS implementation and future FuelEU Maritime regulation.

An initial assessment, dated 18 March 2025, indicates that the new system has successfully encouraged transparent behaviour among shipping companies, with no evidence of systemic avoidance. However, it has also highlighted administrative challenges for smaller vessels (400–5,000 GT), prompting the Commission to consider proportional simplification measures to reduce the burden [64].

4.2.4. Zero Emission Port Guidelines

The universal adoption of Onshore Power Supply (OPS) in ports represents a strategic pillar in the transition toward maritime decarbonisation. The Zero-Emission Port Guidelines, developed within the Fit for 55 package, outline an integrated roadmap in which shore power, clean energy infrastructure, and technical standards become key elements in reducing emissions from auxiliary engines during port calls.

Under the FuelEU Maritime Regulation and the Alternative Fuels Infrastructure Regulation (AFIR – Regulation EU 2023/1804), from 1 January 2030, all passenger and container vessels ≥ 5,000 GT calling at TEN-T core ports must connect to OPS—where available—to fully meet their onboard electricity demand. From 2035, this obligation extends to all EEA ports equipped with OPS [65].

A study by the ICCT shows that in 2019, EU ports had a total OPS demand of approximately 5.9 TWh, while the installed capacity was only 309 MW across 51 ports—serving around 15,700 vessels ≥ 400 GT. Meeting the 2030 target will require tripling or even quadrupling OPS capacity within the next few years [66].

On the operational side, the EMSA Guidance provides a detailed roadmap for port authorities and technical planners, covering:

- Identification of electrical specifications;
- Infrastructure design and engineering;
- Safety standards based on IEC/IEEE 80005-1, the international OPS standard

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The goal is to enable robust and interoperable planning, avoiding isolated, incompatible solutions, and encouraging modular and scalable deployments across ports.

At the Port of Rotterdam, OPS deployment is already underway: by 2030, the port aims to serve:

- 90% of Ro-Ro vessels, ferries, cruise ships, and offshore units, and
- 50% of container ships >10,000 TEU, through 8–10 pilot OPS facilities [67]. Port authorities emphasize the need for a tailored approach and public support, both infrastructural and fiscal, to balance costs, standardisation, and technological uptake.

From a technological perspective, OPS—also referred to as cold ironing, shore-side power (SSP), or alternative maritime power (AMP)—allows ships to shut down their diesel generators while at berth. This not only reduces CO_2 emissions but also effectively eliminates NO_x, SO_x, and particulate matter, significantly improving air quality in and around port areas [68].

Experts and stakeholders largely agree on the value of OPS but caution that it is not a universal solution: for certain vessel segments, zero-emission fuels may offer a more strategic decarbonisation pathway.

To address challenges related to infrastructure costs, grid capacity, and equity between ports and shipowners, it is essential to ensure:

- Coordinated expansion of port and national grid capacity;
- Harmonised technical standards between equipment manufacturers and shipowners;
- Tariff incentives or tax exemptions to reduce the cost gap between electricity and fossil fuels.

The BREEZE project, funded under Interreg Europe, promotes accelerated OPS deployment through knowledge exchange, techno-economic feasibility studies, and policy and financial tool development—identifying efficient and replicable solutions across the EU [69].

4.2.5. Nuclear safety and licensing frameworks

The path toward the adoption of nuclear applications in maritime transport requires a robust framework for safety, oversight, and licensing, provided by the EURATOM system. Established under the Euratom Treaty of 1957, the current system—soon to be updated by the new Safeguards Regulation (which will replace Regulation 302/2005 starting in early 2025)—aims to ensure the exclusively civilian use of nuclear facilities and prevent the diversion of fissile material [70]. Specifically, Euratom sets out control and monitoring standards based on two core pillars:

- Detailed registration and reporting by operators on inventories and movements of radioactive material, with periodic declarations submitted to the European Commission;
- Inspections, both documentary and on-site, conducted by Commission experts and, where applicable, by the IAEA, to detect and prevent potential misuse.

In parallel, Directive 2009/71/Euratom, as amended in 2014, mandates high safety standards for nuclear installations in the EU, including initial safety assessments, ten-year periodic safety

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reviews, and the strengthening of independence and transparency of national regulatory authorities [71].

As regards the development of portable nuclear components for maritime use (e.g. nuclear-powered vessels), a pan-European project called "Harmonise", co-funded by Euratom–Horizon Europe, is currently underway. It aims to establish a harmonised approach to licensing Small Modular Reactors (SMRs) by improving:

- safety standards,
- risk assessment methodologies, and
- streamlined, shared licensing procedures across EU Member States [72].

On the international level, EURATOM has enhanced cooperation with the IAEA through a 2022 Memorandum of Understanding, expanding coordination on SMR development, training, emergency response, and nuclear waste management.

In the emerging maritime context, references to civil nuclear propulsion are beginning to appear in technical literature and public policy debates. Several projects (e.g. Nemo, Minerva, and SMR initiatives by Fincantieri and Newcleo) estimate a minimum implementation timeline of 10 years, underlining the need for dedicated regulatory frameworks to address:

- Multilevel licensing requirements (national + Euratom + IMO);
- Full lifecycle safety of reactors, including radiation protection, waste management, incident prevention, cybersecurity, and port custody protocols;
- Port approval criteria, including inspections, crew training, and insurance and liability oversight.

In summary, the EURATOM framework provides a solid foundation for ensuring safety and licensing in emerging nuclear maritime scenarios. It represents the first pillar of a future multi-level governance architecture (EU, Member States, IMO, flag state) that could enable the deployment of SMR-powered merchant or offshore support vessels—provided that certified, harmonised, and up-to-date technical standards are established.

4.3. Voluntary Mechanisms (Standards, Codes)

Industry-led and classification society initiatives play a complementary role, including:

- Environmental notations for green ships.
- ISO standards for energy and environmental management.
- Private certification schemes rewarding early adopters of sustainable practices.
- Development of voluntary nuclear safety protocols for demonstration projects. These tools accelerate innovation and de-risk investment in emerging technologies.

In the current context, voluntary mechanisms such as standards, codes of conduct, and private certification schemes are gaining increasing importance in the European system of environmental and safety governance, complementing binding laws and regulations. Tools such as **environmental notations for "green ships"**, promoted by major classification societies, already provide commercial and reputational incentives to shipowners adopting advanced emission reduction technologies, energy efficiency measures, and sustainable operational practices. In parallel, **ISO standards** are widely implemented by companies

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seeking to demonstrate compliance with international best practices, even when not legally mandated.

From a regulatory perspective, the EU has strengthened the role of voluntary standards through legislation setting minimum energy efficiency requirements. For example, the **Directive (EU) 2023/1791 (Energy Efficiency Directive, EED-recast)** establishes that enterprises with high annual energy consumption must either implement energy management systems aligned with **ISO 50001:2018** or conduct energy audits according to **EN 16247-1** [73]. Similarly, the **Industrial Emissions Directive (2010/75/EU, IED)** requires operators of large industrial installations to adopt environmental management systems and report environmental performance indicators, where voluntary instruments such as **EMAS** and **ISO 14001:2015** provide a consolidated framework [74].

In the nuclear sector, **Council Directive 2009/71/Euratom** establishes a binding Community framework for the safety of nuclear installations, while **Directive 2011/70/Euratom** regulates spent fuel and radioactive waste management. Alongside these, voluntary initiatives developed at national and international level (e.g., WENRA Safety Reference Levels, IAEA Safety Standards) act as testing grounds for technical requirements, stress-test methodologies, and **safeguards-by-design** approaches that may anticipate binding provisions [75] [76].

4.3.1. Environmental Notations for Green Ships

Currently, classification societies (e.g., DNV, RINA, Lloyd's Register) have introduced voluntary environmental notations certifying compliance with criteria going beyond regulatory baselines, such as reductions in NOx and SOx emissions, improvements in energy efficiency (in line with the IMO Energy Efficiency Design Index – EEDI and the Carbon Intensity Indicator – CII), and the adoption of alternative fuels (LNG, methanol, ammonia, hydrogen). These notations align with the EU framework transposing international rules, such as Regulation (EU) 2015/757 on MRV (Monitoring, Reporting, Verification) of CO_2 emissions from ships [77].

By 2030, with the expansion of the EU ETS to maritime transport and the enforcement of the FuelEU Maritime Regulation (EU) 2023/1805, environmental notations will evolve from voluntary reputational tools into market access conditions, supporting compliance with GHG intensity thresholds [78]. By 2050, in line with the IMO objective of achieving net-zero GHG emissions in shipping, these notations will become global standards integrated into ship financing, insurance policies, and green shipping corridors, including indicators on circular economy, end-of-life ship management, and digital monitoring.

4.3.2. ISO Standards for Energy and Environmental Management

ISO standards represent the most widespread reference for voluntary management systems:

- The **ISO 50001:2018** standard provides a structured methodology for establishing, implementing, maintaining, and improving an Energy Management System (EnMS). Its purpose is to enable organisations to follow a systematic approach to continuous

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improvement of energy performance, including energy efficiency, use, and consumption [9]. The standard is based on the Plan-Do-Check-Act (PDCA) cycle and requires organisations to:

- define an energy baseline (EnB);
- monitor energy performance indicators (EnPIs);
- implement energy efficiency measures;
- ensure management review and continuous improvement.

In the EU regulatory framework, the Energy Efficiency Directive (Directive (EU) 2023/1791, EED-recast) explicitly recognises ISO 50001 as equivalent to mandatory energy audits according to EN 16247-1, for enterprises with annual energy consumption above defined thresholds (≥ 85 TJ/year) [79]. Consequently, certification under ISO 50001 not only enhances operational efficiency but also provides regulatory compliance advantages, reducing audit obligations and facilitating access to EU funding (e.g., Innovation Fund, LIFE programme).

In a global study of 72 organisations (across multiple sectors) that have adopted ISO 50001, *Fuchs, Therkelsen et al.* identify key drivers, benefits, and challenges. Benefits include measurable energy cost savings, improved energy performance, stronger management engagement, and increased organisational capacity to implement continuous improvement. Challenges relate to initial investment, organisational culture, staff training, and obtaining reliable measurement/monitoring systems [80].

An empirical study of early adopters in Spain (57 certified entities) found that organisations with ISO 50001 tend to have better energy-baseline definition, more systematic monitoring of energy performance indicators, and that they expect both economic and reputational returns [81].

Another case: The Saudi Standards, Metrology and Quality Organization (SASO) applied ISO 50001 in government buildings and achieved about 39% reduction in electricity consumption and ~38% decrease in CO_2 emissions compared to baseline, with substantial cost savings. This demonstrates that public sector organisations can also benefit significantly [82].

- The **ISO 14001:2015** standard provides the framework for the design and implementation of an Environmental Management System (EMS), helping organisations to identify, manage, monitor, and control environmental issues in a holistic way. Key components include:

  - systematic identification of environmental aspects and impacts;
  - compliance with legal and regulatory obligations;
  - integration of environmental considerations into business strategy;
  - adoption of life cycle perspective in product and service management .

By 2030, with the implementation of the European Green Deal and the EU Taxonomy for Sustainable Activities (Regulation (EU) 2020/852), ISO certification will become a de facto requirement for access to green finance and support schemes (e.g., Innovation Fund, Horizon Europe) . By 2050, ISO standards will be fully integrated into digital compliance platforms,

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enabling real-time monitoring and alignment with mandatory ESG reporting frameworks such as the Corporate Sustainability Reporting Directive (CSRD, Directive (EU) 2022/2464) [83].

A study “Environmental consequences of ISO 14001 in European economies amidst structural change and technology innovation” (2023) shows that adoption of ISO 14001 is statistically associated with reduced carbon emissions in European countries, especially where structural change and technological innovation are present. However, the magnitude of effect varies, and in some cases the benefits are modest unless accompanied by strong regulatory or market pressure [84].

Research on SMEs in Europe (“Ecological impacts of the ISO14001 certification of small and medium sized enterprises …”) indicates that although ISO 14001 certification by itself does not always produce large direct ecological improvements, it stimulates participation in environmental networks, which then contribute indirectly to improved ecological performance. Thus, the effect is mediated by external collaboration and exchange of best practices [85].

4.3.3. Private Certification Schemes Rewarding Early Adopters

Beyond ISO, private certification schemes (e.g., CarbonNeutral®, Science Based Targets initiative, climate neutrality labels) reward early adopters of sustainable practices, enhancing competitiveness and access to supply chains requiring advanced ESG standards.

By 2030, convergence with the Sustainable Finance Disclosure Regulation (SFDR, Regulation (EU) 2019/2088), the EU Taxonomy, and the upcoming Corporate Sustainability Due Diligence Directive (CSDDD) will transform private certifications into financial value drivers, reducing capital costs for certified operators [86] [87]. By 2050, such schemes are expected to standardise globally, evolving into interoperable meta-standards integrated with ISO and EU frameworks. Thus, voluntary certifications will shift from competitive advantage tools to integral elements of governance, mitigating systemic risks and strengthening global value chain resilience.

4.3.4. Development of Voluntary Nuclear Safety Protocols

In addition to the binding requirements of Directive 2009/71/Euratom and Directive 2011/70/Euratom, voluntary protocols in the nuclear sector — such as WENRA and IAEA safety standards — play a pivotal role in promoting innovation and safety assurance.

- **WENRA (Western European Nuclear Regulators' Association)**: WENRA has developed reference levels for the safety of existing nuclear power plants, recognizing that IAEA safety standards provide a solid foundation for the continuous improvement of national regulatory systems and nuclear safety [88].
- **IAEA (International Atomic Energy Agency)**: The IAEA's safety standards offer fundamental principles, requirements, and recommendations to ensure nuclear safety, serving as a global benchmark to protect people and the environment and contributing to a high level of harmonized safety worldwide [89].

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By 2030, with the deployment of demonstration projects for Small Modular Reactors (SMRs) and advanced nuclear technologies, voluntary protocols will be essential to de-risk investment and build trust among stakeholders. They may also serve as eligibility or bonus criteria in public support schemes, for example under the Net Zero Industry Act (COM(2023)161) [8]. By 2050, as nuclear energy contributes to deep decarbonisation, voluntary protocols will evolve into globally recognised standards, complementing Euratom legislation and IAEA guidance, ensuring safe deployment of Generation IV reactors and decommissioning practices.

By 2030, voluntary mechanisms will become more integrated into the EU's regulatory and financial framework, including:

- mandatory energy management systems aligned with ISO 50001 for large energy consumers;
- greater recognition of EMAS and private certifications in green public procurement and EU funding;
- formalisation of nuclear voluntary protocols in demonstration projects;
- expansion of maritime environmental notations to include life-cycle and GHG performance;
- convergence of voluntary standards (ISO, EMAS, private schemes) with EU regulations and BAT guidance under the IED.

By 2050, the boundary between voluntary and mandatory will blur. Voluntary standards will act as de facto prerequisites for market access, finance, and insurance. Certification systems will be fully digitalised (IoT, blockchain), enabling real-time verification. Supranational voluntary protocols will emerge in high-risk sectors (shipping, nuclear, energy), supporting technologies not yet codified. Ultimately, voluntary mechanisms will function as structural pillars of competitiveness, resilience, and climate neutrality.

4.4. National strategies and strategic investments

The political framework underpinning fleet evolution is defined by:

- The **EU Green Deal** and **Climate Law**, setting climate neutrality by 2050.
- The **Sustainable and Smart Mobility Strategy**, which aims to double inland and short sea shipping by 2050.
- National maritime strategies aligned with European and international climate goals.
- Strategic investments in advanced fuels, including nuclear R&D. These targets direct funding, infrastructure development, and R&D priorities.
- Multimodality

Although international objectives provide guiding principles and European directives establish clear obligations, neither prescribes the specific methods for achieving these emission reductions. This leaves considerable freedom for individual actors to determine the most appropriate strategy. Consequently, different nations have adopted varied approaches, and

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individual shipowners have invested in the technologies they deem most advantageous, fostering a diverse portfolio of decarbonisation solutions.

EU Member States have, in turn, articulated national maritime strategies attuned to their specific geographies, industrial structures, and energy portfolios.

- France's Stratégie nationale pour la transition écologique du transport maritime [90] prioritises fleet modernisation and the development of "green maritime corridors."
- Germany's Maritime Agenda 2025 positions sustainability within an innovation-oriented policy. Germany Government plans to play an active role, supporting the introduction of new fuels and propulsion systems and explore the feasibility of equipping or retrofitting existing vessels with new propulsion methods and to plan new vessels accordingly. [91]
- Italy's National Recovery and Resilience Plan (PNRR) incorporates dedicated funding for LNG-powered vessels, hybrid propulsion, and "cold ironing" infrastructure in key ports. [92]
- Norway is acting as a state-led technology pioneer. It is strategically using its vast energy expertise to provide substantial public funding through mechanisms like the Enova fund. This capital is directed at de-risking and accelerating first-of-a-kind projects in electrification, hydrogen, and ammonia. [93]
- Denmark exemplifies an industry-led approach, in which the national shipowners' association has established climate targets that align seamlessly with the national strategy. [94] This strategy places strong emphasis on positioning Denmark as a global hub for the production and bunkering of green fuels (Power-to-X). Thanks to this synergy, Danish shipowners aim to operate 5% of the national fleet with zero emissions by 2030. From that year onward, all newbuildings ordered by Danish shipowners are to be designed to accommodate net zero-emission fuels or other zero-emission propulsion technologies. [95]

The examples provided represent only a selection of the strategies presented by various states, which are increasingly assuming the role of pioneers in different areas of maritime research. This research effort has thus evolved on multiple levels, encompassing projects financed through international, European, and national funding instruments.

The combined force of this multi-layered political framework, from the global ambitions of the International Maritime Organization (IMO) to the binding regulations of the European Union and the targeted strategies of individual nations, is actively channeling capital flows and research and development (R&D) efforts into specific technological pathways. These political objectives are not mere aspirational targets; rather, they are shaping markets, directing funding, and ultimately determining which technologies will drive the global fleet of the future.

This evolving regulatory and financial landscape is de facto establishing a fuel hierarchy. While biofuels and liquefied natural gas (LNG) are frequently promoted as transitional solutions, their long-term viability is increasingly subject to scrutiny due to the implementation of the well-to-wake accounting method and the growing imperative to consider the full spectrum of greenhouse gases (GHGs). LNG, although associated with lower CO_2 emissions than conventional fuel oil, is under increased examination due to methane slip, which will be penalized under the extended scope of the EU Emissions Trading System (ETS) from 2026

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onward. As a result, Renewable Fuels of Non-Biological Origin (RFNBOs) are emerging as the policy-preferred long-term solution for deep-sea shipping. Accordingly, numerous research initiatives have focused on maritime electrification and the development of hydrogen-, ammonia, or methanol-fueled vessels. [96]

The need to adopt a full life-cycle perspective when evaluating energy sources, rather than focusing solely on emissions produced during navigation, has led to increased attention toward both green and blue fuels. Significant investment has been directed toward the study and development of these fuel types, particularly within the hydrogen sector, although this classification is applicable to other fuels as well.

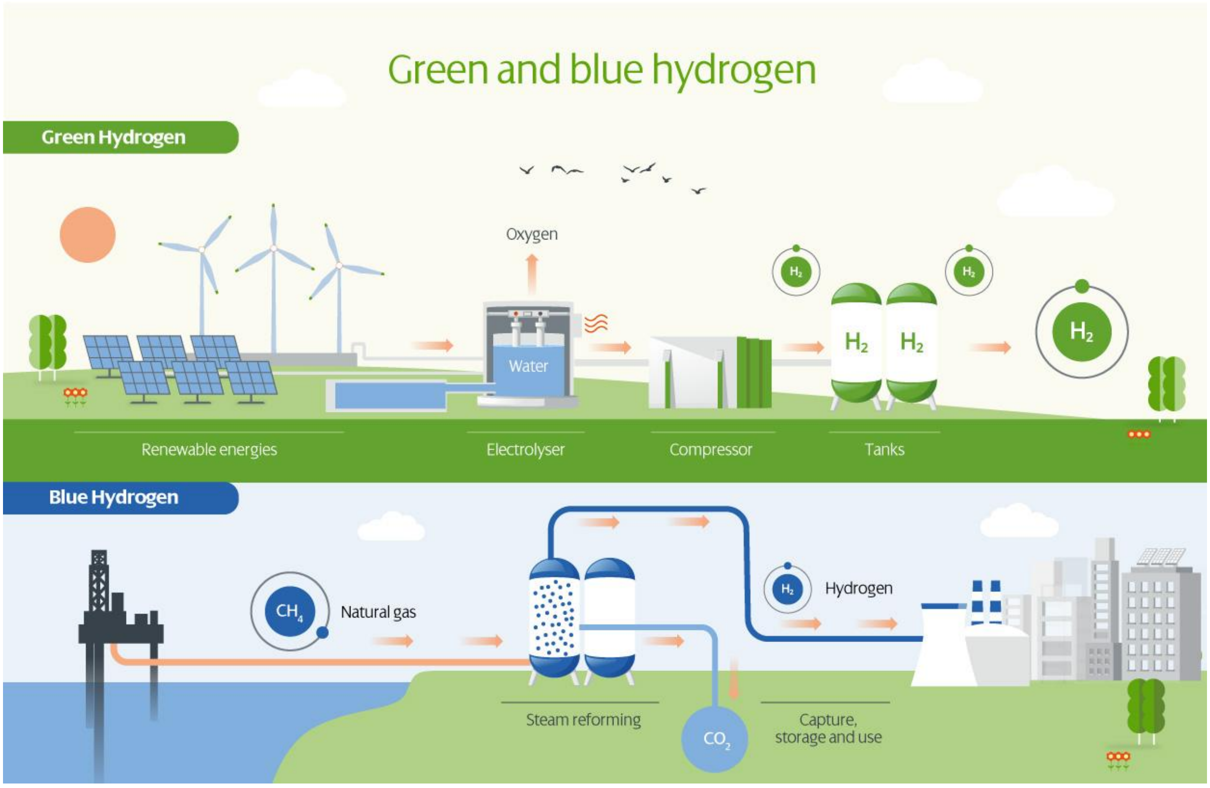

Figure 7: Green and blue hydrogen (image source: Iberdrola website - https://www.iberdrola.com/about-us/what-we-do/green-hydrogen/difference-hydrogen-green-blue)

Blue hydrogen is produced through processes involving hydrocarbons, such as methane. A common method is steam methane reforming, which generates hydrogen alongside carbon dioxide as a by-product. While carbon capture systems can be integrated into this process to reduce CO_2 emissions, their current efficiency ranges between 60% and 65%. As a result, approximately 30% to 35% of the carbon dioxide generated is still released into the atmosphere. Although blue hydrogen incorporates mitigation technologies, it remains reliant on fossil fuels and does not fully eliminate greenhouse gas emissions.

Green hydrogen, by contrast, is obtained through the electrolysis of water, a process that separates hydrogen from oxygen. When powered by electricity from renewable energy

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sources, this method becomes entirely sustainable, producing hydrogen without generating pollutants. The resulting hydrogen can be stored or utilized in industrial applications or heavy-duty transport, while the oxygen by-product can either be released harmlessly into the atmosphere or used in other processes. Additionally, the electrolysis process generates thermal energy, which may be recovered and utilized through heat pump technologies, for example in district heating systems. This makes green hydrogen production a truly zero-emissions solution. [97]

It is important to emphasize, however, that switching to more sustainable fuels is not the sole avenue for achieving emissions reductions. Several projects have explored the use of environmental forces, such as wind and currents, sometimes even leading to structural modifications of vessel design to better harness these natural phenomena. Other initiatives have targeted the optimization of ship operations, including adaptive routing and the deployment of Maritime Autonomous Surface Ships (MASS).

One of the most ambitious, and simultaneously most technically challenging, topics currently under scientific investigation is nuclear propulsion.

The development of Small Modular Reactors (SMRs) offers the potential for a transformative energy source that is genuinely zero-emission at the point of use, provides an exceptionally high-power density, and significantly reduces the need for refueling, thereby offering unparalleled operational autonomy. Research and development in this field are rapidly progressing. Notably, the Norwegian NuProShip project represents a serious academic and industrial endeavor aimed at assessing the feasibility of specific Generation IV SMR designs for maritime application. Following the evaluation of nearly 100 reactor concepts, the project has selected three promising designs for further study: a molten salt reactor, a helium-cooled gas reactor, and a lead-cooled reactor. These advanced technologies promise enhanced passive safety mechanisms compared to conventional large-scale nuclear reactors. [98]

Despite this considerable technological promise, the pathway to the deployment of nuclear-powered commercial vessels remains obstructed by significant challenges. Chief among these is the absence of a comprehensive regulatory framework. Securing public and port-state acceptance for nuclear-powered ships making regular calls at international ports would constitute a profound political challenge. Additionally, the issues of radioactive waste management, crew training, physical safety against accidents or malicious acts, and legal liability in the event of an incident are all highly complex.

Although SMRs represent a high-risk, high-reward pathway with the potential to radically reshape maritime propulsion, they are unlikely to contribute meaningfully to the EU's decarbonization objectives for 2030 or even 2040. Nevertheless, they could emerge as a disruptive technological force in the latter half of the century.

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5. Automation and Digitalization for Efficiency

5.1. *Concepts and services for traffic efficiency*

Across Europe, maritime traffic efficiency is evolving from a collection of local optimizations into a **data-driven, cooperative ecosystem** linking ships, ports, and shore services. Three main technical pillars support this transformation: EU-wide data exchange infrastructures, **Collaborative Decision-Making (CDM)** platforms for ship–port calls, and **Just-in-Time (JIT) arrival** services integrated into voyage and port-call planning. This section presents the European state of the art and key experimental evidence from EU-funded initiatives.

The first pillar concerns the **information and monitoring infrastructure** of the European maritime domain. The **SafeSeaNet (SSN)** system, managed by the European Maritime Safety Agency (EMSA), provides a hub-and-spoke architecture with a **European Index Server** for the secure federation of data on traffic, ports, and incidents [99]. Although originally developed for safety and environmental protection, SSN also underpins **traffic and transport efficiency** by enabling value-added services at national and regional level. In parallel, the **European Maritime Single Window environment (EMSWe)**, established by Regulation (EU) 2019/1239, harmonizes datasets and interfaces for port-call reporting, simplifying communication between declarants, authorities, and service providers across Member States [100]. This standardization is a key enabler for operational synchronization and reduced turnaround times at berth.

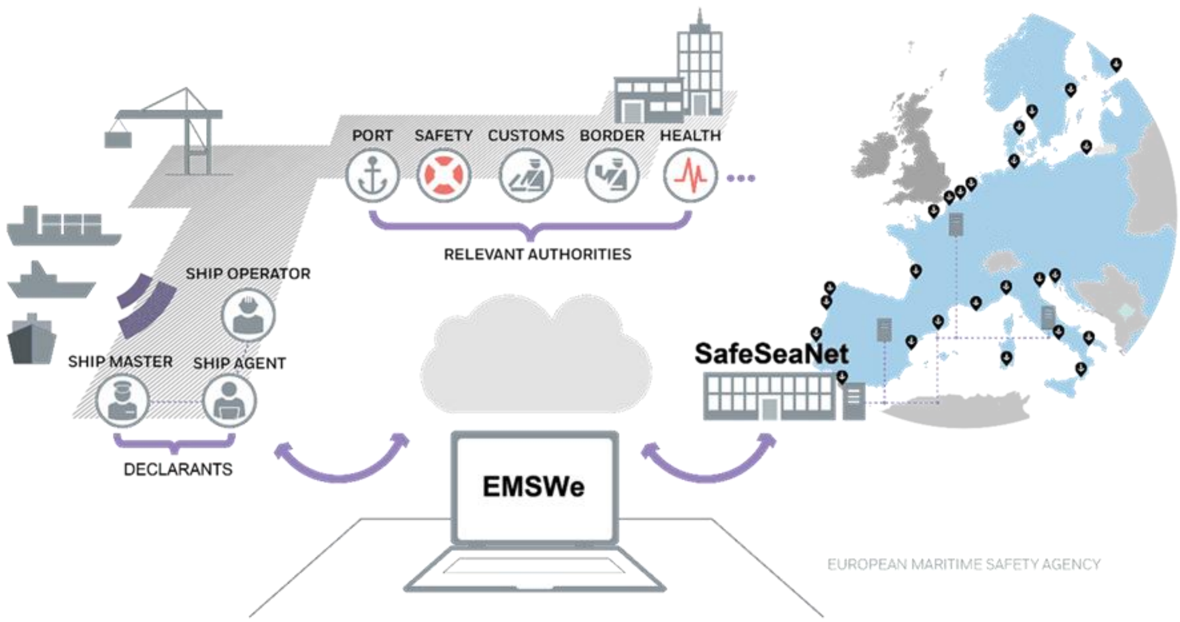

Figure 8 - SafeSeaNet Structure - curtesy EMSA

The second pillar is **Port Collaborative Decision-Making (PortCDM)** [101]. The EU-funded **Sea Traffic Management (STM) Validation Project** demonstrated the feasibility and operational value of standardized information sharing between ships and ports [102]. The large-scale trials involved **300 ships, 13 European ports, five shore centres, and 13 EMSN simulators**,

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exchanging millions of standardized timestamps for Estimated and Actual Times of Arrival and Departure (ETA/ETD), operation status, and slot allocations. The results showed measurable gains in situational awareness, coordination, and port efficiency, forming the foundation for a common digital "language" between ship and shore. The **EfficientFlow project** (Interreg Central Baltic, 2018–2021) extended the validation by implementing PortCDM in **Gävle** and **Rauma**, developing an open-source **Port Activity App** for real-time data sharing. Reported outcomes include smoother port calls, reduced waiting times, and **fuel savings** during approach and anchorage operations [103].

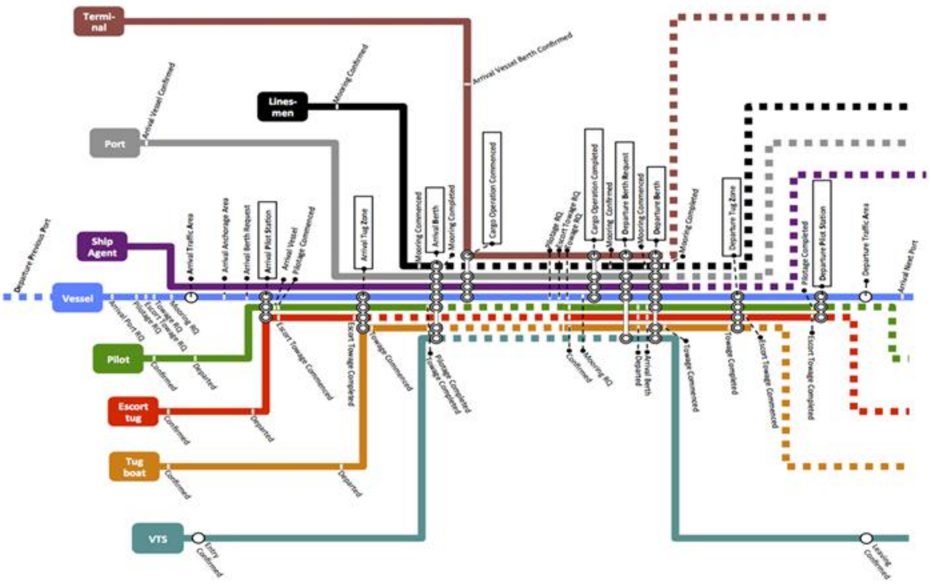

Figure 9 - PortCDM metro map - International PortCDM Council

The third pillar consists of **Just-in-Time (JIT) arrival services**, which optimize voyage speed and arrival time according to real berth and service availability. The IMO's **Global Industry Alliance (GIA)** and European pilot studies have quantified **average fuel savings of about 8 % during the final 24 hours of a voyage**, and up to **14 % total emission reductions per voyage** for container vessels when JIT procedures are coordinated with ports [104]. The **Port of Rotterdam** has operationalized this concept through its **Pronto/PortXchange platform**, recently enhanced with **geofenced JIT corridors** that synchronize approach profiles with terminal operations. Documented results show **up to 20 % reductions in waiting time** and proportional energy savings, supported by predictive ETA models based on machine learning [105].

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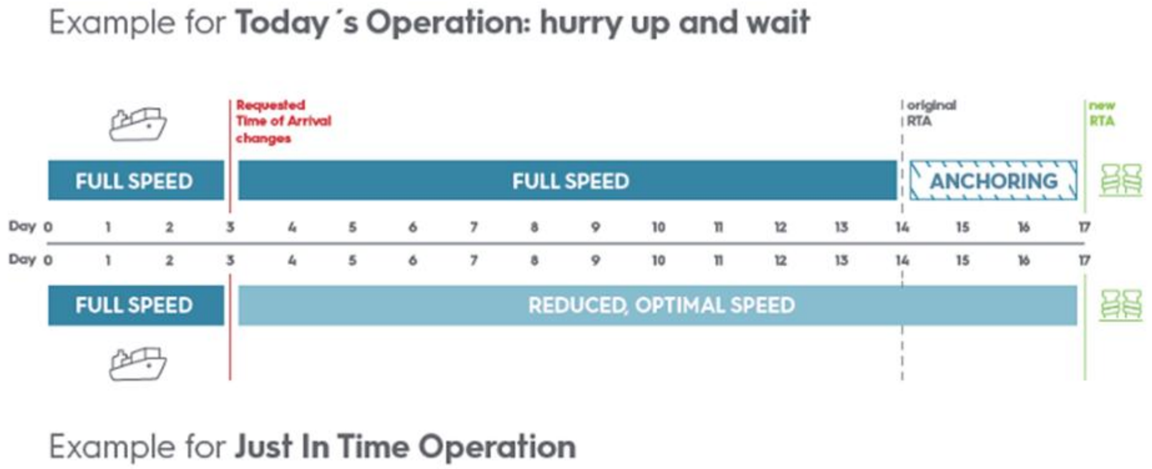

Figure 10 - JIT arrival operation concept - GEF-UNDP-IMO GloMEEP Project and members of the GIA, 2020: Just In Time Arrival Guide – Barriers and Potential Solutions.

Taken together, these technological layers converge into an **integrated operational framework** in which port digital twins and **shore control centres** orchestrate SSN/EMSWe data, PortCDM schedules, and JIT objectives. Within this framework, Sea Traffic Management platforms enable route exchange and speed-advice services directly to onboard ECDIS and voyage-planning systems, while port community systems aggregate live updates from terminals, pilots, tugs, and service providers. This enables **collaborative and auditable decisions** throughout the port call. STM and PortCDM documentation demonstrate that **interface standardization** is the essential condition to ensure that efficiency benefits are retained across heterogeneous digital systems [102] [103] .

This European maritime digital ecosystem is structured around a combination of **mandatory regulatory systems**, **voluntary collaborative platforms**, and a series of **emerging technological trends** that anticipate future regulation. At the foundation, **SafeSeaNet (SSN)** and the **European Maritime Single Window environment (EMSWe)** represent the **core mandatory systems** underpinning maritime data exchange and reporting. SafeSeaNet, established under the Vessel Traffic Monitoring and Information System (VTMIS) Directive (2002/59/EC), obliges all EU coastal states to share standardized vessel and voyage data through national nodes coordinated by EMSA. This system, initially designed for safety and environmental protection, has gradually expanded its role to include functions that enhance operational efficiency and situational awareness. Similarly, the EMSWe, introduced by Regulation (EU) 2019/1239, mandates the harmonization of data reporting procedures across all European ports, requiring ship operators, agents, and authorities to use interoperable electronic interfaces for submitting port call and cargo-related information. Together, these frameworks constitute the **legally binding backbone** of the European maritime information space, ensuring transparency, interoperability, and regulatory compliance across Member States.

Above this regulatory layer, a set of **voluntary but widely adopted platforms** has emerged, driving efficiency through collaboration and data sharing. The **Port Collaborative Decision-Making (PortCDM)** concept, originally developed within the *Sea Traffic Management (STM) Validation Project* and later refined through the *EfficientFlow* programme, provides a

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standardized digital framework for sharing real-time information between ships, terminals, and port service providers. While **not mandated by law**, PortCDM has been **strongly encouraged by the European Commission and EMSA** as a best practice for enhancing predictability and reducing vessel turnaround times, and it is increasingly seen as a candidate for standardization within the European Maritime Transport Space without Barriers initiative. In parallel, the **Just-in-Time (JIT) arrival** approach, endorsed by the **IMO Global Industry Alliance (GIA)** and supported by the **FuelEU Maritime Regulation (2023/1805)**, remains voluntary but is gaining traction as an operational measure for emission reduction. By aligning voyage speed with berth availability, JIT procedures have demonstrated average fuel savings of about eight percent and up to fourteen percent emissions reduction per voyage, particularly in container and Ro-Ro traffic. The **PortXchange** and **Pronto** platforms, developed by the Port of Rotterdam Authority in cooperation with Shell, exemplify the commercial implementation of these principles, enabling shipping companies and terminals to voluntarily coordinate port calls through predictive data analytics.

Beyond these mature systems, the current wave of EU research and innovation projects signals the **emergence of a new generation of digital and automated maritime services**. Initiatives such as **DT4GS (Digital Twin for Green Shipping)** and **SEAMLESS** are exploring the integration of digital twins, artificial intelligence, and remote-control technologies to enable **autonomous and continuously optimized ship–port–corridor operations**. These developments remain at the **research and pre-regulatory stage**—with Technology Readiness Levels between 5 and 7—but they align closely with the European Commission's *Common European Data Space for Smart Mobility* and the forthcoming **IMO MASS Code** for Maritime Autonomous Surface Ships. It is widely anticipated that insights from these projects will inform future European regulatory frameworks for maritime automation and digital interoperability.

Overall, the European landscape shows a clear progression: from **mandatory infrastructures ensuring data and reporting compliance**, through **voluntary collaborative tools enhancing efficiency and sustainability**, toward **emerging automated and AI-driven ecosystems** that will define the next phase of maritime traffic management. This multi-tiered evolution reflects a strategic transition from compliance-oriented systems to proactive, predictive, and low-emission operations, fully consistent with the objectives of the **Zero-Emission Waterborne Transport (ZEWT)** initiative.

Looking forward, the **next wave of traffic efficiency** will couple automation with ship–port–corridor orchestration. The **Horizon Europe project SEAMLESS** (GA 101095438) is developing an **autonomous feeder service** for short-sea and inland waterways, featuring **remote control centres**, automated docking and cargo handling, and full interoperability with port digital twins [106]. Its objective is to achieve continuous 24/7 synchronization between autonomous or semi-autonomous vessels and port infrastructure, delivering measurable improvements in predictability, capacity utilization, and safety.

The degree of adoption of digital traffic efficiency systems across the European maritime domain varies significantly depending on the regulatory status, technical maturity, and market incentives of each platform. While the mandatory frameworks defined by EU legislation are now fully embedded within Member State operations, voluntary and experimental solutions show uneven levels of deployment, often concentrated in pioneering ports or demonstration corridors.

At the regulatory core, **SafeSeaNet (SSN)** and the **European Maritime Single Window environment (EMSWe)** exhibit **near-universal adoption** among EU Member States. SafeSeaNet, established under Directive 2002/59/EC on vessel traffic monitoring and information systems (VTMIS), is fully operational in all EU coastal countries and continuously accessible through a centralized network managed by the European Maritime Safety Agency (EMSA). Each Member State maintains a national node connected to the **European Index Server**, ensuring 24-hour real-time exchange of ship notifications, hazardous cargo data, and port call information. According to EMSA's latest interoperability reports, the system processes **over 15 million ship-related reports per year**, effectively covering 100 % of the vessels and voyages falling under EU reporting obligations. Although primarily created for safety, pollution prevention, and search-and-rescue purposes, SSN has evolved into a critical component of maritime traffic management, enabling data services for efficiency, congestion monitoring, and predictive analytics. Its adoption can therefore be considered **structural and universal** within the EU maritime information space.

The **EMSWe**, introduced by Regulation (EU) 2019/1239, represents a second layer of **legally mandated digital infrastructure**, aimed at harmonizing ship and cargo reporting procedures at the European level. The regulation obliges all Member States to establish **National Single Windows (NSWs)** interoperable with the central EMSWe framework. Although the implementation is being rolled out progressively between 2024 and 2026, all coastal Member States have initiated or completed their integration plans. While full operational alignment varies by country, the adoption rate among the targeted entities—national maritime authorities, customs administrations, and port authorities—is effectively **100 % in scope**, given the regulatory mandate. What remains voluntary, however, are the advanced analytical and interoperability services that EMSWe can support, such as dynamic data exchange with PortCDM or predictive digital twin applications, which depend on each port's digital maturity and investment capacity.

In contrast, the deployment of **voluntary systems**, particularly **Port Collaborative Decision-Making (PortCDM)** and **Just-in-Time (JIT) arrival services**, remains **selective and heterogeneous**. PortCDM, developed within the EU-funded *Sea Traffic Management (STM) Validation Project* (2015–2019), successfully demonstrated the feasibility of standardized port call information sharing, involving **300 ships, 13 ports, and 5 shore centres** across Europe. During the validation campaign, more than **1.7 million timestamped records** were exchanged through PortCDM-compliant interfaces, providing concrete evidence of improved situational awareness and coordination. Following this phase, the *EfficientFlow* project (2018–2021) extended the concept to the Central Baltic region, with operational deployment in the ports of **Gävle** and **Rauma**, where PortCDM remains in use today. Despite these achievements, the system's wider uptake has been limited to a **small cluster of early adopters**, primarily in Northern Europe. There is no consolidated statistic on the total percentage of European ports implementing PortCDM, but the available evidence suggests that its adoption remains **below 10 % of major EU ports**, with several other ports conducting feasibility studies or partial trials.

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Similarly, the **Just-in-Time (JIT) arrival** concept, promoted globally through the **IMO Global Industry Alliance (GIA)** and supported by the EU under the *FuelEU Maritime Regulation (2023/1805)*, is being implemented gradually through port-specific initiatives. Quantitative adoption data are not yet available at European scale, but the model has been successfully operationalized in pioneering ports such as **Rotterdam**, **Antwerp-Bruges**, and **Gothenburg**, where platforms like **PortXchange** and **Pronto** provide real-time voyage optimization and geofenced JIT corridors. Performance evaluations from these cases report **average fuel savings of around eight percent in the final voyage phase**, and up to **fourteen percent emission reductions per voyage**. However, in the absence of a regulatory requirement or a unified technical framework, the JIT approach remains **voluntary**, with uptake largely confined to technologically advanced ports and selected ship operators with high digital maturity.

The **emerging technologies** developed under the Horizon Europe framework, notably **DT4GS (Digital Twin for Green Shipping)** and **SEAMLESS**, are still in the **experimental phase** and therefore have no measurable adoption rates outside research consortia. These projects operate at Technology Readiness Levels between 5 and 7, focusing on the integration of digital twins, artificial intelligence, and remote-control technologies to enable **predictive and autonomous ship–port–corridor operations**. Their outputs are currently being evaluated within controlled test environments and demonstration ports, with the aim of informing future EMSA and IMO regulatory developments, particularly the forthcoming **Maritime Autonomous Surface Ship (MASS) Code** expected around 2026.

In summary, **mandatory systems such as SSN and EMSWe enjoy complete adoption and regulatory enforcement**, forming the foundation of Europe's maritime data governance framework. **Voluntary systems like PortCDM and JIT** have shown strong technical proof of concept and localized operational success but have yet to achieve wide-scale diffusion. Meanwhile, **emerging digital twin and automation technologies** represent the next stage of innovation, still limited to R&D contexts but strategically aligned with the EU's long-term vision for **Zero-Emission Waterborne Transport (ZEWT)**. This landscape highlights a progressive but uneven transition: Europe has achieved full digital compliance at the reporting and monitoring level, while the integration of collaborative, predictive, and autonomous services remains the **frontier of adoption and innovation** for the coming decade.

Table 2 - Automation and digitalization for traffic efficiency

Technology / Concept	EU-funded Project(s)	TRL (2024)	Reported Impact / Quantitative Result	Source
Maritime data federation (SafeSeaNet, EMSWe)	EMSA SSN Programme; EMSWe Implementation (DG MOVE)	8–9	Operational network covering all EU coastal states; >15 million ship reports/year enabling interoperable data access for efficiency and safety applications	[107] , [100]

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Port Collaborative Decision-Making (PortCDM)	STM Validation Project (CEF); EfficientFlow (Interreg CB)	7–8	Reduced vessel waiting times by 15–25%; increased predictability of port calls by 30%; improved coordination among 13 European ports	[101] , [102]
Just-in-Time (JIT) arrival	IMO GIA Pilots; Port of Rotterdam (PortXchange/Pronto)	8–9	Average 8% fuel savings in final voyage phase; up to 14% voyage emission reduction; ~20% shorter anchorage waiting	[103], [104]
Digital twin integration and shore coordination	STM Validation; DT4GS (Horizon Europe, 2023–2026)	6–7	Real-time simulation of port calls and voyage optimization enabling predictive coordination; ongoing validation in major EU ports	[101] , [104]
Autonomous and remotely supervised feeder operations	SEAMLESS (Horizon Europe, GA 101095438)	5–6	Prototype demonstration of fully autonomous short-sea feeder; expected 10–15% throughput improvement and zero local emissions	[104]

5.1.1. Trends Towards 2030

By **2030**, maritime traffic efficiency in Europe is expected to be shaped by the **consolidation of interoperability, predictive operations, and AI-based decision support**. Mandatory systems such as **SSN** and **EMSWe** will reach full digital maturity and operate as federated data infrastructures, providing real-time situational awareness across all EU Member States [107] [108]. These systems will merge seamlessly with emerging **Maritime Data Spaces** under the Digital Europe Programme, allowing authorized data exchange between ships, ports, and authorities with common cybersecurity and governance frameworks [109].

Operationally, **PortCDM** is projected to evolve from pilot implementations to widespread deployment across Europe's core ports, becoming the **de facto standard for port-call synchronization**. It is anticipated that by 2030, **60–70 % of major EU ports** will use PortCDM-compatible solutions, integrating machine learning to anticipate congestion, berthing conflicts, and service demand. The concept will also be linked with **Just-in-Time arrival services**, establishing **AI-driven traffic orchestration** between voyage planning systems and port scheduling [110] [104] .

At the same time, **digital twins** of ports and fairways will become operational planning tools supporting **predictive coordination** between multiple traffic actors. Their integration with **European VTS networks** and the **Maritime Connectivity Platform (MCP)** will facilitate cross-border traffic management and environmental optimization. By combining PortCDM, digital twins, and JIT within a common STM framework, Europe aims to reduce waiting times in ports by **20–30 %** and achieve **10–15 % operational energy savings** across short-sea corridors.

The 2030 landscape will therefore feature a high level of digital maturity in traffic management, where collaboration, transparency, and automation are embedded in daily operations, aligning with the intermediate goals of the **Zero-Emission Waterborne Transport (ZEWT) roadmap** [111].

5.1.2. Trends Towards 2050

By **2050**, maritime traffic management in Europe is expected to operate within a **fully integrated, autonomous, and adaptive digital ecosystem**. The evolution from interoperability to full automation will transform the way ships, ports, and logistic chains interact, marking the transition from **assisted decision-making** to **autonomous traffic orchestration**.

AI-driven multi-agent systems will coordinate fleets, port calls, and corridor capacity dynamically, optimizing routes, schedules, and energy consumption in real time. The **Maritime Data Space** will mature into a distributed intelligence network connecting vessels, ports, terminals, and shore control centres under secure 6G maritime communication standards [112]. Each vessel will act as a node in this network, continuously exchanging operational and environmental data to maintain safe and efficient flow across sea basins.

Digital twins of the entire maritime corridor—from oceanic routes to port terminals—will function as **real-time simulation environments** for predictive decision-making. Combined with autonomous navigation technologies validated under projects like **SEAMLESS** and **AUTOSHIP**, this will enable near-continuous optimization of maritime traffic [113] [114]. Ports will act as **autonomous nodes**, capable of managing berthing allocation, energy exchange, and logistic sequencing without human intervention.

By 2050, it is projected that more than **90 % of European maritime traffic** will be managed through interconnected digital systems with high-level automation and predictive analytics. Waiting times, idle fuel consumption, and emissions associated with port congestion will approach near-zero values. The convergence of **automation, digital twin technology, and collaborative intelligence** will make Europe's maritime traffic system **self-regulating, transparent, and carbon-neutral**, fully aligned with the ZEWT 2050 vision [111] .

5.2. Concepts and services for fuel/energy (consumption) efficiency

Digitalization has become a decisive enabler of energy efficiency and decarbonization across the European maritime sector. While the industry historically focused on optimizing individual parameters such as hull design or propulsion systems, the current transition—accelerated by regulatory and economic drivers—relies on **integrated digital architectures** that continuously monitor, analyse, and optimize ship and fleet energy performance. These systems form the connective layer between operational efficiency and compliance with the **FuelEU Maritime Regulation** [115], the extension of the **EU Emissions Trading System (ETS)** to maritime transport [116], and the long-term objectives of **Zero-Emission Waterborne Transport (ZEWT)** [117].

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At the operational level, modern vessels increasingly deploy **Smart Energy Management Systems (SEMS)** that collect high-frequency data from propulsion, auxiliary equipment, and environmental sensors. Machine-learning algorithms interpret these data streams to recommend real-time adjustments to **speed, trim, engine load**, and **power distribution**, achieving measurable reductions in fuel use [118]. Continuous analysis of machinery parameters allows dynamic voyage optimization that integrates sea-state and weather data, representing a major advance from traditional static route planning.

An Energy Management System (EMS) in the maritime sector is an integrated, software-based platform designed to monitor, analyze, and optimize energy flows across a vessel. By collecting real-time data from propulsion systems, auxiliary machinery, HVAC systems, and cargo management equipment, the EMS provides a comprehensive overview of a ship's energy profile. Through advanced analytics and visualization tools, the system enables both onboard crews and shore-based operators to identify inefficiencies and implement corrective actions aimed at minimizing fuel consumption and improving overall energy performance.

Closely related to EMS, the Power Management System (PMS) serves as a critical control system for managing the vessel's electrical power generation and distribution. The PMS automatically regulates the synchronization, load sharing, and operational scheduling of generators, ensuring stable and efficient power supply throughout the vessel. As ships increasingly rely on hybrid energy architectures the role of PMS becomes even more pivotal. Its ability to dynamically balance power loads prevents blackouts, reduces generator running hours, and maintains power quality across all electrical networks. Environmentally, PMS contributes to energy efficiency by ensuring that generators operate near their optimal load points, thereby minimizing specific fuel oil consumption (SFOC) and associated emissions. Hybrid PMS configurations, which integrate energy storage systems, allow for peak shaving and the absorption of transient power fluctuations, reducing the need for continuous generator operation, especially during low-load conditions or at berth.

The concept of the Digital Twin represents the most advanced manifestation of digitalization in the maritime sector. A Digital Twin is a virtual model that replicates the physical characteristics and operational behavior of a vessel or its subsystems. It is continuously updated using real-time data from onboard sensors and external sources, enabling a high-fidelity representation of the ship's condition and performance. Beyond simple visualization, Digital Twins leverage machine learning algorithms, physics-based simulations, and artificial intelligence to predict system behavior, detect anomalies, and assess the potential impact of operational decisions. In the context of environmental sustainability, Digital Twins serve as powerful analytical tools for enhancing energy efficiency and reducing emissions. By simulating various voyage scenarios, weather conditions, and machinery configurations, they allow operators to evaluate and select the most sustainable operational strategies. For example, a Digital Twin can identify the optimal balance between speed, fuel consumption, and route conditions, thereby minimizing unnecessary energy expenditure. The predictive capabilities of this technology also enable proactive emission control by continuously assessing the environmental consequences of different operating modes and suggesting real-time adjustments. Moreover, Digital Twins support predictive maintenance by monitoring component degradation patterns and scheduling interventions only when necessary, reducing both downtime and waste.

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A crucial complementary technology is **sensor-based condition monitoring**, which enables predictive and condition-based maintenance. Timely hull cleaning, propeller polishing, and engine tuning significantly reduce drag and fuel demand, while extending machinery life. EMSA assessments indicate that predictive maintenance and performance monitoring can yield **2–5 % annual fuel savings** through proactive degradation management [119].

Digital route-optimization and eco-routing systems provide another layer of energy reduction. By combining weather forecasts, ocean currents, and vessel-specific performance models, these platforms calculate energy-efficient voyage trajectories while preserving safety and punctuality. Operational trials and European research projects have demonstrated **fuel savings of 5–10 % per voyage**, depending on vessel class and operating profile [120].

At the systemic level, digitalization enhances **fuel traceability and carbon accounting**. Blockchain-enabled platforms are being piloted to manage fuel origin certification and lifecycle-based carbon-intensity tracking, ensuring transparency and compliance with the FuelEU Maritime framework [121]. Such distributed ledgers provide auditability of fuel transactions and support the development of voluntary carbon-offset or credit-exchange mechanisms.

At the port interface, **smart energy-exchange systems**—including **automated shore-side power (cold-ironing)** connections—allow vessels to switch to renewable electricity during port stays. Digital interfaces coordinate vessel connection, grid load, and energy billing, enabling measurable reductions in local air pollutants and greenhouse-gas emissions [122]. The **Alternative Fuels Infrastructure Regulation (AFIR)** requires all TEN-T core ports to provide on-shore power supply by 2030 [123]; digital integration will ensure that these infrastructures operate as part of broader port energy-management ecosystems.

Current Situation

Despite technological readiness, deployment remains heterogeneous. EMSA and ESSF estimates suggest that approximately **40 % of the EU fleet above 5 000 GT** employs continuous performance monitoring linked to shore-based analytics [119]. Integration between onboard SEMS, fleet operation centres, and port energy systems remains fragmented, constrained by non-standardized data formats and cybersecurity concerns.

The introduction of **FuelEU Maritime** and the maritime **EU ETS** is accelerating uptake by requiring standardized **Monitoring, Reporting and Verification (MRV)** processes [115]

[116]. Operators are investing in AI-based dashboards and automated reporting pipelines capable of producing regulatory MRV datasets while simultaneously optimizing energy consumption. Blockchain-based fuel traceability systems are under evaluation in pilot corridors connecting Northern and Western Europe [121].

Implementation is concentrated among large operators and advanced ports—such as **Rotterdam, Antwerp-Bruges, Gothenburg, Hamburg, and Valencia**—where digital energy-management infrastructures are mature [122]. Smaller operators still face financial and technical barriers, but cost reductions and shared-service models are expected to close this gap before 2030.

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Trends Towards 2030

By **2030**, the European maritime sector is expected to achieve high digital maturity in energy management. Integrated SEMS, predictive maintenance, and adaptive routing will become standard practice for most large operators, and **70–80 % of EU-flagged tonnage** is projected to operate with continuous energy-optimization systems [124].

Digital twins—currently validated in **DT4GS**, **GREEN RAY**, and **SEAMLESS** [125] [126]—will evolve into operational platforms providing continuous simulation of fuel use, machinery wear, and emissions. These virtual replicas will enable **scenario-based decision-support**, allowing operators to anticipate efficiency gains and compliance outcomes before implementation.

Completion of **shore-power infrastructure under AFIR** [123] will make ports active energy nodes capable of managing renewable supply, vessel charging, and micro-grid stability through AI-driven coordination. Interoperability ensured by the **Maritime Data Space**—part of the EU Common Data Spaces programme—will facilitate real-time exchange of verified energy and emission data among ships, ports, and authorities [127]. Collectively, these measures are expected to deliver **20–30 % reductions in fuel consumption and GHG emissions** compared with 2020 baselines [124].

Vision Towards 2050

Looking to **2050**, the maritime transport ecosystem will operate as a **fully digital, energy-optimized network**, where AI-driven automation governs propulsion, energy storage, and logistics decisions. Energy efficiency will be embedded by design in ship architecture and propulsion systems, supported by real-time analytics and continuous learning algorithms [128].

Ships will function as **self-optimizing cyber-physical systems**, autonomously adjusting propulsion profiles and energy flows in coordination with port and corridor infrastructures. Predictive digital twins will interact directly with smart-grid ports, orchestrating maintenance schedules, fuel logistics, and carbon-credit exchanges. Ports will act as **integrated renewable-energy hubs**, balancing vessel demand with local generation and storage capacity.

Blockchain-based verification networks will ensure end-to-end traceability of fuels and emissions, underpinning EU-wide certification of carbon neutrality. Human roles will shift from manual operation to **strategic oversight and sustainability management**, supervising systems that optimize themselves within regulatory and environmental constraints.

By 2050, the convergence of automation, data sharing, and AI will create a **self-regulating, low-emission maritime system** consistent with the ZEWT vision and the broader European Green Deal objectives [117] [128] .

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6. Safety and security

Fleet digitalization and automation necessitate a redefinition of maritime safety:

- Integration of autonomous navigation impacts crew roles and system redundancy.
- Cybersecurity standards are being embedded into vessel IT architectures.
- SOLAS updates are expected to reflect digital monitoring and smart systems.
- Land-based control centers will become key players in fleet operations.
- Nuclear safety protocols and crew training in radiological risk management will be required.

The modernization of navigation, while introducing innovative solutions to make maritime transport more sustainable, also brings with it new risks concerning both the safety and security of navigation.

The adoption of alternative propulsion systems or more sustainable fuels requires not only the adaptation of officer training but also the development and regulation of specific standards, procedures, and rules applicable to ships using alternative fuels.

With regard to autonomous navigation, this represents an entirely new challenge for the maritime sector. Traditionally, the ship's master has held full responsibility for all onboard operations. However, with autonomous systems, the master may become a mere observer of operations, thereby creating a regulatory gap, particularly in terms of navigation risks addressed by SOLAS, and even more critically, in relation to conduct during encounters at sea, as governed by COLREG.

Finally, the ongoing digitalization of the maritime sector represents not only a significant opportunity but also a substantial threat. It exposes maritime operations to entirely new forms of security risks, particularly in the realm of cybersecurity, risks that are still largely unfamiliar to maritime personnel.

6.1. Alternative Fuels regulation

To support the transition to alternative marine fuels, the International Maritime Organization (IMO), through its GreenVoyage2050 project and in collaboration with the Low Carbon Global Industry Alliance (Low Carbon GIA), has conducted a comprehensive regulatory mapping exercise aimed at assessing the extent to which emerging alternative marine fuels are currently covered by existing international regulatory frameworks. [129]

This initiative, supported by the International Chamber of Shipping (ICS), sought to provide a systematic overview of the “regulatory readiness” of various alternative fuels, including both conventional and non-conventional sources. Among the fuels considered were marine diesel and gas oil, bio- and synthetic diesels, methanol, ethanol, dimethyl ether (DME), liquefied petroleum gas (LPG), liquefied natural gas (LNG), ethane, ammonia, and hydrogen. The exercise also examined the relevance and applicability of key IMO instruments, such as the

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International Convention for the Safety of Life at Sea (SOLAS), the International Convention for the Prevention of Pollution from Ships (MARPOL), the International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code), the International Code of Safety for Ships Using Gases or Other Low-flashpoint Fuels (IGF Code), and the International Bulk Chemical Code (IBC Code).

To facilitate the analysis, a colour-coded "traffic light" system was employed, indicating high, medium, or low levels of regulatory preparedness for each fuel. The resulting overview, published on the GreenVoyage2050 website, serves as a practical tool for policymakers, regulators, and industry stakeholders, enabling them to quickly identify existing regulatory coverage and areas where significant gaps remain.

The mapping exercise revealed several critical areas requiring further regulatory development. These include the need for tailored safety guidelines for the onboard use of new fuels, the establishment of universally accepted fuel quality standards, the refinement of lifecycle greenhouse gas (GHG) emissions accounting methodologies, the definition of performance standards for engines operating on alternative fuels, and the development of risk assessment procedures and spill-response protocols specific to these new energy sources. [130]

While IMO has already begun addressing some of these gaps through ongoing regulatory initiatives, the mapping underscores the necessity of further engagement at the level of its technical and legal committees. Notably, the Low Carbon GIA has stressed that a "low" regulatory readiness rating does not inherently prohibit the adoption of a particular fuel. Instead, it highlights areas where further normative clarification and policy development are essential to ensure safe, sustainable, and scalable deployment.

Complementing this effort is the recently launched IMO project titled *"Future fuels and technology for low and zerocarbon shipping"* (FFT), which aims to address many of the challenges identified through the mapping. This forward-looking programme is expected to provide a foundation for the future integration of alternative fuels into the international maritime regulatory landscape.

The International Maritime Organization (IMO) has actively advanced the development of a regulatory framework addressing the safety implications of greenhouse gas (GHG) emissions reduction. This initiative was discussed during the 110th session of the Maritime Safety Committee (MSC), held from 18 to 27 June 2025. [131]

During this session, the Committee made significant progress toward establishing a comprehensive safety regulatory framework to support the maritime sector's transition to alternative fuels and innovative technologies. Specifically, it:

- outlined a list of priority areas to guide relevant sub-committees in advancing work on identified alternative fuels and new technological solutions;

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- addressed the application of the "one ship, one code" policy in response to regulatory challenges encountered by gas carriers using low-flashpoint fuels not transported as cargo; and
- considered the proposed revision of the *Code of Safety for Nuclear Merchant Ships*, while also discussing avenues for enhanced cooperation with the International Atomic Energy Agency (IAEA) and other relevant IMO bodies.

6.2. Maritime Autonomous Surface Ships

The regulatory framework is subject to gradual enrichment and modernization, thus regulating all the technological innovations to which the sector is subject. In particular, this work is focused on Maritime Autonomous Surface Ships (MASS) and therefore a study is conducted on this kind of novel transportation mean.

MASS represents an innovation that drastically goes beyond current regulations (*Figure 11*). [132] [133]

Figure 11: Autonomous ship (credit: IMO website)

The increasing reliance on automated systems in shipping raises concerns regarding the applicability of existing legal frameworks and liability regimes to unmanned vessels. Specifically, questions arose about the legal status of automated ships, the adaptation of minimum manning requirements, the upskilling of existing crews, the effectiveness of automated systems in handling exceptional situations, the classification of remote operators, and the liability of manufacturers of malfunctioning automated components, etc. These issues demand thoughtful consideration and potential revisions to existing maritime regulations. [134]

The advancements in autonomous ship technology and the associated legal questions, IMO started a regulatory scoping exercise in 2017, involving the Maritime Safety Committee (MSC), Legal, and Facilitation Committees. The exercise concluded in 2021, assessing existing IMO instruments to define their applicability to varying degrees of autonomous ship operation.

The regulatory scoping exercise focused on identifying potential gaps or inconsistencies in existing regulations that could pose safety or security risks when applied to MASS. [135] [136]

By conducting this exercise, the MSC sought to ensure that the maritime regulatory framework remains relevant and effective in addressing the emerging challenges associated with autonomous shipping. The regulatory scoping exercise for Maritime Autonomous Surface Ships (MASS) was conducted in two phases.

Phase 1:

- Identify provisions in existing IMO instruments that may apply to MASS.

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- Determine whether these provisions prevent or allow MASS operations.
- Classify provisions as either "applicable and do not prevent MASS operations," "applicable but may require amendment or clarification," "not applicable to MASS operations," or "applicable but may preclude MASS operations."

Phase 2:

- Analyse the classification of provisions from Phase 1.
- Develop a strategy for addressing MASS operations.
- Identify potential solutions, such as:
  - Using equivalences or developing interpretations to make existing provisions applicable to MASS.
  - Amending existing IMO instruments to better address MASS operations.
  - Developing new IMO instruments specifically for MASS.

The scoping exercise will consider a variety of factors, including the human element, technology, and operational factors. This will help to ensure that the IMO develops the most appropriate and effective regulatory approach for MASS. [136]

After completing a comprehensive analysis of MASS and building upon initial work at the 105th session of the MSC. The Committee's 106th session in November 2022 made further strides in developing a goal-based regulatory framework for MASS operations. The intention is to adopt a non-mandatory goal-based MASS Code that will go into effect in 2026, laying the groundwork for a mandatory goal-based MASS Code that is planned to be in place, as SOLAS amendment,on January 1, 2032. [137] [138] [139]

The non-mandatory MASS Code will provide a framework for states to develop their own national MASS regulations, ensuring consistency and safety across the maritime industry.
The mandatory MASS Code will supersede the non-mandatory Code and will become the primary regulatory framework for MASS operations globally.

From this scoping exercise, the MSC identified several key areas requiring further attention and potential revisions to existing maritime conventions, including SOLAS, STCW, MARPOL, and COLREGs: [140]

- To ensure clarity and consistency in the context of autonomous ships, the maritime industry requires a standardized definition of terms like "MASS," "master," "crew," or "responsible person," particularly for Degrees Three (remotely controlled ships) and Four (fully autonomous ships) where the responsibility of the navigation is not taken from someone on board.
- To establish clear guidelines for the functional and operational aspects of remote-control stations/centres is paramount, including the potential classification of remote operators as seafarers.
- To consider how to perform all control tasks currently performed manually by the crew, such as the watchkeeping.

An important aspect is the training of the crew that will need to learn how to manage the new technologies implemented on board. STCW may be subject to change or supplement with

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other conventions for the training of seafarers working on MASS or designated for their remote control from shore stations. [141]

In addition, another convention influenced by the implementation of MASS ships is the Maritime Labour Convention (which regulates maritime work focussed on cargo ships) that could be revolutionized due to the total absence or partial presence of the crew only acting in certain circumstances based on the automation degree above mentioned.

Furthermore, MASS could play a key role in achieving the goal of the 2030 Agenda for Sustainable Development by achieving new environmental standards currently regulated by the MARPOL Convention. On the other hand, one of the great challenges of the MASS is the ability to act in an environment where other ships are present in compliance with the COLREG Convention

6.3. Cybersecurity Risks

The International Maritime Organization (IMO) has increasingly emphasised the critical importance of cyber risk management in maritime transport. As ships and port facilities become more digitally integrated, vulnerabilities arising from the interfacing of operational technology and information technology systems present growing threats to safety, security, and the marine environment. To address these challenges, the IMO has taken a comprehensive, risk-based approach to cybersecurity.

Maritime cyber risk refers to a measure of the extent to which a technology asset could be threatened by a potential circumstance or event, which may result in shipping-related operational, safety or security failures as a consequence of information or systems being corrupted, lost or compromised.

Cyber risk management means the process of identifying, analysing, assessing and communicating a cyber-related risk and accepting, avoiding, transferring or mitigating it to an acceptable level, considering costs and benefits of actions taken to stakeholders

In 2017, the International Maritime Organization (IMO) adopted resolution MSC.428(98) on Maritime Cyber Risk Management in Safety Management System (SMS). The resolution stated that an approved SMS should consider cyber risk management in accordance with the objectives and functional requirements of the (International Safety Management) ISM Code. It further encourages administrations to ensure that cyber risks are appropriately addressed in SMS no later than the first annual verification of the company's Document of Compliance (DoC) after 1 January 2021. The same year, the IMO issued Guidelines on Maritime Cyber Risk Management (MSC-FAL.1/Circ.3, latest Rev.3 in April 2025), intended to support both shipping companies and flag states in embedding cyber resilience into safety and security frameworks. [142]

The guidelines provide high-level recommendations on maritime cyber risk management to safeguard shipping from current and emerging cyber threats and vulnerabilities and include functional elements that support effective cyber risk management.

The vulnerabilities created by accessing, interconnecting or networking with these systems can lead to cyberthreats and risks which should be addressed. Relevant systems could include, but are not limited to: [143]

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- Bridge systems, (such as navigation systems, ship safety systems, communications systems, etc.);
- Cargo, bunkering, lubrication, ballast and other pumping handling and management systems;
- Propulsion, fuel and machinery management and power control systems;
- Security, access control and surveillance systems;
- Passenger and crew servicing and management systems;
- Passenger, crew and subcontracted service personnel facing public networks;
- Administrative and crew welfare systems;
- Ship-port interfaces; and Ship-to-shore integrated systems (e.g. remote control systems/Maritime Autonomous Surface Ships).

The recommendations can be incorporated into existing risk management processes and are complementary to the safety and security management practices already established by IMO.

6.4. Land-based control centers

The progressive implementation of autonomous and semi-autonomous maritime operations has led to the emergence of land-based control centers (LBCC) as key enablers within the future ZEWT ecosystem. These centers are envisioned as the nerve hubs of remote vessel management, enabling shore-based operators to monitor, supervise, and potentially control multiple vessels simultaneously, transforming the safety and operational dynamics of waterborne transport.

The concept of LBCC represents a fundamental shift from the traditional, ship-centric model of navigation. Historically, safety-critical functions have been carried out on board, under the full responsibility of the ship's master. With the increasing adoption of Maritime Autonomous Surface Ships (MASS) and higher levels of automation, LBCC are expected to assume many of these functions, acting as the primary decision-making authority or as an escalation point when onboard systems encounter anomalies.

From a safety perspective, LBCC enhance situational awareness by aggregating real-time data from onboard sensors, port traffic systems, and environmental services. This enables predictive safety management, anomaly detection, and centralized coordination of response efforts in case of incidents. In scenarios involving ZEWT ships operating on alternative fuels (e.g., hydrogen, ammonia), the role of LBCC may also extend to fuel safety monitoring, remote diagnostics, and emergency shutdown procedures in case of leaks or malfunctions.

Land-based control centers are not merely a technological innovation, but a structural transformation of the maritime safety architecture. Their successful implementation will depend on robust standards, cross-border coordination, and the co-evolution of technology, regulation, and workforce skills. Within TRUSTEE, they represent a critical interface between ZEWT-enabled ships and the supporting land infrastructure, reaffirming the principle that the decarbonisation and digitalisation of maritime transport must go hand in hand.

However, the implementation of LBCC introduces new risk domains:

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- Latency, signal degradation, or cybersecurity breaches may compromise remote control capabilities or delay critical interventions.
- The lack of international regulatory clarity regarding the role, liability, and qualification of remote operators poses a challenge for safe operations.
- Human factors such as operator workload, fatigue, and situational awareness in multi-vessel contexts must be addressed through interface design and procedural standards.

These concerns are at the center of regulatory debates at the IMO and are actively explored in projects such as **SEAMLESS** (Safe, Efficient and Autonomous Maritime Transport Systems), funded under Horizon Europe. SEAMLESS focuses on inserting the concept of the autonomous vessel into the regular logistics chain, ensuring seamless interaction with existing maritime information systems and processes. A key aspect of the project is how LBCC interact with other digital systems to enable reliable track & trace of cargo throughout the logistics chain.

Aligned with the broader impacts pursued by SEAMLESS, the project aims to:

- Increase and accelerate the deployment of climate-neutral fuels and electrification of shipping, particularly in intra-European connections.
- Improve overall energy efficiency and significantly reduce vessel fuel consumption.
- Develop innovative port infrastructure to enable zero-emission waterborne transport.
- Promote the introduction of clean, climate-neutral, and resilient inland waterway vessels before 2030, supporting green fleet renewal and modal shift.
- Generate strong technological and operational momentum towards climate neutrality and the elimination of harmful air and water pollution.
- Achieve smart, efficient, secure, and safe integration of maritime and inland shipping into logistics chains, facilitated by full digitalisation and automation.
- Enable fully automated shipping (maritime and inland) with efficient connectivity.
- Support competitive waterborne industries in Europe by providing advanced green and digital technologies to foster job creation and economic growth.

The experience and results of SEAMLESS are highly relevant for TRUSTEE, particularly in the context of ZEWT, where reduced crew configurations and increased automation may become the norm. Thus, LBCC can serve not only as an additional safety layer for high-tech vessels, but also as a platform for centralized monitoring of efficiency and environmental performance across ZEWT fleets.

From a regulatory perspective, integrating LBCC into the SOLAS and STCW frameworks will require the formal recognition of shore-based operators as seafarers and the development of hybrid operational doctrines that combine onboard and remote responsibilities. Training programmes and simulator environments will also need to evolve to incorporate human-machine teaming concepts, with particular attention to emergency response and ethical decision-making in uncertain situations.

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6.5. Adaptation and integration of land infrastructures

The decarbonisation of maritime transport through ZEWT solutions requires profound changes not only on-board vessels but also in the port and land infrastructures that support them. From a safety and security perspective, this entails reorienting the design, operation, and governance of ports to address new risks associated with alternative energy carriers and the full digitalisation of operations.

On the energy side, ports will need dedicated facilities for the storage, transfer, and safe bunkering of fuels such as hydrogen, ammonia, methanol, or LNG. Each fuel presents distinct hazards—toxicity, flammability, cryogenic properties, corrosiveness—that call for specific technical and operational measures: secondary containment, early detection sensors, adapted ventilation and firefighting systems, standardised loading/unloading procedures, and rapid response plans for leaks or fires. These measures must be aligned with international regulatory instruments (IGF Code, IGC Code, SOLAS, etc.) and complemented by port and state-level operational guidelines where necessary.

From a digital perspective, the port becomes a data exchange node linking vessels, Land-Based Control Centers (LBCs), logistics operators, and community stakeholders. Ensuring the safety of these interconnections requires resilient ICT infrastructures redundant networks, authentication and encryption systems, continuous monitoring as well as cybersecurity frameworks consistent with IMO recommendations and EU critical infrastructure obligations.

Particular attention must be paid to Port Community Systems (PCS), energy management networks, and automated terminal equipment, since their disruption or manipulation could have significant operational and safety consequences.

Adaptation also implies establishing integrated emergency management frameworks that clearly assign responsibilities and resources among port authorities, local emergency services, operators, and shipowners. These frameworks should include dedicated protocols for incidents involving alternative fuels, regular joint exercises, and clear communication channels for inter-institutional coordination. At the human capital level, training and certification programmes for port personnel and crews will need to be updated to incorporate safe handling practices, hazardous materials management, and cyber incident response.

Finally, the modernisation of land infrastructures must be understood in the context of the wider logistics chain. Technical and operational interoperability between ports, logistics operators, and information systems is necessary to ensure that sustainability goals do not compromise safety or operational continuity. Regulatory harmonisation—at national, European, and international levels—together with the definition of safety and performance metrics will be key for ports to operate as safe, resilient, and efficient nodes of the ZEWT ecosystem, while at the same time enabling modal shift and new business models.

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7. Environmental Impact Assessment and Climate-Driven Transformations in Waterborne Transport

7.1. Introduction

The integration of zero-emission technologies into the waterborne transport sector requires a comprehensive understanding of how climate dynamics, regulatory pressures, and scientific evidence influence both vessel operations and infrastructure development. As highlighted in global climate policy frameworks and the scientific assessments of the Intergovernmental Panel on Climate Change (IPCC), the maritime domain is simultaneously a contributor to anthropogenic emissions and a sector increasingly exposed to climate-driven risks [144]. Recent projections indicate that climate change will significantly intensify operational disruptions, modify routing conditions, and alter the long-term viability of existing supply chains. These changes underscore the need to assess the environmental performance of current maritime fuels, examine the potential of emerging energy carriers, and evaluate how technological, operational, and infrastructural transformations can support the transition toward Zero-Emission Waterborne Transport (ZEWT).

This chapter builds on the scenario foundations defined in the earlier tasks of the deliverable and connects them with the environmental projections and mitigation pathways established by leading international organisations. It provides an integrated assessment of fuel performance, vessel technologies, port ecosystems, and corridor development, offering a forward-looking perspective on the environmental impacts expected for 2030 and 2050. Throughout the chapter, quantitative evidence and emissions data are aligned with internationally recognised methodologies and well-to-wake (WTW) emission factors derived from the IMO, JRC, IPCC, IEA, and EMSA [144] [19] [145] [146] [147] [148].

7.2. Global Climate Frameworks and Scientific Evidence

The scientific assessments provided by the IPCC constitute the foundation for understanding the environmental pressures shaping maritime decarbonisation. When expressed per unit of delivered energy—for example, **tCO_2/GWh**—the differentiated climate impacts of fossil and alternative fuels become clearer and allow for a structured comparison aligned with global mitigation pathways.

Heavy fuel oil (HFO) remains the most carbon-intensive fuel in maritime transport, with well-to-wake emissions in the range of **306–342 tCO_2/GWh** [19]. Marine diesel oil (MDO) and marine gasoil (MGO) demonstrate only marginal improvements, typically producing **275–325 tCO_2/GWh**. These values explain why fossil-fuel baselines are fundamentally misaligned with the emission-reduction trajectories emphasised in the IPCC's Sixth Assessment Report (AR6) [144] .

Liquefied natural gas (LNG) provides a more complex climate profile. While it may reduce CO_2 emissions by **20–25%** at the point of combustion (≈ **230–274 tCO_2/GWh**), upstream methane leakage (methane slip) can significantly increase its well-to-wake impact. Depending on leakage rates, LNG's total emissions range between **275–342 tCO_2/GWh**, resulting in **0–10%**

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net improvement relative to HFO and, under high leakage conditions, potentially worse performance [145] .

In contrast, alternative fuels compatible with a climate-neutral trajectory show significantly better profiles. Green hydrogen and green ammonia—when produced from renewable electricity—can achieve emissions between **0–90 tCO_2/GWh** [147]. Renewable synthetic fuels (e-methanol, e-diesel) demonstrate values between **30–140 tCO_2/GWh** [146] . Sustainable advanced biofuels typically range between **60–170 tCO_2/GWh**, depending on feedstock and processing pathway [148] .

Beyond emissions factors, IPCC AR6 also points to increasing environmental instability. Sea-level rise, altered storm patterns, intensified heatwaves, and changes in precipitation will reshape the maritime operational landscape [145] . These conditions will influence routing predictability, port operability, and long-term infrastructure resilience, reinforcing the need for integrated mitigation and adaptation strategies.

7.3. Environmental Pressures and Operational Challenges for Waterborne Transport

Climate-driven changes are already altering the environmental conditions under which the maritime sector operates. The increasing frequency and severity of extreme weather events—including storms, heavy precipitation, and strong winds—affect navigability, vessel routing, and port accessibility. These events lead to increased operational disruptions, longer voyages, and higher energy consumption due to evasive manoeuvres or speed reductions [145] .

Hydrological variability is rapidly emerging as a critical challenge. Prolonged droughts and fluctuating water levels in major chokepoints and inland waterways affect vessel draft limits and transit capacity. Such conditions force operators to reduce load factors or increase voyage frequency, resulting in higher emissions per tonne-kilometre transported.

Sea-level rise and storm surges pose long-term risks to ports, many of which are located in low-lying coastal areas. Exposure to flooding threatens critical port assets, energy systems, digital infrastructure, and fuel-storage facilities. Ensuring port resilience will therefore require investment in asset elevation, coastal protection, and climate-informed design standards.

Finally, shifting climatic patterns will influence global routing. Melting Arctic ice may open new seasonal navigation corridors, but these remain associated with unpredictable ice movements, environmental sensitivities, and extreme temperatures. In other regions, changes in storm tracks and ocean currents may alter optimal long-distance routes.

7.4. Environmental Performance of Conventional Fuels

The evaluation of fossil-fuel performance establishes the baseline from which ZEWT transitions must evolve. HFO, representing the backbone of deep-sea shipping, maintains well-to-wake emissions of **306–342 tCO_2/GWh**, alongside elevated emissions of SO_x, NO_x, black carbon, and particulate matter [19]. MDO and MGO offer slight reductions in carbon intensity but remain environmentally unsustainable in the context of long-term decarbonisation goals.

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LNG has been widely promoted as a transitional option. Its combustion reduces CO_2 emissions by 20–25%, but its climate benefits are largely offset by methane slip and upstream leakage. Under realistic supply-chain conditions, LNG's total climate footprint often approaches that of HFO and MDO [145] .

Collectively, these fuels generate substantial operational emissions. A single large commercial vessel consuming 200–300 GWh annually will emit **60,000–100,000 tCO_2 per year** when operating on conventional fuels. This scale highlights the magnitude of the challenge addressed in this chapter and underscores why fossil fuels cannot meet 2050 climate targets.

7.5. Environmental Role of Ports and Green Corridors

Ports and maritime corridors play an increasingly central role in enabling the transition to climate-neutral waterborne transport. Ports serve as energy hubs, logistical coordinators, and innovation catalysts, directly influencing the sector's ability to adopt low- and zero-carbon fuels.

Onshore power supply (OPS) is one of the most impactful technologies for port-based emission reduction. When vessels switch to electricity during hoteling and the electricity originates from low-carbon grids, emissions during port stays can be reduced by **90–100%**, alongside near-elimination of local air pollutants.

The establishment of alternative-fuel bunkering systems—covering hydrogen, ammonia, e-fuels, and advanced biofuels—determines whether vessels can adopt cleaner propulsion systems across long-distance routes. Green corridors formalise this approach by coordinating infrastructure, regulatory requirements, and operational practices across multiple ports, enabling consistent zero-emission operations.

Digital port-call optimisation, berth-allocation systems, and just-in-time arrival protocols can further reduce anchorage emissions by **5–12%**. Combined with OPS and clean bunkering, these measures significantly reduce the environmental footprint of port operations.

However, climate-driven disruptions—such as sea-level rise and storm surges—pose risks to port resilience. Addressing these challenges will require substantial adaptation investments, ensuring that ports remain operational and safe as climate conditions evolve.

7.6. Estimated Sectoral Impacts and Implications for Future Scenarios

Across the 2030 horizon, maritime decarbonisation will be driven primarily by operational optimisation, fleet modernisation, port electrification, and partial uptake of alternative fuels. These measures are expected to yield a **15–30% reduction in GHG intensity** relative to 2008, depending on regional policies and technology uptake [146].

By 2050, the sector is expected to undergo structural transformation, with widespread use of hydrogen, ammonia, renewable e-fuels, and advanced biofuels. Emissions could decrease by **50–90%**, provided that renewable electricity production expands significantly and clean fuel

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supply chains mature [147]. Ports will need to operate as multi-fuel hubs, integrating energy, digital, and safety systems capable of supporting ZEWT technologies at scale.

Climate-related risks—including extreme weather, hydrological variability, and sea-level rise—will require continuous adaptation to ensure infrastructure resilience and operational continuity. Meanwhile, operators adopting ZEWT solutions early may benefit from regulatory incentives, reduced carbon-cost exposure, and access to green corridors.

The transition will also reshape skills, vessel design practices, and safety requirements, particularly for the handling of hydrogen and ammonia. Ensuring that technological and operational advances translate into real-world emission reductions will require coordinated strategies across regulatory, technical, and institutional domains.

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8. EUROPEAN AND GLOBAL TRENDS

In addition to the well-recognised drivers of technological advancement, regulatory compliance, and economic stimuli, the evolution of the European waterborne transport sector is increasingly influenced by a series of deeper demographic and socio-cultural forces. Often labelled as “soft” factors, these elements in fact exert measurable and significant impacts on the industry's operational capabilities, market structures, and its broader societal legitimacy to pursue innovation. Far from being peripheral, these dynamics constitute a core component of any robust strategic outlook concerning the future of Zero Emission Waterborne Transport (ZEWT) in Europe.

Within this broader context, several key trends warrant particular attention:

- The geopolitical landscape influences the routes taken, the goods transported, and the volume of global maritime traffic, rendering it dynamic and often unpredictable.
- The demographic challenge posed by an ageing maritime workforce, which gives rise to a dual threat: the progressive loss of experienced personnel and the difficulty in attracting new talent, both of which have direct consequences for sectoral competence and safety performance.
- The market transformation driven by accelerating urbanisation and heightened public awareness of sustainability, which is reshaping expectations for green logistics and imposing increasingly stringent environmental standards on ports and vessels alike.
- The complex and often polarising influence of public opinion, particularly in relation to the societal acceptance of disruptive technologies, such as the prospective use of nuclear propulsion in maritime operations.
- Climate change poses new challenges to port infrastructure and vessels, while at times also presenting minor opportunities.

8.1. Geopolitical trends

Fleet transformation is shaped by geopolitical dynamics, including access to green fuel supply chains, trade route realignment due to climate risks, and maritime security considerations.

Geopolitics constitutes a critical factor capable of profoundly influencing the development and functioning of the maritime sector. Conflicts, regulatory frameworks, and trade relations can significantly alter maritime operations within relatively short timeframes. In particular, the safety and stability of specific maritime regions play a central role in voyage planning, often leading to substantial variations in fuel consumption and emissions.

Another manifestation of geopolitical pressure is the expansion of so-called “shadow fleets,” wherein aging tankers are used to transport sanctioned commodities for states such as Russia, Iran, and Venezuela. Estimates suggest that these grey fleets now account for between 17% and 63% of global tanker capacity, depending on the region. Their operation has been linked to a growing number of maritime collisions, environmental spills, and port detentions. The

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proliferation of such vessels undermines international sanctions regimes and increases both environmental and safety risks for legitimate maritime actors.

Insurance markets have responded accordingly. In 2024, war-risk premiums in high-threat areas surged by more than 1,500%. Cyber-risk surcharges have also become a standard component of hull and machinery policies. Underwriting strategies are now increasingly informed by detailed threat intelligence, and insurers are working in close collaboration with naval coalitions and maritime cybersecurity centres to implement real-time monitoring and rapid-response protocols. [149]

Lastly, the interplay between geopolitical rivalry and climate change is opening new maritime frontiers. The retreat of Arctic sea ice has intensified interest in the Northern Sea Route, which offers up to a 40% reduction in transit distances between Asia and Europe. However, this potential efficiency comes with significant environmental risks, including black carbon deposition and fuel spills in ecologically sensitive polar regions. While some operators are trialling ice-class, dual-fuel vessels to navigate this passage, many remain cautious due to the intense regulatory scrutiny and reputational risks associated with Arctic operations. [150]

8.1.1. Impact on routes and on traffic volumes

The reconfiguration of global maritime routes has produced measurable shifts in traffic volumes and trade flows, generating macroeconomic ripple effects that extend from canal revenues to consumer prices.

Attacks on vessels in the Red Sea have severely reduced traffic through the Suez Canal, the shortest maritime route between Asia and Europe and a conduit for approximately 15 percent of global seaborne trade. In response, the majority of major shipping companies diverted their fleets around the Cape of Good Hope, thereby extending delivery times by at least ten days. According to Safety4Sea, this rerouting led to a 56 percent decline in Red Sea transits during the first half of 2024, while adding nearly 11,000 nautical miles to each voyage and incremental fuel costs that frequently exceeded USD 1 million per trip. [151]

The environmental consequences have been equally severe: Transport & Environment has estimated a 45 percent increase in carbon emissions per voyage along rerouted Asia–Europe connections, at a time when maritime decarbonisation efforts are becoming increasingly urgent. [152]

On the other side of the globe, a prolonged drought in the Panama Canal during 2023–2024 forced authorities to impose transit restrictions that substantially reduced the number of ships allowed to pass each day. Since October 2023, the canal has seen daily throughput fall by more than 30 percent, affecting another vital chokepoint that normally carries around 5 percent of global maritime trade. The climate-related dimension of this disruption will be further discussed in Section 8.3 Climate Change.

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As a result of these disruptions, transit volumes through the Suez and Panama Canals fell sharply in early 2024, by 50 percent and 32 percent respectively, while traffic around the Cape of Good Hope surged by 74 percent. [153] This reconfiguration of maritime flows has revealed a structural decoupling between trade volumes and trade “effort.” UNCTAD data indicate that seaborne trade measured in tons increased by 2.4 percent in 2023, while trade measured in ton-miles rose by 4.2 percent. [154] The divergence highlights that the world is trading more goods, but travelling longer distances to transport the same volume of goods. This structural inefficiency, directly caused by geopolitical disruptions, translates into greater fuel consumption, longer delivery times, higher costs, and increased greenhouse gas emissions, thereby undermining the European Union’s decarbonisation objectives.

The economic consequences of these shifts are already visible. Egypt, for example, recorded a 40 percent decline in toll revenues from the Suez Canal in early 2024. Globally, persistently elevated freight rates are contributing to inflationary pressures. UNCTAD has projected that these higher transport costs could raise consumer prices worldwide by 0.6 percent by 2025, with an even stronger impact of 0.9 percent in Small Island Developing States (SIDS), where trade dependency is particularly pronounced. [155] At the same time, the strategic vulnerability of the Strait of Hormuz has re-emerged as a focal point in global energy flows. Iran’s repeated threats to close the strait, although unlikely to be carried out fully due to mutual economic interdependencies, have nonetheless triggered spikes in energy prices and insurance premiums, underlining the fragility of international supply chains. [156]

In addition to physical disruptions, protectionist trade policies have become a major source of volatility in global shipping. Protectionist measures, such as the tariffs imposed by the United States in 2025, are forcing a strategic reconsideration of trade flows. Companies are actively diversifying port calls and reconfiguring shipping lanes to avoid hubs exposed to tariffs, demonstrating that trade policy can be just as disruptive as physical blockades. [157] This dynamic is forcing both businesses and policymakers to reassess strategically, shifting the focus from pure cost efficiency to building resilience through diversifying routes and investing in infrastructure that can handle more flexible and unpredictable trade flows. [158] Another phenomenon that has arisen from the application of tariffs is the practice of frontloading, whereby exporters accelerate shipments in anticipation of new tariffs, generates sudden and unpredictable demand surges that strain logistics systems. A recent example is provided by Indian exports to the United States, which rose by 21 percent between April and July 2024, seven times the growth rate of India’s overall exports, in advance of new tariff measures. Tariffs, moreover, are increasingly used not merely as fiscal instruments but as geopolitical tools capable of reshaping supply chains. The mere prospect of a 50 percent U.S. tariff has already prompted companies to redirect exports away from the U.S. market towards alternative destinations in Africa and West Asia, altering long-term trade flows and reshaping economic geographies.

The combined pressures of chokepoint vulnerability and protectionist volatility are accelerating a strategic shift in global supply chains. Long-distance, globalised models are progressively being replaced by regionalised configurations that are more resilient and less exposed to geopolitical shocks. Firms are increasingly encouraged to shorten and simplify

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their supply chains through strategies such as reshoring, near-shoring, or the development of integrated regional networks. Geopolitical risk, therefore, can no longer be regarded as a peripheral operational issue to be mitigated through insurance or contingency planning. It has become a central driver of long-term industrial strategy, influencing decisions at both corporate and national levels. As a result, the very architecture of global production and trade is being reconsidered, with greater emphasis placed on security, diversification, and resilience, even at the expense of cost-efficiency, which had long been the dominant paradigm of globalisation.

8.1.2. Impact on technologies and fuels

While international geopolitics directly affects maritime security, its most profound and enduring influence lies in shaping the economic and technological evolution of the maritime sector.

Energy markets, particularly those concerning fuel supply chains, are intrinsically intertwined with geopolitical stability and international relations. This interconnection arises from the fundamental asymmetry between the geographic concentration of energy resources and the global dispersion of demand, which creates a structural dependency on stable political environments and secure transport corridors. [159] [160]

Consequently, energy resources acquire a strategic dimension: control over their production, distribution, and transit routes becomes a potent instrument of geopolitical power, capable of advancing national or regional political objectives.

Geopolitical developments thus emerge as a primary driver of volatility in both the availability and cost of traditional and emerging fuels. Historical evidence demonstrates that fluctuations in energy prices are often more closely linked to political developments than to underlying market fundamentals of supply and demand. This dynamic reflects the distinctive nature of energy markets, where perceived geopolitical threats are rapidly integrated into risk premiums, amplifying price volatility well beyond the direct physical impact of any disruption. [161]

Recent geopolitical events further confirm this interdependence. The Russia–Ukraine conflict has reshaped global energy flows, introducing embargoes and sanctions that have effectively redrawn the map of international oil trade. These measures have fragmented global markets, disrupted established trade routes, and induced a structural reconfiguration of export patterns. Similarly, ongoing tensions in the Middle East continue to influence global oil price formation, as markets incorporate risk premiums to hedge against potential supply interruptions. [162]

The structural concentration of global fuel supplies within a limited number of nations and political blocks amplifies systemic vulnerabilities. Political instability or policy shifts within key producing regions can exert disproportionate influence on international markets. The OPEC+

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coalition, for instance, controls roughly 55% of global oil production and over 90% of proven reserves, granting it significant market-shaping power despite growing competition from non-OPEC producers. Recent coordinated production cuts (amounting to approximately 2.5 million barrels per day by September 2025) demonstrate the coalition's enduring capacity to steer global pricing.

This concentration extends beyond oil to natural gas markets. Prior to the Ukraine conflict, Russia supplied around 43% of the European Union's natural gas imports, illustrating the geopolitical vulnerability inherent in excessive dependence on a single supplier. Similarly, the global shift toward renewable energy introduces new dependencies. Emerging technologies rely heavily on critical raw materials such as lithium, cobalt, and rare earth elements, resources predominantly extracted in politically unstable or monopolized regions. The Democratic Republic of Congo, for instance, accounts for nearly 70% of global cobalt production, while China dominates the rare earths market, thereby transferring the locus of geopolitical risk from hydrocarbons to strategic minerals. [163] [164]

Geopolitical events influence fuel costs through multiple mechanisms, encompassing both tangible disruptions and intangible market factors like investor sentiment and risk perception. Each form of instability can translate into quantifiable economic consequences, shaping not only energy prices but also broader macroeconomic indicators.

Energy price volatility, driven by geopolitical uncertainty, generates cascading effects throughout the global economy. Given the high degree of interconnection among modern industries, even modest increases in fuel costs can propagate rapidly across sectors, creating inflationary pressures and widespread disruption. Manufacturing industries, for example, face compounded challenges: higher energy inputs for production, increased transportation costs for raw materials, and elevated operational expenditures across entire supply chains.

In an interconnected global economy, no nation is entirely insulated from the geopolitical volatility of energy markets. For this reason, the instability of energy prices has prompted both states and private enterprises to pursue strategies aimed at diversification and resilience. Investments in alternative and renewable energy sources have become central to reducing exposure to fuel price volatility, strengthening energy security, and ensuring the long-term sustainability of economic and technological development.

Beyond immediate economic concerns, geopolitical dynamics increasingly act as catalysts for technological innovation. The pursuit of energy independence and strategic autonomy has accelerated the research, development, and deployment of new energy technologies across multiple domains. Nations exposed to supply disruptions or geopolitical pressures often respond by intensifying investment in renewable energy generation, energy storage systems, and advanced propulsion technologies. [165]

For instance, European countries have significantly expanded their renewable energy portfolios, accelerating offshore wind deployment and advancing hydrogen technologies to diversify their energy mix. Similarly, Asian economies have increased their focus on battery

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innovation and alternative fuels such as ammonia and methanol, seeking to reduce reliance on imported hydrocarbons.

In the maritime sector, geopolitical pressures have directly influenced the pace and direction of decarbonization. The volatility of fossil fuel markets and the growing uncertainty of global supply chains have encouraged shipowners, energy companies, and regulators to invest in technologies that enhance efficiency and reduce dependence on traditional fuels. This includes the development of hybrid propulsion systems, battery-electric vessels, and the exploration of green fuels such as hydrogen, biofuels, and synthetic methane.

8.2. *Social aspects*

The trajectory of the maritime industry is increasingly being charted by forces external to its traditional operational and economic boundaries. Societal pressures, manifesting as public opinion, regulatory mandates, and consumer behavior, are actively shaping the technological and strategic choices that will define the future global fleet.

The contemporary transformation of maritime navigation, driven by the dual imperatives of automation and decarbonization, extends far beyond the realm of technical innovation. It represents a profound socio-technical evolution that intertwines technological progress with societal perception, ethical responsibility, and human adaptation. The maritime sector, traditionally characterized by stability and continuity, now faces disruptive innovations such as Maritime Autonomous Surface Ships (MASS) and the introduction of novel alternative fuels. These changes are reshaping not only operational paradigms but also the social contract underpinning maritime activity.

The adoption of such technologies is not merely contingent upon regulatory approval or economic viability. Rather, it depends fundamentally on public perception and stakeholder acceptance.

8.2.1. Public Perception of disruptive technologies

The adoption of autonomous navigation technologies in the maritime sector could mirror, to a considerable extent, the experience observed in the deployment of autonomous vehicles on land. While the fundamental objective of these systems is to enhance economic efficiency and improve safety through precise operational protocols and continuous autonomous communication between vessels, such intentions may not immediately resonate with the public imagination. The average user or passenger may initially approach autonomy with skepticism or even fear, perceiving a loss of human control and oversight as a potential threat rather than a safeguard.

Moreover, the progressive automation of maritime operations is expected to lead to a structural transformation of the workforce. As vessels become increasingly self-reliant, the demand for onboard personnel will inevitably decline, resulting in a gradual but tangible reduction in maritime employment opportunities. [166] This trend raises significant societal concerns regarding job displacement, the erosion of traditional maritime professions, and the

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potential socio-economic repercussions for coastal and port communities whose livelihoods are closely tied to seafaring activities.

Parallel challenges emerge in the public perception of alternative fuels. [167] [168] While societal support for decarbonization is strong, the transition from conventional fossil fuels to new energy carriers such as hydrogen, ammonia, or methanol introduces safety considerations that directly influence public and stakeholder acceptance. Each of these fuels carries specific hazards: ammonia's toxicity poses serious risks in the event of accidental release; hydrogen, though clean-burning, is extremely flammable and requires stringent containment systems; and methanol, despite its relative handling ease, burns with a nearly invisible flame, complicating fire detection and response. Even transitional fuels like Liquefied Natural Gas (LNG) or Liquefied Petroleum Gas (LPG), though less carbon-intensive, present operational risks during bunkering and transportation.

The risks associated with the aforementioned alternative energy sources, together with those related to nuclear power, already widely employed in military navigation, have sparked societal concerns often described by the "not in my backyard" phenomenon. This reflects a general reluctance among communities to accept the presence of such technologies nearby, driven by fears of potential hazards and a preference for their development to occur elsewhere.

These intrinsic hazards underscore that public acceptance cannot be presumed. The establishment of new fuel infrastructures in ports, for instance, must be accompanied by transparent communication strategies and inclusive stakeholder engagement processes. Only through proactive dialogue can industry actors secure the trust necessary to operate safely and sustainably within local communities.

However, it should not be assumed that the acceptance of a technology depends solely on certifying bodies and the general public. While public perception constitutes a significant sociotechnical barrier to the deployment of disruptive technologies, a parallel and equally critical dimension of resistance is observable within the public authorities responsible for maritime governance. This phenomenon manifests as a structural reluctance by Port Authorities to authorize operations involving new technologies, such as Maritime Autonomous Surface Ships (MASS) and hazardous alternative fuels (e.g., ammonia and hydrogen), in the absence of fully consolidated international frameworks.

The primary driver of this institutional resistance is the misalignment between the rapid pace of technological innovation and the inherently slower cycle of regulatory adaptation.

Furthermore, resistance is exacerbated by a "competence gap" within regulatory bodies. The inspection and authorization of ZEWT (Zero Emission Waterborne Transport) and autonomous systems require specialized technical knowledge that extends beyond traditional naval architecture and seamanship. Port State Control officers and local harbour masters, traditionally trained to inspect conventional diesel-propulsion and manned vessels.

This lack of technical confidence leads to defensive administrative behaviours, where approval processes are prolonged by requests for redundant safety cases and excessive risk mitigation measures that erode the economic viability of the projects.

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The adoption of new technologies in the maritime sector is therefore not a singular goal but a multifaceted negotiation involving diverse stakeholder groups, ranging from the general public to seafarers, regulators, and port authorities. Public concerns about passenger safety must be addressed alongside the maritime workforce's anxieties regarding job security and technological reliability. Furthermore, the fragility of this social contract must not be underestimated: a single major incident, such as a cyberattack on an autonomous vessel or a toxic fuel spill, could crystallize public fear, reinforce skepticism among seafarers, and provoke political resistance capable of delaying regulatory progress for years, regardless of the industry's statistical safety record.

The perception of risk in this context is profoundly asymmetrical. Novel and technologically complex threats, such as system failures or chemical leaks, tend to dominate public consciousness far more than chronic, diffuse, and familiar risks like greenhouse gas emissions or human error in conventional shipping.

The maritime sector's transition toward autonomy and decarbonization must therefore proceed as a collective endeavor, one that integrates human values, addresses public concerns, and fosters a shared vision of safety, sustainability, and trust at sea.

8.2.2. Environmental awareness, social responsibility and conscious consumption

The evolution of the maritime sector is increasingly shaped not only by technological innovation and regulatory development but also by the growing environmental awareness and social responsibility of individuals and communities. People today are more conscious of how their everyday choices (what they buy, how products are transported, and which companies they support) can directly influence the health of the planet. This heightened awareness is gradually transforming consumption patterns and, consequently, influencing the dynamics of global trade and maritime transport.

Shipping has always represented a vital link in the global economy, ensuring the movement of the vast majority of goods that sustain modern life. However, as environmental issues such as greenhouse gas emissions, marine pollution, and the depletion of natural resources have become increasingly visible, citizens are demanding that maritime transport become part of the solution rather than a contributor to the problem. Consumers now expect the products they purchase to have been transported in ways that minimize environmental impact, prompting companies and logistics providers to adopt greener, more transparent, and socially responsible practices. In this sense, every individual decision, whether choosing to buy local products, favouring items certified as sustainable, or supporting companies that rely on low-carbon transport, contributes to shaping the future of the maritime sector.

Social responsibility amplifies this dynamic by turning awareness into concrete action. It extends beyond individual behaviour to encompass the role of society in shaping the ethical commitments of companies, institutions, and policymakers. In the maritime domain, this growing sense of collective responsibility is driving innovation and encouraging the adoption of environmentally friendly solutions, guided by the collective choices of consumers and their increasing preference for sustainability-oriented products and services.

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Conscious consumption provides a practical link between personal ethics and systemic change. Each purchasing decision and each transport choice sends a signal to the market about the kind of production and logistics systems society values. When consumers favour goods transported through sustainable supply chains or companies investing in cleaner shipping technologies, they indirectly reward environmental responsibility and accelerate the transition toward a more sustainable maritime industry. This growing alignment between individual ethics and industrial behaviour reinforces the notion that sustainability is not only a top-down process driven by policy and regulation, but also a bottom-up transformation led by informed and active citizens.

Society's increasing attention to environmental issues, and its willingness to make purchasing decisions based on ecological considerations, has prompted major shipping companies to take sustainability to heart. This shift is reflected in the establishment of corporate foundations, the implementation of sustainability initiatives, and, most importantly, in strategic decisions that redefine the way maritime transport is planned and executed. [169] [170] [171]

8.2.3. Workforce transformation and the demographic challenge

Demographic trends

Demographic trends Europe is undergoing a profound and irreversible demographic transformation marked by the ageing of its population. This long-term trend is primarily driven by persistently low fertility rates and steadily rising life expectancy.

According to Eurostat's publication "Ageing Europe — Looking at the Lives of Older People in the EU," Europeans are living longer than ever, and the demographic structure of society is shifting rapidly. The proportion of people of working age is declining, while the share of older individuals is increasing significantly, a trend set to continue in the coming decades as the post-war baby boom generation transitions fully into retirement.

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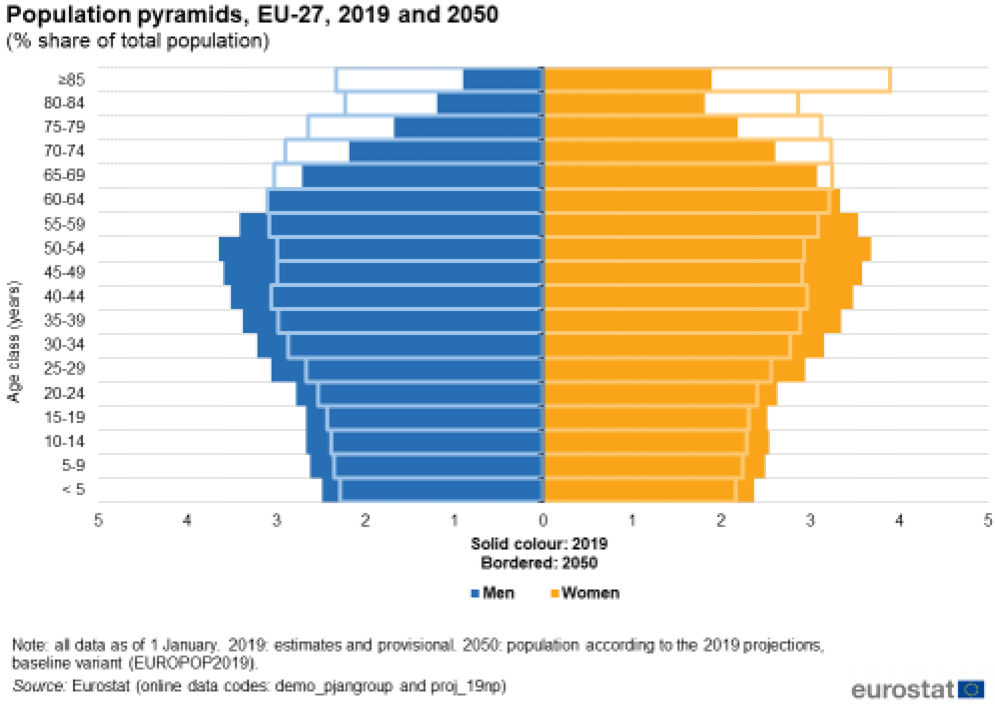
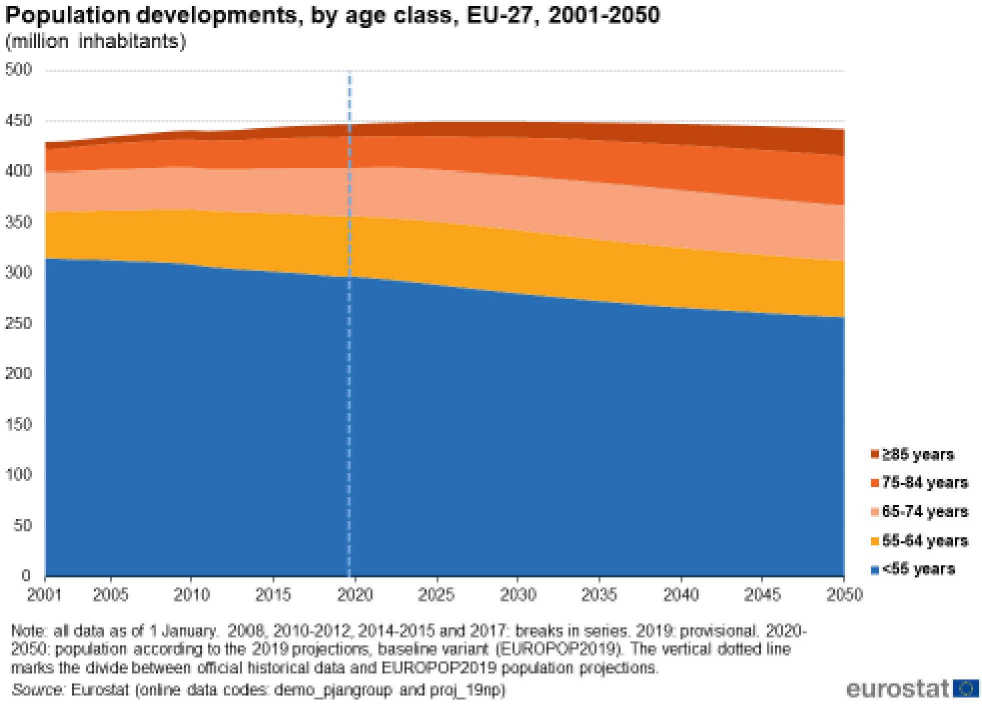


Figure 12 - Population pyramids (credit: eurostat - https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Ageing_Europe_-_statistics_on_population_developments)



These demographic changes carry far-reaching consequences not only for individuals, but also for governments, businesses, and civil society. Key areas expected to be impacted include healthcare and social support systems, labour markets, public finances, and pension schemes.

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Population projections for the EU-27 indicate only a marginal overall increase, from 446.8 million in early 2019 to a peak of 449.3 million between 2026 and 2029, followed by a gradual decline to approximately 441.9 million by 2050. However, the growth in the elderly population will be substantial. The number of people aged 65 and over is expected to rise from 90.5 million in 2019 to 129.8 million by 2050. Within this group, those aged 75 to 84 will increase by 56.1%, and those aged 65 to 74 will rise by 16.6%. In contrast, the population under the age of 55 is projected to decrease by 13.5% over the same period. [172]

The challenge of an ageing maritime workforce is further exacerbated by an emerging global shortage of certified officers. According to the 2021 Seafarer Workforce Report published by BIMCO and the International Chamber of Shipping (ICS) [173], the industry faced a shortfall of 26,240 STCW-certified officers in 2021, a deficit particularly acute in positions demanding advanced technical expertise at the management level.

From a statistical review conducted by EMSA in 2022, the average age of masters and officers holding valid Certificates of Competency (CoCs) was 43.6 years. Whereas the under-25 age group counted 5,057 masters and officers, all other age groups had a relatively uniform distribution, each counting between 16,403 and 25,026 masters and officers, which represented 10% to 15% of the total number. [174]

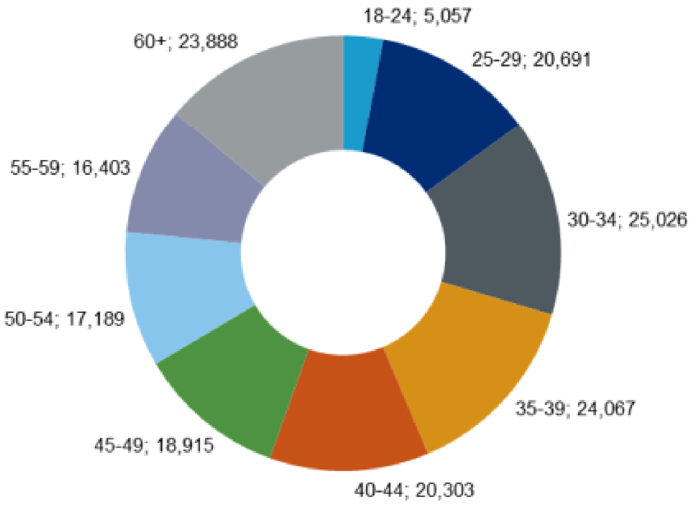

Figure 13 - Age distribution of masters and officers holding valid CoCs (Credit: EMSA - https://www.emsa.europa.eu/newsroom/latest-news/item/5218-seafarer-statistics-in-the-eu-statistical-review-2022-data-stcw-is.html)

The rising average age of seafaring officers has critical implications. As senior officers retire, their departure often occurs without adequate opportunities to transfer accumulated knowledge and practical experience to younger generations. This represents not only a loss of technical skill but also of institutional memory vital to maintaining operational safety and efficiency.

This dual crisis has a compounding effect. The transition to ZEWT necessitates a massive upskilling and reskilling of the workforce. Crews will need new competencies to handle alternative fuels like ammonia and hydrogen, operate advanced digital navigation and automation systems, and manage complex onboard energy grids.18 However, the industry is

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losing the experienced officers who could form the basis for this retraining, while simultaneously failing to attract the digitally native young people who might be best equipped to learn and adapt to these new technologies. The skills gap is therefore not static; it is being actively widened from both ends, threatening to slow the pace of technological adoption and innovation.

National composition and employment patterns of Seafarers

Global migration trends, geography, and the distribution of maritime training and employment opportunities influence the composition and mobility of the workforce in waterborne transport. According to ILO statistics, "maritime nations", such as those in Southeast Asia and along major global shipping routes, dominate employment in waterborne transport, especially the Philippines and Indonesia, which account for a substantial share of the global maritime workforce [175]. Specifically, according to ILO's data of 2021, the Philippines provides more than 250.000 seafarers, while Indonesia over 143.000 [176], representing a significant share of the global maritime workforce. This highlights the substantial labour resources present within Southeast Asia's maritime industry. These regions not only supply a considerable number of officers and ratings but also reflect a long-standing employment pattern, in which seafarers work for international fleets under foreign flags. On the other hand, the Russian Federation also contributes with over 198.000 seafarers to the maritime workforce, underscoring its strategic role as one of the principal labour-supplying countries [176]-.

At the European level, statistics from the European Maritime Safety Agency (EMSA) further demonstrate the international dimension of the waterborne transport workforce. A total of 172,308 masters and officers hold certificates of competency issued by EU countries, while 125,519 officers from non-EU countries are recognised by EU administrations. This means that nearly 42% of certified officers operating under EU flags originate from outside the EU, illustrating the sector's dependence on international labour mobility. From a nationality perspective, the Philippines is the leading source of non-EU officers (44,048 recognised by EU countries), followed by Ukraine (23,608), the Russian Federation (18,885), India (13,318), and Türkiye (5,885). Among EU nationals, the largest certifying countries are Norway (21,204), Poland (17,772), Croatia (14,776), Italy (14,352), and Romania (13,926) [177]. These figures confirm the dual reliance of the EU's maritime sector on both domestic and third-country seafarers.

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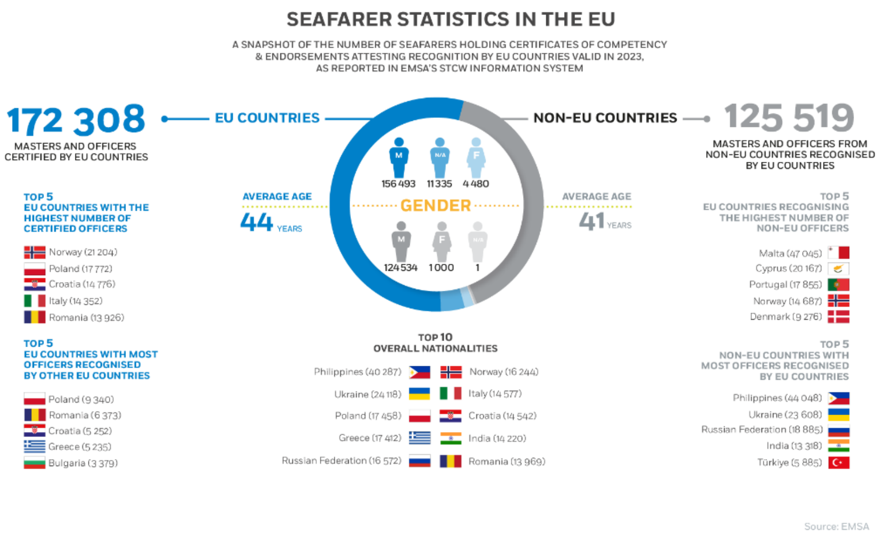

Figure 14. Seafarer Statistics in the EU. Source: EMSA

While waterborne transport remains geographically anchored in a handful of maritime nations, it increasingly depends on a fluid and interconnected global labour system where mobility plays a decisive role in sustaining skills availability and operational resilience.

The multicultural dimension of the workforce on board inevitably shapes both the social and operational dynamics of a vessel. While diversity enhances teamwork, adaptability, and problem-solving, it also introduces challenges related to communication and mutual understanding [178]. Differences in language, cultural values, and non-verbal cues can lead to misinterpretations, reduced coordination, and, in some cases, safety incidents. Effective cross-cultural communication and a strong command of Maritime English are essential to mitigate these risks. This growing reliance on international labour pools requires not only effective management of multicultural crews but also continuous adaptation of training systems to ensure the consistent transfer and recognition of maritime skills across borders. Therefore, fostering multicultural awareness through dedicated training and inclusive management practices is crucial to ensuring a cohesive crew environment and maintaining high safety standards at sea.

Workforce Demographics and Career Lifecycles

The maritime labour market is characterized by distinct entry and exit patterns that mirror broader demographic and economic trends, with clear generational transitions influencing both recruitment and retention patterns. Seafaring careers typically begin in early adulthood after the completion of maritime education or cadetship programmes. However, the duration of service at sea varies considerably across ranks, vessel types, and regions. Many seafarers eventually transition ashore to pursue careers in port operations, training, or logistics, contributing to a continual renewal of the labour force and the need for sustained inflows of qualified entrants [175]-.

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Gender diversity in the maritime sector remains extremely limited and uneven across subsectors. The BIMCO/ICS Seafarer Workforce Report of 2021 reported that women represent only about 2% of the global seafaring workforce, with the majority employed in the cruise segment [179]. More recent figures from ICS indicate a modest increase in women's participation, with 75.6% of female seafarers aged between 21 and 30 and 25.4% over 35, confirming that most women in the sector are early-career professionals [180]. Within the EU context, EMSA shows that women constitute roughly 3% of all certified officers, highlighting persistent barriers to gender inclusion despite gradual progress in recruitment and training initiatives [177]-.

Generational shifts are increasingly evident, with ageing officer populations reported in Europe and East Asia, and concerns about the timely replacement of experienced personnel [177]-. According to EMSA, the average age of EU-certified officers is 44 years, compared to 41 years among those recognised from non-EU countries, suggesting a slightly younger profile among foreign seafarers serving under EU flags. The availability of new entrants varies significantly across regions. Traditional seafaring nations (e.g., the Philippines and Indonesia) continue to supply the majority of young seafarers to the global fleet, reflecting strong vocational training systems and established labour channels. By contrast, many European and OECD (Organisation for Economic Co-operation and Development) countries report declining interest in seagoing careers, linked to changing lifestyle expectations, the perceived hardship of shipboard life, and the growing appeal of shore-based maritime and logistics occupations.

The profile of potential candidates entering the maritime sector is also evolving. New generations of seafarers are more technologically adept and environmentally aware, reflecting the industry's transition toward digital and green operations. However, they increasingly seek clearer career pathways, improved work–life balance, and opportunities for continuous training and progression between shipboard and shore-based roles. These changing expectations call for adaptive human resource and training strategies that combine recruiting younger, tech-savvy talent with retaining experienced professionals. Managing this intergenerational and multicultural workforce effectively requires not only technical competence but also strong communication, leadership, and cross-cultural understanding to sustain safety and cohesion on board [178].

Skills, Safety, and Evolving Work profiles

Seafarer training is a cornerstone of international trade, as well-trained crews are essential for navigating complex trade routes, handling diverse cargo types, and ensuring compliance with international regulations. Competence directly impacts maritime safety, operational efficiency, and the overall reliability of global supply chains. Because shipping is an inherently international activity, a standardized approach to competence and certification is necessary. The International Maritime Organization's STCW Convention provides this global framework by defining minimum competence requirements and regulating the issuance of Certificates of Competency (CoC) for seafarers. These certifications validate a broad range of skills, including navigation and watchkeeping, the use of modern electronic systems such as ECDIS, teamwork and leadership, and security and emergency response procedures. STCW certification also enables seafarers to work across different flag states and ensures global recognition of their qualifications through transparent and verifiable registries maintained by national authorities

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[181]. In this context, ECSA invites the EU Commission to prioritize reskilling and upskilling initiatives for seafarers, particularly in the context of the ongoing review and revision of the STCW Convention, as these are fundamental to managing the sector's green and digital transition. Building skills related to new vessel technologies, alternative fuels, and updated safety regulations must remain a core focus [182].

On one side, digital skills are essential for operating technologically advanced vessels, managing data-driven systems, and ensuring cybersecurity. The maritime workforce must not only possess basic digital literacy but also acquire advanced expertise in fields such as artificial intelligence, programming, and data management, which underpin the digital transition. On the other side, green skills are increasingly in demand due to the industry's commitment to decarbonisation. The introduction of alternative fuels and biofuels requires specialised knowledge in fuel handling, emissions control, and sustainability principles. A systemic understanding of circular economy practices is also essential.

These technological innovations and rising environmental requirements are pushing governments, industry stakeholders, and individual companies to increase investment in seafarer training and professional development. A ZEWT model demands continuous certification and skills upgrading, more adaptable work arrangements that balance time at sea and onshore, longer-term contracts to enhance job stability, and more competitive salary structures to attract and retain talent[178]. Indeed, since the adoption of the STCW, significant technological advances have reshaped the shipping industry. For instance, MARPOL established stricter limits on sulphur emissions, leading to a rapid increase in natural gas-powered vessels, which now number 562 worldwide, with hundreds more under construction or on order. This trend, along with the growing shift to low-flashpoint fuels, has driven demand for specialized training, as reflected in STCW Chapter V-3 for ships using alternative fuels. Training has a profound impact on operational performance, and the transition to a zero-carbon economy, with more electrically powered and digitally integrated ships, requires seafarers to acquire new technical competencies. While the 2010 Manila Amendments introduced roles such as Electro-Technical Officer (ETO) and Electro-Technical Rating (ETR), companies still face difficulties recruiting qualified personnel, underscoring the risk of skill shortages as technology evolves faster than workforce adaptation[178].

Addressing these emerging needs calls for innovative, seafarers-centred educational programs that integrate technological advancements while fostering a commitment to climate change mitigation. A systematic analysis of existing academic offerings, based on criteria such as alignment with research goals, explicit attention to technological innovation and sustainability, and the presence of accredited institutions with strong reputations, has revealed an urgent need for advanced teaching approaches in climate change education, particularly within transport and logistics [183].

Current curricula often fail to provide comprehensive training on decarbonization and climate resilience, underscoring the opportunity to design specialized programs that bridge these gaps by integrating technical, managerial, and policy perspectives. These programs are essential to develop a workforce capable of supporting the maritime and logistics sectors in achieving long-term sustainability and operational resilience.

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Career Attractiveness and the Emerging Risk of Maritime Workforce Shortages Beyond 2026
Attracting and retaining talent in the shipping sector has become an increasingly pressing challenge, as the profession struggles to compete with changing career aspirations and evolving labour market expectations. While seafaring continues to offer distinctive advantages such as financial stability, international mobility, and the opportunity to travel, these benefits are often overshadowed by structural and social challenges that undermine its long-term appeal. Findings from recent studies identify a set of "misvalues" that are currently influencing career choices, such as demanding working conditions, long periods away from home, limited career progression, and persistent isolation at sea, which have reduced the sector's attractiveness, particularly among younger generations [184]. Similarly, other studies highlight that mental health concerns, fatigue, and lack of recognition contribute to declining motivation and higher turnover intentions [185]. Moreover, the pandemic further exposed deficiencies in welfare and communication, reinforcing perceptions of precarity and neglect. Addressing these challenges requires not only improved working and living conditions but also a renewed focus on career development, inclusivity, and employer commitment. Promoting the maritime profession as a modern, sustainable, and supportive career path, aligned with the digital and green transition, emerges as a key condition to attract a new generation of maritime professionals.

These challenges in attracting and retaining talent are reflected in recent global workforce trends. According to the BIMCO/ICS Seafarer Workforce Report, the global merchant fleet currently employs approximately 1.89 million seafarers across more than 74,000 vessels. However, the study also reveals an existing shortfall of around 26,240 STCW-certified officers, projecting that by 2026, an additional 89,510 officers will be required to meet growing demand [186]. This projected gap, if unaddressed, could have severe implications for the stability of global supply chains, as qualified officers play a critical role in ensuring the safe and efficient operation of ships. The shortage is particularly acute among technical and management-level deck officers. Despite modest improvements in turnover and recruitment, BIMCO and ICS warn that, without substantial investment in training, recruitment, and retention, the industry risks a systemic workforce crisis. This growing imbalance between supply and demand underscores the strategic importance of revitalising the seafaring profession, both in image and in working conditions, to secure the future sustainability and competitiveness of the maritime sector.

8.3. Climate change

Climate change constitutes a serious challenge for the maritime sector. The increasing frequency and magnitude of extreme weather events, together with more gradual and persistent phenomena, have given rise to issues affecting both shipping routes (which over the years have been impacted by droughts and, conversely, have taken advantage of ice melt) and port infrastructures (which are confronted with the rising mean sea level and the damages caused by extreme meteorological events).

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8.3.1. Climate change impact on shipping routes

Climate change has begun to redefine the geography of global maritime transport by opening previously inaccessible seaways. Among the most significant of these is the Northern Sea Route (NSR), which extends along the Russian Arctic coast and provides the shortest maritime connection between Europe and Asia. This route can reduce transit distances by up to 40% compared to traditional passages through the Suez Canal, offering a potential breakthrough in terms of efficiency and global trade competitiveness. However, such prospects are counterbalanced by substantial risks, particularly concerning environmental sustainability and navigational safety in ecologically fragile polar regions. [187]

Historically, the NSR, often referred to in Europe as the Northeast Passage and in Russia as the Severnii Morskoi Put, has been the subject of exploratory interest for centuries. Early expeditions consistently encountered insurmountable challenges due to extreme ice conditions, inadequate naval architecture, and limited navigational technologies. A landmark moment occurred with the successful Vega Expedition at the end of the 19th century, which for the first time demonstrated the technical feasibility of transiting the route. Nevertheless, regular use of the NSR remained limited throughout the early 20th century, restricted largely to Russian vessels and merchant fleets of coastal nations. [188]

The dramatic retreat of Arctic sea ice in recent decades has altered this dynamic, enabling an increasing number of foreign merchant vessels to attempt the passage. This shift has brought renewed global attention to the NSR, not only as a commercial opportunity but also as a geopolitical and environmental concern. While some operators have begun experimenting with ice-class, dual-fuel vessels to mitigate both safety and emission-related risks, widespread adoption remains constrained. The Arctic environment poses unique challenges: black carbon emissions from shipping accelerate ice melt, while the threat of oil spills in pristine ecosystems carries irreversible consequences. Moreover, operations in the NSR are subject to intense regulatory oversight, particularly from Russian authorities, and carry reputational risks that deter more conservative shipping companies.

It is important to distinguish the NSR from its counterpart, the Northwest Passage, which runs through the Canadian Arctic Archipelago along the North American coastline. Despite its strategic potential, the Northwest Passage remains less navigable than the NSR due to more severe ice conditions and the complex geography of the archipelago. For this reason, in both academic and policy discourse, the term “Northern Sea Route” is generally reserved for the Eurasian Arctic passage along the Russian coast. [189]

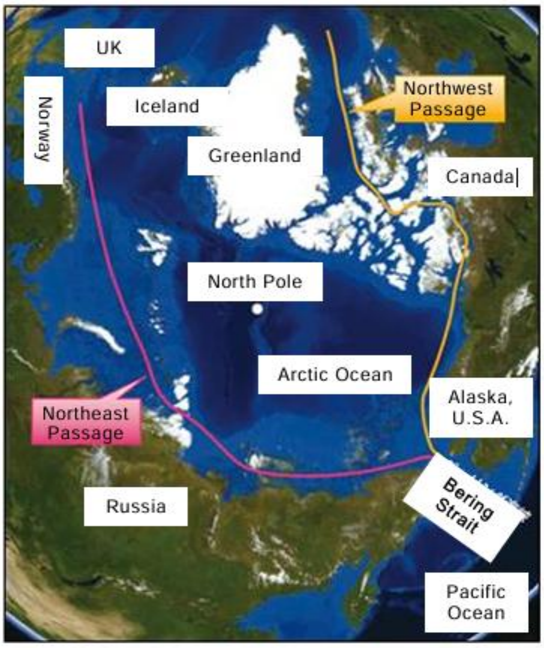

Figure 15 - The Northern Sea Route (Based on the situation in early summer according to NASA World Wind http://worldwind.arc.nasa.gov/java)

At first glance, one might be tempted to view climate change as a paradoxical force that indirectly benefits maritime transport by opening new shipping routes, particularly in polar regions where melting ice allows for shorter passages. This perspective suggests a form of natural self-correction, where the very process of global warming appears to offer logistical advantages by reducing fuel consumption and emissions. However, this interpretation is misleading and does not reflect the broader reality. In truth, climate change has introduced severe challenges to the management of global shipping routes, creating unprecedented disruptions with profound economic and social consequences. [190]

A striking example is the ongoing crisis in the Panama Canal, which in recent years has faced significant operational difficulties due to a prolonged and severe drought. This drought, driven by a combination of anthropogenic climate change and the El Niño phenomenon, has dramatically reduced water levels in Gatún Lake, the artificial reservoir essential for the functioning of the Canal. [191]As a consequence, Panamanian authorities were forced to impose strict limitations on canal traffic. By November 2023, daily ship transits had dropped from the usual average of 38 to only 24, generating long queues at adjacent ports and delaying the transport of vital goods ranging from children's toys to solar panel components and life-saving medicines such as insulin. If restrictions persist, it is estimated that up to 4,000 fewer ships will be able to transit the Canal in 2024, a prospect that underscores the growing fragility of global trade networks in a warming world.

Climatological data highlight the severity of the situation. Since early 2023, Panama has been experiencing one of the worst droughts on record. In October of that year, rainfall was 43% lower than historical averages, making it the driest October since the 1950s. Across the canal region, 2023 ranked among the two driest years since systematic meteorological observations began. This crisis is being amplified by the "double effect" of a particularly strong El Niño

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coupled with record-breaking global warming, which pushed average global temperatures in 2023 to 1.35 °C above pre-industrial levels. El Niño, a recurring climate oscillation characterized by unusually warm ocean and air temperatures along the western coast of the Americas, typically lasts between nine and twelve months, but its intensity has been increasingly linked to climate change. Scientific models suggest that both El Niño and its counterpart La Niña are becoming more extreme and frequent, with projections under high-emission scenarios indicating a 15–20% increase in the intensity of El Niño events. [192]

The drought has had especially severe repercussions for Gatún Lake, the freshwater body that not only supplies the locks of the Panama Canal but also provides drinking water to millions of people in Panama City, Colón, and surrounding areas. On 1 January 2024, water levels in the lake reached their lowest point ever recorded for that date, measuring almost two meters below the levels observed just one year earlier. Given that the locks rely on millions of gallons of freshwater to elevate ships above sea level, insufficient water supply directly compromises the Canal's operability. At the same time, competing demands for freshwater from a growing national population exacerbate the strain on this critical resource.

In response to these unprecedented conditions, the Panama Canal Authority has restricted daily passages to 24 vessels. By the end of 2023, overall transits were already 30% lower than the annual average, and the uncertainty of passage through the Canal has compelled some shipping companies to seek alternative routes. Lower water levels have also imposed restrictions on vessel size. Larger ships, which constitute an increasing share of global fleets due to their efficiency in carrying greater volumes of goods, require more freshwater to pass through the locks and sit deeper in the water, making them more vulnerable to grounding in shallower channels.

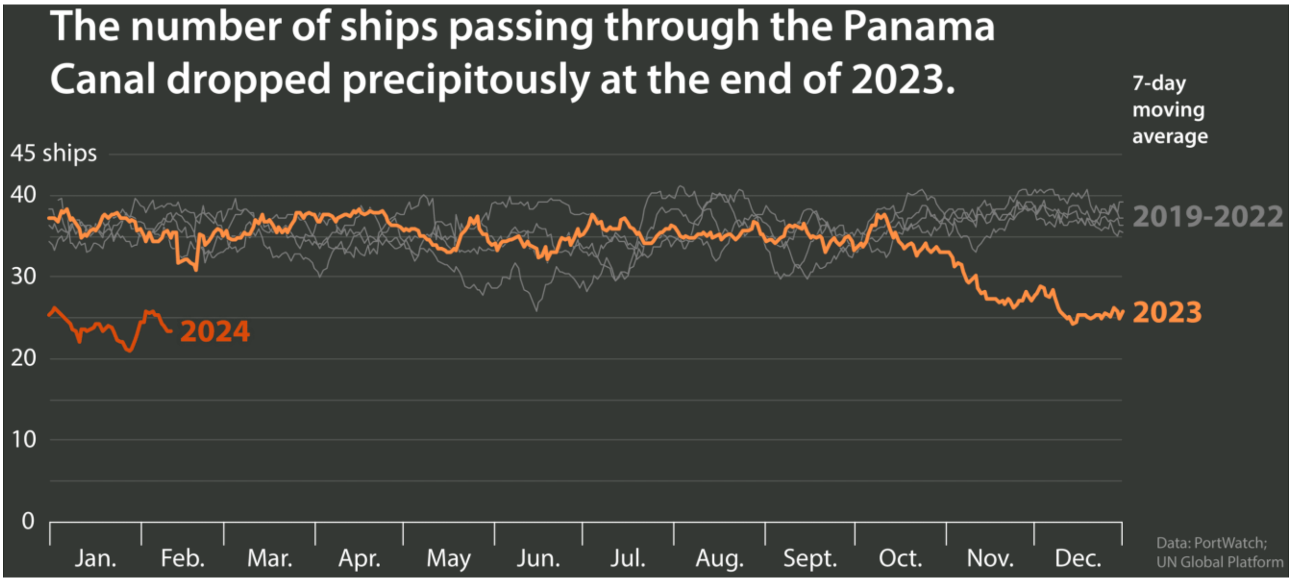

Figure 16 - number of ship passing through the Panama Canal (credit: https://www.woodwellclimate.org/drought-panama-canal-7-graphics/)

The strategic significance of the Panama Canal cannot be overstated. Handling approximately 5% of global maritime trade, it is a linchpin of the world's supply chain. Disruptions here reverberate globally, leading to shipment delays, increased fuel consumption, and measurable GDP losses. The fragility of this critical chokepoint has become even more apparent when considered alongside geopolitical instability affecting another major maritime corridor: the Suez Canal. Since late 2023, attacks by Houthi forces in the Red Sea have disrupted vessel movements, particularly for ships bound to or from Israel, further undermining the reliability of this essential passage between Europe and Asia. With both the Panama and Suez Canals increasingly compromised, shipping companies are often left with no alternative but to reroute vessels along significantly longer paths, such as around the Cape of Good Hope in Africa or Cape Horn in South America, routes that add considerable time, cost, and carbon emissions to global trade.

By early 2025, conditions in Panama had improved, restoring the Canal to its normal operating capacity. Nevertheless, the episode remains highly significant, as it demonstrates the vulnerability of this strategic waterway to environmental stress. With the intensification of the climate emergency, similar disruptions may recur, particularly when long-term warming coincides with cyclical phenomena such as El Niño. Should such events re-emerge with greater severity, they could not only undermine the reliability of the Canal itself but also trigger profound shifts in the configuration of global shipping routes. [193]

In sum, the situation illustrates how climate change is undermining the stability of global shipping by exposing vital chokepoints to severe environmental stressors. The interplay between natural variability, such as El Niño, and anthropogenic warming is already reshaping global trade dynamics, and without decisive mitigation efforts, such disruptions are likely to intensify in the decades ahead.

8.3.2. Sea Level Rise and Climate change impact on port infrastructure

This section argues that the accelerating impacts of climate change pose systemic and multifaceted risks to port infrastructure, compromising both its structural integrity and its operational continuity. By their very nature, ports are located at the interface between land and sea, a geographical position that makes them uniquely vulnerable to the intensifying forces of a changing climate. It is important to note that these facilities are not threatened by a single, predictable hazard but rather by a convergence of multiple stressors, combining chronic, long-term environmental pressures with sudden and high-impact shocks. This compound exposure fundamentally challenges the traditional assumptions underpinning engineering design, operational management, and investment strategies that have guided port development for decades. The simultaneous effects of rising sea levels, more powerful storms, and shifting patterns of temperature and precipitation create a profoundly uncertain operational environment, one in which established planning models and design parameters are increasingly inadequate to ensure resilience.

Sea-level rise represents one of the most certain and consequential manifestations of anthropogenic climate change for coastal systems, and its trajectory poses profound implications for the future of port infrastructure. It is not a uniform or linear process but one that has demonstrably accelerated in recent decades, primarily driven by the thermal

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expansion of warming ocean waters and the influx of meltwater from glaciers and ice sheets. Observational records provide compelling evidence of this acceleration: while global mean sea level rose at an average rate of 1.5 millimetres per year between 1901 and 1990, this rate more than doubled to 3.6 millimetres per year between 2005 and 2015. [194]

Projections for the twenty-first century indicate that such acceleration will persist, although its precise magnitude remains contingent upon future greenhouse gas emission trajectories. Under a high-emission scenario (RCP8.5), the Intergovernmental Panel on Climate Change (IPCC) projects a likely rise of 0.61 to 1.10 metres by 2100 relative to the 1986–2005 baseline.

The IPCC Sixth Assessment Report provides the most comprehensive projections of sea-level rise under different emission scenarios, with important implications for extreme weather amplification. Global mean sea level is projected to rise 0.28-0.55 m under very low emissions (SSP1-1.9) and 0.63-1.02 m under very high emissions (SSP5-8.5) by 2100. However, recent research suggests these projections may underestimate future changes, with high-end scenarios potentially reaching 1.9 m under continued high emissions. [195]

The uncertainty in ice sheet contributions dominates long-term projections, with expert assessment studies indicating potential contributions of 2 m or more cannot be ruled out. Antarctic instabilities could contribute up to 28 cm by 2100 under high emissions scenarios, but longer-term projections show much larger potential contributions reaching several meters over centuries to millennia. . [196] [194]

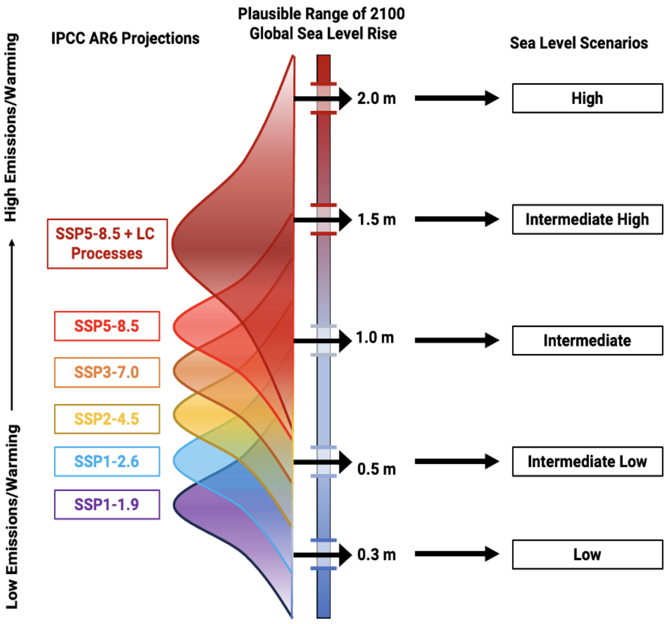

Figure 17 - IPCC AR6 projections of global sea level rise by 2100 under various emission scenarios [197]

Sea-level rise fundamentally transforms the impact of coastal extreme weather events through multiple interconnected mechanisms. Storm surges, the abnormal rise in sea level during storms caused by wind stress and atmospheric pressure changes, become increasingly destructive when superimposed on elevated baseline sea levels. Research demonstrates that even modest sea-level rise of 0.5 m can multiply flood frequency for many coastal sites by factors of 100 or even 1,000. [198] [199]

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8.3.3. Extreme weather events and compound effect

In parallel with rising seas, climate change is fundamentally altering the distribution and intensity of extreme weather events, reshaping the hazard landscape for coastal infrastructure.

The effects of climate change include record-breaking heat waves on land and in the ocean, torrential rains, severe floods, droughts that last for years, extreme wildfires, and widespread flooding during hurricanes are becoming more frequent and more intense. [200]

In addition, the occurrence of extreme phenomena such as hurricanes is increasing because warmer sea surface temperatures intensify tropical storm wind speeds, giving them the potential to deliver more damage if they make landfall. Over the 39-year period from 1979-2017, the number of major hurricanes has increased while the number of smaller hurricanes has decreased. Based on modeling, the National Oceanic and Atmospheric Administration predicts an increase in Category 4 and 5 hurricanes, alongside increased hurricane wind speeds. Warmer sea temperatures also cause wetter hurricanes, with 10-15 percent more precipitation from storms projected. [201]

A critical issue associated with the increasing frequency of extreme events lies in the fact that, during the design phase of a port, environmental characteristics and analyses of past extreme events are traditionally used as references for forecasting the future scenarios in which the port will operate. [202]

This implies that such a rapid rise in mean sea level may significantly reduce the operational lifespan of the port, thereby necessitating constant restoration works to maintain its usability. At the same time, the port must be designed to be more resilient to exceptional events that are statistically expected to occur only once in a century. [194]

For instance, in the case of New York, projections indicate that extreme sea-level events previously expected to occur once every 100 years are projected to occur every 81 years by 2050, and to accelerate further to once every 19 years by 2100. [203] [204]

Such an escalation in frequency implies that a port designed today according to twentieth-century return-period assumptions is inherently under-engineered for the climatic conditions it will face within its operational lifetime. This constitutes a structural and systemic vulnerability embedded in the vast majority of existing global port infrastructure, underscoring the urgent need to revise design principles and adopt adaptive strategies aligned with a non-stationary climate reality.

All the elements described therefore paint a picture in which different phenomena increase their frequency, but it must also be considered that these phenomena do not always occur individually and, on the contrary, as they occur more and more frequently, the probability that several phenomena will occur at the same time also increases as a result.

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The risks to port infrastructure are then further amplified by the increasing likelihood of compound and cascading events, where multiple climate hazards interact to produce impacts greater than the sum of their individual effects.

A quintessential example of a compound event is the coincidence of a coastal storm surge with an extreme precipitation event. Sea-level rise provides a higher starting point, allowing a storm surge of a given magnitude to penetrate further inland and reach higher elevations than it would have previously. Simultaneously, the increasing intensity of tropical cyclones means that the storm surge itself is likely to be higher, and the associated rainfall more extreme. When a powerful storm surge pushes inland, it can overwhelm coastal defenses and block the seaward drainage of rivers and stormwater systems. If this occurs during a period of intense rainfall, the terrestrial runoff has nowhere to go, leading to severe and prolonged "compound flooding" from both the sea and the land. The resulting inundation can be far more catastrophic than what would be caused by either the surge or the rainfall in isolation. This multiplicative effect underscores the limitations of conventional single-hazard assessments, which fail to capture the systemic interactions between marine and terrestrial drivers of flooding. As a result, such approaches risk systematically underestimating the scale and severity of future threats. A comprehensive, multi-hazard framework is therefore essential to accurately evaluate the compounded vulnerabilities of port infrastructure and its hinterland, and to inform the design of resilient adaptation and mitigation strategies. [194]

9. Business and Financial Models

9.1. Business Models for Fleet Green Transformation

The shift to sustainable maritime transport supports:

- Service-oriented models integrating digital platforms for emissions and logistics optimization.
- Collaborative models among stakeholders to share investment and operational risks.
- Green leasing and financing mechanisms promoting the adoption of clean technologies, including demonstration of nuclear-powered vessels.

9.1.1. Context and Drivers of Fleet Transformation

The transition towards Zero-Emission Waterborne Transport (ZEWT) requires a fundamental rethinking of the business and financing models that sustain the maritime sector.

Decarbonising fleets is not only a technological challenge but also a structural economic one, demanding new collaborative, service-based, and risk-sharing frameworks that enable investment at scale.

This transformation is driven by four main vectors:

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- Regulatory drivers: The IMO GHG Strategy, the EU ETS, FuelEU Maritime and the OPS Directive are reshaping the business environment for shipowners.
- Technological drivers: The adoption of alternative fuels (hydrogen, ammonia, methanol, LNG), hybrid/electric propulsion, and digital automation.
- Economic drivers: High CAPEX, fuel price volatility, and the pressure to improve operational efficiency.
- Market drivers: Increasing demand from shippers and logistics chains for verified low-carbon maritime transport.

Despite these drivers, several barriers remain: technological and fuel-supply risks, regulatory uncertainty, immature infrastructure, and limited access to affordable finance.

9.1.2. Emerging Business Models for Green Shipping

To overcome these barriers, new business models are emerging that redefine the way maritime assets are owned, operated, and financed.

A Service-oriented models

Under these arrangements, shipowners no longer purchase full systems but instead access them through service contracts. Examples include Propulsion-as-a-Service or Energy-as-a-Service, where technology providers install and maintain equipment such as batteries, wind-assist systems, or optimisation software and are paid according to verified performance (€/MWh saved or €/tCO_2 avoided).

Similarly, Performance-as-a-Service contracts, supported by digital twins and predictive maintenance, guarantee operational efficiency gains. Integrated digital platforms further support emissions monitoring, fuel traceability, and automated compliance reporting.

Collaborative and risk-sharing models

These models involve partnerships between shipowners, ports, energy providers, and technology firms. Joint ventures and consortia are being created to produce or supply alternative fuels and to develop multi-fuel bunkering hubs. In green corridors, agreements among stakeholders define service standards and common sustainability metrics. Performance-based chartering links freight rates to verified emission reductions, aligning business incentives with environmental goals.

Fleet renewal and retrofit models

Turnkey retrofit programmes combine technology, maintenance, and performance guarantees, allowing shipowners to modernise vessels through pay-as-you-save mechanisms. “Fuel-ready” and “conversion-ready” designs reduce stranded-asset risks by anticipating future fuel transitions.

Demonstrations with advanced technologies

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Pilot projects with emerging or disruptive propulsion systems, including wind-assist or next-generation nuclear/SMR technologies, are being explored within safe testing frameworks. These serve to assess operational feasibility, certification pathways, and social acceptance.

9.1.3. Financial Mechanisms and Investment Strategies

The financial dimension is crucial to the fleet's green transformation. High upfront costs require innovative financing schemes that distribute risk and attract private capital.

Green financial instruments, such as green leasing, sustainability-linked loans, and green bonds, tie funding conditions to environmental KPIs like gCO_2e/t-km, OPS usage or share of alternative fuels. Blended finance models, combining public and private capital, can lower the cost of capital for early-stage technologies.

Risk mitigation tools (performance guarantees, long-term contracts, escrow accounts, partial public guarantees, or risk-sharing facilities) enhance investor confidence. Carbon or Clean Contracts for Difference (CCfDs) help bridge the cost gap between fossil-based and zero-emission operations.

EU and national mechanisms such as the Connecting Europe Facility (CEF), the Innovation Fund, Horizon Europe, and reinvested EU ETS revenues represent key funding channels to support retrofits and green fleet deployment.

9.1.4. Role of Ports and Logistics Integration

Ports play a pivotal role as enablers of fleet transformation, acting as energy and digital nodes that connect ships with onshore systems.

Investments in OPS infrastructure, multi-fuel bunkering stations, and energy-as-a-service schemes at berth are essential to facilitate decarbonised operations. Public-private partnerships (PPPs) can support the co-financing of these infrastructures and the development of joint service models.

On the digital side, Port Community Systems (PCS), emission reporting tools, and certification platforms enhance interoperability between vessels, ports, and Land-Based Control Centres (LBCCs), improving overall safety, transparency, and logistics efficiency.

Ports can also incentivise fleet transformation through green port tariffs, contractual clauses linked to verified emission performance, and the integration of maritime operations into wider intermodal logistics networks.

The decarbonisation of fleets requires innovative business and financing structures that make ZEWT technologies economically viable. Service-based and performance-linked models can reduce capital intensity and accelerate adoption, while collaborative frameworks and PPP structures distribute risk and foster joint innovation.

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Ports must lead in integrating energy and logistics services, linking incentives to measurable outcomes. Blended finance, guarantees, and CCfDs will be essential to crowd-in private investment.

Finally, standardised KPIs, transparent verification mechanisms, and harmonised EU regulation will ensure scalability, interoperability, and long-term sustainability of green fleet transformation models.

9.2. *Focus on Environmental Impact Reduction and Transport Efficiency*

The decarbonization of the European maritime sector requires a systemic change that goes beyond the technological dimension and includes the redefinition of business models and financial structures supporting the transition. In a sector characterized by high capital intensity, long investment cycles, and strong dependence on fossil fuels, the challenge is twofold: ensuring the economic sustainability of interventions and attracting financing flows aligned with long-term environmental objectives.

From this perspective, maritime investment strategies and new business models are evolving along four key directions, which together constitute the framework for a financially sustainable and environmentally neutral ecosystem.

9.2.1. Reduction of carbon intensity and improvement of energy efficiency

From a business model perspective, energy efficiency and carbon intensity reduction become competitive levers: a vessel or fleet that consumes less fuel per unit transported generates not only environmental benefits but also direct economic advantages (lower OPEX) and indirect benefits (reduced exposure to regulatory risk, improved access to credit). Financial institutions and shipowners are integrating this aspect into their evaluation metrics: for instance, ING Bank, in its "shipping climate alignment framework," assesses clients based on fleet efficiency and investment capacity in low-emission technologies [205]. This also results in hybrid financial models: vessel retrofits (e.g., hull coatings, optimized propellers, hybrid engines), which imply higher initial CAPEX but lower OPEX and appreciable residual value. The transition from a conventional vessel to a “fuel-ready” or “efficiency-ready” vessel is therefore a transformation that must be financially modeled: depreciation, leasing plans, residual value, and potential charter rate differentials become critical elements.

Typical interventions include retrofitting existing vessels with low-friction coatings, optimized propellers, waste heat recovery systems, and automation and digitalization of onboard operations. According to the OECD (2025), an average retrofit can reduce fuel consumption by 10–25%, with a return on investment in 3–7 years. From a financial perspective, such projects are often supported through green loans, operational leasing, and public-private “Energy Efficiency Retrofit Funds.”

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9.2.2. Development of intermodal connections to improve logistics

Intermodal logistics – combining sea, rail, road, and inland waterways – requires the maritime business model to integrate with onshore operators and port infrastructure. This means maritime transport no longer operates in isolation but as part of an integrated logistics chain. Financially, this implies leveraging economies of scale, reducing operational inefficiencies (shorter port stays, faster transshipments, fewer empty voyages), and sharing value with logistics partners. Furthermore, adopting "green" port infrastructure (electrified terminals, cold-ironing, digital systems) opens opportunities for public-private partnerships (PPPs), long-term infrastructure financing, and revenue-sharing models among shipowners, port operators, and logistics service providers [206].

In this context, business models also include service contracts rather than simple vessel chartering: for example, a shipping operator could offer "cargo transported with certified emissions" and provide an integrated logistics service including intermodal transport. From a business model standpoint, this entails a shift from a "port-to-port" model to a "door-to-door" model, where the maritime operator actively collaborates with rail operators, port managers, and land distributors. Companies adopting this logic generate value through reduced idle times, use of electrified terminals (cold ironing), and digitalization of customs and loading/unloading processes.

Financing primarily comes from European instruments dedicated to sustainable infrastructure, such as the Connecting Europe Facility (CEF) and Green Port Bonds. Such projects can reduce total supply chain emissions by up to 30%, while increasing logistics efficiency and competitiveness of intra-European routes.

9.2.3. Application of MRV systems and LCA tools for sustainability tracking

From a financial and business model perspective, Measurement, Reporting, and Verification (MRV) and Life Cycle Assessment (LCA) are fundamental to attract "green" capital. Financial institutions now require projects to be ESG-compliant and for investors to demonstrate emissions reduction and sustainability throughout the asset's lifecycle [207]. This translates into financing models including green bonds or sustainability-linked loans, contractual clauses linking interest rates or repayment to environmental targets, and annual fleet carbon footprint reporting. It is therefore essential that the business model considers not only operational profitability but also the "environmental valuation" of the asset and its positioning in sustainable financial markets.

9.2.4. Financing innovative technologies

The fourth direction, more visionary but potentially revolutionary, is the adoption of disruptive technologies. These include wind-assisted propulsion (Flettner rotors, rigid sails, kites), AI-based route planning systems, and modular nuclear microreactors (SMRs) for onboard energy production.

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Investing in radical technologies requires financial models that recognize high initial CAPEX, technological risk, and long investment duration, while also accounting for significant potential returns in terms of OPEX reduction, preferential access to "green" contracts, and regulatory advantages. According to a report by the Environmental Defense Fund and Lloyd's Register Maritime Decarbonisation Hub, there exists a "trillion-dollar financing gap" that could block the transition. To bridge it, innovative models are proposed, such as the "Lending Platform for Energy Efficiency" (a pool of ship retrofits financed by public-private capital) and "Time Stacked Offtake" (fractional green fuel purchase contracts), which make investment more bankable [208].

From a business model perspective, this implies that the vessel is no longer an isolated asset but part of an ecosystem including fuel producers, infrastructure, technology providers, operators, and financiers. The revenue model becomes hybrid: chartering + green premium + potential carbon credit or tax incentive.

By combining these four directions, a maritime business model can become sustainable, efficient, and financially credible. For example: a shipowner decides to retrofit an existing vessel (CAPEX) to install wind-assist technology and digital route optimization systems; applies a charter contract that includes a "low-emission" premium; accesses a green loan with a preferential rate linked to CO_2 targets; uses an MRV reporting product to demonstrate alignment with International Maritime Organization objectives; and considers fuel consumption reduction as an additional operational value stream. Meanwhile, port and logistics partners share the benefits of reduced inefficiencies, creating an ecosystem that monetizes intermodality and modal integration.

In terms of expected outcomes, well-designed models can reduce fuel costs, increase residual value of maritime assets, and improve capital access. For instance, targeted retrofits can achieve 10–20% fuel savings, while financiers recognize lower risk of stranded assets (vessels becoming obsolete under stricter regulations) thanks to future-proof positioning.

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10. OUTLOOK FOR 2050 SCENARIO PREDICTION

By 2050 the European ship fleet is projected to embody the full maturity of the green and digital transition. The intervening twenty years from the 2030 baseline are not simply a period of incremental upgrades but a structural realignment of energy, data, labor and capital around a different definition of maritime performance. The phrase “zero-emission vessel” ceases to denote a niche demonstrator and becomes the predominant design assumption for most new tonnage, supported by a continent-wide infrastructure for low- and zero-carbon fuels and by interoperable data systems that connect ships, ports and hinterland logistics. Legacy vessels persist only where they can be justified on lifecycle grounds and where complete decarbonization is technically infeasible or economically irrational; their share of traffic and emissions steadily contracts under policy pressure and market preference.

This chapter sets out a professional, practice-oriented scenario for 2050 consistent with the high-level thesis above and with the directional evidence of EU research and innovation programs visible by 2030. It treats 2050 not as an endpoint but as a state in which technical, regulatory and economic feedback loops have converged: energy vectors stabilize into a diversified but coherent fuelscape; autonomy and artificial intelligence are embedded deep into navigation and asset management; supply chains are replumbed to privilege predictability, verifiability and environmental performance; safety and cybersecurity are treated as performance domains on par with speed and fuel consumption. Throughout, the analysis assumes that the six pillars of the EU’s Strategic Research and Innovation Agenda—alternative fuels, electrification, energy efficiency, design and retrofitting, digital–green integration and port innovation—remain the organizational grammar of maritime change, even as the specific technologies inside each pillar evolve.

10.1. *Fleet composition and fuel landscape*

In 2050 the European fleet is diverse in energy but unified in architecture. Ammonia and methanol occupy large shares of deep-sea propulsion due to their compatibility with ocean-range energy densities and the maturity of engines, fuel cells and safety systems. Hydrogen—both liquid and compressed—anchors short-sea, inland and ferry segments where route predictability and high-frequency port calls enable reliable supply and rapid turnaround. Advanced biofuels continue to fill specific niches where drop-in capability and compatibility with legacy assets remain valuable, particularly for auxiliary power and specialized vessels with sporadic duty cycles. Battery-electric propulsion is routine for inland waterways, port service craft and short-sea routes with dense charging networks; for larger coastal and deep-sea ships, batteries serve as high-power buffers and black-start capability rather than primary energy stores.

The salient feature of a typical 2050 design is not the fuel type itself but the engineered modularity that allows owners to pivot between molecules with bounded capex and schedule risk. Fuel tanks, conditioning modules, safety systems and prime movers are standardized at the interface level, enabling refits that replace energy vectors without re-engineering the entire platform. The performance penalty of flexibility is small because integration standards

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have matured and because weight and volume allowances are part of contract norms, not bespoke concessions.

In this increasingly modular and interoperable design landscape, fuel choice becomes deeply intertwined with the regulatory expectations governing lifecycle performance, making architectural flexibility and compliance progression mutually reinforcing. By mid-century compliance is measured in well-to-wake terms, not merely tank-to-wake emissions. Fuel certification and origin tracing are embedded into bunkering transactions, enforced through digital ledgers that align customs, taxation and environmental reporting. Methane slip—the Achilles' heel of earlier gas pathways—is constrained to negligible levels by both engine technology and fuel-supply quality, which means transitional LNG has either exited mainstream service or been confined to limited corridors where capture and abatement systems can be guaranteed. Carbon capture at the ship level is rare outside a few industrial support roles because upstream fuel pathways have become cleaner and because capture-logistics economics favor shore-based concentration; where onboard capture remains, it is integrated into heat- and mass-balance optimization rather than treated as a bolt-on.

Despite the progress made in the use of alternative fuels, greater concerns accompany the use of nuclear power. Nuclear propulsion is feasible in specific niches where energy density and autonomy trump public-acceptance constraints: high-latitude research and support vessels, ice-class cargo on Arctic routes where alternative fuels face logistical barriers, and perhaps a small number of ultra-large cargo ships on fixed schedules between consenting ports. The technology base draws on compact marine reactors with passive safety systems and robust containment, with spent-fuel logistics managed under intergovernmental agreements. Governance is stringent: operating corridors are limited, crew training and certification exceed conventional standards, and incident liability frameworks are negotiated well in advance. For the mainstream commercial fleet, nuclear remains outside the economic and social envelope; its presence is notable but not transformative at system scale.

10.2. Energy systems and electrification

Electrical design in 2050 is standardized around medium-voltage DC backbones with zonal architectures for resilience and maintainability. Power electronics act as the universal adaptor between heterogeneous sources—fuel cells, dual-fuel engines, batteries, wind-assist generators—and heterogeneous loads—propulsion motors, hotel systems, mission equipment. Harmonics management, fault ride-through and reconfiguration under damage are solved problems, validated by decades of class rules and incident data. The outcome is an electrical plant that can be tuned in software to changing missions, fuel mixes and regulatory contexts without invasive hardware changes.

In parallel with this maturation of shipboard electrical architectures, energy storage and charging ecosystems evolve as an operational extension of the same principles of modularity, resilience and software-defined adaptability.Batteries in 2050 are safer, denser and more adaptable, but their system-level value is primarily in power management and operational

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resilience. On routes under a few dozen nautical miles, rapid charging with standardized connectors and automated alignment makes full-electric operations routine. On larger ships, energy storage enables wide-bandwidth load following and transient suppression, allowing prime movers to run at efficiency sweet spots and enabling silent or low-signature modes in environmentally sensitive areas. Battery lifecycle is managed by predictive analytics tied to actual duty profiles; second-life pathways for maritime packs into stationary storage are standardized, with contracts priced on verified state-of-health rather than nameplate capacity.

10.3. Efficiency by design and operation

Design optimization for hull form, propeller and appendages is solved with high-fidelity CFD that merges seamlessly into the digital twin used for operations. Low-friction, biofouling-resistant coatings are universal, with maintenance intervals determined by model-based diagnostics rather than fixed calendars. Wind-assist technologies find their stable niches; on trades with favorable wind statistics, rotors or wing sails are as unremarkable as bulbous bows were in earlier decades. Their contribution is algorithmically integrated into speed-power control, and their structural and stability implications are accommodated early in the design spiral.

In continuity with this evolution of design and material efficiency, vessel operations in 2050 are governed by equally sophisticated, data-driven decision systems that close the loop between design intent and real-world performance. Voyage optimization systems in 2050 are not advisory dashboards but constraint-solvers that weigh weather, traffic separation schemes, port slot commitments, energy price signals, environmental zones and contractual penalties to produce executable control trajectories. Human oversight remains, but the default is to accept the system's plan unless safety or commercial imperatives dictate otherwise. The economic benefit is amplified by standardized data sharing across the logistics chain; idle time at anchor is an exception rather than a routine feature of port calls, and slow-steaming is a dynamic choice responsive to real-time port readiness rather than a static policy.

10.4. Digital integration and autonomy

Autonomy is no longer a binary label. Ships carry certified capability profiles: automated collision avoidance within defined traffic densities and environmental conditions; autonomous station-keeping and maneuvering inside berths instrumented for precision navigation; remote operation for specific low-risk phases such as canal transits under authority oversight; full mission autonomy for survey craft and drones operating outside busy sea lanes. The commercial fleet operates most of the time under human supervision and legal responsibility, with autonomy taking over routine and high-precision tasks. The quantifiable benefits are lower incident rates, smoother energy profiles and higher berth throughput from predictable manoeuvres.

As these layered autonomous capabilities mature and expand, they increasingly rely on tightly integrated artificial intelligence systems that support both operational decision-making and asset management across the vessel lifecycle. Artificial intelligence is pervasive but bounded

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by safety-case discipline and auditability. Navigation assistance systems combine sensor fusion, learned behavior models and rule-based logic to produce decisions that are explainable post-hoc for incident review. Predictive maintenance is integrated with procurement and inventory, with parts availability and dock space scheduled through shared platforms that align multiple owners and yards. Anomaly detection guards against both equipment failure and cyber intrusion, trained on fleets of twins rather than single-asset histories to avoid overfitting. The governance of these systems is codified in contracts and class requirements, with traceability from data source to decision outcome.

This deepening digitalization, in turn, heightens the importance of cybersecurity, which becomes a foundational operational function rather than an auxiliary concern. With electrification and autonomy comes systemic exposure to cyber risk. By 2050 cyber operations are embedded into vessel management just as fire safety is. Networks are segmented physically and logically; updates are cryptographically signed and delivered through controlled channels; crew are trained to handle cyber incidents with the same rigor as flooding or fire. Insurers and financiers price cyber posture into premiums and covenants. Regulatory regimes enforce incident reporting and minimum control standards, making cyber maturity a precondition for operating in major corridors and ports.

10.5. Ports, corridors and hinterland integration

European ports in 2050 are energy hubs as much as cargo nodes. Shore power is universal where grid capacity exists, and high-power charging is available on corridors with dense short-sea traffic. Bunkering for ammonia, methanol and hydrogen is organized along declared green corridors with transparent scheduling, safety perimeters and standardized interfaces. The design philosophy is modular: tanks and handling systems can be expanded or reconfigured as demand shifts across fuels. Port authorities monetize reliability and environmental performance through differentiated fees and slot prioritization, and they coordinate with grid operators to ensure energy availability across daily and seasonal peaks.

In this increasingly integrated operating environment, the digital dimension becomes the backbone that links energy resilience with operational fluidity, enabling ports to function as synchronized network nodes rather than isolated terminals. Port calls are synchronized through trusted data spaces. Arrival times, berth readiness, tug allocations and customs clearances are visible to authorized parties with granular, revocable permissions. The result is a reduction in non-productive steaming and anchoring, lower emissions from idle time and more stable asset utilization across the chain. Inland logistics—rail, barge, truck—are tied into the same data fabric, which reduces dwell time and increases the predictability that shippers require to mode-shift from road to lower-emission alternatives.

This fusion of energy, data and operational governance reshapes the industrial structure supporting maritime transport, reinforcing the strategic weight of technology providers and fuel suppliers within the port ecosystem. The maritime supply chain has reconfigured around energy and data. Engine builders, fuel-cell integrators, battery suppliers and power-electronics manufacturers occupy strategic positions alongside traditional yards, with long-term service agreements that bundle availability, cybersecurity and software updates. Fuel suppliers for

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ammonia, methanol and hydrogen have vertically integrated into logistics and, in some cases, port operations to secure market access and quality control. Standards bodies and class societies act as orchestrators of interoperability, resisting vendor lock-in while allowing differentiation where safety and performance warrant it.

The port, however, is not only the main logistical interface of maritime navigation, but it is also the site of a climate battle where climate change makes weather less predictable and port infrastructure more vulnerable. Fleet routing systems incorporate higher-resolution forecasts and stochastic optimization to manage voyage risk, while hull and superstructure designs account for more intense wind and wave regimes. Ports invest in flood defenses, elevated substations and redundancy in energy supply. Emergency response capabilities leverage autonomous craft and drones for surveillance, damage assessment and logistics under disrupted conditions, connecting maritime response to civil protection agencies through interoperable data platforms.

10.6. Sustainability beyond greenhouse gases

Ships are procured as platforms with planned mid-life energy transitions and software refreshes. Contracts include explicit weight, volume and electrical margins for foreseeable upgrades, and they specify documentation standards for future integrators. The result is lower friction for refits and fewer stranded assets as technology progresses. Owners manage configuration across fleets with the same discipline seen in aerospace, reducing the cost of compliance and training.

As these platform-based procurement logics mature, lifecycle considerations extend seamlessly from upgrade planning to end-of-life responsibilities, creating a continuous chain between design intent, operational evolution and material circularity. Circularity is built into materials and joining methods to facilitate dismantling and recycling. Hazardous material inventories are digitized and kept current; environmental liabilities at end-of-life are priced at procurement through extended producer-responsibility mechanisms. New materials—lightweight composites, advanced steels, additive-manufactured components—are used where they can show lifecycle gains and where end-of-life processing pathways exist. Spares manufacturing blends traditional casting with on-demand additive production, constrained by class-approved quality controls embedded in the digital thread.

Shipping is also addressing the issue of sustainability comprehensively. Very often, sustainability is seen only from the point of view of emissions and pollutants, but sustainability also requires attention to the protection of biodiversity.

Compliance regimes for underwater radiated noise are embedded into design and operations for sensitive habitats. Propeller design, shaftline isolation and operating envelopes are tuned to keep ships within corridor-specific noise thresholds, and real-time guidance uses environmental sensing to avoid sensitive seasons and migration patterns. Air quality in and near ports is materially improved by the near-elimination of auxiliary engine use at berth and

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by the relocation of high-emission activities away from population centers. Biofouling management is aligned with invasive-species prevention through coatings, cleaning protocols and port inspection regimes, all integrated into the same data governance systems used for emissions reporting.

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SECTION 3
OUTLINE OF 2035 AND 2050 FORESIGHTS SCENARIOS

11. EXPLORING THE FUTURE

In the elaboration of the present report, the key conceptual and methodological elements required for the definition of foresight scenarios have been outlined.
Foresight can be understood as a structured and systematic approach aimed at exploring potential futures in order to anticipate emerging changes, identify transition pathways, and strengthen the resilience of systems against possible disruptions. This methodology enables actors to act more consciously and strategically in the present, thereby shaping decisions that contribute to building a desirable and sustainable future.

Unlike forecasting, which focuses on predicting or projecting future outcomes by extrapolating from past and present data, foresight does not rely on the assumption of linear continuity in trends. Forecasting generally emphasizes incremental and predictable change, presupposing a relatively stable environment in which the future can be engineered with reasonable accuracy.
Foresight, by contrast, is founded on the recognition that in an increasingly complex, interconnected, and rapidly changing world, uncertainty and ambiguity render precise prediction impractical. Rather than seeking to predict, foresight seeks to understand how global systems evolve, promoting continuous learning and adaptive strategies. Through iterative and participatory processes, foresight tools enhance an organization's ability to make informed and anticipatory decisions, thereby strengthening its capacity to design resilient, equitable, and forward-looking futures.

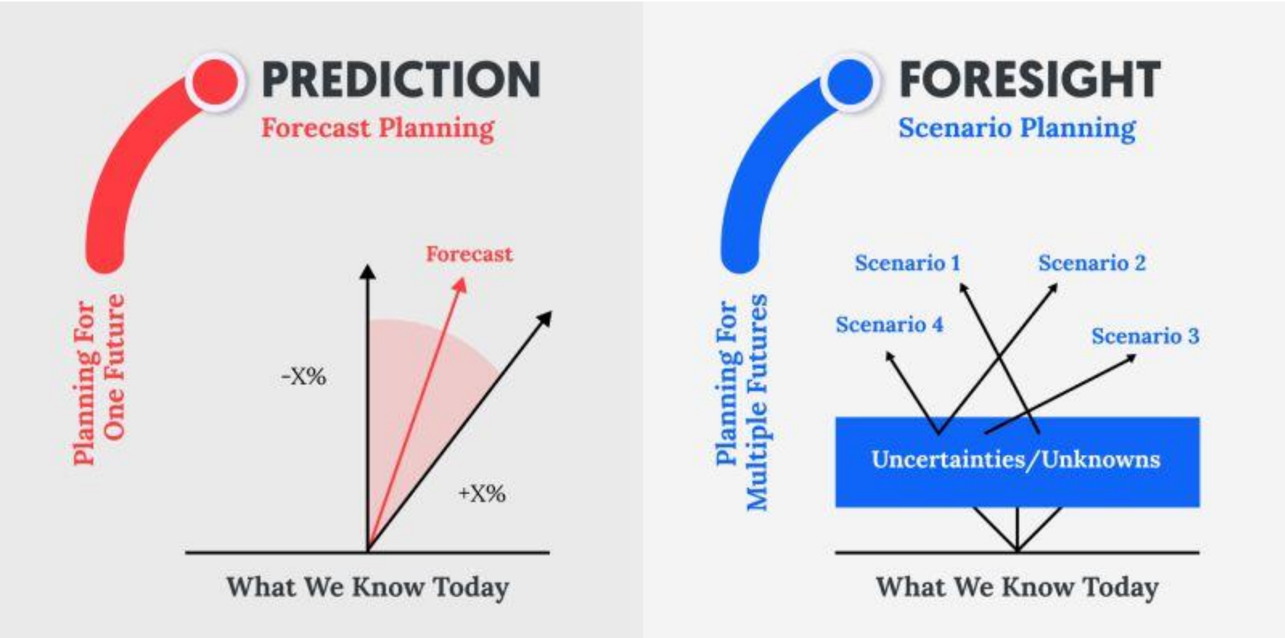

Figure 18 - Forecast vs foresight (https://www.linkedin.com/posts/andrewconstable-mba_in-strategy-understanding-the-difference-activity-7293249649967022080-lRWd/)

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Among the various instruments available for scenario development, one of the most effective, particularly in contexts where no clear direction is established and the objective is to "explore the future", is the exploring the future approach.
This methodology is structured around four key stages, each contributing to a coherent and cumulative process of analysis: [209]

1. Horizon Scanning
   Horizon scanning represents the starting point of the foresight process and consists of the systematic identification and collection of weak signals and early warning indicators of change. These signals, though initially subtle or isolated, may eventually develop into significant drivers of transformation. Horizon scanning enables the timely recognition of emerging trends and potential disruptions, allowing organizations to maintain strategic awareness and preparedness.

2. Driver Mapping
   Driver mapping focuses on identifying and mapping the key forces of change, that is, the economic, technological, political, social, environmental, or cultural factors that are currently shaping a given system. By examining the interactions and interdependencies among these drivers, this phase supports a more comprehensive understanding of systemic evolution and helps delineate the landscape of possible futures.

3. Trend Analysis
   The trend analysis phase consolidates the information gathered through horizon scanning and driver mapping. It involves observing clusters of events, signals, and behavioural patterns that, when aggregated, reveal the most likely directions of change. This analytical step allows for the distinction between short-term fluctuations and long-term structural transformations, thereby providing an empirical foundation for the construction of robust foresight scenarios.

4. Futures/Implications Analysis Wheel
   The futures wheel, also referred to as the implications analysis wheel, serves as a structured tool for systematically exploring the direct and indirect implications of the key trends and issues identified in the preceding stages. By visually mapping the cascading effects of a single development, it facilitates a deeper understanding of the potential consequences, both positive and negative, arising from specific changes, as well as their broader systemic interactions.

In summary, the exploring the future approach constitutes a dynamic and participatory process designed to stimulate strategic reflection and strengthen organizational adaptability in the face of uncertainty. Its purpose is not to forecast what will happen, but rather to prepare decision-makers to recognize and navigate multiple possible futures, cultivating a mindset that is flexible, critical, and action-oriented.

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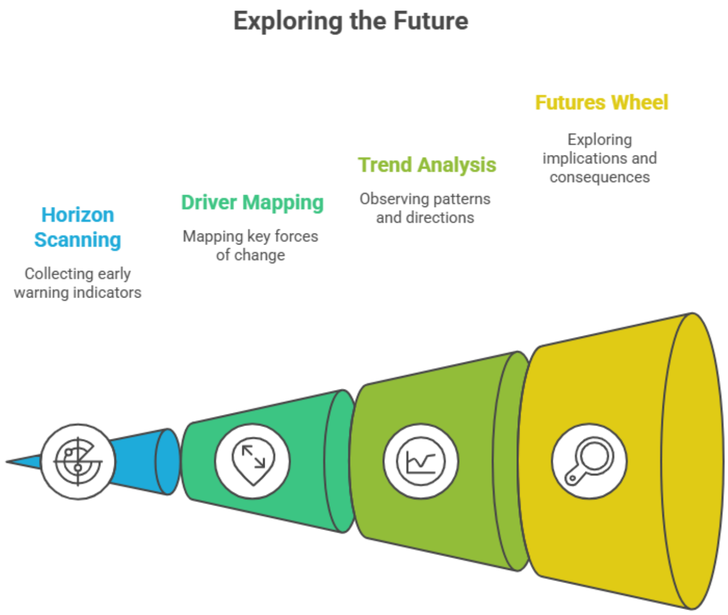

Figure 19 Process for foresight scenarios development

11.1. General Drivers and trends

In the application of the methodology previously described, the analysis identified several principal drivers that are actively shaping the evolution of the world merchant fleet. These drivers operate at different levels (regulatory, societal/climatic and economic) and interact with one another to determine national and corporate strategic responses. The following discussion characterises each driver in depth and then considers how these motivations have been translated into observable strategic trends within the shipbuilding, ship-operations and maritime policy communities.

- **Regulatory driver**
  A primary impetus for change arises from regulatory mechanisms that internalise the environmental externalities of shipping. Instruments that assign an explicit cost to emissions, such as market-based measures and emission focused regulatory regimes, create a clear financial signal that motivates operators and asset owners to seek lower-emission technologies and fuels. By converting environmental burdens into quantifiable obligations, these regulatory frameworks transform abstract sustainability goals into concrete business imperatives: compliance becomes not only an ethical or reputational concern but a matter of cost optimisation and risk management. The regulatory driver therefore acts as a direct and enforceable lever, accelerating investments in alternative fuels, energy-efficient architectures and emissions-reduction retrofits as firms seek to avoid regulatory penalties and to capitalise on potential competitive advantages.
- **Climatic and social driver**
  Closely related to, but conceptually distinct from, regulation is the combined climatic and social driver. The global commitment to mitigate climate change reflects deeply held social values and public expectations, which in turn exert pressure on

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governments and private actors to decarbonise. Beyond normative pressure, climate change produces material effects, such as rising sea levels, increased frequency and intensity of extreme weather events, and altered oceanographic conditions, that create systemic vulnerabilities for maritime infrastructure, port operations and coastal communities. These impacts generate both acute risks (e.g., port inundation, storm damage to critical logistics hubs) and chronic stresses (e.g., shifts in navigational conditions) that necessitate adaptive responses from the maritime sector. Thus, the climatic and social driver combines normative imperatives with tangible operational risks, creating a dual motivation for resilience-building and decarbonisation across the maritime value chain.

- **Economic driver**
  The economic driver stems from uncertainties in energy markets and geopolitical dynamics that affect fuel availability and price volatility. Fluctuations in conventional fuel costs and the strategic desire for energy security push states and firms to explore alternative, more diversified energy pathways. From the perspective of national policy and corporate strategy, reducing dependence on imported fossil fuels becomes a strategic objective that is often aligned with environmental targets: investments in low-carbon fuel technologies and in domestic or allied fuel supply chains can deliver both resilience and emissions reductions. Consequently, the economic driver incentivises research, capital expenditure and supply-chain reconfiguration oriented toward greater autonomy and lower environmental impact.

The ways these drivers are operationalised within national maritime strategies and corporate business plans vary according to the resource endowment of states, the industrial and scientific capabilities present within jurisdictions, and the strategic posture of individual firms. Resource-rich states or those with advanced industrial bases will tend to adopt different combinations of policy instruments and investment priorities compared with less endowed countries. Nonetheless, several cross-cutting strategic trends can be observed internationally:

1. **Substantial investments in alternative fuels**
   A prominent trend is the mobilisation of capital and research efforts towards green and blue fuels, such as ammonia, hydrogen and e-methanol. Pursuit of these pathways necessitates modifications to vessel architecture, fuel-handling systems and on-board safety arrangements; accordingly, ship designs and newbuilding programmes are already beginning to incorporate structural and systems readiness for such fuels. This transition implies a coordinated effort across shipyards, fuel producers, classification societies and regulators to ensure compatibility, safety and scalability.
2. **Route optimisation and wind-assisted propulsion**
   Operators are increasingly pursuing operational strategies that reduce fuel consumption and emissions across the voyage profile. Route optimization, integrating weather routing, speed management and voyage planning, reduces fuel burn through improved operational decision-making. Complementing these software and operations based solutions, wind-assisted propulsion systems are receiving attention as a means of achieving transversal emission reductions without reliance

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on a single fuel pathway. Together, these approaches yield near-term emissions benefits that are complementary to longer-term fuel transitions.

3. **Digitalisation and automation**
   Digital technologies and automation address two related challenges: they offer pathways to improve operational efficiency and they mitigate human-resource constraints. Automation, advanced monitoring and decision-support systems can partially alleviate the shortage of qualified officers by augmenting human capabilities, streamlining routine tasks and enabling safer operations. Digitalisation also allows for improved performance monitoring, predictive maintenance and voyage optimisation, which collectively raise safety standards and reduce lifecycle costs.

Taken together, these drivers and the strategies they engender indicate a maritime sector in technological and organisational transition. Regulatory signals create immediate incentives to reduce emissions; climatic and social pressures shape long-term resilience and legitimacy demands; and economic uncertainty spurs diversification of energy pathways and supply chains.

11.2. Foresight scenarios

The scenario that the maritime sector will be called upon to delineate is not a simple step-by-step pathway, but rather a vast map characterised by multiple trajectories within a complex system, where every issue, event, trend, and decision exerts an influence on the technological development of navigation.

In light of this, it becomes essential to at least attempt to identify plausible scenarios based on current investments and emerging trends, while acknowledging that external factors may significantly alter the course of navigation across this extensive map of future possibilities.

To adequately address this topic, the adopted strategy will explore the potential trajectories of evolution of the European maritime and port system, in light of the key drivers and emerging signals identified in the foresight process. This section presents three plausible and internally coherent scenarios:

- Regulated Transition,
- Accelerated Transition,
- and Fragmentation and Delay

These scenarios are projected across two distinct temporal horizons: 2030 and 2050. The dual temporal perspective allows for a nuanced understanding of medium-term dynamics, shaped by current policies and ongoing investments, and long-term transformations that reflect structural shifts in technology, governance, and global context.

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11.2.1. Scenario 1 – Regulated Transition

2030 Horizon

By 2030, the European maritime system is moving through a gradual and carefully managed transformation. The European Union's regulatory framework has matured, and key policies such as the *FuelEU Maritime* regulation and the inclusion of shipping in the EU Emissions Trading System (ETS) are fully operational. These measures have made carbon emissions more costly, encouraging companies to adopt cleaner technologies while maintaining a degree of economic stability.

Most shipowners have chosen a cautious approach. Instead of replacing entire fleets, many invest in retrofits and dual-fuel systems that can operate with both conventional and alternative fuels. This strategy helps control costs while allowing flexibility for future conversion to fully green options. Major ports have expanded their capacity to handle alternative fuels such as LNG and ammonia, although smaller ports lag behind due to limited funding and local constraints.

Digitalisation is progressing steadily. Systems for energy monitoring, predictive maintenance, and route optimisation are widely used, but true data integration between ports and vessels is still limited. Overall, emissions are declining slowly, not yet fast enough to ensure full alignment with Europe's 2050 climate neutrality goals.

2050 Horizon

By 2050, the Regulated Transition has produced a maritime system that is stable and moderately decarbonised, though uneven in its progress. The European fleet is a mix of new, zero-emission ships powered by green ammonia, hydrogen, and synthetic fuels, alongside older vessels that continue to rely on low-emission transitional fuels. The largest ports have evolved into multi-fuel energy hubs, offering shore-side electricity and circular waste systems, while many regional ports remain only partially modernised.

The overall picture is one of controlled evolution rather than transformation. The industry has become more efficient and environmentally responsible, but the last step toward complete climate neutrality remains challenging. The pace of change depends largely on the price and availability of alternative fuels and the ability of smaller operators to modernise. Europe's regulatory system provides stability, yet differences among Member States persist, creating a patchwork of progress levels.

11.2.2. Scenario 2 – Accelerated Tranisition

2030 Horizon

In this scenario, by 2030 the European maritime sector experiences a strong and coordinated acceleration toward decarbonisation. Governments, financial institutions, and private actors work in alignment, supported by a clear vision and substantial investments. Ambitious regulations are complemented by green incentives, such as tax breaks, low-interest loans, and co-financing schemes, that make sustainable technologies competitive and accessible.

Shipowners move quickly to adopt zero-emission-ready vessels, while ports invest in large-scale infrastructure for hydrogen, ammonia, and e-fuels. Technological innovation advances rapidly: digital platforms enable real-time communication between ships and ports,

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optimising routes, fuel use, and emissions. Automation improves efficiency and safety, while integrated logistics reduce waste and delay.

Economically, the accelerated transition stimulates new industries and employment opportunities. The production of green fuels, the development of smart port systems, and the expansion of digital maritime services create a diversified and innovative ecosystem. However, this rapid transformation also introduces risks. Smaller operators struggle to keep pace, and the need for skilled labour exceeds the supply, making training and education a crucial policy priority.

2050 Horizon

By 2050, the Accelerated Transition has fundamentally transformed Europe's maritime landscape. The continent now leads globally in sustainable shipping technologies and governance. Most of the fleet operates on zero-emission fuels, and ports function as energy ecosystems, integrating renewable production, storage, and distribution. Maritime transport is digitally managed, with advanced automation ensuring high levels of efficiency and safety.

The economic benefits are significant. Lower operational costs, cleaner environments, and strong technological exports strengthen Europe's global competitiveness. Yet, new challenges emerge. Rapid technological turnover requires constant investment in skills and infrastructure, while the concentration of resources in a few large corporations risks marginalising smaller businesses. Environmental sustainability is achieved, but social equity becomes the next frontier.

11.2.3. Scenario 3 – Fragmentation and Delays

2030 Horizon

By 2030, progress toward decarbonisation in the European maritime sector is **slow and uneven**. Economic uncertainty, political fragmentation, and global instability undermine long-term planning. While some Member States invest in clean technologies, others remain dependent on fossil fuels, fearing the economic consequences of rapid transition. The result is a patchwork of policies and standards that generate inefficiencies and market distortions.

Ports mirror this disparity. A few leading hubs attract international investment and deploy green infrastructure, while the majority of regional ports lack the financial and technical capacity to follow suit. The growing frequency of climate-related disruptions—storms, floods, and heatwaves—further exposes the vulnerabilities of maritime infrastructure. Insurance costs rise, and logistical reliability declines.

2050 Horizon

By 2050, the effects of inaction have accumulated. Europe's maritime system, once a global leader, faces structural decline. Regulatory fragmentation and underinvestment have prevented the creation of a unified green market. Many older vessels remain in operation, consuming fossil fuels and generating high emissions. Maintenance costs escalate, and the sector's competitiveness weakens in comparison to Asian and American fleets that have successfully completed their transitions.

Environmental degradation worsens the situation. Rising sea levels and extreme weather events damage coastal infrastructure, leading to recurring port closures and reduced capacity.

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The economic and social consequences are profound: job losses, regional inequality, and higher trade costs. This scenario highlights the high price of delayed action and demonstrates how short-term caution can lead to long-term vulnerability.

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11.3. Outlines of the 2035 and 2050 foresights scenarios

The three scenarios present different but plausible futures for Europe's maritime system. The Regulated Transition illustrates a stable but incremental path, achievable under current policy and investment frameworks. The Accelerated Transition shows how coordinated ambition and innovation could produce a fully decarbonised, technologically advanced maritime economy by mid-century. The Fragmentation and Delay scenario warns of the risks associated with inaction and disjointed policy-making.

Comparing the two time horizons, 2030 represents the testing ground for policies and technologies, while 2050 reflects the structural consequences of today's choices. If Europe sustains coherence, innovation, and inclusivity in its maritime policies, it can achieve both competitiveness and climate neutrality. However, failure to coordinate and invest decisively could lead to fragmentation and long-term decline. The scenarios thus serve as both a guide and a warning: the direction of the maritime future depends less on external inevitabilities and more on collective governance, strategic vision, and the capacity to act decisively today.

Table 3 - Foresight Scenarios

Dimension	Scenario 1: Regulated Transition	Scenario 2: Accelerated Transition	Scenario 3: Fragmentation and Delay
General Description	Gradual, policy-driven transition based on EU regulation and steady technological adoption.	Rapid, coordinated transformation led by strong policy alignment, innovation, and financial support.	Slow and uneven adaptation marked by policy incoherence, underinvestment, and geopolitical instability.
Regulatory Environment	Stable and coherent, but moderate in ambition; uneven enforcement across EU.	Ambitious and harmonised; supported by strong financial mechanisms and public-private partnerships.	Fragmented and inconsistent; lack of long-term coordination.
Technology Adoption	Gradual adoption; focus on fuel flexibility and retrofitting.	Rapid adoption; widespread innovation and digital integration.	Limited and uneven; technological gap widens.

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Dimension	Scenario 1: Regulated Transition	Scenario 2: Accelerated Transition	Scenario 3: Fragmentation and Delay
Infrastructure Development	Concentrated in major ports; uneven regional coverage.	Extensive and coordinated across Europe; creation of energy corridors.	Localised and reactive; insufficient investment in smaller ports.
Economic Impact	Stable market with moderate growth; risks of lock-in to transitional technologies.	Strong growth driven by innovation; new green value chains and employment.	Economic decline, rising costs, and reduced competitiveness.
Environmental Impact	Moderate emissions reduction; progress toward net zero, not yet achieved.	Near-complete decarbonisation and improved environmental performance.	High emissions, environmental degradation, and growing climate vulnerability.
Social and Labour Effects	Incremental workforce adaptation; skills gap persists.	New high-skilled jobs; need for extensive retraining and inclusion measures.	Job losses, inequality between regions, and limited training capacity.
Risks	Lock-in to transitional fuels, uneven benefits across operators.	Overconcentration of capital, circularity and resource management issues.	Systemic vulnerability, high adaptation costs, and long-term decline.
Overall Outlook	Stable but conservative trajectory; feasible under current trends.	Transformative and globally competitive; requires sustained political and financial commitment.	Regressive and fragmented; risk of irreversible decline without coordinated action.
Summary scenario for 2030 Horizon	• FuelEU Maritime and ETS fully implemented. • Widespread use of dual-fuel and retrofitted vessels. • - Limited infrastructure for alternative fuels in smaller ports. • Moderate emissions reduction.	• - Strong EU incentives accelerate zero-emission vessel adoption. • - Rapid deployment of green fuel infrastructure (H_2, ammonia, e-fuels). • - Broad digitalisation and automation. • - Emergence of new green industries.	• - Fragmented policy landscape across Member States. • Persistent reliance on fossil fuels. • Few advanced ports vs. many lagging behind. • Rising climate-related disruptions.

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Dimension	Scenario 1: Regulated Transition	Scenario 2: Accelerated Transition	Scenario 3: Fragmentation and Delay
Summary scenario for 2050 Horizon	• Mixed fleet: new zero-emission and older transitional ships. • Large ports become multi--fuel energy hubs. • Partial achievement of climate neutrality. • Persistent regional disparities.	• - Fully decarbonised and automated fleet. • -Ports act as integrated renewable energy hubs. • Europe leads in sustainable maritime technology. • New challenges in social equity and resource concentration.	• - Technological stagnation and loss of competitiveness. • - Chronic climate impacts on ports. • Persistent use of fossil fuels and high operational costs. • Structural decline in trade and employment.

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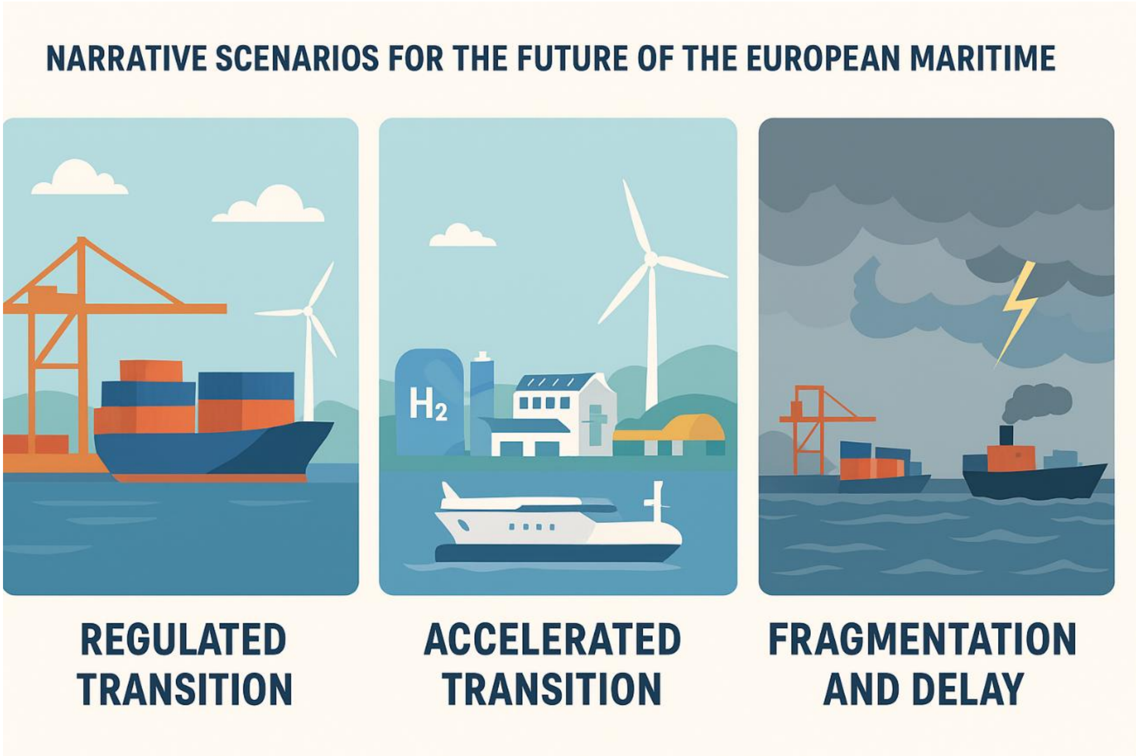

Figure 20 Scenarios for the future of the European Waterborne Transport

Regardless of the trajectory the European maritime sector follows, several strategic priorities emerge as essential for ensuring resilience, competitiveness, and sustainability:

1. Strengthen Policy Coherence and Long-Term Vision
   A clear, stable, and harmonised regulatory framework is the cornerstone of any successful transition. The European Union and its Member States should align maritime, energy, and industrial policies to avoid conflicting objectives and provide investors with predictable long-term signals.
2. Promote Inclusive and Just Transition
   Decarbonisation should not exacerbate inequalities within the maritime ecosystem. Dedicated funding and training programmes should target small and medium-sized operators, port authorities in peripheral regions, and seafarers in need of re-skilling.
3. Invest in Dual-Use Infrastructure
   The development of flexible and modular port infrastructure capable of accommodating multiple alternative fuels (e.g., ammonia, hydrogen, e-fuels) will reduce future risks of technological lock-in and stranded assets.
4. Enhance Digital Integration and Cyber Resilience
   Digitalisation must be pursued alongside investments in cybersecurity and data interoperability to support operational efficiency while safeguarding sensitive information across the maritime value chain.
5. Embed Foresight and Monitoring Mechanisms
   Establishing a permanent foresight and monitoring unit would enable continuous assessment of emerging signals, technological trends, and regulatory developments.

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Regular scenario reviews (e.g., every 3–5 years) can ensure policies remain adaptive and evidence-based.

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Annex – Detailed figures on current fleet

Preliminary results of the current fleet by fleet type as of mid-2025:

General overview by:

- Status,
- Carrier type,
- Year of building group,
- 4th GHG IMO Size Class age
- Engine Derived Power Type,

Overview by 4th GHG IMO Size Class by year of Build (Group), including:

- Number,
- GT,
- DWT,
- TEU,
- Cars Cargo Load (if applicable)

Overview by speed, main engine power (kW), and main engine SFOC (g/kW), showing:

- Average
- Minimum
- Maximum
- Median
- Modus

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12.1. Bulker Fleet

Table 12.1-1 General Overview of Bulker Fleet – by Status

Status	Number of Ships
Damaged/Not in Service	10
Dedicated Storage	6
Idle	929
In Service	12822
Laid Up	14
Repairs	32
Storage	4
Under Arrest	3
Total	**13820**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.1-2 General Overview of Bulker Fleet – by Carrier Type

Carrier Type	Number of Ships
Aggregate Carrier	5
Aggregates Carrier	343
Bulk & Caustic Soda Carrier	11
Bulk Carrier	12566
Bulk/Chemical & Oil Carrier	8
Bulk/Oil Carrier	4
Cement Carrier	357
Chip Carrier	167
Gypsum Carrier	2
Limestone Carrier	36
Miscellaneous Dry Bulk	2
Nickel Carrier	1
Ore & Sulphuric Acid Carrier	3
Ore Carrier	270
Ore/Oil Carrier	36
Salt Carrier	1
Slurry Carrier	4
Urea Carrier	4
Total	**13820**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.1-3 General Overview of Bulker Fleet – by Year of Build Group

Year of Build Group	Number of Ships
1970 and before	31
1971-1975	54
1976-1980	58
1981-1985	89
1986-1990	150
1991-1995	219
1996-2000	561
2001-2005	1166
2006-2010	2944
2011-2015	4382
2016-2020	2167
2021-2025	1999
Total	**13820**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.1-4 General Overview of Bulker Fleet – by 4th GHG IMO Size Class

4th GHG Size Class	Number of Ships
1 0-9,999	646
2 10,000-34,999	2808
3 35,000-59,999	3479
4 60,000-99,999	4837
5 100,000-199,999	1289
6 200,000+	761
Total	**13820**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.1-5 General Overview of Bulker Fleet – by Engine Derived Power Type

Engine Derived Power Type	Number of Ships
Batteries & Diesel	3
Combined	1
Diesel 2-Stroke	12136

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Diesel 4-Stroke	1671
Diesel Electric	9
Total	**13820**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.1-6 General Overview of Bulker Fleet – by Main Engine Designer

Main Engine Designer	Number of Ships
A.B.C.	7
Akasaka	50
Bergen	1
Bergen Normo	1
Bolnes	1
Caterpillar	6
Chinese Std.	1
CSPI	2
Cummins Inc	28
Daihatsu Infinearth	98
Detroit Diesel Corp	1
Deutz	10
Everllence	10620
Fuji Diesel	6
Grenaa	1
Guangzhou Diesel	206
Hanshin	88
HHI-EMD (HiMSEN)	13
Isotta Fraschini	1
Ito	6
J-ENG	176
Jiangsu Antai Power	64
Kawasaki	1
Kromhout	1
MaK	55
Makita	3
Matsui	12
Mitsubishi	549
MWM	1
Niigata	55
Ningbo C.S.I. Power	127
Normo	2
Otsuka	1
Paxman	1
Pielstick	211
Polar	1
Ruston	1
SACM	1
Scania	1
SKL	34
Stork Werkspoor	2
Sulzer	214
Sumiyoshi	5
Volvo Penta	1
Wartsila 2-stroke	458
Wartsila 4-stroke	29
Weichai HM	27
Weichai Power	1
Weifang Diesel	1
Werkspoor	3
WinGD	152
Wuxi Wandi	6
Yanmar	111
Yuchai Marine Power	1
Zichai Power	44
(*unknown*)	321
Total	**13820**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.1-7 General Overview of Bulker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and by Number

	IMO GHG Size Class (dwt)						
Year of Build Group	**1 0-9,999**	**2 10,000-34,999**	**3 35,000-59,999**	**4 60,000-99,999**	**5 100,000-199,999**	**6 200,000+**	Total
1970 and before	28	2	1	-	-	-	31
1971-1975	45	8	1	-	-	-	54
1976-1980	48	8	2	-	-	-	58
1981-1985	45	25	8	10	1	-	89
1986-1990	122	26	1	1	-	-	150
1991-1995	82	75	39	22	1	-	219
1996-2000	31	206	154	164	6	-	561
2001-2005	33	233	411	352	117	20	1166
2006-2010	67	1038	823	535	397	84	2944
2011-2015	71	653	1394	1514	514	236	4382

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2016-2020	51	173	309	1212	162	260	2167
2021-2025	23	361	336	1027	91	161	1999
Total	**646**	**2808**	**3479**	**4837**	**1289**	**761**	**13820**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.1-8 General Overview of Bulker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and GT

	IMO GHG Size Class (dwt)						
Year of Build Group	**1 0-9,999**	**2 10,000-34,999**	**3 35,000-59,999**	**4 60,000-99,999**	**5 100,000-199,999**	**6 200,000+**	Total
1970 and before	50428	26417	22340	-	-	-	99185
1971-1975	98170	107284	28422	-	-	-	233876
1976-1980	129851	77979	46836	-	-	-	254666
1981-1985	103851	281489	189367	449314	70184	-	1094205
1986-1990	224636	338223	24606	39836	-	-	627301
1991-1995	204115	1062827	1000411	855539	62390	-	3185282
1996-2000	96291	3024478	4172182	6448260	498224	-	14239435
2001-2005	87993	3592823	12135601	14321978	10317170	2095666	42551231
2006-2010	171172	14425592	26123131	23464823	35594616	10147670	109927004
2011-2015	231929	11680194	41290292	64155266	44875287	30498589	192731557
2016-2020	213181	2549475	8095854	48571425	14487306	34017449	107934690
2021-2025	93804	4233478	9141175	42095510	8185667	19029252	82778886
Total	**1705421**	**41400259**	**102270217**	**200401951**	**114090844**	**95788626**	**555657318**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.1-9 General Overview of Bulker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and DWT

	IMO GHG Size Class (dwt)						
Year of Build Group	**1 0-9,999**	**2 10,000-34,999**	**3 35,000-59,999**	**4 60,000-99,999**	**5 100,000-199,999**	**6 200,000+**	Total
1970 and before	76748	42220	36790	-	-	-	155758
1971-1975	158752	175725	50826	-	-	-	385303
1976-1980	183642	122985	75546	-	-	-	382173
1981-1985	145775	452701	319553	750737	135160	-	1803926
1986-1990	317519	523069	41337	64850	-	-	946775
1991-1995	287820	1720681	1722052	1610845	120880	-	5462278
1996-2000	140925	4870868	7131203	12181815	969691	-	25294502
2001-2005	133241	5839987	21068528	26922052	20182399	4163786	78309993
2006-2010	256883	23005970	44506944	43412388	68917464	20013351	200113000
2011-2015	346581	18156474	69476168	116615072	85670657	59488454	349753406
2016-2020	290086	3952626	13065400	87443287	27639630	65734619	198125648
2021-2025	128331	6704195	14861945	75176750	15606446	36201435	148679102
Total	**2466303**	**65567501**	**172356292**	**364177796**	**219242327**	**185601645**	**1009411864**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.1-10 General Overview of Bulker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Average) mid of 2025

	IMO GHG Size Class (dwt)						
Year of Build Group	**1 0-9,999**	**2 10,000-34,999**	**3 35,000-59,999**	**4 60,000-99,999**	**5 100,000-199,999**	**6 200,000+**	Total
1970 and before	11	14	16	-	-	-	11
1971-1975	12	14	16	-	-	-	12
1976-1980	12	13	14	-	-	-	12
1981-1985	11	13	14	15	14	-	13
1986-1990	11	13	14	14	-	-	12
1991-1995	12	14	14	14	15	-	13
1996-2000	12	14	14	14	15	-	14
2001-2005	12	14	14	14	14	15	14
2006-2010	12	13	14	14	14	15	14
2011-2015	12	14	14	14	15	15	14
2016-2020	12	13	14	14	15	15	14
2021-2025	13	12	13	14	15	14	13
Total	**12**	**13**	**14**	**14**	**15**	**15**	**14**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.1-11 General Overview of Bulker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Minimum) mid of 2025

	IMO GHG Size Class (dwt)						
Year of Build Group	**1 0-9,999**	**2 10,000-34,999**	**3 35,000-59,999**	**4 60,000-99,999**	**5 100,000-199,999**	**6 200,000+**	Total
1970 and before	8	13	16	-	-	-	8
1971-1975	8	13	16	-	-	-	8
1976-1980	8	12	14	-	-	-	8
1981-1985	8	10	12	14	14	-	8
1986-1990	8	10	14	14	-	-	8

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1991-1995	9	10	12	13	15	-	9
1996-2000	10	11	10	11	13	-	10
2001-2005	5	11	11	11	10	11	5
2006-2010	8	9	9	11	10	11	8
2011-2015	7	10	10	10	10	10	7
2016-2020	9	10	12	11	11	10	9
2021-2025	12	10	11	11	15	11	10
Total	**5**	**9**	**9**	**10**	**10**	**10**	**5**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.1-12 General Overview of Bulker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Maximum) mid of 2025

	IMO GHG Size Class (dwt)						
Year of Build Group	**1 0-9,999**	**2 10,000-34,999**	**3 35,000-59,999**	**4 60,000-99,999**	**5 100,000-199,999**	**6 200,000+**	Total
1970 and before	15	15	16	-	-	-	16
1971-1975	16	16	16	-	-	-	16
1976-1980	16	16	14	-	-	-	16
1981-1985	14	15	15	16	14	-	16
1986-1990	15	15	14	14	-	-	15
1991-1995	15	17	16	17	15	-	17
1996-2000	15	16	17	16	16	-	17
2001-2005	16	20	16	16	16	15	20
2006-2010	16	18	16	17	17	18	18
2011-2015	16	17	17	17	18	18	18
2016-2020	15	16	17	17	18	17	18
2021-2025	15	14	15	16	15	15	16
Total	**16**	**20**	**17**	**17**	**18**	**18**	**20**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.1-13 General Overview of Bulker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Median) mid of 2025

	IMO GHG Size Class (dwt)						
Year of Build Group	**1 0-9,999**	**2 10,000-34,999**	**3 35,000-59,999**	**4 60,000-99,999**	**5 100,000-199,999**	**6 200,000+**	Total
1970 and before	11	14	16	-	-	-	16
1971-1975	12	14	16	-	-	-	16
1976-1980	12	13	14	-	-	-	14
1981-1985	11	13	13	15	14	-	15
1986-1990	11	13	14	14	-	-	14
1991-1995	12	14	14	14	15	-	15
1996-2000	12	14	14	14	15	-	15
2001-2005	13	14	14	14	15	15	15
2006-2010	12	14	14	14	15	15	15
2011-2015	12	14	14	14	15	15	15
2016-2020	12	13	14	14	15	15	15
2021-2025	12	12	13	14	15	15	15
Total	**13**	**14**	**16**	**15**	**15**	**15**	**16**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.1-14 General Overview of Bulker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Modus) mid of 2025

	IMO GHG Size Class (dwt)						
Year of Build Group	**1 0-9,999**	**2 10,000-34,999**	**3 35,000-59,999**	**4 60,000-99,999**	**5 100,000-199,999**	**6 200,000+**	Total
1970 and before	10	...	16	-	-	-	16
1971-1975	10	13	16	-	-	-	16
1976-1980	11	13	...	-	-	-	13
1981-1985	11	13	...	15	14	-	15
1986-1990	11	12	14	14	-	-	14
1991-1995	10	14	14	14	15	-	15
1996-2000	11	14	14	14	15	-	15
2001-2005	14	14	15	14	15	15	15
2006-2010	13	14	14	15	15	15	15
2011-2015	10	14	14	15	15	15	15
2016-2020	11	14	14	15	15	15	15
2021-2025	15	12	13	14	15	15	15
Total	**15**	**14**	**16**	**15**	**15**	**15**	**16**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.1-15 General Overview of Bulker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Average) mid of 2025

	IMO GHG Size Class (dwt)	

Year of Build Group	1 0-9,999	2 10,000-34,999	3 35,000-59,999	4 60,000-99,999	5 100,000-199,999	6 200,000+	Total
1970 and before	1511	6230	11768	-	-	-	2191
1971-1975	1956	6969	10150	-	-	-	2867
1976-1980	1953	5117	8201	-	-	-	2595
1981-1985	1613	5313	8348	11593	11842	-	4494
1986-1990	1288	4765	11003	14880	-	-	2057
1991-1995	1797	5338	8243	10220	13974	-	5074
1996-2000	2507	5748	8468	9761	16485	-	7604
2001-2005	2880	6206	9397	10760	17993	18682	10121
2006-2010	2181	5851	11013	12215	19712	21796	10857
2011-2015	2719	7503	9991	11866	19313	23740	12036
2016-2020	4011	6691	9239	11079	17974	21942	12287
2021-2025	3060	4453	7646	10429	16985	19748	10239
Total	**2045**	**6174**	**9779**	**11243**	**18960**	**21934**	**10863**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.1-16 General Overview of Bulker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Minimum) mid of 2025

	IMO GHG Size Class (dwt)						
Year of Build Group	**1 0-9,999**	**2 10,000-34,999**	**3 35,000-59,999**	**4 60,000-99,999**	**5 100,000-199,999**	**6 200,000+**	Total
1970 and before	368	3928	11768	-	-	-	368
1971-1975	589	4413	10150	-	-	-	589
1976-1980	515	3530	7870	-	-	-	515
1981-1985	198	2942	6708	10003	11842	-	198
1986-1990	427	1066	11003	14880	-	-	427
1991-1995	478	2795	5810	7281	13974	-	478
1996-2000	735	3236	5141	7546	14710	-	735
2001-2005	440	2408	6318	6215	14066	14330	440
2006-2010	406	1764	5830	8458	11180	16676	406
2011-2015	209	2206	4690	5921	10200	13060	209
2016-2020	1326	1470	4690	5921	11827	14900	1326
2021-2025	1192	1765	4080	6160	7046	7095	1192
Total	**198**	**1066**	**4080**	**5921**	**7046**	**7095**	**198**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.1-17 General Overview of Bulker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Maximum) mid of 2025

	IMO GHG Size Class (dwt)						
Year of Build Group	**1 0-9,999**	**2 10,000-34,999**	**3 35,000-59,999**	**4 60,000-99,999**	**5 100,000-199,999**	**6 200,000+**	Total
1970 and before	3678	8532	11768	-	-	-	11768
1971-1975	5226	8826	10150	-	-	-	10150
1976-1980	5112	6620	8532	-	-	-	8532
1981-1985	5737	7980	11856	14057	11842	-	14057
1986-1990	4280	9660	11003	14880	-	-	14880
1991-1995	4522	8124	11474	18216	13974	-	18216
1996-2000	7200	9295	13120	16386	19169	-	19169
2001-2005	3994	9965	15690	16266	21591	27360	27360
2006-2010	5966	24614	15860	22630	23150	27118	27118
2011-2015	7287	26095	15761	25480	24720	34405	34405
2016-2020	7323	12149	30846	19087	26130	39800	39800
2021-2025	4850	27390	13136	19168	22841	38670	38670
Total	**7323**	**27390**	**30846**	**25480**	**26130**	**39800**	**39800**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.1-18 General Overview of Bulker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Median) mid of 2025

	IMO GHG Size Class (dwt)						
Year of Build Group	**1 0-9,999**	**2 10,000-34,999**	**3 35,000-59,999**	**4 60,000-99,999**	**5 100,000-199,999**	**6 200,000+**	Total
1970 and before	1030	6230	11768	-	-	-	11768
1971-1975	1251	7888	10150	-	-	-	10150
1976-1980	1067	5810	8201	-	-	-	8201
1981-1985	972	5296	8083	11730	11842	-	11842
1986-1990	736	4502	11003	14880	-	-	14880
1991-1995	1175	5369	8025	10051	13974	-	13974
1996-2000	1471	5443	8562	9341	15614	-	15614
2001-2005	1552	6480	9480	10700	18573	18541	18573
2006-2010	1356	5288	11280	11856	19958	21115	21115
2011-2015	1912	8219	9962	11550	19964	21837	21837
2016-2020	2629	6871	9240	10716	18394	20374	20374
2021-2025	2100	3530	7616	10239	16956	19155	19155
Total	**2629**	**8219**	**11768**	**14880**	**19964**	**21837**	**21837**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

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Table 12.1-19 General Overview of Bulker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Modus) mid of 2025

	IMO GHG Size Class (dwt)						
Year of Build Group	**1 0-9,999**	**2 10,000-34,999**	**3 35,000-59,999**	**4 60,000-99,999**	**5 100,000-199,999**	**6 200,000+**	Total
1970 and before	397	…	11768	-	-	-	11768
1971-1975	1178	8495	10150	-	-	-	10150
1976-1980	972	3678	…	-	-	-	3678
1981-1985	972	5296	…	11915	11842	-	11915
1986-1990	736	3016	11003	14880	-	-	14880
1991-1995	736	5296	8562	10173	13974	-	13974
1996-2000	736	5296	8562	8877	14710	-	14710
2001-2005	3309	6620	9480	12240	18660	16861	18660
2006-2010	814	8316	10445	11265	18660	25040	25040
2011-2015	2164	8316	9960	8050	21240	34405	34405
2016-2020	1618	8219	9246	8050	15748	28888	28888
2021-2025	2046	2427	7549	11709	16956	18727	18727
Total	**3309**	**8495**	**11768**	**14880**	**21240**	**34405**	**34405**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.1-20 General Overview of Bulker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Average) mid of 2025

	IMO GHG Size Class (dwt)						
Year of Build Group	**1 0-9,999**	**2 10,000-34,999**	**3 35,000-59,999**	**4 60,000-99,999**	**5 100,000-199,999**	**6 200,000+**	Total
1970 and before	-	-	-	-	-	-	-
1971-1975	-	-	-	-	-	-	-
1976-1980	-	-	-	-	-	-	-
1981-1985	-	-	-	-	-	-	-
1986-1990	-	-	-	-	-	-	-
1991-1995	-	-	-	-	-	-	-
1996-2000	-	-	-	-	-	-	-
2001-2005	-	-	-	-	-	-	-
2006-2010	-	-	-	-	-	-	-
2011-2015	-	176	173	172	173	170	172
2016-2020	-	174	170	169	168	167	169
2021-2025	-	181	168	167	168	166	168
Total	**-**	**177**	**171**	**170**	**171**	**168**	**170**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.1-21 General Overview of Bulker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Minimum) mid of 2025

	IMO GHG Size Class (dwt)						
Year of Build Group	**1 0-9,999**	**2 10,000-34,999**	**3 35,000-59,999**	**4 60,000-99,999**	**5 100,000-199,999**	**6 200,000+**	Total
1970 and before	-	-	-	-	-	-	-
1971-1975	-	-	-	-	-	-	-
1976-1980	-	-	-	-	-	-	-
1981-1985	-	-	-	-	-	-	-
1986-1990	-	-	-	-	-	-	-
1991-1995	-	-	-	-	-	-	-
1996-2000	-	-	-	-	-	-	-
2001-2005	-	-	-	-	-	-	-
2006-2010	-	-	-	-	-	-	-
2011-2015	-	167	167	167	167	165	165
2016-2020	-	167	164	164	166	163	163
2021-2025	-	166	164	161	163	163	161
Total	**-**	**166**	**164**	**161**	**163**	**163**	**161**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.1-22 General Overview of Bulker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Maximum) mid of 2025

	IMO GHG Size Class (dwt)						
Year of Build Group	**1 0-9,999**	**2 10,000-34,999**	**3 35,000-59,999**	**4 60,000-99,999**	**5 100,000-199,999**	**6 200,000+**	Total
1970 and before	-	-	-	-	-	-	-
1971-1975	-	-	-	-	-	-	-
1976-1980	-	-	-	-	-	-	-
1981-1985	-	-	-	-	-	-	-
1986-1990	-	-	-	-	-	-	-
1991-1995	-	-	-	-	-	-	-
1996-2000	-	-	-	-	-	-	-
2001-2005	-	-	-	-	-	-	-

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2006-2010	-	-	-	-	-	-	-
2011-2015	-	200	179	176	175	174	200
2016-2020	-	198	179	175	182	171	198
2021-2025	-	200	179	182	182	178	200
Total	**-**	**200**	**179**	**182**	**182**	**178**	**200**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.1-23 General Overview of Bulker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Median) mid of 2025

	IMO GHG Size Class (dwt)						
Year of Build Group	**1 0-9,999**	**2 10,000-34,999**	**3 35,000-59,999**	**4 60,000-99,999**	**5 100,000-199,999**	**6 200,000+**	Total
1970 and before	-	-	-	-	-	-	-
1971-1975	-	-	-	-	-	-	-
1976-1980	-	-	-	-	-	-	-
1981-1985	-	-	-	-	-	-	-
1986-1990	-	-	-	-	-	-	-
1991-1995	-	-	-	-	-	-	-
1996-2000	-	-	-	-	-	-	-
2001-2005	-	-	-	-	-	-	-
2006-2010	-	-	-	-	-	-	-
2011-2015	-	177	173	171	174	171	177
2016-2020	-	170	170	169	168	167	170
2021-2025	-	185	167	166	167	167	185
Total	**-**	**185**	**173**	**171**	**174**	**171**	**185**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.1-24 General Overview of Bulker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Modus) mid of 2025

	IMO GHG Size Class (dwt)						
Year of Build Group	**1 0-9,999**	**2 10,000-34,999**	**3 35,000-59,999**	**4 60,000-99,999**	**5 100,000-199,999**	**6 200,000+**	Total
1970 and before	-	-	-	-	-	-	-
1971-1975	-	-	-	-	-	-	-
1976-1980	-	-	-	-	-	-	-
1981-1985	-	-	-	-	-	-	-
1986-1990	-	-	-	-	-	-	-
1991-1995	-	-	-	-	-	-	-
1996-2000	-	-	-	-	-	-	-
2001-2005	-	-	-	-	-	-	-
2006-2010	-	-	-	-	-	-	-
2011-2015	-	179	175	174	174	168	179
2016-2020	-	170	170	171	168	168	171
2021-2025	-	185	166	165	167	167	185
Total	**-**	**185**	**175**	**174**	**174**	**168**	**185**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

12.2. Container Fleet

Table 12.2-1 General Overview of Container Fleet – by Status

Status	**Number of Ships**
Damaged/Not in Service	8
Detained	1
Idle	250
In Service	6563
Laid Up	3
Repairs	58
Under Arrest	2
Total	**6885**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.2-2 General Overview of Container Fleet – by Carrier Type

Carrier Type	**Number of Ships**
Fully Cellular Container	6885
Total	**6885**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

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Table 12.2-3 General Overview of Container Fleet – by Year of Build Group

Year of Build Group	Number of Ships
1970 and before	11
1971-1975	7
1976-1980	16
1981-1985	19
1986-1990	24
1991-1995	144
1996-2000	546
2001-2005	927
2006-2010	1839
2011-2015	1130
2016-2020	865
2021-2025	1357
Total	**6885**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.2-4 General Overview of Container Fleet – by 4th GHG IMO Size Class

4th GHG Size Class	Number of Ships
1 0-999	1358
2 1,000-1,999	1628
3 2,000-2,999	897
4 3,000-4,999	884
5 5,000-7,999	671
6 8,000-11,999	686
7 12,000-14,499	323
8 14,500-19,999	295
9 20,000 and over	143
Total	**6885**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.2-5 General Overview of Container Fleet – by Engine Derived Power Type

Engine Derived Power Type	Number of Ships
Batteries & Diesel	6
Batteries propulsion	3
Diesel 2-Stroke	5435
Diesel 4-Stroke	1400
Diesel Electric	1
Hybrid Mech./Elec.	39
Steam Turbine	1
Total	**6885**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.2-6 General Overview of Container Fleet – by Main Engine Designer

Main Engine Designer	Number of Ships
Akasaka	5
B. & W.	1
Caterpillar	6
Chinese Std.	4
Cummins Inc	6
Daihatsu Infinearth	53
De Laval	1
Deutz	4
Doxford	1
Everllence	255
Everllence B. & W.	4152
Everllence B. & W. Alpha	9
Gen. Motors	1
Guangzhou Diesel	93
Hanshin	12
HHI-EMD (HiMSEN)	2
HHM	1
J-ENG	70
Leclanche	1
MaK	330
Makita	1
Mitsubishi	104
MWM	24
Niigata	1
Ningbo C.S.I. Power	49
Nippon	1
Normo	1
Pielstick	36
SKL	4
Stork-Wartsila	1
Sulzer	345

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Volvo Penta	2
Wartsila 2-stroke	470
Wartsila 4-stroke	50
Weichai HM	18
Werkspoor	3
Wichmann	1
WinGD	335
Wuxi Wandi	9
Yanmar	29
Zichai Power	44
(unknown)	350
Total	**6885**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.2-7 General Overview of Container Fleet – by 4th GHG IMO Size Class by year of Build (Group) and by Number

	IMO GHG Size Class (dwt)									
Year of Build Group	**1 0–999**	**2 1,000–1,999**	**3 2,000–2,999**	**4 3,000–4,999**	**5 5,000–7,999**	**6 8,000–11,999**	**7 12,000–14,499**	**8 14,500–19,999**	**9 20,000+**	**Total**
1970 & before	11	-	-	-	-	-	-	-	-	**11**
1971-1975	7	-	-	-	-	-	-	-	-	**7**
1976-1980	14	-	2	-	-	-	-	-	-	**16**
1981-1985	15	2	-	2	-	-	-	-	-	**19**
1986-1990	14	5	3	1	-	-	-	-	-	**23**
1991-1995	100	17	13	12	2	-	-	-	-	**144**
1996-2000	206	167	77	38	45	13	-	-	-	**546**
2001-2005	191	167	181	144	184	57	-	-	-	**924**
2006-2010	366	422	211	372	220	207	31	8	-	**1837**
2011-2015	153	201	54	173	87	262	138	62	-	**1130**
2016-2020	165	235	145	30	2	82	74	57	75	**865**
2021-2025	113	410	210	111	131	64	80	168	68	**1355**
Total	**1355**	**1626**	**896**	**883**	**671**	**685**	**323**	**295**	**143**	**6877**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.2-8 General Overview of Container Fleet – by 4th GHG IMO Size Class by year of Build (Group) and GT

	IMO GHG Size Class (dwt)									
Year of Build Group	**1 0–999**	**2 1,000–1,999**	**3 2,000–2,999**	**4 3,000–4,999**	**5 5,000–7,999**	**6 8,000–11,999**	**7 12,000–14,499**	**8 14,500–19,999**	**9 20,000+**	**Total**
1970 & before	24767	-	-	-	-	-	-	-	-	**24767**
1971-1975	16931	-	-	-	-	-	-	-	-	**16931**
1976-1980	59994	-	68154	-	-	-	-	-	-	**128148**
1981-1985	74468	67923	-	78438	-	-	-	-	-	**220829**
1986-1990	65331	98969	96292	52181	-	-	-	-	-	**312773**
1991-1995	480321	258422	394266	499442	132092	-	-	-	-	**1764543**
1996-2000	1199466	2635086	2016256	1759946	3157174	1183280	-	-	-	**11951208**
2001-2005	1343863	2463971	4899793	6259168	12692159	5397629	-	-	-	**33056583**
2006-2010	2471246	6310771	5882057	15401822	14992000	20658412	4646333	1366352	-	**71728993**
2011-2015	835701	2791398	1521549	7656489	5715407	26327081	19932215	11328959	-	**76108799**
2016-2020	932234	3755770	4244134	1176913	119922	8658200	10451177	9625342	16458914	**55422606**
2021-2025	706871	6734333	5875897	4399990	8771984	6166552	10229652	26128873	15927657	**84941809**
Total	**8211193**	**25116643**	**24998398**	**37284389**	**45580738**	**68391154**	**45259377**	**48449526**	**32386571**	**335677989**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.2-9 General Overview of Container Fleet – by 4th GHG IMO Size Class by year of Build (Group) and DWT

	IMO GHG Size Class (dwt)									
Year of Build Group	**1 0–999**	**2 1,000–1,999**	**3 2,000–2,999**	**4 3,000–4,999**	**5 5,000–7,999**	**6 8,000–11,999**	**7 12,000–14,499**	**8 14,500–19,999**	**9 20,000+**	**Total**
1970 & before	33434	-	-	-	-	-	-	-	-	**33434**
1971-1975	25401	-	-	-	-	-	-	-	-	**25401**
1976-1980	75469	-	91959	-	-	-	-	-	-	**167428**
1981-1985	93820	43920	-	61650	-	-	-	-	-	**199390**
1986-1990	89451	116494	117175	60639	-	-	-	-	-	**383759**
1991-1995	634740	330182	496147	608007	135250	-	-	-	-	**2204326**
1996-2000	1541369	3335800	2480598	2164246	3252130	1361204	-	-	-	**14135347**
2001-2005	1670700	3083778	6311131	7576899	13763722	6099529	-	-	-	**38505759**
2006-2010	3096407	7958827	7571758	19065510	16648897	22278934	4858026	1307252	-	**82785611**
2011-2015	1087234	3498068	1835071	9383759	6534762	28842795	20247380	11591684	-	**83020753**
2016-2020	1150859	4752937	5119780	1390351	143195	9905885	10569074	10081622	15641081	**58754784**
2021-2025	915046	8847181	7402349	6014972	10405940	7305914	11491782	27842512	15741233	**95966929**
Total	**10413930**	**31967187**	**31425968**	**46326033**	**50883896**	**75794261**	**47166262**	**50823070**	**31382314**	**376182921**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.2-10 General Overview of Container Fleet – by 4th GHG IMO Size Class by year of Build (Group) and TEU

	IMO GHG Size Class (dwt)									
Year of Build Group	1 0–999	2 1,000–1,999	3 2,000–2,999	4 3,000–4,999	5 5,000–7,999	6 8,000–11,999	7 12,000–14,499	8 14,500–19,999	9 20,000+	Total
1970 & before	2150	-	-	-	-	-	-	-	-	**2150**
1971-1975	1124	-	-	-	-	-	-	-	-	**1124**
1976-1980	4551	-	4825	-	-	-	-	-	-	**9376**
1981-1985	5680	2999	-	6054	-	-	-	-	-	**14733**
1986-1990	5212	8490	7285	4814	-	-	-	-	-	**25801**
1991-1995	43948	23487	31067	42121	10688	-	-	-	-	**151311**
1996-2000	116966	232490	184187	158515	268853	125240	-	-	-	**1086251**
2001-2005	128121	228610	463281	590567	1108338	502477	-	-	-	**3021394**
2006-2010	232922	603793	557253	1535532	1335017	1885314	420354	142528	-	**6712713**
2011-2015	73916	271011	135150	734498	530737	2422526	1850856	1104066	-	**7122760**
2016-2020	80461	355746	373198	110216	12197	847423	1019734	948836	1624976	**5372787**
2021-2025	60074	634474	524957	389402	867909	633276	1065633	2616538	1626712	**8418975**
Total	**755125**	**2361100**	**2281203**	**3571719**	**4133739**	**6416256**	**4356577**	**4811968**	**3251688**	**31939375**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.2-11 General Overview of Container Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Average) mid of 2025

	IMO GHG Size Class (dwt)									
Year of Build Group	1 0–999	2 1,000–1,999	3 2,000–2,999	4 3,000–4,999	5 5,000–7,999	6 8,000–11,999	7 12,000–14,499	8 14,500–19,999	9 20,000+	Total
1970 & before	13	-	-	-	-	-	-	-	-	**13**
1971-1975	11	-	-	-	-	-	-	-	-	**11**
1976-1980	13	-	21	-	-	-	-	-	-	**14**
1981-1985	14	19	-	24	-	-	-	-	-	**16**
1986-1990	14	20	20	24	-	-	-	-	-	**16**
1991-1995	15	19	20	22	25	-	-	-	-	**17**
1996-2000	16	19	20	23	25	24	-	-	-	**19**
2001-2005	17	19	21	23	25	25	-	-	-	**21**
2006-2010	17	19	22	23	25	25	24	24	-	**22**
2011-2015	14	18	20	21	23	23	24	23	-	**21**
2016-2020	12	18	18	18	22	22	23	22	21	**19**
2021-2025	12	16	17	16	20	22	21	22	20	**17**
Total	**16**	**19**	**20**	**22**	**24**	**24**	**23**	**22**	**21**	**20**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.2-12 General Overview of Container Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Minimum) mid of 2025

	IMO GHG Size Class (dwt)									
Year of Build Group	1 0–999	2 1,000–1,999	3 2,000–2,999	4 3,000–4,999	5 5,000–7,999	6 8,000–11,999	7 12,000–14,499	8 14,500–19,999	9 20,000+	Total
1970 & before	11	-	-	-	-	-	-	-	-	**11**
1971-1975	9	-	-	-	-	-	-	-	-	**9**
1976-1980	10	-	21	-	-	-	-	-	-	**10**
1981-1985	11	13	-	23	-	-	-	-	-	**11**
1986-1990	11	19	18	24	-	-	-	-	-	**11**
1991-1995	11	17	19	21	25	-	-	-	-	**11**
1996-2000	10	10	13	12	21	24	-	-	-	**10**
2001-2005	10	12	12	12	15	22	-	-	-	**10**
2006-2010	9	11	11	12	13	17	24	20	-	**9**
2011-2015	8	11	13	14	14	12	23	18	-	**8**
2016-2020	9	12	14	12	21	21	22	14	17	**9**
2021-2025	10	12	12	14	15	14	18	22	18	**10**
Total	**8**	**10**	**11**	**12**	**13**	**12**	**18**	**14**	**17**	**8**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.2-13 General Overview of Container Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Maximum) mid of 2025

	IMO GHG Size Class (dwt)									
Year of Build Group	1 0–999	2 1,000–1,999	3 2,000–2,999	4 3,000–4,999	5 5,000–7,999	6 8,000–11,999	7 12,000–14,499	8 14,500–19,999	9 20,000+	Total
1970 & before	15	-	-	-	-	-	-	-	-	**15**

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1971-1975	14	-	-	-	-	-	-	-	-	**14**
1976-1980	15	-	21	-	-	-	-	-	-	**21**
1981-1985	18	24	-	24	-	-	-	-	-	**24**
1986-1990	17	20	22	24	-	-	-	-	-	**24**
1991-1995	18	21	23	25	25	-	-	-	-	**25**
1996-2000	22	25	23	25	27	25	-	-	-	**27**
2001-2005	21	23	24	26	26	26	-	-	-	**26**
2006-2010	20	23	24	29	27	28	26	25	-	**29**
2011-2015	19	21	23	25	26	27	26	24	-	**27**
2016-2020	16	22	22	23	23	24	25	24	23	**25**
2021-2025	19	20	23	22	22	24	23	22	23	**24**
Total	**22**	**25**	**24**	**29**	**27**	**28**	**26**	**25**	**23**	**29**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.2-14 General Overview of Container Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Median) mid of 2025

	IMO GHG Size Class (dwt)									
Year of Build Group	**1 0–999**	**2 1,000–1,999**	**3 2,000–2,999**	**4 3,000–4,999**	**5 5,000–7,999**	**6 8,000–11,999**	**7 12,000–14,499**	**8 14,500–19,999**	**9 20,000+**	**Total**
1970 & before	14	-	-	-	-	-	-	-	-	**14**
1971-1975	12	-	-	-	-	-	-	-	-	**12**
1976-1980	13	-	21	-	-	-	-	-	-	**21**
1981-1985	15	19	-	24	-	-	-	-	-	**24**
1986-1990	14	20	21	24	-	-	-	-	-	**24**
1991-1995	15	19	20	21	25	-	-	-	-	**25**
1996-2000	16	19	21	24	25	24	-	-	-	**25**
2001-2005	18	19	22	24	25	25	-	-	-	**25**
2006-2010	18	20	22	24	25	25	24	25	-	**25**
2011-2015	13	19	19	22	23	23	24	23	-	**24**
2016-2020	12	19	19	19	22	22	23	23	21	**23**
2021-2025	12	18	18	15	20	23	22	22	22	**23**
Total	**18**	**20**	**22**	**24**	**25**	**25**	**24**	**25**	**22**	**25**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.2-15 General Overview of Container Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Modus) mid of 2025

	IMO GHG Size Class (dwt)									
Year of Build Group	**1 0–999**	**2 1,000–1,999**	**3 2,000–2,999**	**4 3,000–4,999**	**5 5,000–7,999**	**6 8,000–11,999**	**7 12,000–14,499**	**8 14,500–19,999**	**9 20,000+**	**Total**
1970 & before	14	-	-	-	-	-	-	-	-	**14**
1971-1975	…	-	-	-	-	-	-	-	-	**…**
1976-1980	14	-	21	-	-	-	-	-	-	**21**
1981-1985	15	…	-	…	-	-	-	-	-	**15**
1986-1990	15	20	…	24	-	-	-	-	-	**24**
1991-1995	16	17	20	21	25	-	-	-	-	**25**
1996-2000	17	19	21	24	25	24	-	-	-	**25**
2001-2005	18	19	22	25	25	25	-	-	-	**25**
2006-2010	18	20	22	24	25	25	24	25	-	**25**
2011-2015	13	19	19	22	22	22	25	23	-	**25**
2016-2020	11	19	19	12	…	22	23	22	21	**23**
2021-2025	12	19	13	15	22	23	22	22	22	**23**
Total	**18**	**20**	**22**	**25**	**25**	**25**	**25**	**25**	**22**	**25**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.2-16 General Overview of Container Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Average) mid of 2025

	IMO GHG Size Class (dwt)									
Year of Build Group	**1 0–999**	**2 1,000–1,999**	**3 2,000–2,999**	**4 3,000–4,999**	**5 5,000–7,999**	**6 8,000–11,999**	**7 12,000–14,499**	**8 14,500–19,999**	**9 20,000+**	**Total**
1970 & before	2158	-	-	-	-	-	-	-	-	**2158**
1971-1975	2056	-	-	-	-	-	-	-	-	**2056**
1976-1980	2736	-	23128	-	-	-	-	-	-	**5285**
1981-1985	3521	19887	-	31427	-	-	-	-	-	**8181**
1986-1990	3059	12952	18320	47304	-	-	-	-	-	**9124**
1991-1995	4028	10701	18858	27502	48631	-	-	-	-	**8796**
1996-2000	5095	12458	19693	34924	54795	54900	-	-	-	**16807**
2001-2005	6848	12471	22295	37868	55526	65774	-	-	-	**29737**
2006-2010	6506	12759	22818	36672	54404	66450	70377	80080	-	**31032**
2011-2015	3345	10619	18633	28131	39829	52696	64137	58980	-	**36251**
2016-2020	2832	9963	15030	20979	28950	45610	47116	54846	62469	**26069**
2021-2025	2606	9263	13194	16893	27171	33244	41591	48312	65082	**23195**
Total	**5006**	**11169**	**18608**	**31998**	**47438**	**55332**	**55252**	**52678**	**63711**	**27589**

Funded by the European Union

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.2-17 General Overview of Container Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Minimum) mid of 2025

	IMO GHG Size Class (dwt)									
Year of Build Group	**1 0–999**	**2 1,000–1,999**	**3 2,000–2,999**	**4 3,000–4,999**	**5 5,000–7,999**	**6 8,000–11,999**	**7 12,000–14,499**	**8 14,500–19,999**	**9 20,000+**	**Total**
1970 & before	1324	-	-	-	-	-	-	-	-	**1324**
1971-1975	1103	-	-	-	-	-	-	-	-	**1103**
1976-1980	1471	-	22720	-	-	-	-	-	-	**1471**
1981-1985	1470	7999	-	31080	-	-	-	-	-	**1470**
1986-1990	995	9999	13132	47304	-	-	-	-	-	**995**
1991-1995	972	6923	15498	18998	48631	-	-	-	-	**972**
1996-2000	735	6830	12239	15281	48600	54900	-	-	-	**735**
2001-2005	551	7200	14680	21735	28560	39000	-	-	-	**551**
2006-2010	700	7074	16980	15100	8670	26400	48000	80080	-	**700**
2011-2015	447	4205	6050	19620	24408	32800	27500	46620	-	**447**
2016-2020	1040	2648	6050	9500	25000	32940	28310	43505	55000	**1040**
2021-2025	360	2930	4230	8120	23000	24800	36650	37300	45300	**360**
Total	**360**	**2648**	**4230**	**8120**	**8670**	**24800**	**27500**	**37300**	**45300**	**360**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.2-18 General Overview of Container Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Maximum) mid of 2025

	IMO GHG Size Class (dwt)									
Year of Build Group	**1 0–999**	**2 1,000–1,999**	**3 2,000–2,999**	**4 3,000–4,999**	**5 5,000–7,999**	**6 8,000–11,999**	**7 12,000–14,499**	**8 14,500–19,999**	**9 20,000+**	**Total**
1970 & before	4103	-	-	-	-	-	-	-	-	**4103**
1971-1975	4413	-	-	-	-	-	-	-	-	**4413**
1976-1980	5432	-	23536	-	-	-	-	-	-	**23536**
1981-1985	6355	31774	-	31774	-	-	-	-	-	**31774**
1986-1990	7079	14920	20976	47304	-	-	-	-	-	**47304**
1991-1995	9356	16260	27600	51720	48631	-	-	-	-	**51720**
1996-2000	14482	25018	28880	48631	68640	54900	-	-	-	**68640**
2001-2005	14398	21660	28880	57074	68640	68666	-	-	-	**68666**
2006-2010	12052	21660	28880	68640	68666	80080	80080	80080	-	**80080**
2011-2015	9600	19420	25270	43610	57222	94860	74760	75275	-	**94860**
2016-2020	8280	19420	24260	38000	32900	58100	67100	75570	75570	**75570**
2021-2025	6290	19040	30000	24010	32970	42350	54960	64500	75570	**75570**
Total	**14482**	**31774**	**30000**	**68640**	**68666**	**94860**	**80080**	**80080**	**75570**	**94860**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.2-19 General Overview of Container Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Median) mid of 2025

	IMO GHG Size Class (dwt)									
Year of Build Group	**1 0–999**	**2 1,000–1,999**	**3 2,000–2,999**	**4 3,000–4,999**	**5 5,000–7,999**	**6 8,000–11,999**	**7 12,000–14,499**	**8 14,500–19,999**	**9 20,000+**	**Total**
1970 & before	2206	-	-	-	-	-	-	-	-	**2206**
1971-1975	1618	-	-	-	-	-	-	-	-	**1618**
1976-1980	2869	-	23128	-	-	-	-	-	-	**23128**
1981-1985	3678	19887	-	31427	-	-	-	-	-	**31427**
1986-1990	2427	14920	20851	47304	-	-	-	-	-	**47304**
1991-1995	3648	10000	17940	21698	48631	-	-	-	-	**48631**
1996-2000	5295	11680	19796	35204	54900	54900	-	-	-	**54900**
2001-2005	7200	11440	21572	36560	57075	68520	-	-	-	**68520**
2006-2010	7200	12640	21770	36560	57100	68597	72240	80080	-	**80080**
2011-2015	2560	9800	20805	27060	42140	51070	68640	59784	-	**68640**
2016-2020	2560	10910	16080	19620	28950	46480	48600	54950	60380	**60380**
2021-2025	2560	10080	13700	18200	27000	29150	41100	46444	64650	**64650**
Total	**7200**	**19887**	**23128**	**47304**	**57100**	**68597**	**72240**	**80080**	**64650**	**80080**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.2-20 General Overview of Container Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Modus) mid of 2025

	IMO GHG Size Class (dwt)									
Year of Build Group	**1 0–999**	**2 1,000–1,999**	**3 2,000–2,999**	**4 3,000–4,999**	**5 5,000–7,999**	**6 8,000–11,999**	**7 12,000–14,499**	**8 14,500–19,999**	**9 20,000+**	**Total**
1970 & before	2354	-	-	-	-	-	-	-	-	**2354**
1971-1975	…	-	-	-	-	-	-	-	-	**…**
1976-1980	2942	-	…	-	-	-	-	-	-	**2942**
1981-1985	3678	…	-	…	-	-	-	-	-	**3678**

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1986-1990	2188	14920	…	47304	-	-	-	-	-	**47304**
1991-1995	3825	10000	17940	21698	48631	-	-	-	-	**48631**
1996-2000	3354	9989	19810	28368	54900	54900	-	-	-	**54900**
2001-2005	8400	11060	21770	36560	54840	68640	-	-	-	**68640**
2006-2010	8400	15820	21770	36560	62920	68640	72240	80080	-	**80080**
2011-2015	2560	8730	25040	36560	26700	47430	72240	63910	-	**72240**
2016-2020	2560	11960	16080	19620	…	42350	48900	54960	59300	**59300**
2021-2025	2560	11800	14880	20000	26280	41080	37800	45300	75570	**75570**
Total	**8400**	**15820**	**25040**	**47304**	**62920**	**68640**	**72240**	**80080**	**75570**	**80080**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.2-21 General Overview of Container Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Average) mid of 2025

	IMO GHG Size Class (dwt)									
Year of Build Group	**1 0–999**	**2 1,000–1,999**	**3 2,000–2,999**	**4 3,000–4,999**	**5 5,000–7,999**	**6 8,000–11,999**	**7 12,000–14,499**	**8 14,500–19,999**	**9 20,000+**	**Total**
1970 & before	-	-	-	-	-	-	-	-	-	**-**
1971-1975	-	-	-	-	-	-	-	-	-	**-**
1976-1980	-	-	-	-	-	-	-	-	-	**-**
1981-1985	171	-	-	-	-	-	-	-	-	**171**
1986-1990	177	173	173	171	-	-	-	-	-	**173**
1991-1995	176	174	172	173	-	-	-	-	-	**174**
1996-2000	175	173	172	172	172	173	-	-	-	**174**
2001-2005	175	171	172	171	171	172	-	-	-	**172**
2006-2010	178	172	172	173	174	174	176	173	-	**174**
2011-2015	185	173	170	171	172	170	173	168	-	**172**
2016-2020	181	170	168	168	166	166	166	166	167	**168**
2021-2025	188	167	167	166	164	165	166	165	165	**166**
Total	178	171	170	171	170	170	170	166	166	**171**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.2-22 General Overview of Container Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Minimum) mid of 2025

	IMO GHG Size Class (dwt)									
Year of Build Group	**1 0–999**	**2 1,000–1,999**	**3 2,000–2,999**	**4 3,000–4,999**	**5 5,000–7,999**	**6 8,000–11,999**	**7 12,000–14,499**	**8 14,500–19,999**	**9 20,000+**	**Total**
1970 & before	-	-	-	-	-	-	-	-	-	**-**
1971-1975	-	-	-	-	-	-	-	-	-	**-**
1976-1980	-	-	-	-	-	-	-	-	-	**-**
1981-1985	-	-	-	-	-	-	-	-	-	**-**
1986-1990	177	173	173	171	-	-	-	-	-	**171**
1991-1995	167	173	171	171	-	-	-	-	-	**167**
1996-2000	170	171	169	169	171	173	-	-	-	**169**
2001-2005	164	167	169	167	171	171	-	-	-	**164**
2006-2010	164	170	169	169	171	171	172	173	-	**164**
2011-2015	174	169	167	168	165	165	166	165	-	**165**
2016-2020	170	166	166	166	166	165	165	165	165	**165**
2021-2025	167	165	163	163	161	161	163	161	163	**161**
Total	164	165	163	163	161	161	163	161	163	**161**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.2-23 General Overview of Container Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Maximum) mid of 2025

	IMO GHG Size Class (dwt)									
Year of Build Group	**1 0–999**	**2 1,000–1,999**	**3 2,000–2,999**	**4 3,000–4,999**	**5 5,000–7,999**	**6 8,000–11,999**	**7 12,000–14,499**	**8 14,500–19,999**	**9 20,000+**	**Total**
1970 & before	-	-	-	-	-	-	-	-	-	**-**
1971-1975	-	-	-	-	-	-	-	-	-	**-**
1976-1980	-	-	-	-	-	-	-	-	-	**-**
1981-1985	171	-	-	-	-	-	-	-	-	**171**
1986-1990	177	173	173	171	-	-	-	-	-	**177**
1991-1995	181	174	173	173	-	-	-	-	-	**181**
1996-2000	181	177	173	173	173	173	-	-	-	**181**
2001-2005	181	174	174	174	177	173	-	-	-	**181**
2006-2010	196	178	177	177	177	177	177	173	-	**196**
2011-2015	207	184	175	177	177	177	177	173	-	**207**
2016-2020	194	185	175	171	166	167	166	168	181	**194**
2021-2025	197	185	174	168	166	177	181	181	181	**197**
Total	207	185	177	177	177	177	181	181	181	**207**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

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Table 12.2-24 General Overview of Container Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Median) mid of 2025

	IMO GHG Size Class (dwt)									
Year of Build Group	1 0–999	2 1,000–1,999	3 2,000–2,999	4 3,000–4,999	5 5,000–7,999	6 8,000–11,999	7 12,000–14,499	8 14,500–19,999	9 20,000+	Total
1970 & before	-	-	-	-	-	-	-	-	-	-
1971-1975	-	-	-	-	-	-	-	-	-	-
1976-1980	-	-	-	-	-	-	-	-	-	-
1981-1985	171	...	-	...	-	-	-	-	-	171
1986-1990	177	173	173	171	-	-	-	-	-	177
1991-1995	177	174	171	173	...	-	-	-	-	177
1996-2000	176	173	173	171	171	173	-	-	-	176
2001-2005	177	171	173	171	171	171	-	-	-	177
2006-2010	178	171	171	171	173	173	177	173	-	178
2011-2015	178	171	170	171	172	168	177	166	-	178
2016-2020	179	169	167	169	166	166	166	166	166	179
2021-2025	194	166	166	166	163	166	165	165	163	194
Total	**194**	**174**	**173**	**173**	**173**	**173**	**177**	**173**	**166**	**194**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.2-25 General Overview of Container Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Modus) mid of 2025

	IMO GHG Size Class (dwt)									
Year of Build Group	1 0–999	2 1,000–1,999	3 2,000–2,999	4 3,000–4,999	5 5,000–7,999	6 8,000–11,999	7 12,000–14,499	8 14,500–19,999	9 20,000+	Total
1970 & before	-	-	-	-	-	-	-	-	-	-
1971-1975	-	-	-	-	-	-	-	-	-	-
1976-1980	-	-	-	-	-	-	-	-	-	-
1981-1985	171	...	-	...	-	-	-	-	-	171
1986-1990	177	173	173	171	-	-	-	-	-	177
1991-1995	177	174	171	173	...	-	-	-	-	177
1996-2000	174	174	171	171	171	173	-	-	-	174
2001-2005	178	171	171	171	171	171	-	-	-	178
2006-2010	178	174	171	171	177	171	177	173	-	178
2011-2015	178	170	170	171	177	166	177	166	-	178
2016-2020	178	169	167	169	166	166	166	166	166	178
2021-2025	197	166	166	167	163	166	165	165	163	197
Total	**197**	**174**	**173**	**173**	**177**	**173**	**177**	**173**	**166**	**197**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

12.3. *Cruise/Passenger Fleet - Cruise*

Table 12.3-1 General Overview of Cruise Fleet – by Status

Status	Number of Ships
Abandoned	1
Damaged/Not in Service	1
Idle	35
In Service	428
Laid Up	15
Repairs	19
Under Arrest	3
Total	**502**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.3-2 General Overview of Cruise Fleet – by Carrier Type

Carrier Type	Number of Ships
Cruise Ship	502
Total	**502**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.3-3 General Overview of Cruise Fleet – by Year of Build Group

Year of Build Group	Number of Ships
1970 and before	21
1971-1975	6
1976-1980	9
1981-1985	24
1986-1990	24
1991-1995	38
1996-2000	62
2001-2005	64
2006-2010	53
2011-2015	33
2016-2020	81
2021-2025	87

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Total	**502**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.3-4 General Overview of Cruise Fleet – by 4th GHG IMO Size Class

4th GHG Size Class	Number of Ships
1 0-1,999	82
2 2,000-9,999	80
3 10,000-59,999	124
4 60,000_99,999	91
5 100,000-149,999	80
6 150,000+	45
Total	**502**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.3-5 General Overview of Cruise Fleet – by Engine Derived Power Type

Engine Derived Power Type	Number of Ships
Batteries & Diesel	17
Batteries, Diesel & Fuel Cell	2
Diesel 2-Stroke	16
Diesel 4-Stroke	159
Diesel Electric	289
Fuel Cell & Diesel	3
Gas Turbine	8
Wind & Diesel	8
Total	**502**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.3-6 General Overview of Cruise Fleet – by Main Engine Designer

Main Engine Designer	Number of Ships
A.B.C.	5
ALCO	1
B. & W.	3
B. & W. Alpha	8
Bergen	18
Bergen Normo	1
Blackstone	1
Caterpillar	27
Crossley	1
Cummins Inc	12
Daihatsu	1
Detroit Diesel Corp	5
Deutz	2
Enterprise DMG	1
Everllence	64
Gen. Motors	1
Gen. Motors EMD	1
General Electric	11
Hedemora	1
HHM	1
John Deere	1
Kromhout	1
MaK	42
Mitsubishi	1
Moteurs Baudouin	2
MTU	8
MWM	4
Nohab	1
Normo	1
Pielstick	6
Scania	4
Soviet	5
Sulzer	42
Ulstein Bergen	1
Volvo Penta	3
Wartsila	192
Yanmar	3
(unknown)	20
Total	**502**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.3-7 General Overview of Cruise Fleet – by 4th GHG IMO Size Class by year of Build (Group) and by Number

	IMO GHG Size Class (dwt)						
Year of Build Group	**1** **0-9,999**	**2** **10,000-34,999**	**3** **35,000-59,999**	**4** **60,000-99,999**	**5** **100,000-199,999**	**6** **200,000+**	**Total**
1970 and before	12	5	2	-	-	-	19
1971-1975	1	4	1	-	-	-	6
1976-1980	5	2	2	-	-	-	9

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1981-1985	16	4	3	-	-	-	23
1986-1990	5	10	9	-	-	-	24
1991-1995	7	9	15	6	-	-	37
1996-2000	7	3	22	24	6	-	62
2001-2005	6	4	11	28	15	-	64
2006-2010	4	3	6	18	16	6	53
2011-2015	1	2	5	7	15	3	33
2016-2020	8	17	19	4	15	18	81
2021-2025	9	14	28	4	13	18	86
Total	**81**	**77**	**123**	**91**	**80**	**45**	**497**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.3-8 General Overview of Cruise Fleet – by 4th GHG IMO Size Class by year of Build (Group) and GT

	IMO GHG Size Class (dwt)						
Year of Build Group	**1 0-9,999**	**2 10,000-34,999**	**3 35,000-59,999**	**4 60,000-99,999**	**5 100,000-199,999**	**6 200,000+**	Total
1970 and before	8007	29886	26561	-	-	-	64454
1971-1975	101	22537	11906	-	-	-	34544
1976-1980	2650	13004	38530	-	-	-	54184
1981-1985	20281	21399	94796	-	-	-	136476
1986-1990	3396	54625	259619	-	-	-	317640
1991-1995	5443	41918	466947	432318	-	-	946626
1996-2000	6917	11054	594944	1806441	688276	-	3107632
2001-2005	6737	17741	368736	2343133	1773744	-	4510091
2006-2010	5218	9672	137802	1553358	1923770	1071140	4700960
2011-2015	1593	12453	145133	545220	1991685	502489	3198573
2016-2020	4048	123638	737450	397334	1950299	3164603	6377372
2021-2025	4893	87542	828732	295373	1691185	3421834	6329559
Total	**69284**	**445469**	**3711156**	**7373177**	**10018959**	**8160066**	**29778111**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.3-9 General Overview of Cruise Fleet – by 4th GHG IMO Size Class by year of Build (Group) and DWT

	IMO GHG Size Class (dwt)						
Year of Build Group	**1 0-9,999**	**2 10,000-34,999**	**3 35,000-59,999**	**4 60,000-99,999**	**5 100,000-199,999**	**6 200,000+**	Total
1970 and before	1466	12973	3051	-	-	-	17490
1971-1975	-	6195	4174	-	-	-	10369
1976-1980	1200	2496	6055	-	-	-	9751
1981-1985	4709	3101	11591	-	-	-	19401
1986-1990	526	9485	35759	-	-	-	45770
1991-1995	881	5282	54362	40968	-	-	101493
1996-2000	985	2529	62338	188635	63387	-	317874
2001-2005	896	1942	37744	252994	172091	-	465667
2006-2010	1044	3590	14651	158722	169061	81850	428918
2011-2015	374	1387	16663	55620	166885	35700	276629
2016-2020	335	16858	78301	34789	160570	256893	547746
2021-2025	1025	12942	109660	29510	139976	296182	589295
Total	**13441**	**78780**	**434349**	**761238**	**871970**	**670625**	**2830403**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.3-10 General Overview of Cruise Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Average) mid of 2025

	IMO GHG Size Class (dwt)						
Year of Build Group	**1 0-9,999**	**2 10,000-34,999**	**3 35,000-59,999**	**4 60,000-99,999**	**5 100,000-199,999**	**6 200,000+**	Total
1970 and before	12	16	18	-	-	-	14
1971-1975	-	19	18	-	-	-	19
1976-1980	10	15	16	-	-	-	13
1981-1985	12	16	18	-	-	-	14
1986-1990	13	15	19	-	-	-	16
1991-1995	12	14	18	22	-	-	17
1996-2000	13	14	19	22	22	-	20
2001-2005	14	12	20	23	22	-	21
2006-2010	13	12	16	23	22	22	21
2011-2015	13	18	18	21	22	22	21
2016-2020	11	15	18	22	20	21	19
2021-2025	11	16	18	20	21	21	19
Total	**12**	**15**	**18**	**22**	**22**	**21**	**19**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.3-11 General Overview of Cruise Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Minimum) mid of 2025

	IMO GHG Size Class (dwt)						
Year of Build Group	**1 0-9,999**	**2 10,000-34,999**	**3 35,000-59,999**	**4 60,000-99,999**	**5 100,000-199,999**	**6 200,000+**	Total
1970 and before	9	12	17	-	-	-	9
1971-1975	-	16	18	-	-	-	16

1976-1980	9	12	14	-	-	-	9
1981-1985	10	14	12	-	-	-	10
1986-1990	12	12	11	-	-	-	11
1991-1995	9	12	15	20	-	-	9
1996-2000	10	12	15	20	21	-	10
2001-2005	13	10	17	20	20	-	10
2006-2010	13	12	11	20	20	20	11
2011-2015	13	18	16	20	20	22	13
2016-2020	10	12	15	21	14	17	10
2021-2025	**9**	**10**	**11**	**18**	**14**	**17**	**9**
Total	9	12	17	-	-	-	9

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.3-12 General Overview of Cruise Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Maximum) mid of 2025

	IMO GHG Size Class (dwt)						
Year of Build Group	**1 0-9,999**	**2 10,000-34,999**	**3 35,000-59,999**	**4 60,000-99,999**	**5 100,000-199,999**	**6 200,000+**	Total
1970 and before	15	20	20	-	-	-	20
1971-1975	-	23	18	-	-	-	23
1976-1980	12	18	18	-	-	-	18
1981-1985	14	18	22	-	-	-	22
1986-1990	13	18	23	-	-	-	23
1991-1995	14	16	21	24	-	-	24
1996-2000	18	17	29	24	24	-	29
2001-2005	14	15	28	25	24	-	28
2006-2010	14	13	20	25	24	22	25
2011-2015	13	18	21	23	24	22	24
2016-2020	12	16	20	23	23	23	23
2021-2025	11	22	20	23	22	25	25
Total	**18**	**23**	**29**	**25**	**24**	**25**	**29**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.3-13 General Overview of Cruise Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Median) mid of 2025

	IMO GHG Size Class (dwt)						
Year of Build Group	**1 0-9,999**	**2 10,000-34,999**	**3 35,000-59,999**	**4 60,000-99,999**	**5 100,000-199,999**	**6 200,000+**	Total
1970 and before	12	17	18	-	-	-	18
1971-1975	...	17	18	-	-	-	18
1976-1980	10	15	16	-	-	-	16
1981-1985	12	18	21	-	-	-	21
1986-1990	13	15	20	-	-	-	20
1991-1995	13	16	18	21	-	-	21
1996-2000	12	14	18	22	23	-	23
2001-2005	14	12	20	22	22	-	22
2006-2010	13	12	16	23	22	22	23
2011-2015	13	18	19	21	22	22	22
2016-2020	11	15	18	21	21	22	22
2021-2025	11	16	18	21	21	22	22
Total	**14**	**18**	**21**	**23**	**23**	**22**	**23**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.3-14 General Overview of Cruise Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Modus) mid of 2025

	IMO GHG Size Class (dwt)						
Year of Build Group	**1 0-9,999**	**2 10,000-34,999**	**3 35,000-59,999**	**4 60,000-99,999**	**5 100,000-199,999**	**6 200,000+**	Total
1970 and before	12	...	...	-	-	-	12
1971-1975	...	...	18	-	-	-	18
1976-1980	...	...	...	-	-	-	...
1981-1985	12	18	...	-	-	-	18
1986-1990	...	15	...	-	-	-	15
1991-1995	14	16	15	24	-	-	24
1996-2000	10	...	18	24	23	-	24
2001-2005	14	15	20	22	22	-	22
2006-2010	13	12	16	25	24	22	25
2011-2015	13	18	16	23	22	22	23
2016-2020	11	15	17	21	21	23	23
2021-2025	...	16	20	...	21	17	21
Total	**14**	**18**	**20**	**25**	**24**	**23**	**25**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

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Table 12.3-15 General Overview of Cruise Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Average) mid of 2025

	IMO GHG Size Class (dwt)						
Year of Build Group	**1 0-9,999**	**2 10,000-34,999**	**3 35,000-59,999**	**4 60,000-99,999**	**5 100,000-199,999**	**6 200,000+**	Total
1970 and before	1386	4569	11500	-	-	-	3921
1971-1975	-	5641	10297	-	-	-	6805
1976-1980	952	4891	18697	-	-	-	8180
1981-1985	1998	4769	19356	-	-	-	5945
1986-1990	1064	4301	18223	-	-	-	10404
1991-1995	1116	3398	20060	43780	-	-	17607
1996-2000	1114	3273	18002	51928	68429	-	35039
2001-2005	1756	2812	22122	53747	63796	-	43927
2006-2010	1395	2337	16816	57969	69969	84140	54178
2011-2015	2758	11600	16672	40114	69516	68720	50857
2016-2020	1029	5164	20835	46200	54883	73354	38295
2021-2025	736	4972	23458	41600	54557	66838	41442
Total	**1451**	**4449**	**19670**	**51641**	**63278**	**71992**	**35980**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.3-16 General Overview of Cruise Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Minimum) mid of 2025

	IMO GHG Size Class (dwt)						
Year of Build Group	**1 0-9,999**	**2 10,000-34,999**	**3 35,000-59,999**	**4 60,000-99,999**	**5 100,000-199,999**	**6 200,000+**	Total
1970 and before	423	1765	11000	-	-	-	423
1971-1975	-	4000	10297	-	-	-	4000
1976-1980	536	2721	18270	-	-	-	536
1981-1985	1176	3539	12798	-	-	-	1176
1986-1990	1064	2237	7682	-	-	-	1064
1991-1995	662	1014	7200	21838	-	-	662
1996-2000	953	2354	6920	43203	63360	-	953
2001-2005	1567	2400	9000	30600	35700	-	1567
2006-2010	900	2088	6400	36000	63360	75600	900
2011-2015	2758	11600	6400	36000	62400	64680	2758
2016-2020	732	2386	11200	44400	44400	57600	732
2021-2025	736	3282	12968	38400	48000	45800	736
Total	423	1014	6400	21838	35700	45800	423

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.3-17 General Overview of Cruise Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Maximum) mid of 2025

	IMO GHG Size Class (dwt)						
Year of Build Group	**1 0-9,999**	**2 10,000-34,999**	**3 35,000-59,999**	**4 60,000-99,999**	**5 100,000-199,999**	**6 200,000+**	Total
1970 and before	3165	10297	11999	-	-	-	11999
1971-1975	-	7723	10297	-	-	-	10297
1976-1980	1368	7061	19123	-	-	-	19123
1981-1985	2340	7136	24000	-	-	-	24000
1986-1990	1064	8160	38900	-	-	-	38900
1991-1995	1680	8160	36328	57494	-	-	57494
1996-2000	1575	4474	37796	62365	75595	-	75595
2001-2005	2237	3000	37796	72000	75600	-	75600
2006-2010	1642	2462	25200	72000	76800	97020	97020
2011-2015	2758	11600	24000	44400	78540	76800	78540
2016-2020	1428	6400	32000	48000	62400	105600	105600
2021-2025	736	5600	41800	48000	69000	96000	96000
Total	**3165**	**11600**	**41800**	**72000**	**78540**	**105600**	**105600**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.3-18 General Overview of Cruise Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Median) mid of 2025

	IMO GHG Size Class (dwt)						
Year of Build Group	**1 0-9,999**	**2 10,000-34,999**	**3 35,000-59,999**	**4 60,000-99,999**	**5 100,000-199,999**	**6 200,000+**	Total
1970 and before	773	4045	11500	-	-	-	11500
1971-1975	...	5200	13239	-	-	-	13239
1976-1980	536	4891	18270	-	-	-	18270
1981-1985	1804	5998	16475	-	-	-	16475
1986-1990	826	4126	16726	-	-	-	16726
1991-1995	840	3520	19251	48000	-	-	48000
1996-2000	1044	2990	15007	50398	66861	-	66861
2001-2005	1584	2400	24000	53401	66000	-	66000
2006-2010	1642	2460	23040	64000	68416	79800	79800
2011-2015	2758	8150	23040	42000	67200	64680	67200
2016-2020	732	4795	23040	46200	52800	65940	65940

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2021-2025	736	5541	17446	38400	50400	65315	65315
Total	**2758**	**8150**	**24000**	**64000**	**79800**	**68416**	**79800**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.3-19 General Overview of Cruise Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Modus) mid of 2025

	IMO GHG Size Class (dwt)						
Year of Build Group	**1 0-9,999**	**2 10,000-34,999**	**3 35,000-59,999**	**4 60,000-99,999**	**5 100,000-199,999**	**6 200,000+**	Total
1970 and before	662	…	…	-	-	-	662
1971-1975	…	…	13239	-	-	-	13239
1976-1980	…	…	…	-	-	-	…
1981-1985	2340	3539	…	-	-	-	3539
1986-1990	…	…	…	-	-	-	…
1991-1995	…	3520	36000	48000	-	-	48000
1996-2000	1044	…	18599	46078	63360	-	63360
2001-2005	…	1250	27400	50000	63365	-	63365
2006-2010	1642	…	6400	36000	67200	75600	75600
2011-2015	2758	…	6400	36000	62400	64680	64680
2016-2020	714	6400	23520	48000	62400	76800	76800
2021-2025	736	5600	23520	38400	48000	67200	67200
Total	**2758**	**6400**	**36000**	**50000**	**67200**	**76800**	**76800**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.3-20 General Overview of Cruise Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Average) mid of 2025

	IMO GHG Size Class (dwt)						
Year of Build Group	**1 0-9,999**	**2 10,000-34,999**	**3 35,000-59,999**	**4 60,000-99,999**	**5 100,000-199,999**	**6 200,000+**	Total
1970 and before	-	-	176	-	-	-	176
1971-1975	-	190	-	-	-	-	190
1976-1980	-	-	-	-	-	-	-
1981-1985	-	-	176	-	-	-	176
1986-1990	-	186	176	-	-	-	178
1991-1995	-	186	176	174	-	-	177
1996-2000	-	185	177	183	173	-	179
2001-2005	207	-	176	200	209	-	196
2006-2010	208	-	183	178	174	174	178
2011-2015	196	-	182	176	173	177	177
2016-2020	211	190	178	176	174	175	179
2021-2025	215	189	178	173	173	177	179
Total	**209**	**189**	**178**	**184**	**176**	**176**	**181**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.3-21 General Overview of Cruise Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Minimum) mid of 2025

	IMO GHG Size Class (dwt)						
Year of Build Group	**1 0-9,999**	**2 10,000-34,999**	**3 35,000-59,999**	**4 60,000-99,999**	**5 100,000-199,999**	**6 200,000+**	Total
1970 and before	-	-	176	-	-	-	176
1971-1975	-	190	-	-	-	-	190
1976-1980	-	-	-	-	-	-	-
1981-1985	-	-	176	-	-	-	176
1986-1990	-	186	167	-	-	-	167
1991-1995	-	186	174	173	-	-	173
1996-2000	-	185	176	173	173	-	173
2001-2005	207	-	176	173	173	-	173
2006-2010	208	-	176	176	173	173	173
2011-2015	196	-	176	173	170	177	170
2016-2020	211	187	176	173	170	170	170
2021-2025	211	187	174	170	170	170	170
Total	**196**	**185**	**167**	**170**	**170**	**170**	**167**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.3-22 General Overview of Cruise Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Maximum) mid of 2025

	IMO GHG Size Class (dwt)						
Year of Build Group	**1 0-9,999**	**2 10,000-34,999**	**3 35,000-59,999**	**4 60,000-99,999**	**5 100,000-199,999**	**6 200,000+**	Total
1970 and before	-	-	176	-	-	-	176
1971-1975	-	190	-	-	-	-	190
1976-1980	-	-	-	-	-	-	-
1981-1985	-	-	176	-	-	-	176

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1986-1990	-	186	186	-	-	-	186
1991-1995	-	186	177	174	-	-	186
1996-2000	-	185	181	215	173	-	215
2001-2005	207	-	177	227	227	-	227
2006-2010	208	-	187	178	176	178	208
2011-2015	196	-	187	178	177	177	196
2016-2020	211	201	179	178	178	184	211
2021-2025	219	193	179	178	178	184	219
Total	**219**	**201**	**187**	**227**	**227**	**184**	**227**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.3-23 General Overview of Cruise Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Median) mid of 2025

	IMO GHG Size Class (dwt)						
Year of Build Group	**1 0-9,999**	**2 10,000-34,999**	**3 35,000-59,999**	**4 60,000-99,999**	**5 100,000-199,999**	**6 200,000+**	Total
1970 and before	…	…	176	-	-	-	176
1971-1975	…	190	…	-	-	-	190
1976-1980	-	-	-	-	-	-	-
1981-1985	…	…	176	-	-	-	176
1986-1990	…	186	175	-	-	-	186
1991-1995	…	186	177	174	-	-	186
1996-2000	…	185	176	177	173	-	185
2001-2005	207	…	176	177	227	-	227
2006-2010	208	…	187	178	173	173	208
2011-2015	196	…	183	178	173	177	196
2016-2020	211	187	179	176	173	177	211
2021-2025	215	187	179	170	170	177	215
Total	**215**	**190**	**187**	**178**	**227**	**177**	**227**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.3-24 General Overview of Cruise Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Modus) mid of 2025

	IMO GHG Size Class (dwt)						
Year of Build Group	**1 0-9,999**	**2 10,000-34,999**	**3 35,000-59,999**	**4 60,000-99,999**	**5 100,000-199,999**	**6 200,000+**	Total
1970 and before	…	…	176	-	-	-	176
1971-1975	…	190	…	-	-	-	190
1976-1980	-	-	-	-	-	-	-
1981-1985	…	…	176	-	-	-	176
1986-1990	…	186	176	-	-	-	186
1991-1995	…	186	177	174	-	-	186
1996-2000	…	185	176	177	173	-	185
2001-2005	207	…	176	227	227	-	227
2006-2010	208	…	187	178	173	173	208
2011-2015	196	…	187	178	170	177	196
2016-2020	211	187	179	178	170	170	211
2021-2025	…	187	179	170	170	170	187
Total	**211**	**190**	**187**	**227**	**227**	**177**	**227**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

12.4. Cruise/Passenger Fleet - Ferries

Table 12.4-1 General Overview of Ferries Fleet – by Status

Status	**Number of Ships**
Abandoned	2
Commissioned	5
Damaged/Not in Service	4
Idle	209
In Service	3778
Laid Up	67
Repairs	32
Under Arrest	2
Total	**4099**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.4-2 General Overview of Ferries Fleet – by Carrier Type

Status	**Number of Ships**
Air Cushion Ferry	1
Cruise Ship	25
Pass./Car Catamaran Vessel	113
Pass./Car Ferry	2140
Passenger Catamaran Vessel	198
Passenger Vessel	1131

Passenger/Cargo Vessel	236
Passenger/Trimaran	1
Ro-Ro Freight/Passenger	254
Total	**4099**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.4-3 General Overview of Ferries Fleet – by Year of Build Group

Status	Number of Ships
1970 and before	289
1971-1975	174
1976-1980	193
1981-1985	182
1986-1990	344
1991-1995	367
1996-2000	370
2001-2005	387
2006-2010	380
2011-2015	456
2016-2020	613
2021-2025	344
Total	**4099**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.4-4 General Overview of Ferries Fleet – by 4th GHG IMO Size Class

Status	Number of Ships
1 0-1,999	2398
2 2,000-4,999	769
3 5,000-9,999	313
4 10,000-19,999	280
5 20,000+	339
Total	**4099**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.4-5 General Overview of Ferries Fleet – Engine Derived Power Type

Engine Derived Power Type	Number of Ships
Batteries & Diesel	135
Batteries propulsion	36
Batteries, Diesel & Fuel Cell	1
Combined	3
Diesel 2-Stroke	174
Diesel 4-Stroke	3570
Diesel Electric	155
Gas Turbine	18
Hybrid Mech./Elec.	2
Steam Reciprocating	2
Steam Turbine	3
Total	**4099**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.4-6 General Overview of Ferries Fleet – Main Engine Designer

Main Engine Designer	Number of Ships
A.B.C.	10
AGO	1
Akasaka	5
Alpha Diesel	6
Ansaldo	3
Bergen	25
Bergen Normo	6
Blackstone	17
Callesen	3
Caterpillar	323
Chinese Std.	3
Corvus Energy	25
Crepelle	4
Crossley	3
Cummins Inc	184
Dae Dong	2
Daewoo Marine Eng.	4
Daihatsu Infinearth	189
Daimler	2
Detroit Diesel Corp	23
Deutz	51
Doosan Infracore	20
Dorman	1
Duvant	2
EMD	11

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Enterprise	1
Everllence	293
Fairbanks Morse	7
Fiat	27
Fredriksstad	1
Fuji Diesel	2
Gardner L & Sons	3
Gen. Motors	29
General Electric	19
Grandi Motori	15
Gray	1
Grenaa	1
Guangzhou Diesel	45
Guascor	3
Hanshin	22
Hedemora	1
HHI-EMD (HiMSEN)	5
HHM	9
Ikegai	2
Isotta Fraschini	4
Iveco	12
J-ENG	1
Jinan Diesel	3
John Deere	5
Jonkopings	1
Kelvin	3
Kromhout	9
Leclanche	4
Lister Petter	1
Lugger	1
MaK	123
Makita	12
Matsui	1
Mirrlees	12
Mitsubishi	160
Mitsui - MES	1
Moteurs Baudouin	54
MTU	544
MWM	78
National Gas	1
Newbury	1
Niigata	103
Ningbo C.S.I. Power	31
Nohab	4
Normo	26
Paxman	6
Penzadizelmash	4
Perkins	1
Pielstick	149
Polar	15
Poyaud	1
Rolls-Royce Marine	2
Ruston	36
SACM	2
Scania	87
Siemens Energy	8
Skinner Unaflow	1
SKL	18
Solar	10
Stork	2
Stork Werkspoor	6
Stork-Wartsila	3
Sulzer	92
Textron Lycoming	1
Torpedo - Tvornica	1
Ulstein Bergen	5
Uniflow	1
(unknown)	245
Volvo Penta	86
Wartsila 4-stroke	251
Weichai HM	30
Weichai Power	1
Weifang Diesel	4
Werkspoor	5
Westinghouse	1
Wichmann	67
Yanmar	303
Yuchai Marine Power	2
ZEM	2
Zichai Power	47
Total	**4099**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

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Table 12.4-7 General Overview of Ferries Fleet – by 4th GHG IMO Size Class by year of Build (Group) and by Number

	IMO GHG Size Class (dwt)					
Year of Build Group	1 0-1,999	2 2,000-4,999	3 5,000–9,999	4 10,000–19,999	5 20,000+	Total
1970 & before	244	36	8	-	1	289
1971-1975	112	31	18	12	1	174
1976-1980	122	31	15	19	6	193
1981-1985	110	30	15	18	9	182
1986-1990	214	68	15	15	32	344
1991-1995	195	70	25	37	40	367
1996-2000	189	70	38	38	35	370
2001-2005	205	58	27	31	66	387
2006-2010	199	75	26	21	59	380
2011-2015	268	88	52	26	22	456
2016-2020	360	136	49	43	25	613
2021-2025	180	76	25	20	43	344
Total	**2398**	**769**	**313**	**280**	**339**	**4099**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.4-8 General Overview of Ferries Fleet – by 4th GHG IMO Size Class by year of Build (Group) and GT

	IMO GHG Size Class (dwt)					
Year of Build Group	1 0-1,999	2 2,000-4,999	3 5,000–9,999	4 10,000–19,999	5 20,000+	Total
1970 & before	156343	99219	58068	-	38216	351846
1971-1975	94132	93724	130006	150719	22528	491109
1976-1980	101755	92206	109077	278756	134368	716162
1981-1985	93140	84768	96393	255360	253383	783044
1986-1990	134115	217456	109360	210433	995776	1667140
1991-1995	116010	217240	183501	537513	1155718	2209982
1996-2000	135003	225080	247709	536325	1051828	2195945
2001-2005	145832	174457	200678	453400	2292618	3266985
2006-2010	132212	197472	167970	314164	1994224	2806042
2011-2015	173978	200830	375992	338321	744279	1833400
2016-2020	248100	320254	370254	590226	833454	2362288
2021-2025	125969	167355	186619	289399	1883794	2653136
Total	**1656589**	**2090061**	**2235627**	**3954616**	**11400186**	**21337079**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.4-9 General Overview of Ferries Fleet – by 4th GHG IMO Size Class by year of Build (Group) and DWT

	IMO GHG Size Class (dwt)					
Year of Build Group	1 0-1,999	2 2,000-4,999	3 5,000–9,999	4 10,000–19,999	5 20,000+	Total
1970 & before	57011	35084	12733	-	13016	117844
1971-1975	40902	32086	30103	45570	3335	151996
1976-1980	45088	32294	45914	72952	34183	230431
1981-1985	37105	31770	31774	63759	28749	193157
1986-1990	48615	74867	33271	56926	186524	400203
1991-1995	32570	42218	51769	171455	256798	554810
1996-2000	37675	54145	50365	137807	231729	511721
2001-2005	46107	35345	43196	128503	431222	684373
2006-2010	51118	49955	28736	72957	431992	634758
2011-2015	62416	64645	97600	90592	161360	476613
2016-2020	90113	97921	101670	204812	173351	667867
2021-2025	39961	58056	53840	88568	356852	597277
Total	**588681**	**608385**	**580971**	**1133901**	**2309111**	**5221049**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.4-10 General Overview of Ferries Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Average) mid of 2025

	IMO GHG Size Class (dwt)					
Year of Build Group	1 0-1,999	2 2,000-4,999	3 5,000–9,999	4 10,000–19,999	5 20,000+	Total
1970 & before	12	15	17	-	35	13
1971-1975	13	16	19	19	25	15
1976-1980	14	16	18	18	20	15
1981-1985	14	16	17	18	20	15
1986-1990	21	16	17	19	20	19
1991-1995	26	19	18	19	21	22
1996-2000	25	25	32	21	24	25
2001-2005	19	19	24	22	26	21
2006-2010	21	17	25	23	23	21
2011-2015	18	14	17	21	21	18
2016-2020	22	14	17	20	21	20

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2021-2025	25	15	18	31	22	22
Total	**20**	**17**	**21**	**21**	**23**	**20**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.4-11 General Overview of Ferries Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Minimum) mid of 2025

	IMO GHG Size Class (dwt)					
Year of Build Group	**1 0-1,999**	**2 2,000-4,999**	**3 5,000–9,999**	**4 10,000–19,999**	**5 20,000+**	**Total**
1970 & before	7	10	14	-	35	7
1971-1975	9	11	17	16	25	9
1976-1980	8	11	13	12	17	8
1981-1985	9	12	15	14	17	9
1986-1990	7	11	14	17	15	7
1991-1995	9	11	8	10	14	8
1996-2000	5	10	8	12	18	5
2001-2005	6	10	8	15	18	6
2006-2010	8	8	13	16	17	8
2011-2015	8	5	13	13	16	5
2016-2020	7	8	10	10	17	7
2021-2025	9	10	14	18	17	9
Total	**5**	**5**	**8**	**10**	**14**	**5**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.4-12 General Overview of Ferries Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Maximum) mid of 2025

	IMO GHG Size Class (dwt)					
Year of Build Group	**1 0-1,999**	**2 2,000-4,999**	**3 5,000–9,999**	**4 10,000–19,999**	**5 20,000+**	**Total**
1970 & before	18	19	21	-	35	35
1971-1975	20	21	22	22	25	25
1976-1980	30	19	21	22	26	30
1981-1985	31	27	21	24	22	31
1986-1990	50	35	22	23	24	50
1991-1995	45	45	30	25	26	45
1996-2000	58	47	45	40	32	58
2001-2005	42	48	46	40	32	48
2006-2010	43	52	48	40	29	52
2011-2015	41	20	50	47	28	50
2016-2020	40	37	38	40	27	40
2021-2025	40	42	40	40	27	42
Total	**58**	**52**	**50**	**47**	**35**	**58**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.4-13 General Overview of Ferries Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Median) mid of 2025

	IMO GHG Size Class (dwt)					
Year of Build Group	**1 0-1,999**	**2 2,000-4,999**	**3 5,000–9,999**	**4 10,000–19,999**	**5 20,000+**	**Total**
1970 & before	12	15	17	-	35	35
1971-1975	13	17	19	19	25	25
1976-1980	13	16	18	19	20	20
1981-1985	13	16	17	18	20	20
1986-1990	14	15	16	18	21	21
1991-1995	25	15	17	19	20	25
1996-2000	20	20	37	19	22	37
2001-2005	13	15	21	22	23	23
2006-2010	14	15	21	22	22	22
2011-2015	14	14	16	18	22	22
2016-2020	16	14	15	20	21	21
2021-2025	23	14	16	28	21	28
Total	**25**	**20**	**37**	**28**	**35**	**37**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.4-14 General Overview of Ferries Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Modus) mid of 2025

	IMO GHG Size Class (dwt)					
Year of Build Group	**1 0-1,999**	**2 2,000-4,999**	**3 5,000–9,999**	**4 10,000–19,999**	**5 20,000+**	**Total**
1970 & before	12	17	17	-	35	35
1971-1975	15	17	19	19	25	25

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1976-1980	12	18	18	19	…	19
1981-1985	12	12	15	17	19	19
1986-1990	12	14	14	17	22	22
1991-1995	38	12	14	20	20	38
1996-2000	12	36	38	18	24	38
2001-2005	12	14	38	19	22	38
2006-2010	12	12	37	16	22	37
2011-2015	12	12	13	15	22	22
2016-2020	12	14	15	22	21	22
2021-2025	30	14	16	35	20	35
Total	**38**	**36**	**38**	**35**	**35**	**38**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.4-15 General Overview of Ferries Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Average) mid of 2025

	IMO GHG Size Class (dwt)					
Year of Build Group	**1 0-1,999**	**2 2,000-4,999**	**3 5,000–9,999**	**4 10,000–19,999**	**5 20,000+**	**Total**
1970 & before	1019	3604	6160	-	-	1476
1971-1975	1583	4442	9106	11578	33539	3717
1976-1980	1569	3898	9087	13933	18817	4353
1981-1985	1638	3529	7446	13697	20252	4664
1986-1990	2189	3684	7147	13465	21583	5005
1991-1995	2857	5509	8855	13611	22028	7012
1996-2000	3551	11222	21340	20339	30725	11245
2001-2005	2782	5684	16611	20602	38893	12165
2006-2010	3002	4699	16033	19736	29682	9821
2011-2015	1880	3058	7343	14720	25888	4802
2016-2020	2223	2830	8149	15247	27362	4987
2021-2025	3109	2909	9234	23418	31331	8994
Total	**2290**	**4591**	**11038**	**16697**	**29275**	**6807**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.4-16 General Overview of Ferries Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Minimum) mid of 2025

	IMO GHG Size Class (dwt)					
Year of Build Group	**1 0-1,999**	**2 2,000-4,999**	**3 5,000–9,999**	**4 10,000–19,999**	**5 20,000+**	**Total**
1970 & before	184	672	3062	-	-	184
1971-1975	416	1030	3709	7355	33539	416
1976-1980	258	1178	3383	7760	12708	258
1981-1985	294	1104	4413	8584	15225	294
1986-1990	368	883	2560	6178	9416	368
1991-1995	210	600	1305	5280	7920	210
1996-2000	95	1200	2250	4003	5940	95
2001-2005	378	1080	2500	6000	18000	378
2006-2010	110	578	2647	5000	7104	110
2011-2015	180	676	1250	4080	7104	180
2016-2020	110	169	2336	1470	14000	110
2021-2025	100	100	2560	5296	1392	100
Total	**95**	**100**	**1250**	**1470**	**1392**	**95**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.4-17 General Overview of Ferries Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Maximum) mid of 2025

	IMO GHG Size Class (dwt)					
Year of Build Group	**1 0-1,999**	**2 2,000-4,999**	**3 5,000–9,999**	**4 10,000–19,999**	**5 20,000+**	**Total**
1970 & before	4707	8149	13333	-	-	13333
1971-1975	6178	10297	20983	18125	33539	33539
1976-1980	5340	8826	15089	24120	33539	33539
1981-1985	8708	6620	12356	30600	25816	30600
1986-1990	8000	14591	19564	29268	40208	40208
1991-1995	8947	21986	24947	25500	34127	34127
1996-2000	34001	33993	37764	71446	67195	71446
2001-2005	9640	28786	34512	53310	67200	67200
2006-2010	9860	25979	37916	37440	57780	57780
2011-2015	10742	12250	45760	36540	69180	69180
2016-2020	9360	20088	39388	38104	53227	53227
2021-2025	12154	23488	39388	39420	50400	50400
Total	**34001**	**33993**	**45760**	**71446**	**69180**	**71446**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

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Table 12.4-18 General Overview of Ferries Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Median) mid of 2025

	IMO GHG Size Class (dwt)					
Year of Build Group	1 0-1,999	2 2,000-4,999	3 5,000–9,999	4 10,000–19,999	5 20,000+	Total
1970 & before	804	2989	5902	-	-	5902
1971-1975	1062	3883	5884	10591	33539	33539
1976-1980	1251	3678	8605	12474	16115	16115
1981-1985	1210	3490	7129	12474	22948	22948
1986-1990	1877	2664	4500	12157	19600	19600
1991-1995	2206	2889	6710	11610	23037	23037
1996-2000	2206	6615	23866	14022	42239	42239
2001-2005	1619	3728	15036	18479	50400	50400
2006-2010	2026	3214	10205	16146	40637	40637
2011-2015	1454	2465	5950	10381	39760	39760
2016-2020	1916	2648	5999	14940	44400	44400
2021-2025	2640	2464	5970	17140	37650	37650
Total	**2640**	**6615**	**23866**	**18479**	**50400**	**50400**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.4-19 General Overview of Ferries Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Modus) mid of 2025

	IMO GHG Size Class (dwt)					
Year of Build Group	1 0-1,999	2 2,000-4,999	3 5,000–9,999	4 10,000–19,999	5 20,000+	Total
1970 & before	662	5884	…	-	-	5884
1971-1975	1472	4707	5884	10591	33539	33539
1976-1980	1104	5560	8605	11768	…	11768
1981-1985	1472	3678	4413	8584	…	8584
1986-1990	1030	2560	3199	8584	29420	29420
1991-1995	4000	882	3200	7200	36000	36000
1996-2000	4000	24000	28800	14004	46078	46078
2001-2005	1324	2206	28317	11600	91740	91740
2006-2010	9640	2206	28800	37440	30600	37440
2011-2015	660	5000	2938	4080	75600	75600
2016-2020	2880	3533	5540	14940	62400	62400
2021-2025	736	3327	5970	7040	23520	23520
Total	**9640**	**24000**	**28800**	**37440**	**91740**	**91740**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

12.5. Cruise/Passenger Fleet - Ro-Ro

Table 12.5-1 General Overview of Ro-Ro Fleet – by Status

Status	Number of Ships
Damaged/Not in Service	4
Idle	84
In Service	640
Laid Up	10
Repairs	7
Total	**745**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.5-2 General Overview of Ro-Ro Fleet – by Carrier Type

Carrier type	Number of Ships
Ro-Ro	578
Ro-Ro/Container	88
Ro-Ro/Lo-Lo	79
Total	**745**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.5-3 General Overview of Ro-Ro Fleet – by Year of Build Group

Year of Build Group	Number of Ships
1970 and before	14
1971-1975	26
1976-1980	62
1981-1985	56
1986-1990	44
1991-1995	49

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1996-2000	108
2001-2005	76
2006-2010	86
2011-2015	90
2016-2020	77
2021-2025	57
Total	**745**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.5-4 General Overview of Ro-Ro Fleet – by 4th GHG IMO Size Class

4th GHG IMO Size Class	Number of Ships
1 0-4,999	97
2 5,000-9,999	213
3 10,000-14,999	171
4 15,000+	263
(unknown)	1
Total	**745**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.5-5 General Overview of Ro-Ro Fleet – by Type of Power Type Group and by Number

Power Type Group	Number of Ships
Batteries & Diesel	16
Batteries propulsion	2
Diesel 2-Stroke	249
Diesel 4-Stroke	470
Diesel Electric	6
Hybrid Mech./Elec.	2
Total	**745**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.5-6 General Overview of Ro-Ro Fleet – by Type of Main Engine Design and by Number

Main Engine Designer	Number of Ships
A.B.C.	2
Akasaka	1
B. & W. Alpha	4
Bergen Normo	2
Caterpillar	22
Crepelle	3
Cummins Inc	7
Daihatsu	5
Deutz	16
Everllence B. & W.	263
Fiat	2
Gen. Motors	9
Grandi Motori	2
Guangzhou Diesel	4
Hanshin	15
Hedemora	1
HHI-EMD (HiMSEN)	1
Ito	1
J-ENG	3
Kelvin	1
MaK	100
Makita	1
Mirrlees	1
Mitsubishi	26
MTU	1
MWM	5
Niigata	5
Ningbo C.S.I. Power	1
Normo	2
Pielstick	28
Polar	6
Scania	1
SKL	9
Stork	1
Sulzer	37
Volvo Penta	2
Wartsila 2-stroke	15
Wartsila 4-stroke	100
Weichai	3
Werkspoor	2
Wichmann	9
WinGD	4
Yanmar	9

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Zichai Power	4
(unknown)	9
Total	**745**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.5-7 General Overview of Ro-Ro Fleet – by 4th GHG IMO Size Class by year of Build (Group) and by Number

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-4999**	**2 5000-9999**	**3 10000-14999**	**4 15000+**	**Total**
1970 & before	10	4	-	-	14
1971-1975	12	14	-	-	26
1976-1980	12	41	3	6	62
1981-1985	11	30	10	5	56
1986-1990	6	23	8	7	44
1991-1995	10	19	17	3	49
1996-2000	8	24	43	33	108
2001-2005	6	6	28	36	76
2006-2010	10	15	15	46	86
2011-2015	3	13	15	58	89
2016-2020	6	13	22	36	77
2021-2025	3	11	10	33	57
Total	**97**	**213**	**171**	**263**	**744**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.5-8 General Overview of Ro-Ro Fleet – by 4th GHG IMO Size Class by year of Build (Group) and GT

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-4999**	**2 5000-9999**	**3 10000-14999**	**4 15000+**	**Total**
1970 & before	14367	12656	-	-	27023
1971-1975	20108	67986	-	-	88094
1976-1980	24439	201975	36467	99854	362735
1981-1985	14143	172951	101664	106150	394908
1986-1990	22172	140478	82752	140652	386054
1991-1995	13086	134773	160942	47529	356330
1996-2000	6332	230700	529031	1149850	1915913
2001-2005	5741	83005	421894	1228985	1739625
2006-2010	11007	163838	190532	1478936	1844313
2011-2015	3581	154922	191029	2636152	2985684
2016-2020	5142	100052	257310	1757491	2119995
2021-2025	2318	73942	116442	1894023	2086725
Total	**142436**	**1537278**	**2088063**	**10539622**	**14307399**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.5-9 General Overview of Ro-Ro Fleet – by 4th GHG IMO Size Class by year of Build (Group) and DWT

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-4999**	**2 5000-9999**	**3 10000-14999**	**4 15000+**	**Total**
1970 & before	10537	11246	-	-	21783
1971-1975	14674	46233	-	-	60907
1976-1980	12840	147373	27399	72910	260522
1981-1985	11404	115103	78390	73867	278764
1986-1990	6330	89796	61858	90091	248075
1991-1995	10339	82418	130597	40758	264112
1996-2000	4260	123575	343494	599500	1070829
2001-2005	4772	30511	227678	616242	879203
2006-2010	8006	73784	112326	729506	923622
2011-2015	1723	62635	101447	1433981	1599786
2016-2020	3942	53475	154235	805003	1016655
2021-2025	1800	43858	69891	765299	880848
Total	**90627**	**880007**	**1307315**	**5227157**	**7505106**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.5-10 General Overview of Ro-Ro Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Average) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-4999**	**2 5000-9999**	**3 10000-14999**	**4 15000+**	**Total**
1970 & before	14	14	-	-	14

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1971-1975	14	15	-	-	15
1976-1980	14	14	16	18	15
1981-1985	14	14	14	17	14
1986-1990	16	15	16	17	16
1991-1995	13	18	16	15	16
1996-2000	8	18	18	20	18
2001-2005	12	19	20	19	19
2006-2010	11	17	18	21	19
2011-2015	11	18	20	20	19
2016-2020	11	16	20	20	18
2021-2025	-	14	15	19	18
Total	**13**	**16**	**18**	**20**	**17**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.5-11 General Overview of Ro-Ro Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Minimum) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1** **0-4999**	**2** **5000-9999**	**3** **10000-14999**	**4** **15000+**	**Total**
1970 & before	11	12	-	-	11
1971-1975	12	12	-	-	12
1976-1980	10	9	15	15	9
1981-1985	11	10	11	15	10
1986-1990	12	11	15	14	11
1991-1995	9	15	11	15	9
1996-2000	7	14	13	16	7
2001-2005	10	11	10	14	10
2006-2010	9	10	10	18	9
2011-2015	10	12	12	16	10
2016-2020	10	11	11	14	10
2021-2025	...	12	14	14	12
Total	**7**	**9**	**10**	**14**	**7**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.5-12 General Overview of Ro-Ro Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Maximum) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1** **0-4999**	**2** **5000-9999**	**3** **10000-14999**	**4** **15000+**	**Total**
1970 & before	17	17	-	-	17
1971-1975	15	19	-	-	19
1976-1980	16	20	17	21	21
1981-1985	18	17	19	20	20
1986-1990	18	20	21	20	21
1991-1995	20	22	21	16	22
1996-2000	9	30	23	22	30
2001-2005	18	25	26	24	26
2006-2010	13	22	24	26	26
2011-2015	11	24	25	22	25
2016-2020	13	23	25	23	25
2021-2025	...	17	15	21	21
Total	**20**	**30**	**26**	**26**	**30**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.5-13 General Overview of Ro-Ro Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Median) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1** **0-4999**	**2** **5000-9999**	**3** **10000-14999**	**4** **15000+**	**Total**
1970 & before	13	13	-	-	13
1971-1975	14	16	-	-	16
1976-1980	14	14	16	18	18
1981-1985	14	14	14	17	17
1986-1990	17	15	15	17	17
1991-1995	11	17	16	15	17
1996-2000	...	17	18	20	20
2001-2005	10	21	22	19	22
2006-2010	10	17	17	21	21
2011-2015	...	18	23	20	23
2016-2020	12	16	21	20	21
2021-2025	...	12	15	21	21
Total	**17**	**21**	**23**	**21**	**23**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

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Table 12.5-14 General Overview of Ro-Ro Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Modus) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	1 0-4999	2 5000-9999	3 10000-14999	4 15000+	Total
1970 & before	13	…	-	-	13
1971-1975	14	15	-	-	15
1976-1980	10	14	15	19	19
1981-1985	14	16	15	…	16
1986-1990	…	14	15	…	15
1991-1995	11	17	17	…	17
1996-2000	…	19	20	20	20
2001-2005	11	23	22	18	23
2006-2010	11	22	22	20	22
2011-2015	…	21	17	21	21
2016-2020	12	16	23	18	23
2021-2025	…	12	15	21	21
Total	**14**	**23**	**23**	**21**	**23**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.5-15 General Overview of Ro-Ro Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Average) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	1 0-4999	2 5000-9999	3 10000-14999	4 15000+	Total
1970 & before	6414	5001	-	-	6414
1971-1975	3163	6620	-	-	6620
1976-1980	2206	6615	11768	13974	13974
1981-1985	4119	5399	16000	17186	17186
1986-1990	5972	9929	14389	16288	16288
1991-1995	5002	10628	11555	9049	11555
1996-2000	882	47660	16989	32400	47660
2001-2005	2568	16920	36560	45600	45600
2006-2010	2938	16800	19125	43200	43200
2011-2015	1830	16000	15923	22890	22890
2016-2020	2088	12200	15930	31870	31870
2021-2025	810	11040	15930	32040	32040
Total	**6414**	**47660**	**36560**	**45600**	**47660**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.5-16 General Overview of Ro-Ro Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Minimum) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	1 0-4999	2 5000-9999	3 10000-14999	4 15000+	Total
1970 & before	972	956	-	-	956
1971-1975	919	1788	-	-	919
1976-1980	405	1324	6355	5913	405
1981-1985	883	599	2868	5737	599
1986-1990	1472	1987	2953	6609	1472
1991-1995	591	2868	3018	4010	591
1996-2000	478	2574	3882	4192	478
2001-2005	692	4000	1451	4440	692
2006-2010	800	1990	1450	8050	800
2011-2015	700	2206	4720	10080	700
2016-2020	736	1200	2206	3630	736
2021-2025	810	1600	4000	3630	810
Total	**405**	**599**	**1450**	**3630**	**405**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.5-17 General Overview of Ro-Ro Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Maximum) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	1 0-4999	2 5000-9999	3 10000-14999	4 15000+	Total
1970 & before	6414	5001	-	-	6414
1971-1975	3163	6620	-	-	6620
1976-1980	2206	6615	11768	13974	13974

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1981-1985	4119	5399	16000	17186	17186
1986-1990	5972	9929	14389	16288	16288
1991-1995	5002	10628	11555	9049	11555
1996-2000	882	47660	16989	32400	47660
2001-2005	2568	16920	36560	45600	45600
2006-2010	2938	16800	19125	43200	43200
2011-2015	1830	16000	15923	22890	22890
2016-2020	2088	12200	15930	31870	31870
2021-2025	810	11040	15930	32040	32040
Total	**6414**	**47660**	**36560**	**45600**	**47660**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.5-18 General Overview of Ro-Ro Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Median) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1** **0-4999**	**2** **5000-9999**	**3** **10000-14999**	**4** **15000+**	**Total**
1970 & before	1178	2942	-	-	2942
1971-1975	1765	3527	-	-	3527
1976-1980	1765	3310	6546	12000	12000
1981-1985	2206	3310	3599	13199	13199
1986-1990	2391	3592	4800	7197	7197
1991-1995	1280	5428	4889	7620	7620
1996-2000	622	7499	9840	15544	15544
2001-2005	794	6230	13590	18272	18272
2006-2010	1204	8000	8000	19042	19042
2011-2015	984	4250	13280	19027	19027
2016-2020	736	8235	14400	19815	19815
2021-2025	1630	4170	13580	20160	20160
Total	**2391**	**8235**	**14400**	**20160**	**20160**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.5-19 General Overview of Ro-Ro Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Modus) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1** **0-4999**	**2** **5000-9999**	**3** **10000-14999**	**4** **15000+**	**Total**
1970 & before	810	…	-	-	810
1971-1975	1765	5884	-	-	5884
1976-1980	1765	3310	…	5913	5913
1981-1985	2648	5296	2868	13199	13199
1986-1990	…	2960	3199	6620	6620
1991-1995	1280	4472	5296	…	5296
1996-2000	1677	7499	5760	13199	13199
2001-2005	…	16920	16199	12600	16920
2006-2010	…	16800	6000	25200	25200
2011-2015	…	16000	14940	22890	22890
2016-2020	736	7830	15930	19200	19200
2021-2025	…	1600	4000	25560	25560
Total	**2648**	**16920**	**16199**	**25560**	**25560**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.5-20 General Overview of Ro-Ro Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Average) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1** **0-4999**	**2** **5000-9999**	**3** **10000-14999**	**4** **15000+**	**Total**
1970 & before	-	-	-	-	-
1971-1975	-	-	-	-	-
1976-1980	-	-	-	-	-
1981-1985	…	176	…	…	176
1986-1990	176	174	175	176	175
1991-1995	…	172	175	…	173
1996-2000	…	181	177	174	177
2001-2005	…	176	176	175	176
2006-2010	…	177	178	175	176
2011-2015	…	182	171	172	174
2016-2020	202	178	172	174	174
2021-2025	195	187	173	170	173
Total	**187**	**179**	**175**	**173**	**175**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

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Table 12.5-21 General Overview of Ro-Ro Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Minimum) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	1 0-4999	2 5000-9999	3 10000-14999	4 15000+	Total
1970 & before	-	-	-	-	-
1971-1975	-	-	-	-	-
1976-1980	-	-	-	-	-
1981-1985	…	176	…	…	176
1986-1990	175	170	175	176	170
1991-1995	…	170	174	…	170
1996-2000	…	181	170	173	170
2001-2005	…	171	171	171	171
2006-2010	…	171	171	170	170
2011-2015	…	170	168	169	168
2016-2020	202	170	170	166	166
2021-2025	195	176	170	166	166
Total	**175**	**170**	**168**	**166**	**166**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.5-22 General Overview of Ro-Ro Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Maximum) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	1 0-4999	2 5000-9999	3 10000-14999	4 15000+	Total
1970 & before	-	-	-	-	-
1971-1975	-	-	-	-	-
1976-1980	-	-	-	-	-
1981-1985	…	176	…	…	176
1986-1990	177	176	175	176	177
1991-1995	…	175	175	…	175
1996-2000	…	181	181	176	181
2001-2005	…	179	181	178	181
2006-2010	…	181	188	178	188
2011-2015	…	190	181	184	198
2016-2020	202	198	184	184	202
2021-2025	195	198	188	184	198
Total	**202**	**198**	**188**	**184**	**202**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.5-23 General Overview of Ro-Ro Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Median) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	1 0-4999	2 5000-9999	3 10000-14999	4 15000+	Total
1970 & before	-	-	-	-	-
1971-1975	-	-	-	-	-
1976-1980	-	-	-	-	-
1981-1985	…	176	…	…	176
1986-1990	…	173	175	176	176
1991-1995	…	172	175	…	175
1996-2000	…	181	178	174	181
2001-2005	…	179	178	176	179
2006-2010	…	179	178	175	179
2011-2015	…	184	170	170	184
2016-2020	202	172	170	170	202
2021-2025	195	185	170	166	195
Total	**202**	**185**	**178**	**176**	**202**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.5-24 General Overview of Ro-Ro Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Modus) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	1 0-4999	2 5000-9999	3 10000-14999	4 15000+	Total
1970 & before	-	-	-	-	-
1971-1975	-	-	-	-	-
1976-1980	-	-	-	-	-
1981-1985	…	176	…	…	176
1986-1990	…	170	175	176	176
1991-1995	…	170	175	…	175

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1996-2000	…	181	181	174	181
2001-2005	…	179	178	178	179
2006-2010	…	179	181	178	181
2011-2015	…	184	170	170	184
2016-2020	202	170	170	170	202
2021-2025	195	185	170	166	195
Total	**202**	**185**	**181**	**178**	**202**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

12.6. *Tanker – Oil Tanker*

Table 12.6-1 General Overview of Oil Tanker Fleet – by Status

Status	Number of Ships
Damaged/Not in Service	6
Dedicated Storage	17
Detained	2
Idle	144
In Service	2137
Laid Up	8
Repairs	9
Storage	37
Total	**2360**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.6-2 General Overview of Oil Tanker Fleet – by Carrier Type

Carrier Type	Number of Ships
Oil Recovery Tanker	2
Oil Transfer Vessel	2
Shuttle Tanker	104
Tanker	2252
Total	**2360**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.6-3 General Overview of Oil Tanker Fleet – by Year of Build Group

Year of Build Group	Number of Ships
1970 and before	8
1971-1975	9
1976-1980	11
1981-1985	17
1986-1990	14
1991-1995	12
1996-2000	97
2001-2005	388
2006-2010	548
2011-2015	426
2016-2020	559
2021-2025	271
Total	**2360**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.6-4 General Overview of Oil Tanker Fleet – by 4th GHG IMO Size Class

4th GHG IMO Size Class	Number of Ships
1 0-4,999	56
2 5,000-9,999	22
3 10,0000-19,999	34
4 20,000-59,999	26
5 60,000-79,999	64
6 80,000-119,999	637
7 120,000-199,999	646
8 200,000+	875
Total	**2360**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.6-5 General Overview of Oil Tanker Fleet – Engine Derived Power Type

Engine Derived Power Type	Number of Ships
Batteries & Diesel	8
Combined	1
Diesel 2-Stroke	2247
Diesel 4-Stroke	85
Diesel Electric	18
(no type)	1
Total	**2360**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

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Table 12.6-6 General Overview of Oil Tanker Fleet –Main Engine Designer

Main Engine Designer	Number of Ships
Akasaka	6
Bergen	2
Caterpillar	2
Cummins Inc	3
Daihatsu Infinearth	10
Deutz	1
Dvigatel Revolyutsii	1
Everllence B. & W.	1861
Guangzhou Diesel	1
Hanshin	17
Ito	1
MaK	1
Mitsubishi	22
Niigata	3
Ningbo C.S.I. Power	1
SKL	6
Skoda	3
Sulzer	97
Unknown	8
Wartsila 2-stroke	159
Wartsila 4-stroke	24
WinGD	124
Yanmar	5
Zichai Power	1
(unknown)	1
Total	**2360**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.6-7 General Overview of Oil Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and by Number

	IMO GHG Size Class (dwt)								
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**4 10,000–19,999**	**4 20,000–59,999**	**5 60,000–79,999**	**6 80,000–119,999**	**7 120,000-199,999**	**8 200,000+**	**Total**
1991-1995	…	1	…	1	…	7	3	…	12
1996-2000	7	1	10	…	4	16	23	36	97
2001-2005	…	…	4	1	21	151	88	123	388
2006-2010	1	…	6	6	24	189	134	188	548
2011-2015	5	7	…	3	3	85	138	185	426
2016-2020	3	4	1	11	11	123	165	241	559
2021-2025	2	1	2	2	1	66	95	102	271
Total	**56**	**22**	**34**	**26**	**64**	**637**	**646**	**875**	**2360**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.6-8 General Overview of Oil Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and GT

	IMO GHG Size Class (dwt)								
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**4 10,000–19,999**	**4 20,000–59,999**	**5 60,000–79,999**	**6 80,000–119,999**	**7 120,000-199,999**	**8 200,000+**	**Total**
1970 & before	7235	…	6599	…	…	…	…	…	13834
1971-1975	2873	6021	15614	…	…	…	…	…	24508
1976-1980	10470	2872	35900	19653	…	…	…	…	68895
1981-1985	12380	7520	62417	…	…	…	…	…	82317
1986-1990	13441	10127	…	26356	…	…	…	…	49924
1991-1995	…	2528	…	25060	…	381032	234777	…	643397
1996-2000	10081	3675	133970	…	163740	919220	1840022	5633537	8704245
2001-2005	…	…	28896	24916	826410	8930524	7301409	19770921	36883076
2006-2010	2630	…	49428	142424	1013172	11299949	11129954	30080810	53718367
2011-2015	15281	30860	…	103240	132233	5191732	11325990	29916745	46716081
2016-2020	13998	15580	14750	412676	451173	7668059	13638802	38279624	60494662
2021-2025	2258	4498	23281	32726	50531	4161888	7943317	16135580	28354079
Total	**90647**	**83681**	**370855**	**787051**	**2637259**	**38552404**	**53414271**	**139817217**	**235753385**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.6-9 General Overview of Oil Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and DWT

	IMO GHG Size Class (dwt)								
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**4 10,000–19,999**	**4 20,000–59,999**	**5 60,000–79,999**	**6 80,000–119,999**	**7 120,000-199,999**	**8 200,000+**	**Total**
1970 & before	12818	…	11297	…	…	…	…	…	24115
1971-1975	5683,23	10810	24668	…	…	…	…	…	41161
1976-1980	17243	5324	49025	36504	…	…	…	…	108096

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1981-1985	19950	11103	91337	…	…	…	…	…	122390
1986-1990	21953,04	16728	…	35644	…	…	…	…	74325,04
1991-1995	…	5504	…	40406	…	692213	422679	…	1160802
1996-2000	16762	5522	173312	…	285341	1670492	3505682	10724460	16381571
2001-2005	…	…	49471	35181	1460926	16267588	13911914	37884143	69609223
2006-2010	3330	…	81780	224232	1696363	20810199	21279515	58068594	102164013
2011-2015	22553	45877	…	165317	223754	9313420	21475823	57764033	89010777
2016-2020	10190	26082	17500	437134	707102	13888801	25630537	74042051	114759397
2021-2025	3359	5437	31259	49423	69323	7481152	14871897	31160704	53672554
Total	**133841**	**132387**	**529649**	**1023841**	**4442809**	**70123865**	**101098047**	**269643985**	**447128424**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.6-10 General Overview of Oil Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Average) mid of 2025

	IMO GHG Size Class (dwt)								
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**4 10,000–19,999**	**4 20,000–59,999**	**5 60,000–79,999**	**6 80,000–119,999**	**7 120,000-199,999**	**8 200,000+**	**Total**
1970 & before	11	…	15	…	…	…	…	…	12
1971-1975	10	13	11	…	…	…	…	…	11
1976-1980	13	13	13	16	…	…	…	…	13
1981-1985	11	12	14	…	…	…	…	…	12
1986-1990	12	12	…	14	…	…	…	…	12
1991-1995	…	10	…	14	…	15	15	…	15
1996-2000	12	13	13	…	15	14	15	16	15
2001-2005	…	…	11	15	15	15	15	15	15
2006-2010	11	…	11	14	15	15	15	15	15
2011-2015	11	10	…	14	15	15	15	16	15
2016-2020	9	11	13	15	14	14	15	15	15
2021-2025	…	13	13	13	16	14	14	15	14
Total	**11**	**11**	**12**	**14**	**15**	**15**	**15**	**15**	**15**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.6-11 General Overview of Oil Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Minimum) mid of 2025

	IMO GHG Size Class (dwt)								
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**4 10,000–19,999**	**4 20,000–59,999**	**5 60,000–79,999**	**6 80,000–119,999**	**7 120,000-199,999**	**8 200,000+**	**Total**
1970 & before	9	…	15	…	…	…	…	…	9
1971-1975	8	13	11	…	…	…	…	…	8
1976-1980	12	13	13	16	…	…	…	…	12
1981-1985	10	11	13	…	…	…	…	…	10
1986-1990	10	8	…	14	…	…	…	…	8
1991-1995	…	10	…	14	…	13	14	…	10
1996-2000	10	13	11	…	15	10	14	14	10
2001-2005	…	…	11	15	12	10	9	10	9
2006-2010	11	…	10	13	14	11	11	11	10
2011-2015	10	8	…	14	15	13	11	8	8
2016-2020	9	11	13	13	14	11	12	11	9
2021-2025	…	13	13	13	16	11	11	11	11
Total	**8**	**8**	**10**	**13**	**12**	**10**	**9**	**8**	**8**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.6-12 General Overview of Oil Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Maximum) mid of 2025

	IMO GHG Size Class (dwt)								
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**4 10,000–19,999**	**4 20,000–59,999**	**5 60,000–79,999**	**6 80,000–119,999**	**7 120,000-199,999**	**8 200,000+**	**Total**
1970 & before	13	…	15	…	…	…	…	…	15
1971-1975	11	14	11	…	…	…	…	…	14
1976-1980	14	13	13	16	…	…	…	…	16
1981-1985	14	13	14	…	…	…	…	…	14
1986-1990	14	14	…	14	…	…	…	…	14
1991-1995	…	10	…	14	…	16	15	…	16
1996-2000	13	13	14	…	15	15	16	17	17
2001-2005	…	…	11	15	16	16	17	17	17
2006-2010	11	…	13	15	17	21	20	18	21
2011-2015	11	13	…	15	15	16	16	22	22
2016-2020	9	11	13	15	15	16	17	17	17
2021-2025	…	13	13	13	16	15	17	16	17
Total	**14**	**14**	**15**	**16**	**17**	**21**	**20**	**22**	**22**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.6-13 General Overview of Oil Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Median) mid of 2025

	IMO GHG Size Class (dwt)								

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Year of Build Group	1 0-4,999	2 5,000-9,999	4 10,000–19,999	4 20,000–59,999	5 60,000–79,999	6 80,000–119,999	7 120,000-199,999	8 200,000+	Total
1970 & before	11	…	15	…	…	…	…	…	15
1971-1975	10	13	11	…	…	…	…	…	13
1976-1980	13	13	13	16	…	…	…	…	16
1981-1985	12	12	14	…	…	…	…	…	14
1986-1990	11	14	…	14	…	…	…	…	14
1991-1995	…	10	…	14	…	16	15	…	16
1996-2000	12	13	13	…	15	15	15	16	16
2001-2005	…	…	11	15	15	15	15	16	16
2006-2010	11	…	10	15	15	15	15	16	16
2011-2015	11	11	…	14	15	15	15	16	16
2016-2020	9	11	13	15	15	15	15	15	15
2021-2025	…	13	13	13	16	15	15	15	16
Total	**13**	**14**	**15**	**16**	**16**	**16**	**15**	**16**	**16**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.6-14 General Overview of Oil Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Modus) mid of 2025

	IMO GHG Size Class (dwt)								
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**4 10,000–19,999**	**4 20,000–59,999**	**5 60,000–79,999**	**6 80,000–119,999**	**7 120,000-199,999**	**8 200,000+**	**Total**
1970 & before	11	…	15	…	…	…	…	…	15
1971-1975	…	…	11	…	…	…	…	…	11
1976-1980	13	…	13	16	…	…	…	…	16
1981-1985	12	…	14	…	…	…	…	…	14
1986-1990	…	…	…	14	…	…	…	…	14
1991-1995	…	10	…	14	…	16	15	…	16
1996-2000	13	13	13	…	15	15	15	15	15
2001-2005	…	…	11	15	15	15	15	16	16
2006-2010	11	…	10	15	15	15	16	16	16
2011-2015	11	11	…	…	15	15	16	16	16
2016-2020	9	11	13	15	15	15	15	15	15
2021-2025	…	13	…	13	16	14	15	15	16
Total	**13**	**13**	**15**	**16**	**16**	**16**	**16**	**16**	**16**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.6-15 General Overview of Oil Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Average) mid of 2025

	IMO GHG Size Class (dwt)								
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**4 10,000–19,999**	**4 20,000–59,999**	**5 60,000–79,999**	**6 80,000–119,999**	**7 120,000-199,999**	**8 200,000+**	**Total**
1970 & before	1006	…	5884	…	…	…	…	…	1703
1971-1975	476	2979	3678	…	…	…	…	…	2106
1976-1980	2022	2942	4531	8495	…	…	…	…	3514
1981-1985	1110	2096	5099	…	…	…	…	…	2399
1986-1990	1352	2972	…	6715	…	…	…	…	2138
1991-1995	…	2059	…	7281	…	17186	19803	…	15754
1996-2000	1572	2942	5061	…	9962	14194	18377	27799	18092
2001-2005	…	…	3104	13753	12131	15192	19583	30125	20630
2006-2010	3890	…	3050	10498	15710	16298	21225	32041	22647
2011-2015	2340	2639	…	16617	13862	18461	22123	32255	25143
2016-2020	10246	3704	7550	24403	10295	15402	21361	29592	23230
2021-2025	954	…	7255	6810	…	15847	23103	28748	23060
Total	**1962**	**2871**	**4580**	**16582**	**13118**	**16062**	**21399**	**30584**	**22265**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.6-16 General Overview of Oil Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Minimum) mid of 2025

	IMO GHG Size Class (dwt)								
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**4 10,000–19,999**	**4 20,000–59,999**	**5 60,000–79,999**	**6 80,000–119,999**	**7 120,000-199,999**	**8 200,000+**	**Total**
1970 & before	221	…	5884	…	…	…	…	…	221
1971-1975	331	2795	3678	…	…	…	…	…	331
1976-1980	691	2942	4531	8495	…	…	…	…	691
1981-1985	405	1765	3972	…	…	…	…	…	405
1986-1990	662	2295	…	6715	…	…	…	…	662
1991-1995	…	2059	…	7281	…	12180	13033	…	2059
1996-2000	794	2942	2206	…	9333	10804	15124	24468	794
2001-2005	…	…	2400	13753	10010	10765	715	22680	715
2006-2010	3890	…	2400	8298	9710	9480	11324	22650	2400
2011-2015	1134	735	…	11160	12240	10830	14963	25190	735
2016-2020	894	3704	7550	9133	8500	10830	14300	24270	894
2021-2025	954	…	2250	6810	…	10300	15700	21000	954
Total	**221**	**735**	**2206**	**6715**	**8500**	**9480**	**715**	**21000**	**221**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

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Table 12.6-17 General Overview of Oil Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Maximum) mid of 2025

	IMO GHG Size Class (dwt)								
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**4 10,000–19,999**	**4 20,000–59,999**	**5 60,000–79,999**	**6 80,000–119,999**	**7 120,000-199,999**	**8 200,000+**	**Total**
1970 & before	1840	…	5884	…	…	…	…	…	5884
1971-1975	736	3163	3678	…	…	…	…	…	3678
1976-1980	3827	2942	4531	8495	…	…	…	…	8495
1981-1985	2471	2427	7052	…	…	…	…	…	7052
1986-1990	2251	3972	…	6715	…	…	…	…	6715
1991-1995	…	2059	…	7281	…	18020	28305	…	28305
1996-2000	2942	2942	7380	…	10591	16745	28898	33980	33980
2001-2005	…	…	3945	13753	15351	23303	28740	37273	37273
2006-2010	3890	…	3520	14350	26600	30563	29373	38557	38557
2011-2015	2894	4016	…	19347	17107	35392	39268	39730	39730
2016-2020	14922	3704	7550	34000	11880	21495	41847	39190	41847
2021-2025	954	…	12260	6810	…	25080	42095	38843	42095
Total	**14922**	**4016**	**12260**	**34000**	**26600**	**35392**	**42095**	**39730**	**42095**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.6-18 General Overview of Oil Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Median) mid of 2025

	IMO GHG Size Class (dwt)								
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**4 10,000–19,999**	**4 20,000–59,999**	**5 60,000–79,999**	**6 80,000–119,999**	**7 120,000-199,999**	**8 200,000+**	**Total**
1970 & before	809	…	5884	…	…	…	…	…	5884
1971-1975	361	2979	3678	…	…	…	…	…	3678
1976-1980	2355	3126	4531	8495	…	…	…	…	8495
1981-1985	1104	2096	4531	…	…	…	…	…	4531
1986-1990	1264	2648	…	6715	…	…	…	…	6715
1991-1995	…	2059	…	7281	…	18020	17468	…	18020
1996-2000	1324	2942	4892	…	9962	14693	17374	27160	27160
2001-2005	…	…	3036	13753	12036	14904	19817	30067	30067
2006-2010	3890	…	3091	10440	13357	16345	21857	32784	32784
2011-2015	2777	2400	…	19343	12240	16400	21227	32535	32535
2016-2020	8048	3704	7550	32000	10600	15829	19819	29300	32000
2021-2025	1060	…	7255	6810	…	14916	20403	27807	27807
Total	**8048**	**3704**	**7550**	**32000**	**13357**	**18020**	**21857**	**32784**	**32784**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.6-19 General Overview of Oil Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Modus) mid of 2025

	IMO GHG Size Class (dwt)								
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**4 10,000–19,999**	**4 20,000–59,999**	**5 60,000–79,999**	**6 80,000–119,999**	**7 120,000-199,999**	**8 200,000+**	**Total**
1970 & before	…	…	5884	…	…	…	…	…	5884
1971-1975	…	…	3678	…	…	…	…	…	3678
1976-1980	2355	…	4531	8495	…	…	…	…	8495
1981-1985	…	…	…	…	…	…	…	…	…
1986-1990	1030	…	…	6715	…	…	…	…	6715
1991-1995	…	2059	…	7281	…	18020	…	…	18020
1996-2000	…	2942	…	…	9333	14875	16858	25487	25487
2001-2005	…	…	2400	13753	13154	15960	18660	27160	27160
2006-2010	3890	…	…	11160	12240	16358	21942	33549	33549
2011-2015	2894	2400	…	…	12240	16382	19900	35240	35240
2016-2020	14922	3704	7550	32000	11880	14445	18940	29571	32000
2021-2025	1060	…	…	6810	…	14530	20428	29060	29060
Total	**14922**	**3704**	**7550**	**32000**	**13154**	**18020**	**21942**	**35240**	**35240**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.6-20 General Overview of Oil Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Average) mid of 2025

	IMO GHG Size Class (dwt)								
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**4 10,000–19,999**	**4 20,000–59,999**	**5 60,000–79,999**	**6 80,000–119,999**	**7 120,000-199,999**	**8 200,000+**	**Total**
1970 & before	…	…	5884	…	…	…	…	…	5884
1971-1975	…	…	3678	…	…	…	…	…	3678
1976-1980	2355	…	4531	8495	…	…	…	…	8495
1981-1985	…	…	…	…	…	…	…	…	…
1986-1990	1030	…	…	6715	…	…	…	…	6715
1991-1995	…	2059	…	7281	…	18020	…	…	18020
1996-2000	…	2942	…	…	9333	14875	16858	25487	25487
2001-2005	…	…	2400	13753	13154	15960	18660	27160	27160
2006-2010	3890	…	…	11160	12240	16358	21942	33549	33549

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2011-2015	2894	2400	...	...	12240	16382	19900	35240	35240
2016-2020	14922	3704	7550	32000	11880	14445	18940	29571	32000
2021-2025	1060	...	...	6810	...	14530	20428	29060	29060
Total	**14922**	**3704**	**7550**	**32000**	**13154**	**18020**	**21942**	**35240**	**35240**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

12.7. *Tanker Special Tanker*

Table 12.7-1 General Overview of Special Tanker Fleet – by Status

Status	Number of Ships
Detained	1
Idle	3
In Service	196
Laid Up	3
Repairs	1
Total	**204**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.7-2 General Overview of Special Tanker Fleet – by Carrier Type

Status	Number of Ships
Edible Oil Carrier	56
Fruit Juice Carrier	15
Molten Sulphur Carrier	30
Product Carrier/Ro-Ro	2
Sulphuric Acid Carrier	4
Waste Disposal Carrier	53
Water Carrier	33
Wine Carrier	11
Total	**204**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.7-3 General Overview of Special Tanker Fleet – by Year of Build Group

Status	Number of Ships
1970 and before	28
1971-1975	16
1976-1980	24
1981-1985	10
1986-1990	16
1991-1995	22
1996-2000	8
2001-2005	7
2006-2010	14
2011-2015	28
2016-2020	27
2021-2025	4
Total	**204**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.7-4 General Overview of Special Tanker Fleet – by 4th GHG IMO Size Class

Status	Number of Ships
1 0-4999	170
2 5000-9999	16
3 10000-19999	6
4 20000-39999	9
5 40000+	3
Total	**204**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.7-5 General Overview of Special Tanker Fleet – Engine Derived Power Type

Engine Derived Power Type	Number of Ships
Diesel 2-Stroke	23
Diesel 4-Stroke	179
Diesel Electric	2
Gesamtergebnis	**204**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.7-6 General Overview of Special Tanker Fleet – Main Engine Designer

Main Engine Designer	Number of Ships
Akasaka	18
Ansaldo	1

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Blackstone	3
Caterpillar	14
Cooper Bessemer	1
Cummins Inc	8
Daihatsu Infinearth	3
Detroit Diesel Corp	1
Deutz	10
Doosan Infracore	1
Everllence B. & W.	19
Fairbanks Morse	1
General Electric	3
Guangzhou Diesel	2
Hanshin	27
HHI-EMD (HiMSEN)	1
Isotta Fraschini	1
MaK	9
Makita	2
Mirrlees	1
Mitsubishi	5
MWM	5
Niigata	9
Otsuka	1
Polar	2
Ruston	1
SKL	6
Skoda	2
Sulzer	5
Sumiyoshi	1
Volvo Penta	3
Wartsila 4-stroke	6
Weichai HM	3
Wichmann	1
Yanmar	16
Yuchai Marine Power	4
(unknown)	8
Total	**204**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.7-7 General Overview of Special Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and by Number

	IMO GHG Size Class (dwt)					
Year of Build Group	**1** **0-4,999**	**2** **5,000-9,999**	**3** **10,000–19,999**	**4** **20,000–39,999**	**5** **40,000+**	**Total**
1970 & before	28	-	-	-	-	**28**
1971-1975	16	-	-	-	-	**16**
1976-1980	24	-	-	-	-	**24**
1981-1985	8	2	-	-	-	**10**
1986-1990	15	-	1	-	-	**16**
1991-1995	16	2	3	1	-	**22**
1996-2000	6	1	-	1	-	**8**
2001-2005	3	2	-	-	2	**7**
2006-2010	8	3	1	1	1	**14**
2011-2015	18	4	1	5	-	**28**
2016-2020	24	2	-	1	-	**27**
2021-2025	4	-	-	-	-	**4**
Total	**170**	**16**	**6**	**9**	**3**	**204**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.7-8 General Overview of Special Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and GT

	IMO GHG Size Class (dwt)					
Year of Build Group	**1** **0-4,999**	**2** **5,000-9,999**	**3** **10,000–19,999**	**4** **20,000–39,999**	**5** **40,000+**	**Total**
1970 & before	26768	-	-	-	-	**26768**
1971-1975	21731	-	-	-	-	**21731**
1976-1980	21916	-	-	-	-	**21916**
1981-1985	7511	6532	-	-	-	**14043**
1986-1990	15752	-	6526	-	-	**22278**
1991-1995	19452	10065	43869	16771	-	**90157**
1996-2000	7042	3277	-	22063	-	**32382**
2001-2005	5766	7495	-	-	66010	**79271**
2006-2010	25271	14220	9416	30912	33070	**112889**
2011-2015	26036	13208	9465	127372	-	**176081**
2016-2020	58617	7020	-	27600	-	**93237**
2021-2025	8264	-	-	-	-	**8264**
Total	**244126**	**61817**	**69276**	**224718**	**99080**	**699017**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

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Table 12.7-9 General Overview of Special Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and DWT

	IMO GHG Size Class (dwt)					
Year of Build Group	1 0-4,999	2 5,000-9,999	3 10,000–19,999	4 20,000–39,999	5 40,000+	Total
1970 & before	39005	-	-	-	-	39005
1971-1975	35233	-	-	-	-	35233
1976-1980	36061	-	-	-	-	36061
1981-1985	13693	11083	-	-	-	24776
1986-1990	24696	-	10520	-	-	35216
1991-1995	31853	15172	55000	21649	-	123674
1996-2000	11458	5790	-	26863	-	44111
2001-2005	6597	11803	-	-	85502	103902
2006-2010	33976	19950	12497	34966	43420	144809
2011-2015	32954	23372	13800	159977	-	230103
2016-2020	78645	11146	-	39202	-	128993
2021-2025	11189	-	-	-	-	11189
Total	355360	98316	91817	282657	128922	957072

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.7-10 General Overview of Special Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Average) mid of 2025

	IMO GHG Size Class (dwt)					
Year of Build Group	1 0-4,999	2 5,000-9,999	3 10,000–19,999	4 20,000–39,999	5 40,000+	Total
1970 & before	11	...	...	...	...	11
1971-1975	13	...	...	...	...	13
1976-1980	11	...	...	...	...	11
1981-1985	10	12	...	...	...	10
1986-1990	11	...	12	...	...	11
1991-1995	12	13	19	14	...	13
1996-2000	12	13	...	15	...	12
2001-2005	13	12	...	...	21	15
2006-2010	13	10	14	22	18	13
2011-2015	11	12	17	14	...	12
2016-2020	11	11	...	14	...	11
2021-2025	12	...	...	...	...	12
Total	11	12	17	15	20	12

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.7-11 General Overview of Special Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Minimum) mid of 2025

	IMO GHG Size Class (dwt)					
Year of Build Group	1 0-4,999	2 5,000-9,999	3 10,000–19,999	4 20,000–39,999	5 40,000+	Total
1970 & before	9	...	...	...	...	9
1971-1975	11	...	...	...	...	11
1976-1980	8	...	...	...	...	8
1981-1985	7	12	...	...	...	7
1986-1990	10	...	12	...	...	10
1991-1995	10	13	18	14	...	10
1996-2000	8	13	...	15	...	8
2001-2005	12	10	...	...	21	10
2006-2010	11	10	14	22	18	10
2011-2015	7	11	17	12	...	7
2016-2020	7	11	...	14	...	7
2021-2025	12	...	...	...	...	12
Total	7	10	12	12	18	7

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.7-12 General Overview of Special Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Maximum) mid of 2025

	IMO GHG Size Class (dwt)					
Year of Build Group	1 0-4,999	2 5,000-9,999	3 10,000–19,999	4 20,000–39,999	5 40,000+	Total
1970 & before	14	...	...	...	...	14
1971-1975	14	...	...	...	...	14
1976-1980	13	...	...	...	...	13
1981-1985	12	13	...	...	...	13
1986-1990	12	...	12	...	...	12
1991-1995	14	14	20	14	...	20
1996-2000	13	13	...	15	...	15
2001-2005	13	14	...	...	21	21

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2006-2010	15	10	14	22	18	**22**
2011-2015	14	15	17	15	…	**17**
2016-2020	14	11	…	14	…	**14**
2021-2025	12	…	…	…	…	**12**
Total	**15**	**15**	**20**	**22**	**21**	**22**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.7-13 General Overview of Special Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Median) mid of 2025

	IMO GHG Size Class (dwt)					
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,000–19,999**	**4 20,000–39,999**	**5 40,000+**	**Total**
1970 & before	11	…	…	…	…	**11**
1971-1975	14	…	…	…	…	**14**
1976-1980	12	…	…	…	…	**12**
1981-1985	12	12	…	…	…	**12**
1986-1990	10	…	12	…	…	**12**
1991-1995	13	14	20	14	…	**20**
1996-2000	8	13	…	15	…	**15**
2001-2005	12	14	…	…	21	**21**
2006-2010	13	10	14	22	18	**22**
2011-2015	13	11	17	14	…	**17**
2016-2020	13	11	…	14	…	**14**
2021-2025	12	…	…	…	…	**12**
Total	**14**	**14**	**20**	**22**	**21**	**22**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.7-14 General Overview of Special Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Modus) mid of 2025

	IMO GHG Size Class (dwt)					
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,000–19,999**	**4 20,000–39,999**	**5 40,000+**	**Total**
1970 & before	12	…	…	…	…	**12**
1971-1975	13	…	…	…	…	**13**
1976-1980	8	…	…	…	…	**8**
1981-1985	12	…	…	…	…	**12**
1986-1990	10	…	12	…	…	**12**
1991-1995	10	…	…	14	…	**14**
1996-2000	…	13	…	15	…	**15**
2001-2005	…	…	…	…	21	**21**
2006-2010	13	10	14	22	18	**22**
2011-2015	11	11	17	15	…	**17**
2016-2020	12	11	…	14	…	**14**
2021-2025	12	…	…	…	…	**12**
Total	**13**	**13**	**17**	**22**	**21**	**22**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.7-15 General Overview of Special Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Average) mid of 2025

	IMO GHG Size Class (dwt)					
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,000–19,999**	**4 20,000–39,999**	**5 40,000+**	**Total**
1970 & before	899	…	…	…	…	**899**
1971-1975	1587	…	…	…	…	**1587**
1976-1980	1079	…	…	…	…	**1079**
1981-1985	962	1737	…	…	…	**1134**
1986-1990	955	…	2979	…	…	**1081**
1991-1995	1218	3770	10868	7145	…	**3122**
1996-2000	1644	2574	…	7061	…	**2551**
2001-2005	1960	2911	…	…	28232	**11034**
2006-2010	2594	2385	5326	21770	15820	**5059**
2011-2015	1330	1076	6480	6738	…	**2529**
2016-2020	1710	1640	…	4598	…	**1812**
2021-2025	1620	…	…	…	…	**1620**
Total	**1327**	**2134**	**7898**	**8251**	**24094**	**2261**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.7-16 General Overview of Special Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Minimum) mid of 2025

	IMO GHG Size Class (dwt)					
Year of Build Group	**1**	**2**	**3**	**4**	**5**	**Total**

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	0-4,999	5,000-9,999	10,000–19,999	20,000–39,999	40,000+	
1970 & before	184	…	…	…	…	184
1971-1975	721	…	…	…	…	721
1976-1980	286	…	…	…	…	286
1981-1985	442	1472	…	…	…	442
1986-1990	294	…	2979	…	…	294
1991-1995	220	2574	9098	7145	…	220
1996-2000	956	2574	…	7061	…	956
2001-2005	1714	2880	…	…	27962	1714
2006-2010	1765	2384	5326	21770	15820	1765
2011-2015	970	454	6480	4598	…	454
2016-2020	590	1640	…	4598	…	590
2021-2025	894	…	…	…	…	894
Total	184	454	2979	4598	15820	184

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.7-17 General Overview of Special Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Maximum) mid of 2025

	IMO GHG Size Class (dwt)					
Year of Build Group	1 0-4,999	2 5,000-9,999	3 10,000–19,999	4 20,000–39,999	5 40,000+	Total
1970 & before	1840	…	…	…	…	1840
1971-1975	2648	…	…	…	…	2648
1976-1980	2576	…	…	…	…	2576
1981-1985	1325	2001	…	…	…	2001
1986-1990	1765	…	2979	…	…	2979
1991-1995	2574	4965	12180	7145	…	12180
1996-2000	2648	2574	…	7061	…	7061
2001-2005	2206	2942	…	…	28501	28501
2006-2010	4080	2386	5326	21770	15820	21770
2011-2015	2312	2942	6480	8600	…	8600
2016-2020	2942	1640	…	4598	…	4598
2021-2025	2350	…	…	…	…	2350
Total	4080	4965	12180	21770	28501	28501

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.7-18 General Overview of Special Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Median) mid of 2025

	IMO GHG Size Class (dwt)					
Year of Build Group	1 0-4,999	2 5,000-9,999	3 10,000–19,999	4 20,000–39,999	5 40,000+	Total
1970 & before	809	…	…	…	…	809
1971-1975	2133	…	…	…	…	2133
1976-1980	883	…	…	…	…	883
1981-1985	188	1472	…	…	…	1472
1986-1990	589	…	2979	…	…	2979
1991-1995	1103	4965	11327	7145	…	11327
1996-2000	956	2574	…	7061	…	7061
2001-2005	1714	2942	…	…	28501	28501
2006-2010	2426	2384	5326	21770	15820	21770
2011-2015	1060	454	6480	4598	…	6480
2016-2020	2050	1640	…	4598	…	4598
2021-2025	894	…	…	…	…	894
Total	2426	4965	11327	21770	28501	28501

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.7-19 General Overview of Special Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Modus) mid of 2025

	IMO GHG Size Class (dwt)					
Year of Build Group	1 0-4,999	2 5,000-9,999	3 10,000–19,999	4 20,000–39,999	5 40,000+	Total
1970 & before	809	…	…	…	…	809
1971-1975	2206	…	…	…	…	2206
1976-1980	742	…	…	…	…	742
1981-1985	1325	…	…	…	…	1325
1986-1990	736	…	2979	…	…	2979
1991-1995	1471	…	…	7145	…	7145
1996-2000	…	…	…	7061	…	7061
2001-2005	…	…	…	…	…	…
2006-2010	2647	2384	5326	21770	15820	21770
2011-2015	404	454	6480	7220	…	7220
2016-2020	1764	1640	…	4598	…	4598
2021-2025	…	…	…	…	…	…
Total	2647	2384	6480	21770	15820	21770

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

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Table 12.7-20 General Overview of Special Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Average) mid of 2025

	IMO GHG Size Class (dwt)					
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,000–19,999**	**4 20,000–39,999**	**5 40,000+**	**Total**
1970 & before	-	-	-	-	-	**-**
1971-1975	-	-	-	-	-	**-**
1976-1980	-	-	-	-	-	**-**
1981-1985	-	-	-	-	-	**-**
1986-1990	…	…	175	…	…	**175**
1991-1995	…	…	173	…	…	**173**
1996-2000	185	…	…	167	…	**176**
2001-2005	…	185	…	…	…	**185**
2006-2010	180	…	…	172	170	**176**
2011-2015	…	…	179	172	…	**174**
2016-2020	189	196	…	…	…	**190**
2021-2025	177	…	…	…	…	**177**
Total	**186**	**192**	**176**	**171**	**170**	**182**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.7-21 General Overview of Special Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Minimum) mid of 2025

	IMO GHG Size Class (dwt)					
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,000–19,999**	**4 20,000–39,999**	**5 40,000+**	**Total**
1970 & before	-	-	-	-	-	**-**
1971-1975	-	-	-	-	-	**-**
1976-1980	-	-	-	-	-	**-**
1981-1985	-	-	-	-	-	**-**
1986-1990	…	…	175	…	…	**175**
1991-1995	…	…	173	…	…	**173**
1996-2000	185	…	…	167	…	**167**
2001-2005	…	185	…	…	…	**185**
2006-2010	175	…	…	172	170	**170**
2011-2015	…	…	179	170	…	**170**
2016-2020	177	196	…	…	…	**177**
2021-2025	177	…	…	…	…	**177**
Total	**175**	**185**	**173**	**167**	**170**	**167**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.7-22 General Overview of Special Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Maximum) mid of 2025

	IMO GHG Size Class (dwt)					
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,000–19,999**	**4 20,000–39,999**	**5 40,000+**	**Total**
1970 & before	-	-	-	-	-	**-**
1971-1975	-	-	-	-	-	**-**
1976-1980	-	-	-	-	-	**-**
1981-1985	-	-	-	-	-	**-**
1986-1990	…	…	175	…	…	**175**
1991-1995	…	…	173	…	…	**173**
1996-2000	185	…	…	167	…	**185**
2001-2005	…	185	…	…	…	**185**
2006-2010	185	…	…	172	170	**185**
2011-2015	…	…	179	175	…	**179**
2016-2020	195	196	…	…	…	**196**
2021-2025	177	…	…	…	…	**177**
Total	**195**	**196**	**179**	**175**	**170**	**196**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.7-23 General Overview of Special Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Median) mid of 2025

	IMO GHG Size Class (dwt)					
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,000–19,999**	**4 20,000–39,999**	**5 40,000+**	**Total**
1970 & before	…	…	…	…	…	**…**
1971-1975	…	…	…	…	…	**…**
1976-1980	…	…	…	…	…	**…**
1981-1985	…	…	…	…	…	**…**
1986-1990	…	…	175	…	…	**175**
1991-1995	…	…	173	…	…	**173**

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1996-2000	185	177	…	167	…	**185**
2001-2005	…	185	…	…	…	**185**
2006-2010	175	…	…	172	170	**175**
2011-2015	200	…	179	170	…	**200**
2016-2020	177	196	…	…	…	**196**
2021-2025	177	…	…	…	…	**177**
Total	**200**	**196**	**179**	**172**	**170**	**200**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.7-24 General Overview of Special Tanker Fleet – by 4th GHG IMO Size Class by year of Build Group) and Main SFOC g/kWh (Modus) mid of 2025

	IMO GHG Size Class (dwt)					
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,000–19,999**	**4 20,000–39,999**	**5 40,000+**	**Total**
1970 & before	…	…	…	…	…	**…**
1971-1975	…	…	…	…	…	**…**
1976-1980	…	…	…	…	…	**…**
1981-1985	…	…	…	…	…	**…**
1986-1990	…	…	175	…	…	**175**
1991-1995	…	…	173	…	…	**173**
1996-2000	185	177	…	167	…	**185**
2001-2005	…	185	…	…	…	**185**
2006-2010	…	…	…	172	170	**172**
2011-2015	200	…	179	170	…	**200**
2016-2020	195	196	…	…	…	**196**
2021-2025	…	…	…	…	…	**…**
Total	**200**	**196**	**179**	**172**	**170**	**200**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

12.8. Tanker LNG

Table 12.8-1 General Overview of LNG Tanker Fleet – by Status

Status	Number of Ships
Damaged/Not in Service	**1**
Dedicated Storage	**3**
Idle	**46**
In Service	**741**
Laid Up	**11**
Repairs	**2**
Storage	**15**
Total	**819**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.8-2 General Overview of LNG Tanker Fleet – by Carrier Type

Carrier Type	Number of Ships
CNG Carrier	1
LNG & Oil Bunkering Vessel	4
LNG Bunkering Vessel	25
LNG Carrier	729
LNG/Ethylene/LPG	18
LNG/Regasification	42
Total	**819**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.8-3 General Overview of LNG Tanker Fleet – by Year of Build Group

Year of Build Grou	Number of Ships
1971-1975	1
1976-1980	3
1986-1990	3
1991-1995	11
1996-2000	31
2001-2005	55
2006-2010	179
2011-2015	101
2016-2020	204
2021-2025	231
Total	**819**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

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Table 12.8-4 General Overview of LNG Tanker Fleet – by 4th GHG IMO Size Class

4th GHG IMO Size Class	Number of Ships
1 0-49,999	73
2 50,000-99,999	10
3 100,000-199,999	682
4 200,000-+	54
Total	**819**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.8-5 General Overview of LNG Tanker Fleet – Engine Derived Power Type

Engine Derived Power Type	Number of Ships
Combined	8
Diesel 2-Stroke	346
Diesel 4-Stroke	32
Diesel Electric	218
Steam Turbine	215
Total	**819**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.8-6 General Overview of LNG Tanker Fleet – Main Engine Designer

Main Engine Designer	Number of Ships
Bergen	1
Everllence B. & W.	220
General Electric	4
Guascor	2
Hanshin	1
HHI-EMD	7
Kawasaki	123
MaK	6
Mitsubishi	89
Siemens Energy	1
Sulzer	1
Wartsila	209
WinGD	154
(unknown)	1
Total	**819**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.8-7 General Overview of LNG Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and by Number

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-49,999**	**2 50,000-99,999**	**3 100,000–199,999**	**4 200,000+**	**Total**
1971-1975	1	-	-	-	**1**
1976-1980	-	-	3	-	**3**
1986-1990	-	-	3	-	**3**
1991-1995	1	-	10	-	**11**
1996-2000	3	2	26	-	**31**
2001-2005	1	-	54	-	**55**
2006-2010	6	3	125	45	**179**
2011-2015	11	-	90	-	**101**
2016-2020	19	-	184	1	**204**
2021-2025	31	5	187	8	**231**
Total	**73**	**10**	**682**	**54**	**819**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.8-8 General Overview of LNG Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and GT

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-49,999**	**2 50,000-99,999**	**3 100,000–199,999**	**4 200,000+**	**Total**
1971-1975	626	-	-	-	**626**
1976-1980	-	-	285252	-	**285252**
1986-1990	-	-	321008	-	**321008**
1991-1995	16336	-	1012875	-	**1029211**
1996-2000	52689	93110	2816721	-	**2962520**
2001-2005	1687	-	5405858	-	**5407545**
2006-2010	51351	154633	13047031	6543814	**19796829**
2011-2015	159807	-	9634634	-	**9794441**
2016-2020	304973	-	21934665	169253	**22408891**
2021-2025	377308	301380	21531058	1029392	**23239138**

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Total	964777	549123	75989102	7742459	85245461

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.8-9 General Overview of LNG Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and DWT

	IMO GHG Size Class (dwt)				
Year of Build Group	1 0-49,999	2 50,000-99,999	3 100,000–199,999	4 200,000+	Total
1971-1975	129	-	-	-	129
1976-1980	-	-	217732	-	217732
1986-1990	-	-	212575	-	212575
1991-1995	10975	-	713450	-	724425
1996-2000	34406	71520	1925890	-	2031816
2001-2005	817	-	4200144	-	4200961
2006-2010	41721	115148	10370404	5459018	15986291
2011-2015	144980	-	7820073	-	7965053
2016-2020	235202	-	16977824	151915	17364941
2021-2025	239700	226498	17360693	860737	18687628
Total	707930	413166	59798785	6471670	67391551

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.8-10 General Overview of LNG Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Cargo Capacity

	IMO GHG Size Class (dwt)				
Year of Build Group	1 0-49,999	2 50,000-99,999	3 100,000–199,999	4 200,000+	Total
1971-1975	167	-	-	-	167
1976-1980	-	-	376300	-	376300
1986-1990	-	-	392467	-	392467
1991-1995	18928	-	1307336	-	1326264
1996-2000	60968	130000	3542094	-	3733062
2001-2005	1100	-	7564698	-	7565798
2006-2010	47760	224053	18967032	10336179	29575024
2011-2015	182468	-	14535051	-	14717519
2016-2020	344598	-	31743034	263000	32350632
2021-2025	377943	399636	32625955	1600000	35003534
Total	1033932	753689	111053967	12199179	125040767

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.8-11 General Overview of LNG Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Average) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	1 0-49,999	2 50,000-99,999	3 100,000–199,999	4 200,000+	Total
1971-1975	13	-	-	-	13
1976-1980	-	-	20	-	20
1986-1990	-	-	18	-	18
1991-1995	15	-	20	-	19
1996-2000	15	17	19	-	19
2001-2005	14	-	19	-	19
2006-2010	13	18	19	19	19
2011-2015	16	-	19	-	19
2016-2020	15	-	18	18	18
2021-2025	13	17	19	19	18
Total	14	17	19	19	19

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.8-12 General Overview of LNG Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Minimum) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	1 0-49,999	2 50,000-99,999	3 100,000–199,999	4 200,000+	Total
1971-1975	13	-	-	-	13
1976-1980	-	-	20	-	20
1986-1990	-	-	18	-	18
1991-1995	15	-	19	-	15
1996-2000	15	17	16	-	15
2001-2005	14	-	13	-	13
2006-2010	6	18	14	18	6
2011-2015	14	-	13	-	13
2016-2020	10	-	12	18	10

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2021-2025	10	16	12	19	**10**
Total	**6**	**16**	**12**	**18**	**6**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.8-13 General Overview of LNG Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Maximum) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-49,999**	**2 50,000-99,999**	**3 100,000–199,999**	**4 200,000+**	**Total**
1971-1975	13	-	-	-	**13**
1976-1980	-	-	20	-	**20**
1986-1990	-	-	19	-	**19**
1991-1995	15	-	21	-	**21**
1996-2000	15	17	21	-	**21**
2001-2005	14	-	21	-	**21**
2006-2010	18	18	22	20	**22**
2011-2015	17	-	22	-	**22**
2016-2020	18	-	21	18	**21**
2021-2025	16	18	20	20	**20**
Total	**18**	**18**	**22**	**20**	**22**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.8-14 General Overview of LNG Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Median) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-49,999**	**2 50,000-99,999**	**3 100,000–199,999**	**4 200,000+**	**Total**
1971-1975	13	-	-	-	**13**
1976-1980	-	-	20	-	**20**
1986-1990	-	-	19	-	**19**
1991-1995	15	-	20	-	**20**
1996-2000	15	17	20	-	**20**
2001-2005	13	-	20	-	**20**
2006-2010	15	18	20	20	**20**
2011-2015	16	-	20	-	**20**
2016-2020	16	-	20	18	**20**
2021-2025	13	17	20	20	**20**
Total	**16**	**18**	**20**	**20**	**20**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.8-15 General Overview of LNG Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Modus) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-49,999**	**2 50,000-99,999**	**3 100,000–199,999**	**4 200,000+**	**Total**
1971-1975	13	-	-	-	**13**
1976-1980	-	-	20	-	**20**
1986-1990	-	-	19	-	**19**
1991-1995	15	-	20	-	**20**
1996-2000	15	17	20	-	**20**
2001-2005	…	-	20	-	**20**
2006-2010	16	18	20	20	**20**
2011-2015	16	-	20	-	**20**
2016-2020	16	-	20	18	**20**
2021-2025	14	…	20	20	**20**
Total	**16**	**18**	**20**	**20**	**20**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.8-16 General Overview of LNG Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Average) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-49,999**	**2 50,000-99,999**	**3 100,000–199,999**	**4 200,000+**	**Total**
1971-1975	960	-	-	-	**960**
1976-1980	-	-	31626	-	**31626**
1986-1990	-	-	17886	-	**17886**
1991-1995	5516	-	23780	-	**22120**
1996-2000	6276	12302	27360	-	**24348**
2001-2005	3080	-	26289	-	**25867**
2006-2010	6329	17600	30660	35618	**30872**
2011-2015	8338	-	34574	-	**31716**

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2016-2020	7815	-	32266	36000	**30007**
2021-2025	5475	27752	24902	27858	**22533**
Total	**6539**	**21616**	**29406**	**34475**	**27633**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.8-17 General Overview of LNG Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Minimum) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-49,999**	**2 50,000-99,999**	**3 100,000–199,999**	**4 200,000+**	**Total**
1971-1975	960	-	-	-	**960**
1976-1980	-	-	31626	-	**31626**
1986-1990	-	-	16894	-	**16894**
1991-1995	5516	-	16894	-	**5516**
1996-2000	5516	12284	19638	-	**5516**
2001-2005	3080	-	21318	-	**3080**
2006-2010	1082	15000	13540	23530	**1082**
2011-2015	2059	-	13970	-	**2059**
2016-2020	2520	-	17550	36000	**2520**
2021-2025	1800	26800	14880	27576	**1800**
Total	**960**	**12284**	**13540**	**23530**	**960**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.8-18 General Overview of LNG Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Maximum) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-49,999**	**2 50,000-99,999**	**3 100,000–199,999**	**4 200,000+**	**Total**
1971-1975	960	-	-	-	**960**
1976-1980	-	-	31626	-	**31626**
1986-1990	-	-	19625	-	**19625**
1991-1995	5516	-	29400	-	**29400**
1996-2000	7796	12320	29600	-	**29600**
2001-2005	3080	-	29600	-	**29600**
2006-2010	12900	22800	41250	39240	**41250**
2011-2015	11700	-	41250	-	**41250**
2016-2020	14400	-	64350	36000	**64350**
2021-2025	14900	31560	36400	27952	**36400**
Total	**14900**	**31560**	**64350**	**39240**	**64350**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.8-19 General Overview of LNG Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Median) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-49,999**	**2 50,000-99,999**	**3 100,000–199,999**	**4 200,000+**	**Total**
1971-1975	960	-	-	-	**960**
1976-1980	-	-	31626	-	**31626**
1986-1990	-	-	17140	-	**17140**
1991-1995	5516	-	23536	-	**23536**
1996-2000	5516	12302	27738	-	**27738**
2001-2005	2206	-	26478	-	**26478**
2006-2010	4530	15000	29400	37320	**37320**
2011-2015	8040	-	36060	-	**36060**
2016-2020	6840	-	27620	36000	**36000**
2021-2025	4680	26800	24046	27952	**27952**
Total	**8040**	**26800**	**36060**	**37320**	**37320**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.8-20 General Overview of LNG Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Modus) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-49,999**	**2 50,000-99,999**	**3 100,000–199,999**	**4 200,000+**	**Total**
1971-1975	960	-	-	-	**960**
1976-1980	-	-	31626	-	**31626**
1986-1990	-	-	…	-	**…**
1991-1995	5516	-	19638	-	**19638**
1996-2000	5516	…	26864	-	**26864**

2001-2005	...	-	26478	-	**26478**
2006-2010	7000	15000	29400	38540	**38540**
2011-2015	11700	-	38500	-	**38500**
2016-2020	11700	-	36400	36000	**36400**
2021-2025	3000	26800	22000	27952	**27952**
Total	**11700**	**26800**	**38500**	**38540**	**38540**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.8-21 General Overview of LNG Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Average) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-49,999**	**2 50,000-99,999**	**3 100,000–199,999**	**4 200,000+**	**Total**
1971-1975	190	-	-	-	**190**
1976-1980	-	-	-	-	**-**
1986-1990	-	-	-	-	**-**
1991-1995	-	-	-	-	**-**
1996-2000	-	-	-	-	**-**
2001-2005	-	-	-	-	**-**
2006-2010	181	-	184	169	**170**
2011-2015	178	-	179	-	**179**
2016-2020	194	-	174	184	**175**
2021-2025	192	184	179	180	**180**
Total	189	184	177	171	**177**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.8-22 General Overview of LNG Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Minimum) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-49,999**	**2 50,000-99,999**	**3 100,000–199,999**	**4 200,000+**	**Total**
1971-1975	190	-	-	-	**190**
1976-1980	-	-	-	-	**-**
1986-1990	-	-	-	-	**-**
1991-1995	-	-	-	-	**-**
1996-2000	-	-	-	-	**-**
2001-2005	-	-	-	-	**-**
2006-2010	179	-	184	169	**169**
2011-2015	174	-	171	-	**171**
2016-2020	184	-	166	184	**166**
2021-2025	184	182	166	179	**166**
Total	174	182	166	169	**166**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.8-23 General Overview of LNG Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Maximum) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-49,999**	**2 50,000-99,999**	**3 100,000–199,999**	**4 200,000+**	**Total**
1971-1975	190	-	-	-	**190**
1976-1980	-	-	-	-	**-**
1986-1990	-	-	-	-	**-**
1991-1995	-	-	-	-	**-**
1996-2000	-	-	-	-	**-**
2001-2005	-	-	-	-	**-**
2006-2010	184	-	184	171	**184**
2011-2015	184	-	184	-	**184**
2016-2020	199	-	184	184	**199**
2021-2025	199	184	184	182	**199**
Total	199	184	184	184	**199**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.8-24 General Overview of LNG Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Median) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-49,999**	**2 50,000-99,999**	**3 100,000–199,999**	**4 200,000+**	**Total**
1971-1975	190	-	-	-	**190**
1976-1980	-	-	-	-	**-**

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1986-1990	-	-	-	-	**-**
1991-1995	-	-	-	-	**-**
1996-2000	-	-	-	-	**-**
2001-2005	-	-	-	-	**-**
2006-2010	179	...	184	169	**184**
2011-2015	179	-	184	-	**184**
2016-2020	199	-	167	184	**199**
2021-2025	194	184	182	179	**194**
Total	**199**	**184**	**184**	**184**	**199**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.8-25 General Overview of LNG Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Modus) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1** **0-49,999**	**2** **50,000-99,999**	**3** **100,000–199,999**	**4** **200,000+**	**Total**
1971-1975	190	-	-	-	**190**
1976-1980	-	-	-	-	**-**
1986-1990	-	-	-	-	**-**
1991-1995	-	-	-	-	**-**
1996-2000	-	-	-	-	**-**
2001-2005	-	-	-	-	**-**
2006-2010	179	...	...	169	**179**
2011-2015	174	-	184	-	**184**
2016-2020	199	-	182	184	**199**
2021-2025	199	184	182	179	**199**
Total	**199**	**184**	**184**	**184**	**199**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

12.9. Tanker LPG

Table 12.9-1 General Overview of LPG Tanker Fleet – by Status

Status	Number of Ships
Abandoned	1
Damaged/Not in Service	1
Detained	1
Idle	81
In Service	1482
Laid Up	11
Repairs	5
Storage	4
Gesamtergebnis	**1586**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.9-2 General Overview of LPG Tanker Fleet – by Carrier Type

Carrier Type	Number of Ships
Ethane/LPG	30
Ethylene/LPG	168
LCO2 Carrier	7
Liquid Hydrogen Carrier	1
LPG Carrier	1380
Total	**1586**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.9-3 General Overview of LPG Tanker Fleet – by Year of Build Group

Year of Build Group	Number of Ships
1970 and before	9
1971-1975	9
1976-1980	27
1981-1985	19
1986-1990	42
1991-1995	99
1996-2000	153
2001-2005	114
2006-2010	303
2011-2015	276
2016-2020	279
2021-2025	256
Total	**1586**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

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Table 12.9-4 General Overview of LPG Tanker Fleet – by 4th GHG IMO Size Class

4th GHG IMO Size Class	Number of Ships
1 0-49,999	1132
2 50,000-99,999	454
Total	**1586**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.9-5 General Overview of LPG Tanker Fleet – Engine Derived Power Type

Engine Derived Power Type	Number of Ships
Diesel 2-Stroke	1139
Diesel 4-Stroke	440
Diesel Electric	5
Hybrid Mech./Elec.	2
Total	**1586**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.9-6 General Overview of LPG Tanker Fleet – Main Engine Designer

Main Engine Designer	Number of Ships
A.B.C.	1
Akasaka	116
Caterpillar	3
Cummins Inc	1
Daihatsu Infinearth	39
Deutz	1
Everllence B. & W.	1003
GM	1
Guangzhou Diesel	10
Hanshin	72
HHM	1
J-ENG	8
Kromhout	2
MaK	44
Mitsubishi	140
MWM	1
Niigata	7
Ningbo C.S.I. Power	3
Nippon	1
Pielstick	1
Qingdao Zichai	2
Stork	1
Sulzer	22
Unbekannt	3
Wartsila	34
Weichai	2
Weichai HM	4
Weifang Diesel	1
Wichmann	3
WinGD	10
Yanmar	46
Zichai Power	3
Total	**1586**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.9-7 General Overview of LPG Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and by Number

	IMO GHG Size Class (dwt)		
Year of Build Group	**1 0-49,999**	**2 50,000-99,999**	**Total**
1970 and before	9	-	9
1971-1975	9	-	9
1976-1980	27	-	27
1981-1985	18	1	19
1986-1990	37	5	42
1991-1995	79	20	99
1996-2000	140	13	153
2001-2005	81	33	114
2006-2010	231	72	303
2011-2015	212	64	276
2016-2020	155	124	279
2021-2025	134	122	256
Total	**1132**	**454**	**1586**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

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Table 12.9-8 General Overview of LPG Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and GT

	IMO GHG Size Class (dwt)		
Year of Build Group	**1 0-49,999**	**2 50,000-99,999**	**Total**
1970 and before	7097	-	7097
1971-1975	9350	-	9350
1976-1980	37076	-	37076
1981-1985	23052	43849	66901
1986-1990	90657	221362	312019
1991-1995	394544	883919	1278463
1996-2000	862022	596993	1459015
2001-2005	572904	1419777	1992681
2006-2010	1992480	3320949	5313429
2011-2015	1707440	3006975	4714415
2016-2020	2150928	6001787	8152715
2021-2025	1660835	6394870	8055705
Total	**9508385**	**21890481**	**31398866**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.9-9 General Overview of LPG Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and DWT

	IMO GHG Size Class (dwt)		
Year of Build Group	**1 0-49,999**	**2 50,000-99,999**	**Total**
1970 and before	6408	-	6408
1971-1975	10859	-	10859
1976-1980	40962	-	40962
1981-1985	26389	55361	81750
1986-1990	114146	251529	365675
1991-1995	459298	1037265	1496563
1996-2000	1033622	670841	1704463
2001-2005	653085	1648232	2301317
2006-2010	2294815	3908932	6203747
2011-2015	1857021	3440440	5297461
2016-2020	2337105	6694956	9032061
2021-2025	1776238	7004052	8780290
Total	**10609948**	**24711608**	**35321556**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.9-10 General Overview of LPG Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Average) mid of 2025

	IMO GHG Size Class (dwt)		
Year of Build Group	**1 0-49,999**	**2 50,000-99,999**	**Total**
1970 and before	11	-	11
1971-1975	12	-	12
1976-1980	12	-	12
1981-1985	12	16	12
1986-1990	12	16	13
1991-1995	13	16	14
1996-2000	14	17	14
2001-2005	15	17	15
2006-2010	15	17	15
2011-2015	15	17	15
2016-2020	15	17	16
2021-2025	14	16	15
Total	**14**	**17**	**15**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.9-11 General Overview of LPG Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Minimum) mid of 2025

	IMO GHG Size Class (dwt)		
Year of Build Group	**1 0-49,999**	**2 50,000-99,999**	**Total**
1970 and before	10	-	10
1971-1975	10	-	10
1976-1980	8	-	8
1981-1985	11	16	11
1986-1990	10	16	10
1991-1995	10	13	10
1996-2000	10	16	10

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2001-2005	9	13	9
2006-2010	9	15	9
2011-2015	12	15	12
2016-2020	10	12	10
2021-2025	10	16	10
Total	**8**	**12**	**8**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.9-12 General Overview of LPG Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Maximum) mid of 2025

	IMO GHG Size Class (dwt)		
Year of Build Group	**1 0-49,999**	**2 50,000-99,999**	**Total**
1970 and before	13	-	13
1971-1975	13	-	13
1976-1980	14	-	14
1981-1985	15	16	16
1986-1990	16	17	17
1991-1995	19	17	19
1996-2000	17	18	18
2001-2005	18	19	19
2006-2010	19	20	20
2011-2015	23	20	23
2016-2020	18	20	20
2021-2025	17	18	18
Total	**23**	**20**	**23**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.9-13 General Overview of LPG Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Median) mid of 2025

	IMO GHG Size Class (dwt)		
Year of Build Group	**1 0-49,999**	**2 50,000-99,999**	**Total**
1970 and before	12	-	12
1971-1975	12	-	12
1976-1980	12	-	12
1981-1985	12	16	16
1986-1990	12	16	16
1991-1995	13	17	17
1996-2000	14	17	17
2001-2005	15	17	17
2006-2010	15	17	17
2011-2015	15	17	17
2016-2020	16	17	17
2021-2025	14	16	16
Total	**16**	**17**	**17**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.9-14 General Overview of LPG Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Modus) mid of 2025

	IMO GHG Size Class (dwt)		
Year of Build Group	**1 0-49,999**	**2 50,000-99,999**	**Total**
1970 and before	11	-	11
1971-1975	12	-	12
1976-1980	12	-	12
1981-1985	11	16	16
1986-1990	12	16	16
1991-1995	13	16	16
1996-2000	13	17	17
2001-2005	17	17	17
2006-2010	16	17	17
2011-2015	14	17	17
2016-2020	16	17	17
2021-2025	16	16	16
Total	**17**	**17**	**17**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

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Table 12.9-15 General Overview of LPG Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Average) mid of 2025

	IMO GHG Size Class (dwt)		
Year of Build Group	**1 0-49,999**	**2 50,000-99,999**	**Total**
1970 and before	858	-	858
1971-1975	1318	-	1318
1976-1980	1559	-	1559
1981-1985	1337	16997	2161
1986-1990	1885	10790	2946
1991-1995	3265	11861	5002
1996-2000	3917	13514	4733
2001-2005	4457	12909	6903
2006-2010	4926	13126	6874
2011-2015	4337	12857	6313
2016-2020	5554	13134	8935
2021-2025	4785	13691	9046
Total	**4311**	**13164**	**6849**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.9-16 General Overview of LPG Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Minimum) mid of 2025

	IMO GHG Size Class (dwt)		
Year of Build Group	**1 0-49,999**	**2 50,000-99,999**	**Total**
1970 and before	589	-	589
1971-1975	537	-	537
1976-1980	537	-	537
1981-1985	736	16997	736
1986-1990	368	9120	368
1991-1995	883	10260	883
1996-2000	440	12356	440
2001-2005	736	9720	736
2006-2010	882	9480	882
2011-2015	216	10115	216
2016-2020	1176	9580	1176
2021-2025	218	11830	218
Total	**216**	**9120**	**216**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.9-17 General Overview of LPG Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Maximum) mid of 2025

	IMO GHG Size Class (dwt)		
Year of Build Group	**1 0-49,999**	**2 50,000-99,999**	**Total**
1970 and before	1324	-	1324
1971-1975	2059	-	2059
1976-1980	2868	-	2868
1981-1985	4560	16997	16997
1986-1990	10440	12577	12577
1991-1995	13377	13087	13377
1996-2000	11106	17640	17640
2001-2005	11100	17385	17385
2006-2010	9981	15979	15979
2011-2015	9960	16080	16080
2016-2020	12040	18050	18050
2021-2025	10320	18050	18050
Total	**13377**	**18050**	**18050**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.9-18 General Overview of LPG Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Median) mid of 2025

	IMO GHG Size Class (dwt)		
Year of Build Group	**1 0-49,999**	**2 50,000-99,999**	**Total**
1970 and before	883	-	883
1971-1975	1471	-	1471
1976-1980	1196	-	1196
1981-1985	1030	16997	16997
1986-1990	1324	10260	10260
1991-1995	2482	12356	12356
1996-2000	2700	12356	12356

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2001-2005	3770	12390	12390
2006-2010	3400	13560	13560
2011-2015	3310	12400	12400
2016-2020	5110	12536	12536
2021-2025	3000	13150	13150
Total	**5110**	**16997**	**16997**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.9-19 General Overview of LPG Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Modus) mid of 2025

	IMO GHG Size Class (dwt)		
Year of Build Group	**1 0-49,999**	**2 50,000-99,999**	**Total**
1970 and before	…	-	…
1971-1975	…	-	…
1976-1980	…	-	…
1981-1985	…	…	…
1986-1990	…	…	…
1991-1995	187	…	187
1996-2000	187	…	187
2001-2005	195	184	195
2006-2010	184	187	187
2011-2015	190	185	190
2016-2020	185	185	185
2021-2025	190	185	190
Total	**195**	**187**	**195**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.9-20 General Overview of LPG Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Average) mid of 2025

	IMO GHG Size Class (dwt)		
Year of Build Group	**1 0-49,999**	**2 50,000-99,999**	**Total**
1970 and before	-	-	-
1971-1975	-	-	-
1976-1980	-	-	-
1981-1985	-	-	-
1986-1990	174	167	171
1991-1995	175	165	173
1996-2000	176	171	176
2001-2005	176	170	174
2006-2010	176	171	175
2011-2015	177	169	175
2016-2020	173	168	171
2021-2025	172	166	169
Total	**175**	**168**	**173**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.9-21 General Overview of LPG Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Minimum) mid of 2025

	IMO GHG Size Class (dwt)		
Year of Build Group	**1 0-49,999**	**2 50,000-99,999**	**Total**
1970 and before	-	-	-
1971-1975	-	-	-
1976-1980	-	-	-
1981-1985	-	-	-
1986-1990	171	165	165
1991-1995	171	165	165
1996-2000	170	171	170
2001-2005	171	169	169
2006-2010	167	169	167
2011-2015	168	167	167
2016-2020	167	166	166
2021-2025	165	164	164
Total	**165**	**164**	**164**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.9-22 General Overview of LPG Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Maximum) mid of 2025

	IMO GHG Size Class (dwt)	

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Year of Build Group	1 0-49,999	2 50,000-99,999	Total
1970 and before	-	-	-
1971-1975	-	-	-
1976-1980	-	-	-
1981-1985	-	-	-
1986-1990	177	173	177
1991-1995	177	165	177
1996-2000	181	171	181
2001-2005	179	170	179
2006-2010	188	175	188
2011-2015	199	174	199
2016-2020	199	171	199
2021-2025	197	171	197
Total	**199**	**175**	**199**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.9-23 General Overview of LPG Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Median) mid of 2025

	IMO GHG Size Class (dwt)		
Year of Build Group	**1 0-49,999**	**2 50,000-99,999**	**Total**
1970 and before	-	-	-
1971-1975	-	-	-
1976-1980	-	-	-
1981-1985	-	-	-
1986-1990	175	165	175
1991-1995	175	165	175
1996-2000	177	171	177
2001-2005	177	170	177
2006-2010	177	170	177
2011-2015	177	169	177
2016-2020	170	167	170
2021-2025	171	164	171
Total	**177**	**171**	**177**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.9-24 General Overview of LPG Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Modus) mid of 2025

	IMO GHG Size Class (dwt)		
Year of Build Group	**1 0-49,999**	**2 50,000-99,999**	**Total**
1970 and before	-	-	-
1971-1975	-	-	-
1976-1980	-	-	-
1981-1985	-	-	-
1986-1990	171	165	171
1991-1995	175	165	175
1996-2000	177	171	177
2001-2005	177	170	177
2006-2010	179	170	179
2011-2015	177	167	177
2016-2020	170	167	170
2021-2025	168	164	168
Total	**179**	**171**	**179**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

12.10. *Tanker Product*

Table 12.10-1 General Overview of Tanker Product Fleet – by Status

Status	Number of Ships
Abandoned	1
Damaged/Not in Service	8
Dedicated Storage	1
Detained	4
Idle	380
In Service	10563
Laid Up	53
Repairs	36
Storage	73
Under Arrest	4
Total	**11123**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

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Table 12.10-2 General Overview of Tanker Product Fleet – by Carrier Type

Carrier Type	Number of Ships
Asphalt & Bitumen Carrier	273
Chemical & LPG Carrier	4
Chemical & Oil Carrier	5587
Methanol Bunkering Tanker	10
Methanol Carrier	53
Oil & Liquid Gas Carrier	1
Oil Bunkering Tanker	379
Product Carrier	4702
Tanker	114
Total	**11123**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.10-3 General Overview of Tanker Product Fleet – by Year of Build Group

Year of Build Group	Number of Ships
1970 and before	233
1971-1975	184
1976-1980	328
1981-1985	316
1986-1990	365
1991-1995	568
1996-2000	597
2001-2005	1270
2006-2010	2919
2011-2015	1839
2016-2020	1469
2021-2025	1035
Total	**11123**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.10-4 General Overview of Tanker Product Fleet – by 4th GHG IMO Size Class

4th GHG Size Class	Number of Ships
1 0-4,999	3815
2 5,000-9,999	2040
3 10,999-19,999	1481
4 20,000-59,999	2922
5 60,000-79,999	369
6 80,000-119,999	474
7 120,000-199,999	20
8 200,000+	2
Total	**11123**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.10-5 General Overview of Tanker Product Fleet – Engine Derived Power Type

Engine Derived Power Type	Number of Ships
Batteries & Diesel	39
Diesel 2-Stroke	5208
Diesel 4-Stroke	5812
Diesel Electric	64
Total	**11123**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.10-6 General Overview of Tanker Product Fleet – Main Engine Designer

Main Engine Designer	Number of Ships
A.B.C.	15
AGO	1
Akasaka	306
Allen	1
Alpha Diesel	1
Ansaldo	1
Bergen	16
Bergen Normo	2
Blackstone	14
Bolnes	3
Brons	1
Callesen	3
Caterpillar	99
Chinese Std.	8
Christiansen & Meyer	1
Crepelle	1

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Crossley	1
Cummins Inc	180
Daihatsu Infinearth	270
Daimler	1
Daldiesel	2
Detroit Diesel Corp	8
Deutz	63
Doosan Infracore	1
Dorman	1
Dvigatel Revolyutsii	21
Eng. Elec.	1
Enterprise	1
Everllence B. & W.	4877
Fairbanks Morse	4
Fiat	2
Fuji Diesel	14
Gen. Motors	6
Grenaa	2
Guangzhou Diesel	381
Guascor	8
Halberstadt	1
Hanshin	684
HD Infracore	1
HHI-EMD (HiMSEN)	49
HHM	12
Hyundai Motor	1
Isotta Fraschini	1
Isuzu	4
Ito	1
J-ENG	75
Jinan Diesel	8
Kinoshita	1
Kirloskar	1
Kobe Diesel	2
MaK	478
Makita	27
Matsui	26
Maybach	1
Mirrlees	5
Mitsubishi	438
Moteurs Baudouin	7
MTU	2
MWM	28
Niigata	131
Ningbo C.S.I. Power	408
Nippon	5
Nohab	1
Normo	3
Otsuka	2
Paxman	2
Pielstick	43
Polar	6
Poyaud	1
Qingdao Zichai	2
Ruston	18
Scania	5
SKL	164
Skoda	23
Smit-Bolnes	4
Soviet	10
Stork	1
Stork Werkspoor	1
Stork-Wartsila	6
Sulzer	83
Sumiyoshi	8
Ulstein Bergen	17
Unknown	470
Usuki	1
Volvo Penta	17
Wartsila 2-stroke	132
Wartsila 4-stroke	529
Weichai HM	73
Weifang Diesel	5
Werkspoor	7
Wichmann	3
Widdop	1
WinGD	132
Wuxi Diesel	3
Wuxi Wandi	22
Yanmar	504
YCRRC Engine	1
Yuchai Marine Power	3
Zichai Power	106
Total	**11123**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

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Table 12.10-7 General Overview of Tanker Product Fleet – by 4th GHG IMO Size Class by year of Build (Group) and by Number

	IMO GHG Size Class (dwt)								
Year of Build Group	1 0-4,999	2 5,000-9,999	3 10,999-19,999	4 20,000-59,999	5 60,000-79,999	6 80,000-119,999	7 120,000-199,999	8 200,000+	Total
1970 & before	225	8	-	-	-	-	-	-	233
1971-1975	170	13	1	-	-	-	-	-	184
1976-1980	297	27	4	-	-	-	-	-	328
1981-1985	239	61	8	8	-	-	-	-	316
1986-1990	310	44	2	7	-	2	-	-	365
1991-1995	436	94	29	9	-	-	-	-	568
1996-2000	199	131	105	146	6	10	-	-	597
2001-2005	297	232	141	493	73	29	5	-	1270
2006-2010	574	596	618	830	171	123	7	-	2919
2011-2015	595	375	197	533	55	80	2	2	1839
2016-2020	270	232	234	553	62	112	6	-	1469
2021-2025	203	227	142	343	2	118	-	-	1035
Total	3815	2040	1481	2922	369	474	20	2	11123

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.10-8 General Overview of Tanker Product Fleet – by 4th GHG IMO Size Class by year of Build (Group) and GT

	IMO GHG Size Class (dwt)								
Year of Build Group	1 0-4,999	2 5,000-9,999	3 10,999-19,999	4 20,000-59,999	5 60,000-79,999	6 80,000-119,999	7 120,000-199,999	8 200,000+	Total
1970 & before	211126	32111	-	-	-	-	-	-	243237
1971-1975	209615	49045	7686	-	-	-	-	-	266346
1976-1980	364701	109130	26225	-	-	-	-	-	500056
1981-1985	316904	258812	59925	178607	-	-	-	-	814248
1986-1990	348854	185493	15946	137675	-	104664	-	-	792632
1991-1995	593288	400374	242918	204157	-	-	-	-	1440737
1996-2000	369882	616750	951211	3611845	254836	564863	-	-	6369387
2001-2005	617204	1082509	1385506	12475372	3031053	1726431	406350	-	20724425
2006-2010	1203891	2902377	5887127	22178679	7168374	7487485	586958	-	47414891
2011-2015	1112498	1809655	2062185	14660110	2341141	4975540	170932	335156	27467217
2016-2020	550480	1223116	2429967	14892182	2700924	7067086	488040	-	29351795
2021-2025	413388	1233213	1489794	9420290	89335	7546526	-	-	20192546
Total	6311831	9902585	14558490	77758917	15585663	29472595	1652280	335156	155577517

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.10-9 General Overview of Tanker Product Fleet – by 4th GHG IMO Size Class by year of Build (Group) and DWT

	IMO GHG Size Class (dwt)								
Year of Build Group	1 0-4,999	2 5,000-9,999	3 10,999-19,999	4 20,000-59,999	5 60,000-79,999	6 80,000-119,999	7 120,000-199,999	8 200,000+	Total
1970 & before	341506	43789	-	-	-	-	-	-	385295
1971-1975	345024	86099	12812	-	-	-	-	-	443935
1976-1980	575473	168704	44272	-	-	-	-	-	788449
1981-1985	525240	396394	94823	260456	-	-	-	-	1276912
1986-1990	598251	282723	28722	218316	-	173761	-	-	1301773
1991-1995	1012342	642216	381065	337031	-	-	-	-	2372654
1996-2000	563167	934299	1507723	5751110	445349	1028622	-	-	10230270
2001-2005	907008	1636689	2219967	19985276	5280020	3107531	797085	-	33933576
2006-2010	1767589	4269331	9138937	36329517	12593695	13520353	1123707	-	78743129
2011-2015	1629718	2598762	3148351	24047831	4103142	8867942	312028	641516	45349290
2016-2020	767928	1711908	3665621	24289331	4642174	12450344	933217	-	48460523
2021-2025	557403	1683772	2245289	15424388	152451	13341849	-	-	33405152
Total	9590647	14454686	22487582	126643256	27216831	52490402	3166037	641516	256690957

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.10-10 General Overview of Tanker Product Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Average) mid of 2025

	IMO GHG Size Class (dwt)								
Year of Build Group	1 0-4,999	2 5,000-9,999	3 10,999-19,999	4 20,000-59,999	5 60,000-79,999	6 80,000-119,999	7 120,000-199,999	8 200,000+	Total
1970 & before	11	12	-	-	-	-	-	-	11
1971-1975	11	12	12	-	-	-	-	-	11
1976-1980	11	12	13	-	-	-	-	-	11

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1981-1985	11	12	13	15	-	-	-	-	**12**
1986-1990	11	12	14	14	-	16	-	-	**12**
1991-1995	12	13	13	15	-	-	-	-	**12**
1996-2000	12	13	14	15	15	15	-	-	**13**
2001-2005	12	13	14	14	15	15	16	-	**14**
2006-2010	11	13	14	14	14	15	15	-	**13**
2011-2015	11	12	14	14	15	14	15	16	**13**
2016-2020	11	12	14	14	14	14	16	-	**13**
2021-2025	12	12	13	14	15	14	-	-	**13**
Total	**11**	**12**	**14**	**14**	**14**	**14**	**15**	**16**	**13**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.10-11 General Overview of Tanker Product Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Minimum) mid of 2025

	IMO GHG Size Class (dwt)								
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,999-19,999**	**4 20,000-59,999**	**5 60,000-79,999**	**6 80,000-119,999**	**7 120,000-199,999**	**8 200,000+**	**Total**
1970 & before	7	10	-	-	-	-	-	-	**7**
1971-1975	8	10	12	-	-	-	-	-	**8**
1976-1980	6	10	10	-	-	-	-	-	**6**
1981-1985	6	11	10	14	-	-	-	-	**6**
1986-1990	7	10	14	14	-	15	-	-	**7**
1991-1995	6	9	10	14	-	-	-	-	**6**
1996-2000	5	10	10	10	14	14	-	-	**5**
2001-2005	5	8	10	10	10	11	16	-	**5**
2006-2010	6	7	9	10	11	10	10	-	**6**
2011-2015	7	7	9	9	11	12	15	16	**7**
2016-2020	6	7	11	11	12	12	15	-	**6**
2021-2025	8	10	11	10	15	12	-	-	**8**
Total	**5**	**7**	**9**	**9**	**10**	**10**	**10**	**16**	**5**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.10-12 General Overview of Tanker Product Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Maximum) mid of 2025

	IMO GHG Size Class (dwt)								
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,999-19,999**	**4 20,000-59,999**	**5 60,000-79,999**	**6 80,000-119,999**	**7 120,000-199,999**	**8 200,000+**	**Total**
1970 & before	17	13	-	-	-	-	-	-	**17**
1971-1975	14	14	12	-	-	-	-	-	**14**
1976-1980	16	14	15	-	-	-	-	-	**16**
1981-1985	15	15	14	15	-	-	-	-	**15**
1986-1990	19	15	14	15	-	16	-	-	**19**
1991-1995	17	15	16	16	-	-	-	-	**17**
1996-2000	15	15	16	17	15	16	-	-	**17**
2001-2005	15	16	17	17	17	16	16	-	**17**
2006-2010	16	16	18	19	16	17	16	-	**19**
2011-2015	16	16	24	17	16	16	15	16	**24**
2016-2020	14	17	17	17	16	16	18	-	**18**
2021-2025	15	17	16	20	15	15	-	-	**20**
Total	**19**	**17**	**24**	**20**	**17**	**17**	**18**	**16**	**24**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.10-13 General Overview of Tanker Product Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Median) mid of 2025

	IMO GHG Size Class (dwt)								
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,999-19,999**	**4 20,000-59,999**	**5 60,000-79,999**	**6 80,000-119,999**	**7 120,000-199,999**	**8 200,000+**	**Total**
1970 & before	11	13	-	-	-	-	-	-	**13**
1971-1975	11	13	12	-	-	-	-	-	**13**
1976-1980	11	12	14	-	-	-	-	-	**14**
1981-1985	11	13	14	15	-	-	-	-	**15**
1986-1990	11	13	14	14	-	16	-	-	**16**
1991-1995	12	13	13	15	-	-	-	-	**15**
1996-2000	12	13	14	15	15	15	-	-	**15**
2001-2005	12	13	14	15	15	15	16	-	**16**
2006-2010	12	13	14	15	15	15	15	-	**15**
2011-2015	11	12	14	15	15	15	15	16	**16**
2016-2020	12	13	14	15	14	15	16	-	**16**
2021-2025	12	13	13	14	15	14	-	-	**15**
Total	**12**	**13**	**14**	**15**	**15**	**16**	**16**	**16**	**16**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

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Table 12.10-14 General Overview of Tanker Product Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Modus) mid of 2025

	IMO GHG Size Class (dwt)								
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,999-19,999**	**4 20,000-59,999**	**5 60,000-79,999**	**6 80,000-119,999**	**7 120,000-199,999**	**8 200,000+**	**Total**
1970 & before	10	13	-	-	-	-	-	-	**13**
1971-1975	11	13	…	-	-	-	-	-	**13**
1976-1980	11	11	…	-	-	-	-	-	**11**
1981-1985	10	13	14	15	-	-	-	-	**15**
1986-1990	10	14	14	14	-	…	-	-	**14**
1991-1995	11	12	13	16	-	-	-	-	**16**
1996-2000	12	13	14	15	15	15	-	-	**15**
2001-2005	12	14	14	15	15	16	16	-	**16**
2006-2010	11	12	14	15	15	15	15	-	**15**
2011-2015	10	10	13	15	15	15	15	16	**16**
2016-2020	12	12	14	15	14	15	15	-	**15**
2021-2025	12	12	13	15	…	14	-	-	**15**
Total	**12**	**14**	**14**	**16**	**15**	**16**	**16**	**16**	**16**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.10-15 General Overview of Tanker Product Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Average) mid of 2025

	IMO GHG Size Class (dwt)								
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,999-19,999**	**4 20,000-59,999**	**5 60,000-79,999**	**6 80,000-119,999**	**7 120,000-199,999**	**8 200,000+**	**Total**
1970 & before	822	2055	-	-	-	-	-	-	**856**
1971-1975	1167	2362	4266	-	-	-	-	-	**1269**
1976-1980	1219	2652	4358	-	-	-	-	-	**1380**
1981-1985	1229	2772	4367	8119	-	-	-	-	**1812**
1986-1990	1119	2819	3661	7812	-	11400	-	-	**1538**
1991-1995	1486	3122	4694	9457	-	-	-	-	**2052**
1996-2000	1813	3397	5904	10002	12566	15110	-	-	**5300**
2001-2005	1914	3735	6592	10642	14312	16141	19118	-	**7473**
2006-2010	2037	3975	6562	11743	15015	17077	21531	-	**7848**
2011-2015	1571	3492	6618	11365	15292	16392	22200	32540	**6724**
2016-2020	2005	3566	6304	10830	13613	14995	20041	-	**7940**
2021-2025	1828	3511	5758	10677	16685	16288	-	-	**7618**
Total	**1546**	**3586**	**6349**	**11077**	**14651**	**16150**	**20548**	**32540**	**6345**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.10-16 General Overview of Tanker Product Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Minimum) mid of 2025

	IMO GHG Size Class (dwt)								
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,999-19,999**	**4 20,000-59,999**	**5 60,000-79,999**	**6 80,000-119,999**	**7 120,000-199,999**	**8 200,000+**	**Total**
1970 & before	106	941	-	-	-	-	-	-	**106**
1971-1975	106	212	4266	-	-	-	-	-	**106**
1976-1980	230	972	3972	-	-	-	-	-	**230**
1981-1985	191	1148	2942	6697	-	-	-	-	**191**
1986-1990	224	1765	3659	5590	-	11400	-	-	**224**
1991-1995	63	784	2204	7333	-	-	-	-	**63**
1996-2000	111	1764	2355	6263	9040	11253	-	-	**111**
2001-2005	63	1501	2664	6078	7900	13700	17038	-	**63**
2006-2010	216	1472	220	6000	11060	11224	18840	-	**216**
2011-2015	206	735	2000	6480	11060	10701	22200	32200	**206**
2016-2020	216	1396	2665	5346	8820	11350	19228	-	**216**
2021-2025	578	1220	1470	2794	13960	10300	-	-	**578**
Total	**63**	**212**	**220**	**2794**	**7900**	**10300**	**17038**	**32200**	**63**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.10-17 General Overview of Tanker Product Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Maximum) mid of 2025

	IMO GHG Size Class (dwt)								
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,999-19,999**	**4 20,000-59,999**	**5 60,000-79,999**	**6 80,000-119,999**	**7 120,000-199,999**	**8 200,000+**	**Total**
1970 & before	3177	3170	-	-	-	-	-	-	**3177**
1971-1975	3089	3678	4266	-	-	-	-	-	**4266**
1976-1980	3827	4433	4781	-	-	-	-	-	**4781**
1981-1985	3456	4590	5516	9267	-	-	-	-	**9267**

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1986-1990	3580	6119	3663	9284	-	11400	-	-	**11400**
1991-1995	7179	6390	9347	14195	-	-	-	-	**14195**
1996-2000	6142	5788	11910	22861	15423	18141	-	-	**22861**
2001-2005	4719	9279	11360	17520	19864	18609	21130	-	**21130**
2006-2010	6895	18498	15995	20960	19864	23057	25158	-	**25158**
2011-2015	6140	9461	21649	17483	19865	23057	22200	32880	**32880**
2016-2020	7280	17916	13290	32928	19410	18960	20448	-	**32928**
2021-2025	4205	7357	11751	32509	19410	21450	-	-	**32509**
Total	**7280**	**18498**	**21649**	**32928**	**19865**	**23057**	**25158**	**32880**	**32928**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.10-18 General Overview of Tanker Product Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Median) mid of 2025

	IMO GHG Size Class (dwt)								
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,999-19,999**	**4 20,000-59,999**	**5 60,000-79,999**	**6 80,000-119,999**	**7 120,000-199,999**	**8 200,000+**	**Total**
1970 & before	736	2132	-	-	-	-	-	-	**2132**
1971-1975	1030	2501	4266	-	-	-	-	-	**4266**
1976-1980	972	2648	4339	-	-	-	-	-	**4339**
1981-1985	1104	2721	4413	8164	-	-	-	-	**8164**
1986-1990	885	2779	3661	7854	-	11400	-	-	**11400**
1991-1995	1261	2942	4736	8562	-	-	-	-	**8562**
1996-2000	1618	3174	5495	9580	12842	15510	-	-	**15510**
2001-2005	1765	3837	6480	10921	14500	15887	18840	-	**18840**
2006-2010	1795	3900	6318	12031	14686	16440	18840	-	**18840**
2011-2015	1300	3192	6868	11363	15374	16158	22200	32540	**32540**
2016-2020	1770	3330	6455	10645	13770	14878	20448	-	**20448**
2021-2025	1941	3021	6210	10896	16685	15460	-	-	**16685**
Total	**1941**	**3900**	**6868**	**12031**	**16685**	**16440**	**22200**	**32540**	**32540**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.10-19 General Overview of Tanker Product Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Modus) mid of 2025

	IMO GHG Size Class (dwt)								
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,999-19,999**	**4 20,000-59,999**	**5 60,000-79,999**	**6 80,000-119,999**	**7 120,000-199,999**	**8 200,000+**	**Total**
1970 & before	736	…	-	-	-	-	-	-	**736**
1971-1975	1472	2030	…	-	-	-	-	-	**2030**
1976-1980	883	2795	…	-	-	-	-	-	**2795**
1981-1985	1325	2868	4413	8164	-	-	-	-	**8164**
1986-1990	736	1765	…	…	-	11400	-	-	**11400**
1991-1995	736	2942	3700	8562	-	-	-	-	**8562**
1996-2000	736	3089	3882	8562	…	16480	-	-	**16480**
2001-2005	735	3900	6480	9480	17520	15887	…	-	**17520**
2006-2010	735	2942	4440	9960	14210	16440	18840	-	**18840**
2011-2015	735	2400	7399	10768	16146	16458	22200	…	**22200**
2016-2020	735	2206	7086	10463	13945	12037	20448	-	**20448**
2021-2025	2206	2206	7086	11278	…	14450	-	-	**14450**
Total	**2206**	**3900**	**7399**	**11278**	**17520**	**16480**	**22200**	**…**	**22200**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.10-20 General Overview of Tanker Product Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Average) mid of 2025

	IMO GHG Size Class (dwt)								
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,999-19,999**	**4 20,000-59,999**	**5 60,000-79,999**	**6 80,000-119,999**	**7 120,000-199,999**	**8 200,000+**	**Total**
1970 & before	-	-	-	-	-	-	-	-	**-**
1971-1975	-	-	-	-	-	-	-	-	**-**
1976-1980	-	-	-	-	-	-	-	-	**-**
1981-1985	-	-	-	170	-	-	-	-	**170**
1986-1990	175	175	176	172	-	-	-	-	**174**
1991-1995	177	177	176	174	-	-	-	-	**176**
1996-2000	190	180	175	173	171	172	-	-	**175**
2001-2005	199	182	179	171	170	170	172	-	**173**
2006-2010	196	183	181	172	171	171	172	-	**174**
2011-2015	195	186	180	171	174	170	174	171	**175**
2016-2020	190	187	183	168	168	167	168	-	**172**
2021-2025	197	187	183	168	167	168	-	-	**172**
Total	**193**	**185**	**181**	**171**	**171**	**169**	**171**	**171**	**174**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

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Table 12.10-21 General Overview of Tanker Product Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Minimum) mid of 2025

	IMO GHG Size Class (dwt)								
Year of Build Group	1 0-4,999	2 5,000-9,999	3 10,999-19,999	4 20,000-59,999	5 60,000-79,999	6 80,000-119,999	7 120,000-199,999	8 200,000+	Total
1970 & before	-	-	-	-	-	-	-	-	-
1971-1975	-	-	-	-	-	-	-	-	-
1976-1980	-	-	-	-	-	-	-	-	-
1981-1985	-	-	-	170	-	-	-	-	170
1986-1990	175	175	176	170	-	-	-	-	170
1991-1995	175	175	175	174	-	-	-	-	174
1996-2000	177	175	170	167	171	171	-	-	167
2001-2005	179	175	171	167	170	169	169	-	167
2006-2010	179	175	176	167	169	169	169	-	167
2011-2015	176	176	173	167	170	167	174	171	167
2016-2020	176	174	174	164	167	167	168	-	164
2021-2025	189	171	171	164	167	164	-	-	164
Total	175	171	170	164	167	164	168	171	164

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.10-22 General Overview of Tanker Product Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Maximum) mid of 2025

	IMO GHG Size Class (dwt)								
Year of Build Group	1 0-4,999	2 5,000-9,999	3 10,999-19,999	4 20,000-59,999	5 60,000-79,999	6 80,000-119,999	7 120,000-199,999	8 200,000+	Total
1970 & before	-	-	-	-	-	-	-	-	-
1971-1975	-	-	-	-	-	-	-	-	-
1976-1980	-	-	-	-	-	-	-	-	-
1981-1985	-	-	-	170	-	-	-	-	170
1986-1990	175	175	176	174	-	-	-	-	176
1991-1995	181	177	177	174	-	-	-	-	181
1996-2000	210	198	178	176	171	173	-	-	210
2001-2005	210	198	185	177	174	174	174	-	210
2006-2010	210	200	200	179	177	175	174	-	210
2011-2015	212	200	200	181	177	175	174	171	212
2016-2020	207	200	200	181	171	171	168	-	207
2021-2025	207	200	195	177	167	182	-	-	207
Total	212	200	200	181	177	182	174	171	212

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.10-23 General Overview of Tanker Product Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Median) mid of 2025

	IMO GHG Size Class (dwt)								
Year of Build Group	1 0-4,999	2 5,000-9,999	3 10,999-19,999	4 20,000-59,999	5 60,000-79,999	6 80,000-119,999	7 120,000-199,999	8 200,000+	Total
1970 & before	-	-	-	-	-	-	-	-	-
1971-1975	-	-	-	-	-	-	-	-	-
1976-1980	-	-	-	-	-	-	-	-	-
1981-1985	-	-	-	170	-	-	-	-	170
1986-1990	175	175	176	172	-	-	-	-	176
1991-1995	177	177	177	174	-	-	-	-	177
1996-2000	181	177	176	174	171	171	-	-	181
2001-2005	194	185	178	171	170	170	174	-	194
2006-2010	192	185	179	171	170	170	174	-	192
2011-2015	197	185	179	170	174	170	174	171	197
2016-2020	193	185	181	168	168	167	168	-	193
2021-2025	197	186	185	167	167	165	-	-	197
Total	197	186	185	174	174	171	174	171	197

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.10-24 General Overview of Tanker Product Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Modus) mid of 2025

	IMO GHG Size Class (dwt)								
Year of Build Group	1 0-4,999	2 5,000-9,999	3 10,999-19,999	4 20,000-59,999	5 60,000-79,999	6 80,000-119,999	7 120,000-199,999	8 200,000+	Total
1970 & before	-	-	-	-	-	-	-	-	-
1971-1975	-	-	-	-	-	-	-	-	-
1976-1980	-	-	-	-	-	-	-	-	-
1981-1985	-	-	-	…	-	-	-	-	…

1986-1990	…	…	176	…	-	-	-	-	**176**
1991-1995	177	177	177	174	-	-	-	-	**177**
1996-2000	177	177	174	174	171	171	-	-	**177**
2001-2005	210	185	178	171	170	170	174	-	**210**
2006-2010	210	185	178	171	170	170	174	-	**210**
2011-2015	202	185	179	167	174	167	174	171	**202**
2016-2020	195	189	179	168	167	167	168	-	**195**
2021-2025	198	185	185	167	167	165	-	-	**198**
Total	**210**	**189**	**185**	**174**	**174**	**171**	**174**	**171**	**210**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

12.11. *Tanker – Crude Tanker*

Table 12.11-1 General Overview of Crude Tanker Fleet – by Status

Status	Number of Ships
Damaged/Not in Service	1
Dedicated Storage	17
Detained	2
Idle	159
In Service	2042
Laid Up	2
Repairs	10
Storage	38
Total	**2271**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.11-2 General Overview of Crude Tanker Fleet – by Carrier Type

Status	Number of Ships
Oil Recovery Tanker	2
Shuttle Tanker	88
Tanker	2181
Total	**2271**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.11-3 General Overview of Crude Tanker Fleet – by Year of Build Group

Status	Number of Ships
1991-1995	10
1996-2000	86
2001-2005	412
2006-2010	540
2011-2015	415
2016-2020	544
2021-2025	264
Total	**2271**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.11-4 General Overview of Crude Tanker Fleet – by 4th GHG IMO Size Class

Status	Number of Ships
4 20,000-59,999	2
5 60,000-79,999	69
6 80,000-119,999	664
7 120,000-199,999	650
8 200,000 +	886
Total	**2271**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.11-5 General Overview of Crude Tanker Fleet – Engine Derived Power Type

Engine Derived Power Type	Number of Ships
Batteries & Diesel	6
Combined	1
Diesel 2-Stroke	2254
Diesel Electric	10
Total	**2271**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.11-6 General Overview of Crude Tanker Fleet – Main Engine Designer

Main Engine Designer	Number of Ships
Everllence B. & W.	1855
Mitsubishi	18
Sulzer	102

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Unknown	2
Wartsila 2-stroke	161
Wartsila 4-stroke	11
WinGD	122
Total	**2271**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.11-7 General Overview of Crude Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and by Number

	IMO GHG Size Class (dwt)					
Year of Build Group	**1 20,000-59,999**	**2 60,000-79,999**	**3 80,000–119,999**	**4 120,000–199,999**	**5 200,000+**	**Total**
1991-1995	-	-	7	3	-	10
1996-2000	-	4	19	23	40	86
2001-2005	-	28	165	90	129	412
2006-2010	-	22	193	135	190	540
2011-2015	2	3	86	139	185	415
2016-2020	-	11	126	166	241	544
2021-2025	-	1	68	94	101	264
Total	**2**	**69**	**664**	**650**	**886**	**2271**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.11-8 General Overview of Crude Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and GT

	IMO GHG Size Class (dwt)					
Year of Build Group	**1 20,000-59,999**	**2 60,000-79,999**	**3 80,000–119,999**	**4 120,000–199,999**	**5 200,000+**	**Total**
1991-1995	-	-	381032	234777	-	615809
1996-2000	-	163740	1091101	1840022	6268602	9363465
2001-2005	-	1108261	9763392	7464027	20703172	39038852
2006-2010	-	913440	11530406	11209189	30400970	54054005
2011-2015	72606	132233	5248981	11410146	29916745	46780711
2016-2020	-	451173	7852614	13720231	38279624	60303642
2021-2025	-	50531	4286446	7859071	15975369	28171417
Total	**72606**	**2819378**	**40153972**	**53737463**	**141544482**	**238327901**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.11-9 General Overview of Crude Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and DWT

	IMO GHG Size Class (dwt)					
Year of Build Group	**1 20,000-59,999**	**2 60,000-79,999**	**3 80,000–119,999**	**4 120,000–199,999**	**5 200,000+**	**Total**
1991-1995	-	-	692213	422679	-	1114892
1996-2000	-	285341	1987127	3505682	11931127	17709277
2001-2005	-	1949937	17785777	14232218	39692992	73660924
2006-2010	-	1556480	21252054	21429391	58680837	102918762
2011-2015	118652	223754	9418945	21633387	57764033	89158771
2016-2020	-	707102	14230761	25787592	74042051	114767506
2021-2025	-	69323	7707911	14713989	30854704	53345927
Total	**118652**	**4791937**	**73074788**	**101724938**	**272965744**	**452676059**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.11-10 General Overview of Crude Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Average) mid of 2025

	IMO GHG Size Class (dwt)					
Year of Build Group	**1 20,000-59,999**	**2 60,000-79,999**	**3 80,000–119,999**	**4 120,000–199,999**	**5 200,000+**	**Total**
1991-1995	-	-	15	15	-	15
1996-2000	-	15	14	15	16	15
2001-2005	-	15	15	15	15	15
2006-2010	-	15	15	15	15	15
2011-2015	14	15	15	15	16	15
2016-2020	-	14	14	15	15	15
2021-2025	-	15	14	14	15	15
Total	**14**	**15**	**15**	**15**	**15**	**15**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

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Table 12.11-11 General Overview of Crude Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Minimum) mid of 2025

	IMO GHG Size Class (dwt)					
Year of Build Group	1 20,000-59,999	2 60,000-79,999	3 80,000–119,999	4 120,000–199,999	5 200,000+	Total
1991-1995	-	-	13	14	-	13
1996-2000	-	15	10	14	14	10
2001-2005	-	12	10	9	10	9
2006-2010	-	14	11	11	11	11
2011-2015	14	15	13	11	8	8
2016-2020	-	14	11	12	11	11
2021-2025	-	15	11	11	11	11
Total	**14**	**12**	**10**	**9**	**8**	**8**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.11-12 General Overview of Crude Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Maximum) mid of 2025

	IMO GHG Size Class (dwt)					
Year of Build Group	1 20,000-59,999	2 60,000-79,999	3 80,000–119,999	4 120,000–199,999	5 200,000+	Total
1991-1995	-	-	16	15	-	16
1996-2000	-	15	15	16	17	17
2001-2005	-	16	16	17	17	17
2006-2010	-	17	21	20	18	21
2011-2015	14	15	16	16	22	22
2016-2020	-	15	16	17	17	17
2021-2025	-	15	15	17	16	17
Total	**14**	**17**	**21**	**20**	**22**	**22**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.11-13 General Overview of Crude Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Median) mid of 2025

	IMO GHG Size Class (dwt)					
Year of Build Group	1 20,000-59,999	2 60,000-79,999	3 80,000–119,999	4 120,000–199,999	5 200,000+	Total
1991-1995	-	-	15	15	-	15
1996-2000	-	15	15	15	16	16
2001-2005	-	15	15	15	16	16
2006-2010	-	15	15	15	16	16
2011-2015	14	15	15	15	16	16
2016-2020	-	15	15	15	15	15
2021-2025	-	15	15	15	15	15
Total	**14**	**15**	**15**	**15**	**16**	**16**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.11-14 General Overview of Crude Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Modus) mid of 2025

	IMO GHG Size Class (dwt)					
Year of Build Group	1 20,000-59,999	2 60,000-79,999	3 80,000–119,999	4 120,000–199,999	5 200,000+	Total
1991-1995	-	-	15	…	-	15
1996-2000	-	15	15	15	16	16
2001-2005	-	15	15	15	16	16
2006-2010	-	15	15	16	16	16
2011-2015	14	15	15	16	16	16
2016-2020	-	15	15	15	15	15
2021-2025	-	15	14	15	15	15
Total	**14**	**15**	**15**	**16**	**16**	**16**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.11-15 General Overview of Crude Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Average) mid of 2025

	IMO GHG Size Class (dwt)					
Year of Build Group	1 20,000-59,999	2 60,000-79,999	3 80,000–119,999	4 120,000–199,999	5 200,000+	Total
1991-1995	-	-	14942	18484	-	16004
1996-2000	-	9962	13439	16638	26150	20045
2001-2005	-	11113	13311	17836	27550	18612
2006-2010	-	12937	13713	18395	28123	19925

2011-2015	9960	12454	13930	17539	28195	21468
2016-2020	-	9509	12349	16365	25161	19193
2021-2025	-	-	12844	16252	23823	18278
Total	**9960**	**11435**	**13298**	**17241**	**26670**	**19591**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.11-16 General Overview of Crude Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Minimum) mid of 2025

	IMO GHG Size Class (dwt)					
Year of Build Group	**1 20,000-59,999**	**2 60,000-79,999**	**3 80,000–119,999**	**4 120,000–199,999**	**5 200,000+**	**Total**
1991-1995	-	-	12180	13033	-	12180
1996-2000	-	9333	10804	14829	23536	9333
2001-2005	-	10010	10765	12370	22650	10010
2006-2010	-	9710	9480	11324	22650	9480
2011-2015	9960	12240	10830	12210	22653	9960
2016-2020	-	8500	9450	10440	21670	8500
2021-2025	-	-	10300	11468	18700	10300
Total	**9960**	**8500**	**9450**	**10440**	**18700**	**8500**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.11-17 General Overview of Crude Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Maximum) mid of 2025

	IMO GHG Size Class (dwt)					
Year of Build Group	**1 20,000-59,999**	**2 60,000-79,999**	**3 80,000–119,999**	**4 120,000–199,999**	**5 200,000+**	**Total**
1991-1995	-	-	15402	27000	-	27000
1996-2000	-	10591	14875	19976	29420	29420
2001-2005	-	13560	15820	25200	35090	35090
2006-2010	-	22400	27120	25200	33600	33600
2011-2015	9960	12882	19800	21770	31640	31640
2016-2020	-	10600	16695	22161	33250	33250
2021-2025	-	-	17040	21840	32970	32970
Total	**9960**	**22400**	**27120**	**27000**	**35090**	**35090**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.11-18 General Overview of Crude Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Median) mid of 2025

	IMO GHG Size Class (dwt)					
Year of Build Group	**1 20,000-59,999**	**2 60,000-79,999**	**3 80,000–119,999**	**4 120,000–199,999**	**5 200,000+**	**Total**
1991-1995	-	-	15402	13956	-	15402
1996-2000	-	10371	12435	16857	25487	25487
2001-2005	-	11060	13560	18623	27160	27160
2006-2010	-	12240	13560	18660	29331	29331
2011-2015	9960	12240	13560	18215	29260	29260
2016-2020	-	9600	11820	15310	24500	24500
2021-2025	-	-	11350	15700	22650	22650
Total	**9960**	**12240**	**15402**	**18660**	**29331**	**29331**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.11-19 General Overview of Crude Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Modus) mid of 2025

	IMO GHG Size Class (dwt)					
Year of Build Group	**1 20,000-59,999**	**2 60,000-79,999**	**3 80,000–119,999**	**4 120,000–199,999**	**5 200,000+**	**Total**
1991-1995	-	-	15402	…	-	15402
1996-2000	-	…	12268	16858	25487	25487
2001-2005	-	10223	13560	18660	27160	27160
2006-2010	-	12240	13560	18660	25480	25480
2011-2015	9960	12240	13560	18660	31640	31640
2016-2020	-	10600	11730	15100	24500	24500
2021-2025	-	-	11200	15100	22200	22200
Total	**9960**	**12240**	**15402**	**18660**	**31640**	**31640**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

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Table 12.11-20 General Overview of Crude Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC (Average) mid of 2025

	IMO GHG Size Class (dwt)					
Year of Build Group	1 20,000-59,999	2 60,000-79,999	3 80,000–119,999	4 120,000–199,999	5 200,000+	Total
1991-1995	-	-	171	171	-	171
1996-2000	-	173	173	171	171	171
2001-2005	-	170	170	171	167	170
2006-2010	-	172	172	173	170	171
2011-2015	175	175	173	172	170	171
2016-2020	-	168	168	168	166	167
2021-2025	-	-	170	165	166	167
Total	**175**	**171**	**171**	**170**	**168**	**169**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.11-21 General Overview of Crude Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC (Minimum) mid of 2025

	IMO GHG Size Class (dwt)					
Year of Build Group	1 20,000-59,999	2 60,000-79,999	3 80,000–119,999	4 120,000–199,999	5 200,000+	Total
1991-1995	-	-	171	171	-	171
1996-2000	-	173	171	169	166	166
2001-2005	-	170	169	169	166	166
2006-2010	-	170	169	169	166	166
2011-2015	175	174	167	167	165	165
2016-2020	-	167	167	167	165	165
2021-2025	-	-	164	163	163	163
Total	**175**	**167**	**164**	**163**	**163**	**163**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.11-22 General Overview of Crude Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC (Maximum) mid of 2025

	IMO GHG Size Class (dwt)					
Year of Build Group	1 20,000-59,999	2 60,000-79,999	3 80,000–119,999	4 120,000–199,999	5 200,000+	Total
1991-1995	-	-	171	171	-	171
1996-2000	-	173	173	174	171	174
2001-2005	-	171	174	174	174	174
2006-2010	-	177	175	174	174	177
2011-2015	175	175	176	175	174	176
2016-2020	-	168	182	184	171	184
2021-2025	-	-	182	184	184	184
Total	**175**	**177**	**182**	**184**	**184**	**184**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.11-23 General Overview of Crude Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC (Median) mid of 2025

	IMO GHG Size Class (dwt)					
Year of Build Group	1 20,000-59,999	2 60,000-79,999	3 80,000–119,999	4 120,000–199,999	5 200,000+	Total
1991-1995	-	-	171	171	-	171
1996-2000	-	173	173	171	171	173
2001-2005	-	170	170	169	166	170
2006-2010	-	171	170	174	171	174
2011-2015	175	175	174	171	168	175
2016-2020	-	168	167	167	166	168
2021-2025	-	-	167	163	166	167
Total	**175**	**175**	**174**	**174**	**171**	**175**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.11-24 General Overview of Crude Tanker Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC (Modus) mid of 2025

	IMO GHG Size Class (dwt)					
Year of Build Group	1 20,000-59,999	2 60,000-79,999	3 80,000–119,999	4 120,000–199,999	5 200,000+	Total
1991-1995	-	-	171	171	-	171
1996-2000	-	173	173	171	171	173
2001-2005	-	170	170	169	166	170
2006-2010	-	170	170	174	173	174

2011-2015	175	175	174	174	168	175
2016-2020	-	168	167	167	166	168
2021-2025	-	-	167	163	166	167
Total	**175**	**175**	**174**	**174**	**173**	**175**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

12.12. *Tanker - Chemical*

Table 12.12-1 General Overview of Tanker Chemical Fleet – by Status

Status	Number of Ships
Damaged/Not in Service	4
Dedicated Storage	1
Detained	1
Idle	177
In Service	3498
Laid Up	11
Repairs	10
Under Arrest	3
Total	**3705**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.12-2 General Overview of Tanker Chemical Fleet – by Carrier Type

Carrier Type	Number of Ships
Chemical & Oil Carrier	3700
Chemical & LPG Carrier	4
Slop Reception Vessel	1
Total	**3705**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.12-3 General Overview of Tanker Chemical Fleet – by Year of Build Group

Year of Build Group	Number of Ships
1970 and before	14
1971-1975	17
1976-1980	19
1981-1985	53
1986-1990	83
1991-1995	170
1996-2000	285
2001-2005	459
2006-2010	1211
2011-2015	459
2016-2020	528
2021-2025	407
Total	**3705**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.12-4 General Overview of Tanker Chemical Fleet – by 4th GHG IMO Size Class

4th GHG Size Class	Number of Ships
1 0-4,999	821
2 5,000-9,999	948
3 10,000-19,999	1223
4 20,000-39,999	490
5 40,000+	223
Total	**3705**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.12-5 General Overview of Tanker Chemical Fleet – Engine Derived Power Type

Engine Derived Power Type	Number of Ships
Batteries & Diesel	33
Diesel 2-Stroke	1869
Diesel 4-Stroke	1765
Diesel Electric	38
Total	**3705**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.12-6 General Overview of Tanker Chemical Fleet – Main Engine Designer

Main Engine Designer	Number of Ships

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A.B.C.	10
Akasaka	65
Allen	1
Bergen	13
Bergen Normo	1
Blackstone	1
Callesen	1
Caterpillar	8
Cummins Inc	8
Daihatsu Infinearth	73
Deutz	7
Everllence B. & W.	1777
Fuji Diesel	2
Guangzhou Diesel	87
Guascor	1
Hanshin	194
HHI-EMD (HiMSEN)	17
HHM	1
J-ENG	56
Jinan Diesel	3
MaK	352
Makita	2
Matsui	5
Mirrlees	1
Mitsubishi	273
MWM	1
Niigata	31
Ningbo C.S.I. Power	70
Otsuka	2
Pielstick	10
Polar	1
SKL	5
Smit-Bolnes	3
Soviet	1
Stork-Wartsila	6
Sulzer	12
Sumiyoshi	2
Ulstein Bergen	5
Wartsila 2-stroke	15
Wartsila 4-stroke	285
Weichai HM	12
Werkspoor	2
WinGD	68
Wuxi Diesel	1
Wuxi Wandi	10
Yanmar	117
Zichai Power	25
(unknown)	62
Total	**3705**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.12-7 General Overview of Tanker Chemical Fleet – by 4th GHG IMO Size Class by year of Build (Group) and by Number

	IMO GHG Size Class (dwt)					
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,999-19,999**	**4 20,000-39,999**	**5 40,000+**	**Total**
1970 & before	14	-	-	-	-	14
1971-1975	17	-	-	-	-	17
1976-1980	18	1	-	-	-	19
1981-1985	39	12	1	-	1	53
1986-1990	66	14	2	1	-	83
1991-1995	113	34	19	4	-	170
1996-2000	55	86	87	44	13	285
2001-2005	99	136	128	75	21	459
2006-2010	201	296	564	109	41	1211
2011-2015	67	147	136	68	41	459
2016-2020	67	103	178	134	46	528
2021-2025	65	119	108	55	60	407
Total	**821**	**948**	**1223**	**490**	**223**	**3705**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.12-8 General Overview of Tanker Chemical Fleet – by 4th GHG IMO Size Class by year of Build (Group) and GT

	IMO GHG Size Class (dwt)					
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,999-19,999**	**4 20,000-39,999**	**5 40,000+**	**Total**
1970 & before	9545	-	-	-	-	9545
1971-1975	19839	-	-	-	-	19839
1976-1980	18508	5207	-	-	-	23715

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TRUSTEE Project GA n° 101192328

1981-1985	43552	52829	7175	-	29763	133319
1986-1990	56158	63796	18040	16555	-	154549
1991-1995	146215	163587	156735	76786	-	543323
1996-2000	110177	409382	759837	885369	357267	2522032
2001-2005	224753	653396	1258943	1350586	611171	4098849
2006-2010	466949	1470320	5428178	1923057	1162974	10451478
2011-2015	163764	743872	1436342	1294571	1231205	4869754
2016-2020	173735	525167	1848022	2558609	1377538	6483071
2021-2025	186627	633979	1153544	966932	1847476	4788558
Total	**1619822**	**4721535**	**12066816**	**9072465**	**6617394**	**34098032**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.12-9 General Overview of Tanker Chemical Fleet – by 4th GHG IMO Size Class by year of Build (Group) and DWT

	IMO GHG Size Class (dwt)					
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,999-19,999**	**4 20,000-39,999**	**5 40,000+**	**Total**
1970 & before	15783	-	-	-	-	15783
1971-1975	30669	-	-	-	-	30669
1976-1980	28678	9148	-	-	-	37826
1981-1985	71090	82227	12824	-	51668	217809
1986-1990	96663	104802	26859	27821	-	256145
1991-1995	241054	264285	252985	122794	-	881118
1996-2000	165059	631723	1223559	1381979	583975	3986295
2001-2005	323092	1006026	2035290	2134384	955052	6453844
2006-2010	647628	2165897	8432800	3082891	1885666	16214882
2011-2015	226769	1059451	2256317	2044871	1992200	7579608
2016-2020	231659	748503	2861735	3996449	2204135	10042481
2021-2025	230329	869201	1790400	1462399	3034113	7386442
Total	**2308473**	**6941263**	**18892769**	**14253588**	**10706809**	**53102902**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.12-10 General Overview of Tanker Chemical Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Average) mid of 2025

	IMO GHG Size Class (dwt)					
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,999-19,999**	**4 20,000-39,999**	**5 40,000+**	**Total**
1970 & before	11	-	-	-	-	11
1971-1975	11	-	-	-	-	11
1976-1980	11	13	-	-	-	11
1981-1985	11	13	11	-	15	12
1986-1990	11	13	14	14	-	12
1991-1995	12	13	13	15	-	12
1996-2000	13	14	14	15	14	14
2001-2005	13	13	14	14	15	14
2006-2010	12	13	14	15	15	13
2011-2015	12	12	14	15	14	13
2016-2020	12	13	14	15	14	14
2021-2025	12	13	13	14	14	13
Total	**12**	**13**	**14**	**15**	**14**	**13**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.12-11 General Overview of Tanker Chemical Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Minimum) mid of 2025

	IMO GHG Size Class (dwt)					
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,999-19,999**	**4 20,000-39,999**	**5 40,000+**	**Total**
1970 & before	10	-	-	-	-	10
1971-1975	8	-	-	-	-	8
1976-1980	8	13	-	-	-	8
1981-1985	10	12	11	-	15	10
1986-1990	9	11	12	14	-	9
1991-1995	8	9	12	15	-	8
1996-2000	10	11	11	13	13	10
2001-2005	9	9	10	11	13	9
2006-2010	9	8	9	10	12	8
2011-2015	9	10	9	13	12	9
2016-2020	9	10	11	11	12	9
2021-2025	11	10	11	12	12	10
Total	**8**	**8**	**9**	**10**	**12**	**8**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

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Table 12.12-12 General Overview of Tanker Chemical Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Maximum) mid of 2025

	IMO GHG Size Class (dwt)					
Year of Build Group	1 0-4,999	2 5,000-9,999	3 10,999-19,999	4 20,000-39,999	5 40,000+	Total
1970 & before	12	-	-	-	-	12
1971-1975	13	-	-	-	-	13
1976-1980	13	13	-	-	-	13
1981-1985	13	14	11	-	15	15
1986-1990	19	15	15	14	-	19
1991-1995	14	15	16	16	-	16
1996-2000	15	15	16	17	15	17
2001-2005	15	16	17	17	15	17
2006-2010	16	16	17	17	16	17
2011-2015	15	16	24	17	16	24
2016-2020	14	15	17	17	16	17
2021-2025	15	17	16	17	20	20
Total	**19**	**17**	**24**	**17**	**20**	**24**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.12-13 General Overview of Tanker Chemical Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Median) mid of 2025

	IMO GHG Size Class (dwt)					
Year of Build Group	1 0-4,999	2 5,000-9,999	3 10,999-19,999	4 20,000-39,999	5 40,000+	Total
1970 & before	11	-	-	-	-	11
1971-1975	11	-	-	-	-	11
1976-1980	11	13	-	-	-	13
1981-1985	11	13	11	-	15	15
1986-1990	11	13	14	14	-	14
1991-1995	12	13	13	16	-	16
1996-2000	13	13	14	15	14	15
2001-2005	13	14	14	15	15	15
2006-2010	12	13	14	15	15	15
2011-2015	12	12	14	15	15	15
2016-2020	12	13	14	15	15	15
2021-2025	12	13	13	14	14	14
Total	**13**	**14**	**14**	**16**	**15**	**16**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.12-14 General Overview of Tanker Chemical Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Modus) mid of 2025

	IMO GHG Size Class (dwt)					
Year of Build Group	1 0-4,999	2 5,000-9,999	3 10,999-19,999	4 20,000-39,999	5 40,000+	Total
1970 & before	12	-	-	-	-	12
1971-1975	11	-	-	-	-	11
1976-1980	13	13	-	-	-	13
1981-1985	11	12	11	-	15	15
1986-1990	11	13	…	14	-	14
1991-1995	11	13	13	16	-	16
1996-2000	13	13	14	15	14	15
2001-2005	13	14	15	15	15	15
2006-2010	13	13	14	16	15	16
2011-2015	12	10	13	15	15	15
2016-2020	12	12	14	15	15	15
2021-2025	12	13	13	14	14	14
Total	**13**	**14**	**15**	**16**	**15**	**16**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.12-15 General Overview of Tanker Chemical Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Average) mid of 2025

	IMO GHG Size Class (dwt)					
Year of Build Group	1 0-4,999	2 5,000-9,999	3 10,999-19,999	4 20,000-39,999	5 40,000+	Total
1970 & before	761	-	-	-	-	761
1971-1975	1235	-	-	-	-	1235
1976-1980	1145	4413	-	-	-	1317
1981-1985	1066	2888	4413	-	9267	1708
1986-1990	984	3063	4888	5590	-	1484
1991-1995	1379	3379	4573	8620	-	2306
1996-2000	2006	3431	5184	8752	8788	4530
2001-2005	1919	3431	5655	8001	9755	4814

2006-2010	1926	3120	5182	7821	10068	4625
2011-2015	1735	2975	5120	7201	9151	4620
2016-2020	1781	2879	4494	6435	7613	4599
2021-2025	2016	2799	4423	5825	8495	4452
Total	**1645**	**3112**	**5045**	**7187**	**8862**	**4346**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.12-16 General Overview of Tanker Chemical Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Minimum) mid of 2025

	IMO GHG Size Class (dwt)					
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,999-19,999**	**4 20,000-39,999**	**5 40,000+**	**Total**
1970 & before	497	-	-	-	-	497
1971-1975	324	-	-	-	-	324
1976-1980	442	4413	-	-	-	442
1981-1985	552	2427	4413	-	9267	552
1986-1990	508	2379	4075	5590	-	508
1991-1995	441	784	2251	7333	-	441
1996-2000	735	1764	3494	6178	8160	735
2001-2005	406	1839	3604	6150	8407	406
2006-2010	218	1800	442	6000	8193	218
2011-2015	216	1913	1913	4860	7180	216
2016-2020	735	1912	3300	4860	6500	735
2021-2025	735	1810	2942	4200	6650	735
Total	**216**	**784**	**442**	**4200**	**6500**	**216**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.12-17 General Overview of Tanker Chemical Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Maximum) mid of 2025

	IMO GHG Size Class (dwt)					
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,999-19,999**	**4 20,000-39,999**	**5 40,000+**	**Total**
1970 & before	1294	-	-	-	-	1294
1971-1975	2354	-	-	-	-	2354
1976-1980	2648	4413	-	-	-	4413
1981-1985	2059	4413	4413	-	9267	9267
1986-1990	3374	3604	5700	5590	-	5700
1991-1995	3001	5280	7060	10415	-	10415
1996-2000	4707	5281	8562	11472	9414	11472
2001-2005	3372	5970	8400	11060	13085	13085
2006-2010	4787	5400	10793	11539	13085	13085
2011-2015	5148	7200	7360	8730	11300	11300
2016-2020	2647	4500	10320	10680	10860	10860
2021-2025	2942	5884	8000	8000	10860	10860
Total	**5148**	**7200**	**10793**	**11539**	**13085**	**13085**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.12-18 General Overview of Tanker Chemical Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Median) mid of 2025

	IMO GHG Size Class (dwt)					
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,999-19,999**	**4 20,000-39,999**	**5 40,000+**	**Total**
1970 & before	626	-	-	-	-	626
1971-1975	971	-	-	-	-	971
1976-1980	883	4413	-	-	-	4413
1981-1985	883	2967	4413	-	9267	9267
1986-1990	736	3089	4888	5590	-	5590
1991-1995	883	3375	3883	8365	-	8365
1996-2000	1618	3111	5224	7943	8713	8713
2001-2005	1920	3640	6178	7980	9480	9480
2006-2010	1913	2970	4457	7860	9960	9960
2011-2015	1471	2640	4900	7290	9473	9473
2016-2020	1618	2800	4440	6050	7320	7320
2021-2025	1998	2700	4440	5730	8260	8260
Total	**1998**	**4413**	**6178**	**8365**	**9960**	**9960**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.12-19 General Overview of Tanker Chemical Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Modus) mid of 2025

	IMO GHG Size Class (dwt)					
Year of Build Group	**1**	**2**	**3**	**4**	**5**	**Total**

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	0-4,999	5,000-9,999	10,999-19,999	20,000-39,999	40,000+	
1970 & before	809	-	-	-	-	809
1971-1975	1471	-	-	-	-	1471
1976-1980	736	4413	-	-	-	4413
1981-1985	589	2992	4413	-	9267	9267
1986-1990	736	3089	...	5590	-	5590
1991-1995	736	3089	3700	...	-	3700
1996-2000	736	3089	3882	7059	8562	8562
2001-2005	735	3900	4440	7980	8410	8410
2006-2010	1920	3900	4440	7860	9960	9960
2011-2015	735	2400	4440	7290	9473	9473
2016-2020	735	2400	4440	5640	7211	7211
2021-2025	1765	3000	4620	5730	7320	7320
Total	**1920**	**4413**	**4620**	**7980**	**9960**	**9960**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.12-20 General Overview of Tanker Chemical Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Average) mid of 2025

	IMO GHG Size Class (dwt)					
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,999-19,999**	**4 20,000-39,999**	**5 40,000+**	**Total**
1970 & before	-	-	-	-	-	-
1971-1975	-	-	-	-	-	-
1976-1980	-	-	-	-	-	-
1981-1985	-	-	-	-	-	-
1986-1990	-	175	-	-	-	175
1991-1995	176	175	175	175	-	175
1996-2000	179	176	175	172	173	175
2001-2005	185	178	176	170	171	176
2006-2010	187	181	178	172	172	178
2011-2015	191	183	178	172	172	178
2016-2020	191	181	176	170	168	175
2021-2025	191	183	175	172	167	176
Total	**187**	**181**	**177**	**171**	**170**	**177**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.12-21 General Overview of Tanker Chemical Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Minimum) mid of 2025

	IMO GHG Size Class (dwt)					
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,999-19,999**	**4 20,000-39,999**	**5 40,000+**	**Total**
1970 & before	-	-	-	-	-	-
1971-1975	-	-	-	-	-	-
1976-1980	-	-	-	-	-	-
1981-1985	-	-	-	-	-	-
1986-1990	-	175	-	-	-	175
1991-1995	174	170	167	173	-	167
1996-2000	177	175	167	167	171	167
2001-2005	175	175	167	167	170	167
2006-2010	175	176	170	167	170	167
2011-2015	181	176	170	164	167	164
2016-2020	177	174	167	164	164	164
2021-2025	182	174	163	164	165	163
Total	**174**	**170**	**163**	**164**	**164**	**163**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.12-22 General Overview of Tanker Chemical Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Maximum) mid of 2025

	IMO GHG Size Class (dwt)					
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,999-19,999**	**4 20,000-39,999**	**5 40,000+**	**Total**
1970 & before	-	-	-	-	-	-
1971-1975	-	-	-	-	-	-
1976-1980	-	-	-	-	-	-
1981-1985	-	-	-	-	-	-
1986-1990	-	175	-	-	-	175
1991-1995	177	177	177	176	-	177
1996-2000	186	187	187	176	174	187
2001-2005	210	185	187	177	173	210
2006-2010	202	195	188	179	175	202
2011-2015	210	200	181	179	175	210
2016-2020	198	190	188	179	175	198
2021-2025	198	200	185	185	168	200
Total	**210**	**200**	**188**	**185**	**175**	**210**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

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Table 12.12-23 General Overview of Tanker Chemical Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Median) mid of 2025

	IMO GHG Size Class (dwt)					
Year of Build Group	1 0-4,999	2 5,000-9,999	3 10,999-19,999	4 20,000-39,999	5 40,000+	Total
1970 & before	-	-	-	-	-	-
1971-1975	-	-	-	-	-	-
1976-1980	-	-	-	-	-	-
1981-1985	-	-	-	-	-	-
1986-1990	-	175	-	-	-	175
1991-1995	177	175	177	176	-	177
1996-2000	177	176	176	174	174	177
2001-2005	182	178	178	171	171	182
2006-2010	188	181	179	171	171	188
2011-2015	188	185	179	171	175	188
2016-2020	190	179	176	170	167	190
2021-2025	189	181	174	170	167	189
Total	**190**	**185**	**179**	**176**	**175**	**190**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.12-24 General Overview of Tanker Chemical Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Modus) mid of 2025

	IMO GHG Size Class (dwt)					
Year of Build Group	1 0-4,999	2 5,000-9,999	3 10,999-19,999	4 20,000-39,999	5 40,000+	Total
1970 & before	-	-	-	-	-	-
1971-1975	-	-	-	-	-	-
1976-1980	-	-	-	-	-	-
1981-1985	-	-	-	-	-	-
1986-1990	-	175	-	-	-	175
1991-1995	177	175	177	176	-	177
1996-2000	177	175	177	174	174	177
2001-2005	182	179	178	167	170	182
2006-2010	190	179	179	167	171	190
2011-2015	184	185	179	168	175	185
2016-2020	198	179	174	170	168	198
2021-2025	187	179	174	170	167	187
Total	**198**	**185**	**179**	**176**	**175**	**198**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

12.13. *General Cargo - General Cargo*

Table 12.13-1 General Overview of General Cargo Fleet – by Status

Status	Number of Ships
In Service	14251
Repairs	169
Idle	494
Damaged/Not in Service	15
Abandoned	6
Laid Up	59
Under Arrest	6
Storage	1
Detained	1
Total	**15002**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.13-2 General Overview of General Cargo Fleet – by Carrier Type

Carrier Type	Number of Ships
Barge Carrier	3
Deck Cargo Carrier	463
Fish Feed Carrier	1
General Cargo	8117
Heavy Lift Cargo Vessel	27
Landing Craft	839
Livestock Carrier	106
Miscellaneous Cargo	14
Multi-Purpose	2825
Multi-Purpose/Heavy Lift Cargo	473
Open Hatch Carrier	1087
Palletised Cargo Carrier	26
Products/Multi-Purpose Cargo	7

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Reefer Fish Carrier	265
Ro-Ro	585
Ro-Ro/Container	86
Ro-Ro/Lo-Lo	78
Total	**15002**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.13-3 General Overview of General Cargo Fleet – by Year of Build Group

Year of Build Group	Number of Ships
1970 and before	621
1971-1975	461
1976-1980	812
1981-1985	1106
1986-1990	995
1991-1995	1225
1996-2000	1207
2001-2005	1456
2006-2010	2875
2011-2015	1927
2016-2020	1074
2021-2025	1243
Total	**15002**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.13-4 General Overview of General Cargo Fleet – by 4th GHG IMO Size Class

4th GHG Size Class	Number of Ships
1 0-4,999	8377
2 5,000-9,999	3738
3 10,000-19,999	1462
4 20,000+	1425
Total	**15002**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.13-5 General Overview of General Cargo Fleet – by Engine Derived Power Type

Engine Derived Power Type	Number of Ships
Batteries & Diesel	53
Batteries propulsion	2
Diesel 2-Stroke	2903
Diesel 4-Stroke	11982
Diesel Electric	53
Hybrid Mech./Elec.	2
Nuclear	1
Steam Turbine	1
Wind & Diesel	5
Total	**15002**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.13-6 General Overview of General Cargo Fleet – by Main Engine Designer

Main Engine Designer	Number of Ships
A.B.C.	85
Akasaka	338
Allen	3
Alpha Diesel	11
Ansaldo	5
Barnaultransmash	2
Bergen	19
Bergen Normo	8
Blackstone	26
Bolnes	9
Brons	22
Callesen	33
Caterpillar	377
Chinese Std.	77
CMI	2
Crepelle	4
Crossley	1
Cummins Inc	428
Daihatsu Infinearth	223
Daldiesel	10
De Industrie	5
Detroit Diesel Corp	17
Deutz	418
Doosan Infracore	4
Duvant	2
Dvigatel Revolyutsii	125

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Eng. Elec.	2
Enterprise	4
Everllence B. & W.	2566
Fairbanks Morse	4
Fiat	2
Fuji Diesel	15
Gardner L & Sons	1
Gen. Motors	21
General Electric	1
Grandi Motori	6
Grenaa	2
Guangzhou Diesel	406
Guascor	2
Hanshin	872
HD Infracore	1
Hedemora	1
HHI-EMD (HiMSEN)	32
HHM	17
Hyundai Machinery	1
Imperial	1
Isotta Fraschini	1
Ito	7
Iveco	1
J-ENG	30
Jiangsu Antai Power	4
Jinan Diesel	3
Kelvin	5
Kinoshita	2
Kirloskar	1
Kobe Diesel	2
Komatsu	2
Kromhout	22
Kubota	1
Lang	3
Leyland	1
MaK	1602
Makita	122
Matsui	92
Mercedes	1
Mirrlees	5
Mitsubishi	618
Moteurs Baudouin	8
MTU	7
MWM	148
Nantong Shengang	2
National Gas	1
Niigata	316
Ningbo C.S.I. Power	484
Nippon	12
Nissan	11
Nohab	1
Normo	11
Otsuka	4
Penzadizelmash	3
Pervomaydizelmash	2
Pielstick	110
Polar	17
Poyaud	6
Rolls-Royce Marine	1
Ruston	3
Scania	10
SDEC Power	3
SKL	678
Skoda	179
Smit-Bolnes	3
Soviet	61
Stork	3
Stork Werkspoor	28
Stork-Wartsila	12
Sulzer	133
Sumiyoshi	14
Ulstein Bergen	10
Volund	1
Volvo Penta	62
Wartsila 2-stroke	110
Wartsila 4-stroke	754
Waukesha	1
Weichai HM	283
Weichai Power	1
Weifang Diesel	69
Werkspoor	35
Wichmann	27
WinGD	71
Wizeman	1
Wuxi Diesel	10
Wuxi Wandi	80
Yanmar	531

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Yuchai Marine Power	14
Zichai Power	440
(unknown)	1495
Total	**15002**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.13-7 General Overview of General Cargo Fleet – by 4th GHG IMO Size Class by year of Build (Group) and by Number

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,000-19,999**	**4 20,000+**	**Total**
1970 & before	585	35	1	-	621
1971-1975	381	77	2	1	461
1976-1980	707	89	15	1	812
1981-1985	950	138	16	2	1106
1986-1990	836	135	19	5	995
1991-1995	946	216	38	25	1225
1996-2000	573	405	77	152	1207
2001-2005	758	424	159	115	1456
2006-2010	1255	972	442	206	2875
2011-2015	665	479	314	469	1927
2016-2020	398	324	139	213	1074
2021-2025	323	444	240	236	1243
Total	**8377**	**3738**	**1462**	**1425**	**15002**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.13-8 General Overview of General Cargo Fleet – by 4th GHG IMO Size Class by year of Build (Group) and GT

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,000-19,999**	**4 20,000+**	**Total**
1970 & before	602634	134375	11310	-	748319
1971-1975	575839	324227	19863	30435	950364
1976-1980	1196039	433519	242450	18588	1890596
1981-1985	1666674	727791	218950	62280	2675695
1986-1990	1389849	786890	276351	126919	2580009
1991-1995	1657654	1244596	342956	708121	3953327
1996-2000	1138224	2537353	1174155	3512198	8361930
2001-2005	1310348	2170497	1857952	3023579	8362376
2006-2010	2185285	4696535	5058345	5194348	17134513
2011-2015	1103639	2640089	3772163	12487612	20003503
2016-2020	682415	1802398	2031409	6297426	10813648
2021-2025	625266	2379745	3311031	7702483	14018525
Total	**14133866**	**19878015**	**18316935**	**39163989**	**91492805**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.13-9 General Overview of General Cargo Fleet – by 4th GHG IMO Size Class by year of Build (Group) and DWT

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,000-19,999**	**4 20,000+**	**Total**
1970 & before	839484	191449	12932	-	1043865
1971-1975	714725	486363	28510	46265	1275863
1976-1980	1382399	579370	200572	28421	2190762
1981-1985	2039365	935429	226679	68425	3269897
1986-1990	1620672	924487	247752	129250	2922161
1991-1995	2197747	1494448	467706	1019462	5179363
1996-2000	1587716	2915426	1046807	4873305	10423254
2001-2005	1961595	2748173	1985098	3905467	10600333
2006-2010	3349103	6594124	5848059	7712514	23503800
2011-2015	1512406	3356161	4400497	17344509	26613573
2016-2020	906185	2279751	1884294	8784087	13854317
2021-2025	840529	3263207	3281147	11015344	18400227
Total	**18951924**	**25768387**	**19630053**	**54927049**	**119277413**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.13-10 General Overview of General Cargo Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Average) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,000-19,999**	**4 20,000+**	**Total**

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1970 & before	11	11	20	-	11
1971-1975	12	13	16	15	12
1976-1980	12	13	17	15	12
1981-1985	11	13	15	16	11
1986-1990	11	13	15	19	12
1991-1995	12	13	14	15	12
1996-2000	12	14	16	15	13
2001-2005	11	14	15	16	13
2006-2010	11	13	15	15	13
2011-2015	11	13	15	15	14
2016-2020	11	12	16	14	13
2021-2025	11	11	15	14	13
Total	**11**	**13**	**15**	**15**	**12**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.13-11 General Overview of General Cargo Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Minimum) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,000-19,999**	**4 20,000+**	**Total**
1970 & before	7	10	20	-	7
1971-1975	6	9	14	15	6
1976-1980	7	9	14	15	7
1981-1985	5	10	12	13	5
1986-1990	6	8	11	18	6
1991-1995	6	8	11	13	6
1996-2000	6	9	10	12	6
2001-2005	5	5	11	11	5
2006-2010	5	5	5	12	5
2011-2015	7	9	9	11	7
2016-2020	6	7	10	12	6
2021-2025	**6**	**10**	**10**	**11**	**6**
Total	7	10	20	-	7

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.13-12 General Overview of General Cargo Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Maximum) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,000-19,999**	**4 20,000+**	**Total**
1970 & before	17	15	20	-	20
1971-1975	19	16	18	15	19
1976-1980	20	18	21	15	21
1981-1985	18	19	20	18	20
1986-1990	20	21	20	20	21
1991-1995	22	21	21	19	22
1996-2000	23	30	22	21	30
2001-2005	25	26	23	24	26
2006-2010	22	24	26	21	26
2011-2015	24	25	22	22	25
2016-2020	16	25	21	23	25
2021-2025	16	17	21	20	21
Total	**25**	**30**	**26**	**24**	**30**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.13-13 General Overview of General Cargo Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Median) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,000-19,999**	**4 20,000+**	**Total**
1970 & before	11	12	20	-	20
1971-1975	12	13	16	15	16
1976-1980	11	13	18	15	18
1981-1985	11	13	15	16	16
1986-1990	11	13	15	18	18
1991-1995	11	13	15	15	15
1996-2000	12	14	15	15	15
2001-2005	10	13	14	15	15
2006-2010	11	12	15	15	15
2011-2015	10	12	15	15	15
2016-2020	11	11	15	14	15
2021-2025	10	11	15	14	15
Total	**12**	**14**	**20**	**18**	**20**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

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Table 12.13-14 General Overview of General Cargo Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Modus) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	1 0-4,999	2 5,000-9,999	3 10,000-19,999	4 20,000+	Total
1970 & before	10	10	…	-	10
1971-1975	10	13	…	…	13
1976-1980	10	10	19	…	19
1981-1985	10	12	14	…	14
1986-1990	10	10	13	18	18
1991-1995	10	13	15	16	16
1996-2000	12	13	15	14	15
2001-2005	10	11	13	14	14
2006-2010	10	11	15	15	15
2011-2015	10	12	14	14	14
2016-2020	10	10	15	14	15
2021-2025	10	10	21	14	21
Total	**12**	**13**	**21**	**18**	**21**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.13-15 General Overview of General Cargo Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Average) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	1 0-4,999	2 5,000-9,999	3 10,000-19,999	4 20,000+	Total
1970 & before	842	2089	6770	-	906
1971-1975	1216	2768	6473	12798	1498
1976-1980	1298	3067	10103	8605	1670
1981-1985	1118	3099	7722	8750	1467
1986-1990	1108	3393	8133	17620	1646
1991-1995	1363	3506	5522	11133	2098
1996-2000	1806	5014	9397	9642	4471
2001-2005	1407	3997	7387	12141	3896
2006-2010	1412	3475	7971	10674	3910
2011-2015	1463	3843	7643	10918	5693
2016-2020	1622	4333	8206	10453	5650
2021-2025	1660	2770	6846	9944	5057
Total	**1320**	**3701**	**7714**	**10642**	**3538**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.13-16 General Overview of General Cargo Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Minimum) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	1 0-4,999	2 5,000-9,999	3 10,000-19,999	4 20,000+	Total
1970 & before	38	1319	6770	-	38
1971-1975	74	1319	5884	12798	74
1976-1980	16	735	3773	8605	16
1981-1985	51	776	3012	8750	51
1986-1990	164	1087	2992	11474	164
1991-1995	99	1320	2575	4765	99
1996-2000	199	1420	3853	4880	199
2001-2005	81	800	1912	2390	81
2006-2010	62	373	1474	6240	62
2011-2015	114	1089	735	4230	114
2016-2020	89	350	2646	4400	89
2021-2025	216	700	1765	3920	216
Total	**16**	**350**	**735**	**2390**	**16**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.13-17 General Overview of General Cargo Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Maximum) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	1 0-4,999	2 5,000-9,999	3 10,000-19,999	4 20,000+	Total
1970 & before	6414	4413	6770	-	6770
1971-1975	6620	4928	7061	12798	12798
1976-1980	13240	11768	17211	8605	17211
1981-1985	7338	16000	18278	8750	18278
1986-1990	9929	18514	19809	29420	29420
1991-1995	9989	11555	14843	16462	16462
1996-2000	13239	47660	35780	31777	47660
2001-2005	16920	25200	28380	45600	45600

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2006-2010	16605	25100	49291	25048	49291
2011-2015	17313	20640	27270	32359	32359
2016-2020	11939	20717	30180	41973	41973
2021-2025	9881	22434	36660	35721	36660
Total	**17313**	**47660**	**49291**	**45600**	**49291**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.13-18 General Overview of General Cargo Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Median) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,000-19,999**	**4 20,000+**	**Total**
1970 & before	662	2208	6770	-	6770
1971-1975	1030	2795	6473	12798	12798
1976-1980	1030	2795	10555	8605	10555
1981-1985	957	2868	5737	8750	8750
1986-1990	883	2501	6320	15446	15446
1991-1995	1066	3089	5399	12078	12078
1996-2000	1369	3898	6550	8252	8252
2001-2005	963	2760	4975	10190	10190
2006-2010	1069	2952	6000	9360	9360
2011-2015	1163	3164	5566	9360	9360
2016-2020	1353	2662	5736	8640	8640
2021-2025	1348	2360	4436	8814	8814
Total	**1369**	**3898**	**10554,5**	**15446**	**15446**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.13-19 General Overview of General Cargo Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Modus) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,000-19,999**	**4 20,000+**	**Total**
1970 & before	221	1324	…	-	1324
1971-1975	736	2795	…	…	2795
1976-1980	1030	1324	5590	…	5590
1981-1985	1030	2206	13199	…	13199
1986-1990	1030	4413	4950	15446	15446
1991-1995	736	1940	5428	9036	9036
1996-2000	736	3235	3883	8252	8252
2001-2005	425	1765	3900	7061	7061
2006-2010	1618	1765	6959	7705	7705
2011-2015	736	2400	11450	6480	11450
2016-2020	1323	2400	5076	8829	8829
2021-2025	1348	2206	30180	7715	30180
Total	**1618**	**4413**	**30180**	**15446**	**30180**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.13-20 General Overview of General Cargo Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Average) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,000-19,999**	**4 20,000+**	**Total**
1970 & before	-	-	-	-	-
1971-1975	-	-	-	-	-
1976-1980	-	-	-	-	-
1981-1985	-	177	177	-	177
1986-1990	180	175	173	-	178
1991-1995	176	176	175	-	176
1996-2000	188	177	176	-	178
2001-2005	199	181	179	170	180
2006-2010	198	184	179	171	184
2011-2015	197	185	179	172	180
2016-2020	197	185	178	170	178
2021-2025	198	189	177	167	179
Total	**196**	**184**	**179**	**170**	**181**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.13-21 General Overview of General Cargo Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Minimum) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1**	**2**	**3**	**4**	**Total**

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	0-4,999	5,000-9,999	10,000-19,999	20,000+	
1970 & before	-	-	-	-	-
1971-1975	-	-	-	-	-
1976-1980	-	-	-	-	-
1981-1985	-	177	177	-	177
1986-1990	170	174	173	-	170
1991-1995	167	174	175	-	167
1996-2000	176	169	170	-	169
2001-2005	187	175	177	164	164
2006-2010	177	175	171	167	167
2011-2015	177	176	175	167	167
2016-2020	185	176	172	164	164
2021-2025	185	177	163	164	163
Total	**167**	**169**	**163**	**164**	**163**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.13-22 General Overview of General Cargo Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Maximum) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1** **0-4,999**	**2** **5,000-9,999**	**3** **10,000-19,999**	**4** **20,000+**	**Total**
1970 & before	-	-	-	-	-
1971-1975	-	-	-	-	-
1976-1980	-	-	-	-	-
1981-1985	-	177	177	-	177
1986-1990	220	177	173	-	220
1991-1995	177	177	175	-	177
1996-2000	210	200	178	-	210
2001-2005	210	198	181	178	210
2006-2010	221	210	202	179	221
2011-2015	210	202	189	179	210
2016-2020	207	202	194	185	207
2021-2025	213	200	200	195	213
Total	**221**	**210**	**202**	**195**	**221**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.13-23 General Overview of General Cargo Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Median) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1** **0-4,999**	**2** **5,000-9,999**	**3** **10,000-19,999**	**4** **20,000+**	**Total**
1970 & before	-	-	-	-	-
1971-1975	-	-	-	-	-
1976-1980	-	-	-	-	-
1981-1985	...	177	177	...	177
1986-1990	177	175	173	...	177
1991-1995	177	175	175	...	177
1996-2000	190	177	177	...	190
2001-2005	198	179	179	170	198
2006-2010	198	179	179	171	198
2011-2015	198	183	179	172	198
2016-2020	195	184	175	170	195
2021-2025	197	187	178	166	197
Total	**198**	**187**	**179**	**172**	**198**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.13-24 General Overview of General Cargo Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Modus) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1** **0-4,999**	**2** **5,000-9,999**	**3** **10,000-19,999**	**4** **20,000+**	**Total**
1970 & before	-	-	-	-	-
1971-1975	-	-	-	-	-
1976-1980	-	-	-	-	-
1981-1985	...	177	...	...	177
1986-1990	177	175	...	...	177
1991-1995	177	175	175	...	177
1996-2000	194	177	178	...	194
2001-2005	198	179	179	167	198
2006-2010	198	179	179	167	198
2011-2015	198	179	179	170	198
2016-2020	195	184	175	170	195
2021-2025	197	185	178	166	197
Total	**198**	**185**	**179**	**170**	**198**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

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12.14. General Cargo – MPP

Table 12.14-1 General Overview of General Cargo MPP Fleet – by Status

Status	Number of Ships
Damaged/Not in Service	5
Idle	138
In Service	3155
Laid Up	7
Repairs	47
Under Arrest	2
Total	**3354**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.14-2 General Overview of General Cargo MPP Fleet – by Carrier Type

Carrier Type	Number of Ships
Multi-Purpose	2881
Multi-Purpose/Heavy Lift Cargo	473
Total	**3354**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.14-3 General Overview of General Cargo MPP Fleet – by Year of Build Group

Year of Build Group	Number of Ships
1970 and before	3
1971-1975	26
1976-1980	53
1981-1985	124
1986-1990	135
1991-1995	306
1996-2000	491
2001-2005	448
2006-2010	880
2011-2015	548
2016-2020	145
2021-2025	195
Total	**3354**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.14-4 General Overview of General Cargo MPP Fleet – by 4th GHG IMO Size Class

4th GHG Size Class	Number of Ships
1 0-4,999	1031
2 5,000-9999	1346
3 10,000-19,999	660
4 20,000+	317
Total	**3354**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.14-5 General Overview of General Cargo MPP Fleet – by Engine Derived Power Type

Engine Derived Power Type	Number of Ships
Batteries & Diesel	1
Diesel 2-Stroke	627
Diesel 4-Stroke	2714
Diesel Electric	12
Total	**3354**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.14-6 General Overview of General Cargo MPP Fleet – by Main Engine Designer

Main Engine Designer	Number of Ships
A.B.C.	40
Akasaka	18
Bergen	10
Bolnes	1
Caterpillar	41
Chinese Std.	1
CMI	2
Cummins Inc	2

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Daihatsu Infinearth	67
Deutz	154
Dvigatel Revolyutsii	9
Everllence B. & W.	650
Gen. Motors	1
Guangzhou Diesel	81
Hanshin	58
HHI-EMD (HiMSEN)	9
HHM	3
J-ENG	2
Jiangsu Antai Power	3
Kromhout	1
MaK	1055
Makita	5
Mitsubishi	62
MWM	48
Ningbo C.S.I. Power	58
Pielstick	44
Scania	5
SKL	67
Skoda	17
Stork Werkspoor	22
Stork-Wartsila	9
Sulzer	25
Ulstein Bergen	1
Unknown	156
Wartsila 2-stroke	57
Wartsila 4-stroke	464
Weichai HM	8
Werkspoor	3
Wichmann	1
WinGD	21
Wuxi Diesel	1
Wuxi Wandi	13
Yanmar	51
Zichai Power	8
Total	**3354**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.14-7 General Overview of General Cargo MPP Fleet – by 4th GHG IMO Size Class by year of Build (Group) and by Number

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,000-19,999**	**4 20,000+**	**Total**
1970 & before	1	2	-	-	3
1971-1975	6	20	-	-	26
1976-1980	31	20	2	-	53
1981-1985	71	49	4	-	124
1986-1990	85	38	10	2	135
1991-1995	190	92	24	-	306
1996-2000	229	204	22	36	491
2001-2005	144	198	80	26	448
2006-2010	163	406	259	52	880
2011-2015	55	189	157	147	548
2016-2020	14	63	44	24	145
2021-2025	42	65	58	30	195
Total	**1031**	**1346**	**660**	**317**	**3354**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.14-8 General Overview of General Cargo MPP Fleet – by 4th GHG IMO Size Class by year of Build (Group) and GT

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,000-19,999**	**4 20,000+**	**Total**
1970 & before	3241	9265	-	-	12506
1971-1975	14944	87189	-	-	102133
1976-1980	82473	90996	16892	-	190361
1981-1985	204484	215413	48530	-	468427
1986-1990	226639	199463	90133	37148	553383
1991-1995	511443	467937	191769	-	1171149
1996-2000	636956	1084184	255010	581051	2557201
2001-2005	399376	925667	725388	553390	2603821
2006-2010	446173	2029803	2628214	1105529	6209719
2011-2015	170378	995001	1709299	3088784	5963462
2016-2020	39988	363521	487339	577476	1468324
2021-2025	107079	381692	701310	1072353	2262434
Total	**2843174**	**6850131**	**6853884**	**7015731**	**23562920**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

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Table 12.14-9 General Overview of General Cargo MPP Fleet – by 4th GHG IMO Size Class by year of Build (Group) and DWT

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,000-19,999**	**4 20,000+**	**Total**
1970 & before	4543	13538	-	-	18081
1971-1975	19380	134306	-	-	153686
1976-1980	108689	134781	27306	-	270776
1981-1985	257188	317108	68262	-	642558
1986-1990	290586	273938	128052	45820	738396
1991-1995	712718	612716	289366	-	1614800
1996-2000	895014	1445795	347012	820354	3508175
2001-2005	571842	1302838	994018	721879	3590577
2006-2010	648255	2832400	3488038	1540357	8509050
2011-2015	204835	1326187	2304639	4178680	8014341
2016-2020	57478	481411	554286	792455	1885630
2021-2025	159897	497994	787970	1590813	3036674
Total	**3930425**	**9373012**	**8988949**	**9690358**	**31982744**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.14-10 General Overview of General Cargo MPP Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Average) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,000-19,999**	**4 20,000+**	**Total**
1970 & before	16	15	-	-	15
1971-1975	13	14	-	-	14
1976-1980	12	14	14	-	13
1981-1985	12	13	16	-	12
1986-1990	12	12	14	18	12
1991-1995	12	13	14	-	13
1996-2000	12	14	15	16	14
2001-2005	12	13	14	18	13
2006-2010	12	13	15	16	14
2011-2015	13	13	14	15	14
2016-2020	11	12	15	15	14
2021-2025	11	12	15	-	12
Total	**12**	**13**	**15**	**15**	**13**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.14-11 General Overview of General Cargo MPP Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Minimum) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,000-19,999**	**4 20,000+**	**Total**
1970 & before	16	15	-	-	15
1971-1975	13	12	-	-	12
1976-1980	10	11	14	-	10
1981-1985	9	10	14	-	9
1986-1990	9	10	11	18	9
1991-1995	10	10	11	-	10
1996-2000	10	9	14	14	9
2001-2005	8	8	11	14	8
2006-2010	10	9	5	13	5
2011-2015	9	10	9	11	9
2016-2020	11	10	14	14	10
2021-2025	10	10	12	-	10
Total	**8**	**8**	**5**	**11**	**5**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.14-12 General Overview of General Cargo MPP Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Maximum) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,000-19,999**	**4 20,000+**	**Total**
1970 & before	16	15	-	-	16
1971-1975	14	16	-	-	16
1976-1980	18	17	14	-	18
1981-1985	15	16	18	-	18
1986-1990	16	15	16	18	18
1991-1995	16	17	17	-	17

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1996-2000	16	21	17	17	21
2001-2005	17	20	18	19	20
2006-2010	17	17	20	19	20
2011-2015	21	17	20	19	21
2016-2020	13	14	18	18	18
2021-2025	12	13	18	-	18
Total	**21**	**21**	**20**	**19**	**21**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.14-13 General Overview of General Cargo MPP Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Median) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,000-19,999**	**4 20,000+**	**Total**
1970 & before	16	15	-	-	16
1971-1975	14	13	-	-	14
1976-1980	13	14	14	-	14
1981-1985	12	13	16	-	16
1986-1990	11	12	13	18	18
1991-1995	12	13	15	-	15
1996-2000	12	15	15	17	17
2001-2005	12	13	15	18	18
2006-2010	12	13	15	15	15
2011-2015	12	13	14	15	15
2016-2020	11	12	15	15	15
2021-2025	11	12	15	-	15
Total	**16**	**15**	**16**	**18**	**18**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.14-14 General Overview of General Cargo MPP Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Modus) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,000-19,999**	**4 20,000+**	**Total**
1970 & before	16	15	-	-	16
1971-1975	13	13	-	-	13
1976-1980	12	11	...	-	12
1981-1985	11	13	14	-	14
1986-1990	11	10	13	18	18
1991-1995	11	14	15	-	15
1996-2000	13	14	15	17	17
2001-2005	12	11	13	17	17
2006-2010	12	13	16	15	16
2011-2015	12	12	14	15	15
2016-2020	11	12	15	14	15
2021-2025	10	12	15	-	15
Total	**16**	**15**	**16**	**18**	**18**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.14-15 General Overview of General Cargo MPP Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Average) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,000-19,999**	**4 20,000+**	**Total**
1970 & before	2942	3678	-	-	3432
1971-1975	1898	2766	-	-	2558
1976-1980	1886	3322	4413	-	2523
1981-1985	1392	2623	6055	-	2029
1986-1990	1436	2950	5403	15446	2364
1991-1995	1824	3151	5001	-	2472
1996-2000	2140	4263	7164	9292	3772
2001-2005	1960	3293	5508	13521	3899
2006-2010	1847	3114	6162	9248	4154
2011-2015	2233	2961	5837	8931	5386
2016-2020	1727	2488	5879	7688	4425
2021-2025	1496	2485	4890	7659	3773
Total	**1864**	**3221**	**5856**	**9238**	**3895**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

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Table 12.14-16 General Overview of General Cargo MPP Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Minimum) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	1 0-4,999	2 5,000-9,999	3 10,000-19,999	4 20,000+	Total
1970 & before	2942	2942	-	-	2942
1971-1975	1471	2137	-	-	1471
1976-1980	591	2206	4413	-	591
1981-1985	441	776	4413	-	441
1986-1990	591	1912	2992	15446	591
1991-1995	600	1764	2999	-	600
1996-2000	749	1420	4192	6300	749
2001-2005	735	735	1912	6300	735
2006-2010	750	1290	2352	6475	750
2011-2015	426	1200	2573	4230	426
2016-2020	1396	1200	2646	4400	1200
2021-2025	1104	1326	2427	4400	1104
Total	**426**	**735**	**1912**	**4230**	**426**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.14-17 General Overview of General Cargo MPP Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Maximum) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	1 0-4,999	2 5,000-9,999	3 10,000-19,999	4 20,000+	Total
1970 & before	2942	4413	-	-	4413
1971-1975	2942	4928	-	-	4928
1976-1980	6620	5221	4413	-	6620
1981-1985	2698	4413	7796	-	7796
1986-1990	3089	5119	11459	15446	15446
1991-1995	3800	6000	6505	-	6505
1996-2000	4500	9449	9359	12484	12484
2001-2005	3958	9449	13202	16520	16520
2006-2010	3600	7200	20880	16520	20880
2011-2015	5920	7200	12600	26010	26010
2016-2020	2040	3950	8280	10850	10850
2021-2025	5920	4500	8340	8200	8340
Total	**6620**	**9449**	**20880**	**26010**	**26010**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.14-18 General Overview of General Cargo MPP Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Median) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	1 0-4,999	2 5,000-9,999	3 10,000-19,999	4 20,000+	Total
1970 & before	2942	3494	-	-	3494
1971-1975	1765	2795	-	-	2795
1976-1980	1766	2942	6840	-	6840
1981-1985	1378	2795	6987	-	6987
1986-1990	1287	2501	4950	15446	15446
1991-1995	1692	2960	5177	-	5177
1996-2000	1800	3957	6979	8562	8562
2001-2005	1800	2879	5322	15785	15785
2006-2010	1803	2968	5396	8670	8670
2011-2015	1980	2927	5400	8280	8280
2016-2020	1682	2400	5460	7000	7000
2021-2025	1104	2400	4800	8000	8000
Total	**2942**	**3957**	**6987**	**15785**	**15785**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.14-19 General Overview of General Cargo MPP Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Modus) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	1 0-4,999	2 5,000-9,999	3 10,000-19,999	4 20,000+	Total
1970 & before	2942	2942	-	-	2942
1971-1975	1471	2206	-	-	2206
1976-1980	1470	2942	4413	-	4413
1981-1985	1324	2206	7599	-	7599
1986-1990	1030	4413	4950	15446	15446
1991-1995	1500	1940	5428	-	5428
1996-2000	1800	3960	7799	8252	8252
2001-2005	1800	3840	4320	15820	15820

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2006-2010	1520	3840	5322	11060	11060
2011-2015	1520	2400	5430	6810	6810
2016-2020	1600	2400	7945	6960	7945
2021-2025	1104	2400	4800	8000	8000
Total	**2942**	**4413**	**7945**	**15820**	**15820**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.14-20 General Overview of General Cargo MPP Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Average) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,000-19,999**	**4 20,000+**	**Total**
1970 & before	-	-	-	-	-
1971-1975	-	-	-	-	-
1976-1980	-	-	-	-	-
1981-1985	-	-	-	-	-
1986-1990	175	175	170	-	174
1991-1995	176	175	-	-	175
1996-2000	183	178	175	170	176
2001-2005	186	181	177	169	177
2006-2010	185	182	177	173	179
2011-2015	185	183	178	173	178
2016-2020	187	184	175	169	178
2021-2025	183	185	174	167	176
Total	**183**	**182**	**177**	**171**	**178**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.14-21 General Overview of General Cargo MPP Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Minimum) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,000-19,999**	**4 20,000+**	**Total**
1970 & before	-	-	-	-	-
1971-1975	-	-	-	-	-
1976-1980	-	-	-	-	-
1981-1985	-	-	-	-	-
1986-1990	174	170	170	-	170
1991-1995	174	170	-	-	170
1996-2000	181	176	174	164	164
2001-2005	181	176	170	164	164
2006-2010	176	176	167	167	167
2011-2015	176	177	167	167	167
2016-2020	184	176	170	167	167
2021-2025	179	172	166	165	165
Total	**174**	**170**	**166**	**164**	**164**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.14-22 General Overview of General Cargo MPP Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Maximum) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,000-19,999**	**4 20,000+**	**Total**
1970 & before	-	-	-	-	-
1971-1975	-	-	-	-	-
1976-1980	-	-	-	-	-
1981-1985	-	-	-	-	-
1986-1990	177	177	170	-	177
1991-1995	177	177	-	-	177
1996-2000	185	181	177	174	185
2001-2005	198	198	200	177	200
2006-2010	190	198	200	179	200
2011-2015	190	202	200	185	202
2016-2020	195	194	188	170	195
2021-2025	188	189	187	185	189
Total	**198**	**202**	**200**	**185**	**202**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.14-23 General Overview of General Cargo MPP Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Median) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1**	**2**	**3**	**4**	**Total**

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	0-4,999	5,000-9,999	10,000-19,999	20,000+	
1970 & before	-	-	-	-	-
1971-1975	-	-	-	-	-
1976-1980	-	-	-	-	-
1981-1985	-	-	-	-	-
1986-1990	174	176	170	-	176
1991-1995	177	177	-	-	177
1996-2000	182	177	174	171	182
2001-2005	185	179	177	170	185
2006-2010	184	184	176	174	184
2011-2015	185	184	176	174	185
2016-2020	184	185	174	170	185
2021-2025	184	185	174	167	185
Total	**185**	**185**	**177**	**174**	**185**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.14-24 General Overview of General Cargo MPP Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Modus) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1** **0-4,999**	**2** **5,000-9,999**	**3** **10,000-19,999**	**4** **20,000+**	**Total**
1970 & before	-	-	-	-	-
1971-1975	-	-	-	-	-
1976-1980	-	-	-	-	-
1981-1985	-	-	-	-	-
1986-1990	174	177	170	-	177
1991-1995	177	177	-	-	177
1996-2000	181	181	174	171	181
2001-2005	185	176	177	170	185
2006-2010	184	184	176	171	184
2011-2015	190	184	176	175	190
2016-2020	184	185	170	167	185
2021-2025	184	185	170	167	185
Total	**190**	**185**	**177**	**175**	**190**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

12.15. *General Cargo – PCC*

Table 12.15-1 General Overview of General Cargo PCC Fleet – by Status

Status	Number of Ships
Damaged/Not in Service	3
Hijacked	1
Idle	24
In Service	817
Repairs	2
Total	**847**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.15-2 General Overview of General Cargo PCC Fleet – by Carrier Type

Carrier Type	Number of Ships
Pure Car Carrier	847
Total	**847**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.15-3 General Overview of General Cargo PCC Fleet – by Year of Build Group

StatusYear of Build Group	Number of Ships
1981-1985	4
1986-1990	15
1991-1995	29
1996-2000	100
2001-2005	91
2006-2010	273
2011-2015	151
2016-2020	74
2021-2025	110
Total	**847**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

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Table 12.15-4 General Overview of General Cargo PCC Fleet – by 4th GHG IMO Size Class

4th GHG IMO Size Class	Number of Ships
1 0-4,999	57
2 5,000-9999	67
3 10,000-14,999	130
4 15,000+	593
Total	**847**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.15-5 General Overview of General Cargo PCC Fleet – by Engine Derived Power Type

Engine Derived Power Type	Number of Ships
Batteries & Diesel	22
Diesel 2-Stroke	780
Diesel 4-Stroke	45
Gesamtergebnis	**847**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.15-6 General Overview of General Cargo PCC Fleet – by Main Engine Designer

Main Engine Designer	Number of Ships
Daihatsu Infinearth	4
Everllence B. & W.	525
Guangzhou Diesel	3
Hanshin	6
J-ENG	6
MaK	8
Mitsubishi	235
Ningbo C.S.I. Power	3
Pielstick	2
Sulzer	15
(unknown)	1
Wartsila 2-stroke	5
Wartsila 4-stroke	12
Weichai HM	1
WinGD	20
Yanmar	1
Total	**847**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.15-7 General Overview of General Cargo PCC Fleet – by 4th GHG IMO Size Class by year of Build (Group) and by Number

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,000-14,999**	**4 15,000+**	**Total**
1981-1985	3	-	1	-	4
1986-1990	11	3	-	1	15
1991-1995	14	4	5	6	29
1996-2000	13	9	20	58	100
2001-2005	4	13	12	62	91
2006-2010	6	18	57	192	273
2011-2015	3	8	22	118	151
2016-2020	2	8	4	60	74
2021-2025	1	4	9	96	110
Total	**57**	**67**	**130**	**593**	**847**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.15-8 General Overview of General Cargo PCC Fleet – by 4th GHG IMO Size Class by year of Build (Group) and GT

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,000-14,999**	**4 15,000+**	**Total**
1981-1985	16449	-	36201	-	52650
1986-1990	38824	68406	-	48017	155247
1991-1995	110913	59185	234136	315763	719997
1996-2000	144486	210004	760258	3325849	4440597
2001-2005	35620	297046	504610	3617793	4455069
2006-2010	72871	407773	2466299	11218684	14165627
2011-2015	27119	146094	959267	7419477	8551957
2016-2020	6982	148923	171572	4138552	4466029
2021-2025	2993	70547	277538	6658856	7009934
Total	**456257**	**1407978**	**5409881**	**36742991**	**44017107**

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Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.15-9 General Overview of General Cargo PCC Fleet – by 4th GHG IMO Size Class by year of Build (Group) and DWT

	IMO GHG Size Class (dwt)				
Year of Build Group	1 0-4,999	2 5,000-9,999	3 10,000-14,999	4 15,000+	Total
1981-1985	16449	-	36201	-	52650
1986-1990	38824	68406	-	48017	155247
1991-1995	110913	59185	234136	315763	719997
1996-2000	144486	210004	760258	3325849	4440597
2001-2005	35620	297046	504610	3617793	4455069
2006-2010	72871	407773	2466299	11218684	14165627
2011-2015	27119	146094	959267	7419477	8551957
2016-2020	6982	148923	171572	4138552	4466029
2021-2025	2993	70547	277538	6658856	7009934
Total	**456257**	**1407978**	**5409881**	**36742991**	**44017107**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.15-10 General Overview of General Cargo PCC Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Number of Cars Cargo Load mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	1 0-4,999	2 5,000-9,999	3 10,000-14,999	4 15,000+	Total
1981-1985	2050	-	3470	-	5520
1986-1990	3772	6460	-	5300	15532
1991-1995	9548	5493	25157	34827	75025
1996-2000	13197	17798	78003	359417	468415
2001-2005	3669	24197	56782	392393	477041
2006-2010	7493	36269	257440	1184805	1486007
2011-2015	2358	13452	99116	795090	910016
2016-2020	1139	15624	15400	438794	470957
2021-2025	503	7185	27698	677009	712395
Total	**43729**	**126478**	**563066**	**3887635**	**4620908**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.15-11 General Overview of General Cargo PCC Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Average) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	1 0-4,999	2 5,000-9,999	3 10,000-14,999	4 15,000+	Total
1981-1985	14	-	18	-	15
1986-1990	14	18	-	18	15
1991-1995	17	15	19	20	18
1996-2000	18	20	19	20	19
2001-2005	17	20	20	20	20
2006-2010	18	19	19	20	20
2011-2015	17	19	19	20	20
2016-2020	19	16	18	20	19
2021-2025	-	16	15	19	18
Total	**17**	**19**	**19**	**20**	**19**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.15-12 General Overview of General Cargo PCC Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Minimum) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	1 0-4,999	2 5,000-9,999	3 10,000-14,999	4 15,000+	Total
1981-1985	13	-	18	-	13
1986-1990	10	14	-	18	10
1991-1995	14	14	18	19	14
1996-2000	15	16	15	19	15
2001-2005	15	17	20	20	15
2006-2010	17	16	14	14	14
2011-2015	17	17	18	14	14
2016-2020	18	16	16	16	16
2021-2025	-	16	12	18	12
Total	**10**	**14**	**12**	**14**	**10**

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Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.15-13 General Overview of General Cargo PCC Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Maximum) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	1 0-4,999	2 5,000-9,999	3 10,000-14,999	4 15,000+	Total
1981-1985	15	-	18	-	18
1986-1990	20	22	-	18	22
1991-1995	20	16	20	21	21
1996-2000	21	21	20	21	21
2001-2005	20	24	21	22	24
2006-2010	20	21	22	23	23
2011-2015	18	25	21	23	25
2016-2020	21	16	20	22	22
2021-2025	-	16	16	20	20
Total	**21**	**25**	**22**	**23**	**25**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.15-14 General Overview of General Cargo PCC Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Median) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	1 0-4,999	2 5,000-9,999	3 10,000-14,999	4 15,000+	Total
1981-1985	14	-	18	-	18
1986-1990	13	18	-	18	18
1991-1995	17	16	19	20	20
1996-2000	18	21	19	20	21
2001-2005	17	21	20	20	21
2006-2010	18	19	20	20	20
2011-2015	18	19	20	20	20
2016-2020	19	16	18	20	20
2021-2025	...	16	16	19	19
Total	19	21	20	20	21

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.15-15 General Overview of General Cargo PCC Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Modus) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	1 0-4,999	2 5,000-9,999	3 10,000-14,999	4 15,000+	Total
1981-1985	...	-	18	-	18
1986-1990	14	...	-	18	18
1991-1995	18	...	...	21	21
1996-2000	20	21	20	19	21
2001-2005	...	21	20	20	21
2006-2010	18	21	20	20	21
2011-2015	...	17	20	20	20
2016-2020	...	16	16	20	20
2021-2025	...	16	16	19	19
Total	20	21	20	21	21

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.15-16 General Overview of General Cargo PCC Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Average) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	1 0-4,999	2 5,000-9,999	3 10,000-14,999	4 15,000+	Total
1981-1985	2402	-	9179	-	4097
1986-1990	2213	7249	-	9672	3718
1991-1995	4746	4108	11484	13963	7727
1996-2000	7745	11994	11185	13981	12432
2001-2005	8445	11720	11346	14484	13410
2006-2010	7499	9864	12764	14412	13616
2011-2015	4922	10442	12736	14788	14063
2016-2020	4560	7564	9475	13620	12496
2021-2025	3900	7503	7029	13575	12832
Total	**5355**	**9736**	**11847**	**14224**	**12912**

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Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.15-17 General Overview of General Cargo PCC Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Minimum) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	1 0-4,999	2 5,000-9,999	3 10,000-14,999	4 15,000+	Total
1981-1985	1471	-	9179	-	1471
1986-1990	662	3089	-	9672	662
1991-1995	2942	2779	10368	10812	2779
1996-2000	4529	5978	9989	9989	4529
2001-2005	3310	3900	10900	11179	3310
2006-2010	3900	6150	10992	11432	3900
2011-2015	3900	6480	9473	11300	3900
2016-2020	3900	4980	7550	11100	3900
2021-2025	3900	4980	1471	4500	1471
Total	**662**	**2779**	**1471**	**4500**	**662**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.15-18 General Overview of General Cargo PCC Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Maximum) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	1 0-4,999	2 5,000-9,999	3 10,000-14,999	4 15,000+	Total
1981-1985	2868	-	9179	-	9179
1986-1990	7061	10738	-	9672	10738
1991-1995	9000	5119	13239	16358	16358
1996-2000	12960	16799	14315	16357	16799
2001-2005	12960	19123	14314	17760	19123
2006-2010	12000	12599	14940	18080	18080
2011-2015	6965	19125	14940	19041	19125
2016-2020	5220	17400	11400	19040	19040
2021-2025	3900	10720	10800	17430	17430
Total	**12960**	**19125**	**14940**	**19041**	**19125**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.15-19 General Overview of General Cargo PCC Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Median) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	1 0-4,999	2 5,000-9,999	3 10,000-14,999	4 15,000+	Total
1981-1985	2868	-	9179	-	9179
1986-1990	2940	7919	-	9336	9336
1991-1995	4119	4266	10655	14315	14315
1996-2000	5982	11981	10591	14122	14122
2001-2005	10480	11900	11060	14280	14280
2006-2010	6598	9170	12640	14315	14315
2011-2015	3900	9204	12210	14298	14298
2016-2020	4560	4980	9475	13200	13200
2021-2025	3900	6810	8095	13319	13319
Total	**10480**	**11981**	**12640**	**14315**	**14315**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.15-20 General Overview of General Cargo PCC Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Modus) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	1 0-4,999	2 5,000-9,999	3 10,000-14,999	4 15,000+	Total
1981-1985	2868	-	9179	-	9179
1986-1990	1325	...	-	...	1325
1991-1995	5973	...	...	14315	14315
1996-2000	4801	16799	9989	14315	16799
2001-2005	12960	9170	11060	15540	15540
2006-2010	12000	11927	14220	14280	14280
2011-2015	3900	6480	11620	14280	14280
2016-2020	...	4980	11400	13200	13200
2021-2025	3900	...	8640	16695	16695
Total	**12960**	**16799**	**14220**	**16695**	**16799**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

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Table 12.15-21 General Overview of General Cargo PCC Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Average) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,000-14,999**	**4 15,000+**	**Total**
1981-1985	175	-	-	-	175
1986-1990	170	173	-	-	172
1991-1995	174	174	173	173	174
1996-2000	177	174	172	173	173
2001-2005	177	173	171	170	170
2006-2010	177	175	172	170	171
2011-2015	179	175	173	171	172
2016-2020	179	173	170	170	170
2021-2025	179	174	176	169	170
Total	**176**	**174**	**172**	**170**	**171**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.15-22 General Overview of General Cargo PCC Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Minimum) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,000-14,999**	**4 15,000+**	**Total**
1981-1985	175	-	-	-	175
1986-1990	170	170	-	-	170
1991-1995	170	170	173	173	170
1996-2000	177	170	167	173	167
2001-2005	177	170	169	167	167
2006-2010	170	172	167	167	167
2011-2015	179	170	170	167	167
2016-2020	178	167	169	166	166
2021-2025	179	168	166	166	166
Total	**170**	**167**	**166**	**166**	**166**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.15-23 General Overview of General Cargo PCC Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Maximum) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,000-14,999**	**4 15,000+**	**Total**
1981-1985	175	-	-	-	175
1986-1990	170	175	-	-	175
1991-1995	177	177	173	173	177
1996-2000	177	177	174	174	177
2001-2005	177	179	171	171	179
2006-2010	179	179	176	176	179
2011-2015	179	179	175	174	179
2016-2020	179	177	170	184	184
2021-2025	179	177	184	189	189
Total	**179**	**179**	**184**	**189**	**189**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.15-24 General Overview of General Cargo PCC Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Median) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,000-14,999**	**4 15,000+**	**Total**
1981-1985	175	-	-	-	175
1986-1990	175	173	-	-	175
1991-1995	175	175	173	173	175
1996-2000	177	174	173	173	177
2001-2005	176	172	171	169	176
2006-2010	178	174	171	170	178
2011-2015	179	176	174	171	179
2016-2020	179	174	170	169	179
2021-2025	179	177	177	166	179
Total	**179**	**177**	**177**	**173**	**179**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

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Table 12.15-25 General Overview of General Cargo PCC Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Modus) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,000-14,999**	**4 15,000+**	**Total**
1981-1985	175	-	-	-	175
1986-1990	…	…	-	-	…
1991-1995	177	175	173	173	177
1996-2000	177	174	174	173	177
2001-2005	176	172	171	169	176
2006-2010	179	172	171	170	179
2011-2015	179	179	175	171	179
2016-2020	…	174	169	171	174
2021-2025	179	177	184	166	184
Total	**179**	**179**	**184**	**173**	**184**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

12.16. *General Cargo – Reefer*

Table 12.16-1 General Overview of Cargo - Reefer Fleet – by Status

Status	Number of Ships
In Service	896
Laid Up	12
Repairs	2
Under Arrest	1
Total	**911**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.16-2 General Overview of Cargo - Reefer Fleet – by Carrier Type

Carrier Type	Number of Ships
Reefer	612
Reefer Fish Carrier	277
Reefer/General Cargo	4
Reefer/Pallets Carrier	14
Reefer/Pass./Ro-Ro	1
Reefer/Ro-Ro Cargo	3
Total	**911**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.16-3 General Overview of Cargo - Reefer Fleet – by Year of Build Group

Year of Build Group	Number of Ships
1970 and before	40
1971-1975	37
1976-1980	87
1981-1985	108
1986-1990	168
1991-1995	152
1996-2000	114
2001-2005	29
2006-2010	28
2011-2015	29
2016-2020	66
2021-2025	53
Total	**911**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.16-4 General Overview of Cargo - Reefer Fleet – by 4th GHG IMO Size Class

4th GHG IMO Size Class	Number of Ships
1 0-1,999	340
2 2,000-5,999	250
3 6,000-9,999	178
4 10,000+	143
Total	**911**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

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Table 12.16-5 General Overview of Cargo - Reefer Fleet – by Engine Derived Power Type

Engine Derived Power Type	Number of Ships
Batteries & Diesel	2
Diesel 2-Stroke	417
Diesel 4-Stroke	492
Total	**911**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.16-6 General Overview of Cargo - Reefer Fleet – by Main Engine Designer

Main Engine Designer	Number of Ships
Akasaka	78
Alpha Diesel	1
Bergen	1
Blackstone	2
Caterpillar	8
Chinese Std	20
Daihatsu	4
Daldiesel	2
Deutz	26
Everllence B. & W.	254
Gen. Motors	2
Guangzhou	4
Guascor	2
Hanshin	33
J-ENG	14
Jinan	1
MaK	40
Makita	9
Matsui	1
Mirrlees	1
Mitsubishi	155
Moteurs Baudouin	1
Niigata	15
Ningbo C.S.I. Power	4
Pielstick	3
Polar	2
SACM	1
SKL	69
Smit-Bolnes	1
Soviet	2
Sulzer	18
Wartsila	21
Weichai HM	2
Werkspoor	3
Wichmann	1
Yanmar	6
Zichai Power	8
(unknown)	96
Total	**911**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.16-7 General Overview of Cargo - Reefer Fleet – by 4th GHG IMO Size Class by year of Build (Group) and by Number

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-1,999**	**2 2,000-5,999**	**3 6,000-9,999**	**4 10,000+**	**Total**
1970 & before	34	6	-	-	40
1971-1975	25	11	1	-	37
1976-1980	49	37	1	-	87
1981-1985	60	40	5	3	108
1986-1990	64	52	42	10	168
1991-1995	27	25	61	39	152
1996-2000	14	32	25	43	114
2001-2005	14	8	4	3	29
2006-2010	2	9	-	17	28
2011-2015	15	10	3	1	29
2016-2020	22	13	24	7	66
2021-2025	14	7	12	20	53
Total	**340**	**250**	**178**	**143**	**911**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.16-8 General Overview of Cargo - Reefer Fleet – by 4th GHG IMO Size Class by year of Build (Group) and GT

	IMO GHG Size Class (dwt)

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Year of Build Group	1 0-1,999	2 2,000-5,999	3 6,000-9,999	4 10,000+	Total
1970 & before	33459	19464	-	-	52923
1971-1975	17362	27169	6271	-	50802
1976-1980	48225	93551	12282	-	154058
1981-1985	66510	116497	40113	31192	254312
1986-1990	66383	195144	303838	111716	677081
1991-1995	29087	100077	419930	438240	987334
1996-2000	13574	124263	197984	483856	819677
2001-2005	11949	30491	25836	39726	108002
2006-2010	2376	30457	-	220755	253588
2011-2015	21814	36817	20246	14091	92968
2016-2020	30650	51982	146431	126574	355637
2021-2025	11830	34584	80594	281175	408183
Total	**353219**	**860496**	**1253525**	**1747325**	**4214565**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.16-9 General Overview of Cargo - Reefer Fleet – by 4th GHG IMO Size Class by year of Build (Group) and DWT

	IMO GHG Size Class (dwt)				
Year of Build Group	1 0-1,999	2 2,000-5,999	3 6,000-9,999	4 10,000+	Total
1970 & before	37297	20786	-	-	58083
1971-1975	17036	38932	6536	-	62504
1976-1980	43797	110887	9544	-	164228
1981-1985	57206	134632	38251	34644	264733
1986-1990	51379	207252	309428	133950	702009
1991-1995	17235	107680	445018	473901	1043834
1996-2000	11538	136614	215066	507037	870255
2001-2005	6294	33000	30116	42234	111644
2006-2010	2724	30754	-	216379	249857
2011-2015	2705	43448	21282	15692	83127
2016-2020	1430	53415	176959	125166	356970
2021-2025	5178	31057	92208	290989	419432
Total	**253819**	**948457**	**1344408**	**1839992**	**4386676**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.16-10 General Overview of Cargo - Reefer Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Average) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	1 0-1,999	2 2,000-5,999	3 6,000-9,999	4 10,000+	Total
1970 & before	12	15	-	-	12
1971-1975	12	14	20	-	13
1976-1980	12	13	15	-	13
1981-1985	12	14	17	16	13
1986-1990	12	15	17	19	15
1991-1995	12	15	18	21	17
1996-2000	12	15	19	21	18
2001-2005	10	14	16	21	15
2006-2010	13	15	-	21	18
2011-2015	-	15	19	23	17
2016-2020	-	13	14	21	15
2021-2025	13	13	14	16	15
Total	**12**	**14**	**17**	**20**	**15**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.16-11 General Overview of Cargo - Reefer Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Minimum) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	1 0-1,999	2 2,000-5,999	3 6,000-9,999	4 10,000+	Total
1970 & before	10	12	-	-	10
1971-1975	6	13	20	-	6
1976-1980	9	11	15	-	9
1981-1985	9	12	14	15	9
1986-1990	9	11	15	17	9
1991-1995	11	13	15	17	11
1996-2000	6	13	16	17	6
2001-2005	7	11	13	21	7
2006-2010	11	11	-	19	11
2011-2015	-	12	18	23	12
2016-2020	-	12	12	20	12

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2021-2025	12	13	13	14	12
Total	**6**	**11**	**12**	**14**	**6**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.16-12 General Overview of Cargo - Reefer Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Maximum) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-1,999**	**2 2,000-5,999**	**3 6,000-9,999**	**4 10,000+**	**Total**
1970 & before	15	18	-	-	18
1971-1975	15	17	20	-	20
1976-1980	15	19	15	-	19
1981-1985	14	17	18	17	18
1986-1990	16	18	20	21	21
1991-1995	17	18	21	23	23
1996-2000	15	18	21	23	23
2001-2005	13	16	19	21	21
2006-2010	15	16	-	22	22
2011-2015	-	20	20	23	23
2016-2020	-	14	17	23	23
2021-2025	14	13	16	19	19
Total	**17**	**20**	**21**	**23**	**23**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.16-13 General Overview of Cargo - Reefer Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Median) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-1,999**	**2 2,000-5,999**	**3 6,000-9,999**	**4 10,000+**	**Total**
1970 & before	12	16	-	-	16
1971-1975	12	13	20	-	20
1976-1980	12	14	15	-	15
1981-1985	12	14	17	17	17
1986-1990	11	15	17	19	19
1991-1995	11	15	18	21	21
1996-2000	13	15	19	21	21
2001-2005	10	15	17	21	21
2006-2010	13	15	-	21	21
2011-2015	...	15	19	23	23
2016-2020	...	14	14	21	21
2021-2025	13	13	14	15	15
Total	**13**	**16**	**20**	**23**	**23**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.16-14 General Overview of Cargo - Reefer Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Modus) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-1,999**	**2 2,000-5,999**	**3 6,000-9,999**	**4 10,000+**	**Total**
1970 & before	12	17	-	-	17
1971-1975	12	14	20	-	20
1976-1980	12	14	15	-	15
1981-1985	12	15	18	...	18
1986-1990	11	14	18	17	18
1991-1995	11	15	17	21	21
1996-2000	...	15	19	21	21
2001-2005	...	15	...	21	21
2006-2010	...	15	-	21	21
2011-2015	...	12	...	23	23
2016-2020	...	14	14	20	20
2021-2025	...	13	15	15	15
Total	**12**	**17**	**20**	**23**	**23**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.16-15 General Overview of Cargo - Reefer Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Average) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1**	**2**	**3**	**4**	**Total**

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	0-1,999	2,000-5,999	6,000-9,999	10,000+	
1970 & before	1117	3371	-	-	1473
1971-1975	1013	3435	7281	-	1860
1976-1980	1137	2271	6623	-	1716
1981-1985	1072	2692	5874	6276	2086
1986-1990	982	3232	5752	7911	3413
1991-1995	977	3249	6184	11882	6344
1996-2000	1318	3285	8241	11589	7315
2001-2005	1320	2905	5155	14729	4495
2006-2010	1243	2525	-	14722	10110
2011-2015	1662	2940	4550	14270	3180
2016-2020	2316	3032	3708	15511	5439
2021-2025	1471	3304	3809	8881	5826
Total	**1118**	**2969**	**5870**	**11571**	**4454**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.16-16 General Overview of Cargo - Reefer Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Minimum) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1** **0-1,999**	**2** **2,000-5,999**	**3** **6,000-9,999**	**4** **10,000+**	**Total**
1970 & before	294	1177	-	-	294
1971-1975	294	1912	7281	-	294
1976-1980	165	1324	6623	-	165
1981-1985	294	735	3972	5516	294
1986-1990	441	1472	3272	5414	441
1991-1995	588	1250	4042	5414	588
1996-2000	530	1471	5100	2273	530
2001-2005	600	2060	3250	12640	600
2006-2010	720	735	-	11552	720
2011-2015	552	735	4550	14270	552
2016-2020	1616	1764	2700	9860	1616
2021-2025	736	2574	2700	4530	736
Total	**165**	**735**	**2700**	**2273**	**165**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.16-17 General Overview of Cargo - Reefer Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Maximum) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1** **0-1,999**	**2** **2,000-5,999**	**3** **6,000-9,999**	**4** **10,000+**	**Total**
1970 & before	2206	5663	-	-	5663
1971-1975	1986	6620	7281	-	7281
1976-1980	2648	9709	6623	-	9709
1981-1985	3089	4781	7598	7796	7796
1986-1990	2245	5700	7985	11311	11311
1991-1995	3678	6355	9989	16320	16320
1996-2000	3427	4902	12640	17759	17759
2001-2005	2206	3900	6300	15774	15774
2006-2010	1765	3250	-	15820	15820
2011-2015	2648	4550	4550	14270	14270
2016-2020	3163	4500	5220	18760	18760
2021-2025	1912	4170	4650	18760	18760
Total	**3678**	**9709**	**12640**	**18760**	**18760**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.16-18 General Overview of Cargo - Reefer Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Median) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1** **0-1,999**	**2** **2,000-5,999**	**3** **6,000-9,999**	**4** **10,000+**	**Total**
1970 & before	810	3089	-	-	3089
1971-1975	810	3641	8495	-	8495
1976-1980	742	2134	6254	-	6254
1981-1985	857	2940	6252	7061	7061
1986-1990	589	3089	5148	6950	6950
1991-1995	476	3042	5999	11412	11412
1996-2000	750	3242	7958	11472	11472
2001-2005	668	2993	5535	15774	15774
2006-2010	660	2847	-	15809	15809
2011-2015	2023	2998	4550	14270	14270
2016-2020	2055	2574	3325	15300	15300
2021-2025	1911	3270	3943	9480	9480

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Total	**2055**	**3641**	**8495**	**15809**	**15809**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.16-19 General Overview of Cargo - Reefer Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Modus) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-1,999**	**2 2,000-5,999**	**3 6,000-9,999**	**4 10,000+**	**Total**
1970 & before	1471	2942	-	-	2942
1971-1975	736	4119	...	-	4119
1976-1980	1324	2206	...	-	2206
1981-1985	1324	1912	6620	7061	7061
1986-1990	221	1950	5148	5414	5414
1991-1995	232	1471	4350	12270	12270
1996-2000	202	3249	7061	11915	11915
2001-2005	441	2993	...	15774	15774
2006-2010	...	2700	-	15820	15820
2011-2015	...	2998	4550	14270	14270
2016-2020	...	3480	4550	15300	15300
2021-2025	1912	3900	3309	9860	9860
Total	**1912**	**4119**	**7061**	**15820**	**15820**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.16-20 General Overview of Cargo - Reefer Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Average) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-1,999**	**2 2,000-5,999**	**3 6,000-9,999**	**4 10,000+**	**Total**
1970 & before	-	-	-	-	-
1971-1975	-	-	-	-	-
1976-1980	-	-	-	-	-
1981-1985	-	177	-	-	177
1986-1990	177	174	170	169	172
1991-1995	-	174	171	172	172
1996-2000	-	176	171	171	172
2001-2005	198	180	177	170	178
2006-2010	204	180	-	171	174
2011-2015	-	179	179	174	179
2016-2020	-	186	179	169	177
2021-2025	202	178	177	170	174
Total	**192**	**176**	**172**	**171**	**173**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.16-21 General Overview of Cargo - Reefer Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Minimum) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-1,999**	**2 2,000-5,999**	**3 6,000-9,999**	**4 10,000+**	**Total**
1970 & before	-	-	-	-	-
1971-1975	-	-	-	-	-
1976-1980	-	-	-	-	-
1981-1985	-	177	-	-	177
1986-1990	177	170	167	167	167
1991-1995	-	167	167	167	167
1996-2000	-	175	167	167	167
2001-2005	198	179	177	170	170
2006-2010	204	179	-	170	170
2011-2015	-	179	179	174	174
2016-2020	-	174	175	164	164
2021-2025	202	172	171	164	164
Total	**177**	**167**	**167**	**164**	**164**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.16-22 General Overview of Cargo - Reefer Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Maximum) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-1,999**	**2 2,000-5,999**	**3 6,000-9,999**	**4 10,000+**	**Total**
1970 & before	-	-	-	-	-
1971-1975	-	-	-	-	-

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1976-1980	-	-	-	-	-
1981-1985	-	177	-	-	177
1986-1990	177	177	171	173	177
1991-1995	-	177	177	174	177
1996-2000	-	177	177	174	177
2001-2005	198	182	177	171	198
2006-2010	204	182	-	175	204
2011-2015	-	181	179	174	181
2016-2020	-	210	181	171	210
2021-2025	202	179	185	178	202
Total	**204**	**210**	**185**	**178**	**210**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.16-23 General Overview of Cargo - Reefer Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Median) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-1,999**	**2 2,000-5,999**	**3 6,000-9,999**	**4 10,000+**	**Total**
1970 & before	-	-	-	-	-
1971-1975	-	-	-	-	-
1976-1980	-	-	-	-	-
1981-1985	210	177	…	…	210
1986-1990	177	175	170	167	177
1991-1995	…	175	170	173	175
1996-2000	209	176	171	171	209
2001-2005	202	179	177	170	202
2006-2010	204	179	-	170	204
2011-2015	…	179	179	174	179
2016-2020	…	174	179	171	179
2021-2025	202	179	174	171	202
Total	**210**	**179**	**179**	**174**	**210**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.16-24 General Overview of Cargo - Reefer Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Modus) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-1,999**	**2 2,000-5,999**	**3 6,000-9,999**	**4 10,000+**	**Total**
1970 & before	-	-	-	-	-
1971-1975	-	-	-	-	-
1976-1980	-	-	-	-	-
1981-1985	210	177	…	…	210
1986-1990	177	175	170	167	177
1991-1995	…	175	170	173	175
1996-2000	209	176	171	171	209
2001-2005	198	179	177	170	198
2006-2010	204	179	-	170	204
2011-2015	…	179	179	174	179
2016-2020	…	174	179	171	179
2021-2025	202	179	174	171	202
Total	**210**	**179**	**179**	**174**	**210**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

12.17. General Cargo – Combos

Table 12.17-1 General Overview of General Cargo - Combo Fleet – by Status

Status	Number of Ships
Dedicated Storage	1
In Service	9
Repairs	1
Storage	1
Total	**12**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.17-2 General Overview of General Cargo - Combo Fleet – by Carrier Type

Carrier type	Number of Ships
Bulk/Chemical & Oil Carrier	8
Bulk/Oil Carrier	4
Total	**12**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.17-3 General Overview of General Cargo - Combo Fleet – by Year of Build Group

Year of Build Group	Number of Ships
1981-1985	1
1996-2000	1
2001-2005	2
2016-2020	5
2021-2025	3
Total	**12**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.17-4 General Overview General Cargo - Combo Fleet – by 4th GHG IMO Size Class

4th GHG IMO Size Class	Number of Ships
4 60,000-99,999	8
5 100,000-199,999	4
Total	**12**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.17-5 General Overview of General Cargo - Combo Fleet – by Type of Power Type Group and by Number

Power Type Group	Number of Ships
Diesel 2-Stroke	12
Total	**12**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.17-6 General Overview of General Cargo - Combo Fleet – by Main Engine Designer

Main Engine Designer	Number of Ships
WinGD	8
Everllence B. & W.	4
Total	**12**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.17-7 General Overview of Cargo - Combo Fleet – by 4th GHG IMO Size Class by year of Build (Group) and by Number

	IMO GHG Size Class (dwt)		
Year of Build Group	**4 60,000-99,999**	**5 100,000-199,999**	**Total**
1970 & before	-	1	1
1971-1975	-	1	1
1976-1980	-	2	2
1981-1985	5	-	5
1986-1990	3	-	3
Total	**8**	**4**	**12**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.17-8 General Overview of Cargo - Combo Fleet – by 4th GHG IMO Size Class by year of Build (Group) and GT

	IMO GHG Size Class (dwt)		
Year of Build Group	**4 60,000-99,999**	**5 100,000-199,999**	**Total**
1970 & before	…	1	1
1971-1975	…	1	1
1976-1980	…	2	2
1981-1985	5	…	5
1986-1990	3	…	3
Total	**8**	**4**	**12**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

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Table 12.17-9 General Overview of Cargo - Combo Fleet – by 4th GHG IMO Size Class by year of Build (Group) and DWT

	IMO GHG Size Class (dwt)		
Year of Build Group	**4 60,000-99,999**	**5 100,000-199,999**	**Total**
1970 & before	-	135160	135160
1971-1975	-	109832	109832
1976-1980	-	241168	241168
1981-1985	413118	-	413118
1986-1990	247173	-	247173
Total	**660291**	**486160**	**1146451**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.17-10 General Overview of Cargo - Combo Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Average) mid of 2025

	IMO GHG Size Class (dwt)		
Year of Build Group	**4 60,000-99,999**	**5 100,000-199,999**	**Total**
1970 & before	-	14	14
1971-1975	-	16	16
1976-1980	-	15	15
1981-1985	14	-	14
1986-1990	14	-	14
Total	**14**	**15**	**14**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.17-11 General Overview of Cargo - Combo Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Minimum) mid of 2025

	IMO GHG Size Class (dwt)		
Year of Build Group	**4 60,000-99,999**	**5 100,000-199,999**	**Total**
1970 & before	-	14	14
1971-1975	-	16	16
1976-1980	-	15	15
1981-1985	14	-	14
1986-1990	14	-	14
Total	**14**	**14**	**14**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.17-12 General Overview of Cargo - Combo Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Maximum) mid of 2025

	IMO GHG Size Class (dwt)		
Year of Build Group	**4 60,000-99,999**	**5 100,000-199,999**	**Total**
1970 & before	-	14	14
1971-1975	-	16	16
1976-1980	-	15	15
1981-1985	14	-	14
1986-1990	14	-	14
Total	**14**	**16**	**16**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.17-13 General Overview of Cargo - Combo Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Median) mid of 2025

	IMO GHG Size Class (dwt)		
Year of Build Group	**4 60,000-99,999**	**5 100,000-199,999**	**Total**
1970 & before	-	14	14
1971-1975	-	16	16
1976-1980	-	15	15
1981-1985	14	-	14
1986-1990	14	-	14
Total	**14**	**16**	**16**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

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Table 12.17-14 General Overview of Cargo - Combo Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Modus) mid of 2025

	IMO GHG Size Class (dwt)		
Year of Build Group	**4 60,000-99,999**	**5 100,000-199,999**	**Total**
1970 & before	-	14	14
1971-1975	-	16	16
1976-1980	-	15	15
1981-1985	14	-	14
1986-1990	14	-	14
Total	**14**	**16**	**16**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.17-15 General Overview of Cargo - Combo Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Average) mid of 2025

	IMO GHG Size Class (dwt)		
Year of Build Group	**4 60,000-99,999**	**5 100,000-199,999**	**Total**
1970 & before	-	11842	11842
1971-1975	-	13827	13827
1976-1980	-	15550	15550
1981-1985	9600	-	9600
1986-1990	9600	-	9600
Total	**9600**	**14192**	**11131**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.17-16 General Overview of Cargo - Combo Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Minimum) mid of 2025

	IMO GHG Size Class (dwt)		
Year of Build Group	**4 60,000-99,999**	**5 100,000-199,999**	**Total**
1970 & before	-	11842	11842
1971-1975	-	13827	13827
1976-1980	-	15550	15550
1981-1985	9600	-	9600
1986-1990	9600	-	9600
Total	**9600**	**11842**	**9600**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.17-17 General Overview of Cargo - Combo Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Maximum) mid of 2025

	IMO GHG Size Class (dwt)		
Year of Build Group	**4 60,000-99,999**	**5 100,000-199,999**	**Total**
1970 & before	-	11842	11842
1971-1975	-	13827	13827
1976-1980	-	15550	15550
1981-1985	9600	-	9600
1986-1990	9600	-	9600
Total	**9600**	**15550**	**15550**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.17-18 General Overview of Cargo - Combo Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Median) mid of 2025

	IMO GHG Size Class (dwt)		
Year of Build Group	**4 60,000-99,999**	**5 100,000-199,999**	**Total**
1970 & before	-	11842	11842
1971-1975	-	13827	13827
1976-1980	-	15550	15550
1981-1985	9600	-	9600
1986-1990	9600	-	9600
Total	**9600**	**15550**	**15550**

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Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.17-19 General Overview of Cargo - Combo Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Modus) mid of 2025

	IMO GHG Size Class (dwt)		
Year of Build Group	**4 60,000-99,999**	**5 100,000-199,999**	**Total**
1970 & before	-	14	14
1971-1975	-	16	16
1976-1980	-	15	15
1981-1985	9600	-	9600
1986-1990	14	-	14
Total	**9600**	**16**	**9600**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.17-20 General Overview of Cargo - Combo Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Average) mid of 2025

	IMO GHG Size Class (dwt)		
Year of Build Group	**4 60,000-99,999**	**5 100,000-199,999**	**Total**
1970 & before	-	-	-
1971-1975	-	171	171
1976-1980	-	174	174
1981-1985	168	-	168
1986-1990	168	-	168
Total	**168**	**173**	**169**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.17-21 General Overview of Cargo - Combo Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Minimum) mid of 2025

	IMO GHG Size Class (dwt)		
Year of Build Group	**4 60,000-99,999**	**5 100,000-199,999**	**Total**
1970 & before	-	-	-
1971-1975	-	171	171
1976-1980	-	174	174
1981-1985	168	-	168
1986-1990	168	-	168
Total	**168**	**171**	**168**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.17-22 General Overview of Cargo - Combo Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Maximum) mid of 2025

	IMO GHG Size Class (dwt)		
Year of Build Group	**4 60,000-99,999**	**5 100,000-199,999**	**Total**
1970 & before	-	-	-
1971-1975	-	171	171
1976-1980	-	174	174
1981-1985	168	-	168
1986-1990	168	-	168
Total	**168**	**174**	**174**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.17-23 General Overview of Cargo - Combo Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Median) mid of 2025

	IMO GHG Size Class (dwt)		
Year of Build Group	**4 60,000-99,999**	**5 100,000-199,999**	**Total**
1970 & before	-	-	-
1971-1975	-	171	171
1976-1980	-	174	174
1981-1985	168	-	168
1986-1990	168	-	168
Total	**168**	**174**	**174**

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Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.17-24 General Overview of Cargo - Combo Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Modus) mid of 2025

	IMO GHG Size Class (dwt)		
Year of Build Group	**4 60,000-99,999**	**5 100,000-199,999**	**Total**
1970 & before	-	-	-
1971-1975	-	171	171
1976-1980	-	174	174
1981-1985	168	-	168
1986-1990	168	-	168
Total	**168**	**174**	**174**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

12.18. *Others – Dredger*

Table 12.18-1 General Overview of Dredger Fleet – by Status

Status	Number of Ships
Idle	1
In Service	779
Laid Up	26
Repairs	5
Total	**811**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.18-2 General Overview of Dredger Fleet – by Carrier Type

Carrier type	Number of Ships
Backhoe/Dipper/Grab Dredger	84
Bucket Ladder Dredger	15
Cutter Suction/Bucket Wheel Dredger	58
Dredger (Unspecified)	13
Dredgers (Stone Dumping, Fallpipe)	17
Gravel/Stone Discharge	5
Other Dredger	41
Special Equipment Dredger	16
Suction Dredger	32
Suction Hopper Dredger	30
Trailing Suction Hopper Dredger	500
Total	**811**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.18-3 General Overview of Dredger Fleet – by Year of Build Group

Year of Build Group	Number of Ships
1970 and before	82
1971-1975	60
1976-1980	73
1981-1985	88
1986-1990	72
1991-1995	38
1996-2000	57
2001-2005	66
2006-2010	71
2011-2015	88
2016-2020	75
2021-2025	41
Total	**811**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.18-4 General Overview of Dredger Fleet – by 4^{th} GHG IMO Size Class

4^{th} GHG IMO Size Class	Number of Ships
1 0-4,999	538
2 5,000-9,999	159
3 10,000-19,999	81
4 20,000-39,999	33
Total	**811**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.18-5 General Overview of Dredger Fleet – by Type of Power Type Group and by Number

Power Type Group	Number of Ships
Batteries & Diesel	5
Batteries, Diesel & Fuel Cell	1
Diesel 2-Stroke	49
Diesel 4-Stroke	648
Diesel Electric	108
Total	**811**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.18-6 General Overview of Dredger Fleet – by Main Engine Designer

Main Engine Designer	Number of Ships
A.B.C.	16
Akasaka	5
ALCO	1
Allen	3
Alpha Diesel	1
Ansaldo	1
Bergen	7
Blackstone	10
Bolnes	18
Brons	1
Caterpillar	92
Cooper Bessemer	1
Crepelle	2
Cummins Inc	35
Daihatsu Infinearth	24
Daldiesel	5
Detroit Diesel Corp	3
Deutz	41
Dorman	2
EMD	3
Everllence B. & W.	107
Fiat	2
Fuji Diesel	2
Gen. Motors	6
General Electric	4
Grandi Motori	1
Grenaa	1
Guangzhou Diesel	9
Guascor	2
Hanshin	17
Kelvin	1
Kirloskar	1
Kromhout	2
MaK	29
Matsui	2
Mirrlees	14
Mitsubishi	13
Moteurs Baudouin	4
MTU	4
MWM	23
Niigata	24
Ningbo C.S.I. Power	20
Penzadizelmash	2
Pervomaydizelmash	7
Pielstick	10
Polar	5
Ruston	9
SACM	1
Scania	5
SKL	22
Smit-Bolnes	7
Soviet	1
Stork	1
Stork Werkspoor	5
Sulzer	10
Unknown	47
Vivian	1
Volvo Penta	7
Wartsila 4-stroke	76
Weichai HM	8
Weifang Diesel	1
Werkspoor	11
Wuxi Wandi	1
Yanmar	13
Zichai Power	2

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Total	**811**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.18-7 General Overview of Dredger Fleet – by 4th GHG IMO Size Class by year of Build (Group) and by Number

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,000-19,999**	**4 20,000+**	**Total**
1970 & before	78	3	1	-	82
1971-1975	50	9	1	-	60
1976-1980	58	9	6	-	73
1981-1985	76	5	6	1	88
1986-1990	60	11	1	-	72
1991-1995	26	8	4	-	38
1996-2000	40	5	6	6	57
2001-2005	33	15	11	7	66
2006-2010	32	23	10	6	71
2011-2015	43	22	17	6	88
2016-2020	28	32	11	4	75
2021-2025	14	17	7	3	41
Total	**538**	**159**	**81**	**33**	**811**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.18-8 General Overview of Dredger Fleet – by 4th GHG IMO Size Class by year of Build (Group) and GT

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,000-19,999**	**4 20,000+**	**Total**
1970 & before	81569	11687	10338	-	103594
1971-1975	59435	42295	6817	-	108547
1976-1980	105428	51256	58969	-	215653
1981-1985	125781	25040	51874	19516	222211
1986-1990	74412	45486	7905	-	127803
1991-1995	42410	39712	46152	-	128274
1996-2000	76535	24930	80858	123127	305450
2001-2005	77497	81867	106071	138412	403847
2006-2010	95449	120202	117902	112900	446453
2011-2015	128312	117820	198511	140424	585067
2016-2020	98712	221781	120190	76473	517156
2021-2025	34041	124063	75526	71683	305313
Total	**999581**	**906139**	**881113**	**682535**	**3469368**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.18-9 General Overview of Dredger Fleet – by 4th GHG IMO Size Class by year of Build (Group) and DWT

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,000-19,999**	**4 20,000+**	**Total**
1970 & before	98336	19754	16880	-	134970
1971-1975	64975	54194	12187	-	131356
1976-1980	110062	67641	71486	-	249189
1981-1985	148625	33263	71081	20958	273927
1986-1990	85515	69399	13122	-	168036
1991-1995	55134	59034	56461	-	170629
1996-2000	89112	35557	86281	155850	366800
2001-2005	65877	102503	152100	176684	497164
2006-2010	70697	157967	144406	151044	524114
2011-2015	92704	154162	242736	173252	662854
2016-2020	69920	232779	142933	103338	548970
2021-2025	27052	119074	89787	85515	321428
Total	**978009**	**1105327**	**1099460**	**866641**	**4049437**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.18-10 General Overview of Dredger Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Average) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,000-19,999**	**4 20,000+**	**Total**

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1970 & before	10	10	18	-	10
1971-1975	10	12	14	-	10
1976-1980	10	13	13	-	11
1981-1985	10	13	14	13	11
1986-1990	10	12	14	-	11
1991-1995	10	13	14	-	11
1996-2000	11	12	15	16	12
2001-2005	11	13	14	16	13
2006-2010	11	12	14	15	13
2011-2015	11	13	15	15	13
2016-2020	11	13	14	15	12
2021-2025	12	12	14	14	13
Total	**10**	**13**	**14**	**15**	**11**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.18-11 General Overview of Dredger Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Minimum) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1** **0-4,999**	**2** **5,000-9,999**	**3** **10,000-19,999**	**4** **20,000+**	**Total**
1970 & before	5	6	18	-	5
1971-1975	7	10	14	-	7
1976-1980	6	10	11	-	6
1981-1985	6	12	14	13	6
1986-1990	5	8	14	-	5
1991-1995	7	10	13	-	7
1996-2000	7	12	12	14	7
2001-2005	6	12	11	14	6
2006-2010	3	11	11	12	3
2011-2015	8	11	12	14	8
2016-2020	10	11	12	15	10
2021-2025	12	12	14	14	12
Total	**3**	**6**	**11**	**12**	**3**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.18-12 General Overview of Dredger Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Maximum) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1** **0-4,999**	**2** **5,000-9,999**	**3** **10,000-19,999**	**4** **20,000+**	**Total**
1970 & before	13	15	18	-	18
1971-1975	13	13	14	-	14
1976-1980	15	15	15	-	15
1981-1985	14	14	15	13	15
1986-1990	18	14	14	-	18
1991-1995	14	15	16	-	16
1996-2000	15	13	16	17	17
2001-2005	15	18	16	16	18
2006-2010	16	17	16	16	17
2011-2015	13	14	15	16	16
2016-2020	12	14	15	16	16
2021-2025	12	13	15	15	15
Total	**18**	**18**	**18**	**17**	**18**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.18-13 General Overview of Dredger Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Median) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1** **0-4,999**	**2** **5,000-9,999**	**3** **10,000-19,999**	**4** **20,000+**	**Total**
1970 & before	10	11	18	-	18
1971-1975	10	12	14	-	14
1976-1980	9	13	13	-	13
1981-1985	10	13	14	13	14
1986-1990	10	13	14	-	14
1991-1995	10	13	14	-	14
1996-2000	11	12	15	16	16
2001-2005	11	12	15	16	16
2006-2010	12	12	15	16	16
2011-2015	11	13	15	15	15
2016-2020	10	14	14	15	15
2021-2025	12	12	14	14	14
Total	**12**	**14**	**18**	**16**	**18**

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Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.18-14 General Overview of Dredger Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Modus) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,000-19,999**	**4 20,000+**	**Total**
1970 & before	10	…	18	-	18
1971-1975	10	12	…	-	12
1976-1980	8	12	13	-	13
1981-1985	10	12	14	13	14
1986-1990	11	13	14	-	14
1991-1995	11	…	13	-	13
1996-2000	10	12	…	16	16
2001-2005	11	12	15	16	16
2006-2010	13	12	16	16	16
2011-2015	11	14	15	16	16
2016-2020	10	14	14	15	15
2021-2025	…	12	…	…	12
Total	**13**	**14**	**18**	**16**	**18**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.18-15 General Overview of Dredger Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Average) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,000-19,999**	**4 20,000+**	**Total**
1970 & before	964	2852	8829	-	1144
1971-1975	1327	3696	6472	-	1791
1976-1980	1923	5550	5512	-	2675
1981-1985	1682	5817	7715	6436	2398
1986-1990	1424	4636	7995	-	2014
1991-1995	1718	5148	9697	-	3280
1996-2000	2084	3730	11746	19811	5340
2001-2005	2706	5303	8461	15940	5800
2006-2010	4783	4931	14460	15988	7279
2011-2015	5307	4919	12202	15033	7344
2016-2020	4930	6151	9335	18265	6977
2021-2025	3086	9442	10543	18080	8310
Total	**2264**	**5542**	**10284**	**16676**	**4370**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.18-16 General Overview of Dredger Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Minimum) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,000-19,999**	**4 20,000+**	**Total**
1970 & before	221	1824	8829	-	221
1971-1975	368	1943	6472	-	368
1976-1980	239	1802	3089	-	239
1981-1985	221	2602	2797	6436	221
1986-1990	412	2498	7995	-	412
1991-1995	390	2268	5999	-	390
1996-2000	706	1935	5800	11520	706
2001-2005	436	3542	2206	7297	436
2006-2010	600	2206	5050	8826	600
2011-2015	298	2206	4500	8000	298
2016-2020	588	1323	4590	14400	588
2021-2025	1126	2686	7104	14400	1126
Total	**221**	**1323**	**2206**	**6436**	**221**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.18-17 General Overview of Dredger Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Maximum) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,000-19,999**	**4 20,000+**	**Total**
1970 & before	3324	4413	8829	-	8829

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1971-1975	6899	6472	6472	-	6899
1976-1980	7149	9600	7061	-	9600
1981-1985	10297	9709	10150	6436	10297
1986-1990	9885	7708	7995	-	9885
1991-1995	5300	9709	14399	-	14399
1996-2000	8800	4928	21422	25198	25198
2001-2005	16800	7296	14389	25184	25184
2006-2010	21600	8825	18145	23200	23200
2011-2015	22500	8200	23060	22500	23060
2016-2020	27840	21600	16000	21600	27840
2021-2025	7050	41220	14400	21600	41220
Total	**27840**	**41220**	**23060**	**25198**	**41220**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.18-18 General Overview of Dredger Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Median) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,000-19,999**	**4 20,000+**	**Total**
1970 & before	548	3161	8829	-	8829
1971-1975	1104	3443	7355	-	7355
1976-1980	750	5590	6252	-	6252
1981-1985	1103	5539	9304	7995	9304
1986-1990	736	3875	8499	-	8499
1991-1995	736	5200	9195	-	9195
1996-2000	1707	4310	10700	19980	19980
2001-2005	1620	5252	8399	16800	16800
2006-2010	2356	5000	16000	14700	16000
2011-2015	1440	4269	12000	13950	13950
2016-2020	1826	5760	9280	18530	18530
2021-2025	2244	6010	9000	18240	18240
Total	**2356**	**6010**	**16000**	**19980**	**19980**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.18-19 General Overview of Dredger Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Modus) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,000-19,999**	**4 20,000+**	**Total**
1970 & before	221	...	8829	-	8829
1971-1975	2472	6472	...	-	6472
1976-1980	191	5737	...	-	5737
1981-1985	1472	...	...	...	1472
1986-1990	736	3226	...	-	3226
1991-1995	736	...	...	-	736
1996-2000	1471	4919	...	...	4919
2001-2005	2401	5000	7800	17389	17389
2006-2010	3800	5000	17400	12000	17400
2011-2015	600	2984	12000	3530	12000
2016-2020	1492	1323	4590	...	4590
2021-2025	1988	13510	14400	...	14400
Total	**3800**	**13510**	**17400**	**17389**	**17400**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.18-20 General Overview of Dredger Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Average) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	**1 0-4,999**	**2 5,000-9,999**	**3 10,000-19,999**	**4 20,000+**	**Total**
1970 & before	-	-	-	-	-
1971-1975	-	-	-	-	-
1976-1980	207	-	-	-	207
1981-1985	-	-	-	-	-
1986-1990	-	-	-	-	-
1991-1995	181	-	-	-	181
1996-2000	181	-	176	177	178
2001-2005	180	181	181	178	180
2006-2010	187	192	180	181	186
2011-2015	185	188	182	182	185
2016-2020	187	184	178	181	183
2021-2025	200	185	185	178	184
Total	**185**	**186**	**181**	**180**	**183**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

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Table 12.18-21 General Overview of Dredger Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Minimum) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	1 0-4,999	2 5,000-9,999	3 10,000-19,999	4 20,000+	Total
1970 & before	-	-	-	-	-
1971-1975	-	-	-	-	-
1976-1980	207	-	-	-	207
1981-1985	-	-	-	-	-
1986-1990	-	-	-	-	-
1991-1995	181	-	-	-	181
1996-2000	176	-	173	173	173
2001-2005	176	176	181	177	176
2006-2010	178	182	177	181	177
2011-2015	170	176	178	177	170
2016-2020	176	174	176	170	170
2021-2025	200	184	176	170	170
Total	**170**	**174**	**173**	**170**	**170**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.18-22 General Overview of Dredger Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Maximum) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	1 0-4,999	2 5,000-9,999	3 10,000-19,999	4 20,000+	Total
1970 & before	-	-	-	-	-
1971-1975	-	-	-	-	-
1976-1980	207	-	-	-	207
1981-1985	-	-	-	-	-
1986-1990	-	-	-	-	-
1991-1995	181	-	-	-	181
1996-2000	186	-	181	181	186
2001-2005	187	187	181	181	187
2006-2010	200	200	185	181	200
2011-2015	207	201	188	185	207
2016-2020	195	201	179	184	201
2021-2025	200	187	195	184	200
Total	**207**	**201**	**195**	**185**	**207**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.18-23 General Overview of Dredger Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Median) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	1 0-4,999	2 5,000-9,999	3 10,000-19,999	4 20,000+	Total
1970 & before	…	…	…	-	…
1971-1975	…	…	…	-	…
1976-1980	207	…	…	-	207
1981-1985	…	…	…	…	…
1986-1990	185	…	…	-	185
1991-1995	181	…	…	-	181
1996-2000	185	…	176	176	185
2001-2005	176	181	181	177	181
2006-2010	186	187	177	181	187
2011-2015	184	183	181	184	184
2016-2020	187	181	179	184	187
2021-2025	200	184	185	179	200
Total	**207**	**187**	**185**	**184**	**207**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.18-24 General Overview of Dredger Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main SFOC g/kWh (Modus) mid of 2025

	IMO GHG Size Class (dwt)				
Year of Build Group	1 0-4,999	2 5,000-9,999	3 10,000-19,999	4 20,000+	Total
1970 & before	…	…	…	-	…
1971-1975	…	…	…	-	…
1976-1980	207	…	…	-	207
1981-1985	…	…	…	…	…

1986-1990	185	...	...	-	185
1991-1995	181	...	...	-	181
1996-2000	176	...	176	...	176
2001-2005	176	176	181	177	181
2006-2010	184	200	177	181	200
2011-2015	184	201	181	184	201
2016-2020	184	181	179	184	184
2021-2025	200	184	...	...	200
Total	**207**	**201**	**181**	**184**	**207**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

12.19. *Others - Offshore*

Table 12.19-1 General Overview of Offshore Fleet – by Status

Status	Number of Ships
Damaged/Not in Service	3
Idle	416
In Service	4027
Laid Up	882
Repairs	63
Under Arrest	2
Total	**5393**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.19-2 General Overview of Offshore Fleet – by Carrier Type

Carrier type	Number of Ships
Anchor Handling Tug	502
Cable Layer	93
Cable Layer (Fibre Optic)	57
Construction Service Operations Vsl	31
Crew Boat	105
Crew/Fast Supply Vessel	374
Cylindrical Floating Prod. Unit	7
Derrick/Lay Vessel	10
Diving Support	107
Drillship	107
ERRV	195
Extended Well Test Vessel	4
Floating Production Unit	9
FPDSO	1
FPSO	197
FSO	77
FSRU	12
FSU	9
Geophysical Survey	74
Heavy Lift/Crane Ship	127
Hydrographic Survey	65
LNG/FPSO	7
LPG/FPSO	1
LPG/FSO	4
Maintenance	166
Miscellaneous Offshore Service	16
Multi-Purpose Support	290
Oceanographic Survey	129
Offshore Crew Tender	5
Oil Transfer Vessel	2
Oilfield Pollution Control	46
Pipe Layer	28
Platform Supply	1194
ROV/Submersible Support	43
Seismic Support	39
Seismic Survey	114
Semi-Submersible Heavy Lift	63
Service Operations Vessel	31
Standby Safety/Guard	29
Transport (Heavy Lift)	316
Umbilicals & Flowline Flex Layer	27
Utility/Workboat	647
Well Stimulation	33
Total	**5393**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.19-3 General Overview of Offshore Fleet – by Year of Build Group

Year of Build Group	Number of Ships

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1970 and before	93
1971-1975	139
1976-1980	215
1981-1985	263
1986-1990	174
1991-1995	129
1996-2000	337
2001-2005	526
2006-2010	1128
2011-2015	1329
2016-2020	561
2021-2025	499
Total	**5393**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.19-4 General Overview of Offshore Fleet – by 4th GHG IMO Size Class

4th GHG IMO Size Class	Number of Ships
1 0-1,999	2404
2 2,000-9,999	2130
3 10,000-59,999	548
4 60,000-99,999	156
5 100,000-149,999	62
6 150,000+	93
Total	**5393**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.19-5 General Overview of Offshore Fleet – by Type of Power Type Group and by Number

Power Type Group	Number of Ships
Batteries & Diesel	186
Batteries, Diesel & Fuel Cell	3
Combined	4
Diesel 2-Stroke	366
Diesel 4-Stroke	3148
Diesel Electric	1434
Fuel Cell & Battery	1
Gas Turbine	1
Hybrid Mech./Elec.	16
Non Propelled	210
Steam Turbine	24
Total	**5393**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.19-6 General Overview of Offshore Fleet – by Main Engine Designer and by Number

Main Engine Designer	Number of Ships
A.B.C.	29
Akasaka	3
ALCO	8
Allen	2
Alpha Diesel	1
Anqing CSSC	1
Barnaultransmash	1
Bergen	214
Bergen Normo	5
Blackstone	17
Bolnes	5
Caterpillar	1549
Chinese Std.	2
Cleveland	1
Corvus Energy	1
Crepelle	3
CRRC Dalian	1
Cummins Inc	600
Daihatsu Infinearth	52
De Industrie	4
Detroit Diesel Corp	92
Deutz	44
DMR	1
Duvant-Crepelle	1
Dvigatel Revolyutsii	6
EMD	14
Everllence B. & W.	331
Fuji Diesel	7
Gen. Motors	75
General Electric	37
Grandi Motori	1

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Guangzhou Diesel	50
Guascor	3
Hanshin	9
Hedemora	2
HHI-EMD (HiMSEN)	66
HHM	1
Ishikawajima	8
Jinan Diesel	1
Kawasaki	2
Kelvin	2
Kromhout	15
MaK	232
Matsui	1
Mirrlees	3
Mitsubishi	74
Mitsui - MES	2
Moteurs Baudouin	13
MTU	97
MWM	17
Niigata	201
Ningbo C.S.I. Power	30
Nohab	5
Normo	5
Otsuka	5
Paxman	5
Pielstick	15
Polar	18
Poyaud	2
Richardsons	1
Ruston	11
Scania	10
SKL	15
Smit-Bolnes	1
Soviet	7
Stal-Laval	2
Stork	1
Stork Werkspoor	5
Stork-Wartsila	1
Sulzer	87
Ulstein Bergen	34
Unknown	239
Volvo Penta	8
Wartsila 2-stroke	4
Wartsila 4-stroke	503
Weichai HM	15
Werkspoor	2
Wichmann	16
Wuxi Wandi	1
Yanmar	206
YCRRC Engine	2
Yuchai Marine Power	1
Zichai Power	20
(unknown)	209
Total	**5393**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.19-7 General Overview of Offshore Fleet – by 4th GHG IMO Size Class by year of Build (Group) and by Number

	IMO GHG Size Class (dwt)						
Year of Build Group	**1 0-1,999**	**2 2,000-9,999**	**3 10,000-59,999**	**4 60,000-99,999**	**5 100,000-149,999**	**6 150,000+**	**Total**
1970 & before	81	7	4	-	1	-	93
1971-1975	106	7	4	6	15	1	139
1976-1980	164	21	9	9	7	5	215
1981-1985	194	36	25	3	3	2	263
1986-1990	79	44	35	4	9	3	174
1991-1995	49	36	21	9	5	9	129
1996-2000	181	92	30	16	3	15	337
2001-2005	285	163	34	16	8	20	526
2006-2010	586	436	74	21	2	9	1128
2011-2015	440	723	115	41	5	5	1329
2016-2020	151	305	79	12	1	13	561
2021-2025	88	260	118	19	3	11	499
Total	**2404**	**2130**	**548**	**156**	**62**	**93**	**5393**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

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Table 12.19-8 General Overview of Offshore Fleet – by 4th GHG IMO Size Class by year of Build (Group) and GT

	IMO GHG Size Class (dwt)						
Year of Build Group	1 0-1,999	2 2,000-9,999	3 10,000-59,999	4 60,000-99,999	5 100,000-149,999	6 150,000+	Total
1970 & before	56504	24017	112547	-	120000	-	313068
1971-1975	81501	32699	127271	457365	1974728	151123	2824687
1976-1980	124706	89720	259951	773160	955928	879563	3083028
1981-1985	128762	127606	649547	214001	411093	351675	1882684
1986-1990	62665	176042	1408249	282391	1233157	468535	3631039
1991-1995	42553	187305	705291	657318	728077	1404711	3725255
1996-2000	142064	363892	1328491	1149417	219126	2425035	5628025
2001-2005	198244	557862	834783	1335751	926723	3577887	7431250
2006-2010	457501	1601855	1710831	1488464	111914	1623575	6994140
2011-2015	385354	2911944	3423238	2692122	567296	1198782	11178736
2016-2020	128019	1315305	1774804	898826	109654	2624679	6851287
2021-2025	56661	1156398	2615596	1304618	415999	2362763	7912035
Total	**1864534**	**8544645**	**14950599**	**11253433**	**7773695**	**17068328**	**61455234**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.19-9 General Overview of Offshore Fleet – by 4th GHG IMO Size Class by year of Build (Group) and DWT

	IMO GHG Size Class (dwt)						
Year of Build Group	1 0-1,999	2 2,000-9,999	3 10,000-59,999	4 60,000-99,999	5 100,000-149,999	6 150,000+	Total
1970 & before	37706	13820	196887	-	-	-	248413
1971-1975	71601	24225	246111	839888	3803019	294572	5279416
1976-1980	100422	62120	337010	1047925	1883710	1769024	5200211
1981-1985	118451	76149	848414	393114	620844	683612	2740584
1986-1990	33268	95059	2013956	449054	1836791	879607	5307735
1991-1995	28950	122559	1013158	1130594	1363129	2306940	5965330
1996-2000	145378	348721	2302479	1790464	299300	4114949	9001291
2001-2005	190732	581508	1042810	2055979	1152683	6374866	11398578
2006-2010	392851	1655737	1727198	2126183	129193	2873169	8904331
2011-2015	281503	2994427	2884136	2767971	500999	1747414	11176450
2016-2020	92621	1211957	1502932	832444	136574	3343740	7120268
2021-2025	32361	1454357	2720325	1211964	648323	2896088	8963418
Total	**1525844**	**8640639**	**16835416**	**14645580**	**12374565**	**27283981**	**81306025**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.19-10 General Overview of Offshore Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Average) mid of 2025

	IMO GHG Size Class (dwt)						
Year of Build Group	1 0-1,999	2 2,000-9,999	3 10,000-59,999	4 60,000-99,999	5 100,000-149,999	6 150,000+	Total
1970 & before	12	12	13	-	-	-	12
1971-1975	12	11	16	14	16	16	13
1976-1980	12	13	13	16	13	15	12
1981-1985	11	13	14	15	12	16	12
1986-1990	12	13	14	14	14	15	13
1991-1995	13	13	14	13	15	15	14
1996-2000	15	13	14	13	-	15	15
2001-2005	16	14	14	16	19	15	15
2006-2010	15	14	14	14	-	16	14
2011-2015	15	13	13	12	12	14	14
2016-2020	18	13	13	13	-	-	15
2021-2025	26	13	13	11	-	-	15
Total	**14**	**13**	**14**	**13**	**15**	**15**	**14**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.19-11 General Overview of Offshore Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Minimum) mid of 2025

	IMO GHG Size Class (dwt)						
Year of Build Group	1 0-1,999	2 2,000-9,999	3 10,000-59,999	4 60,000-99,999	5 100,000-149,999	6 150,000+	Total
1970 & before	6	6	11	-	-	-	6
1971-1975	6	7	15	13	14	16	6
1976-1980	5	9	10	7	10	15	5
1981-1985	4	7	10	15	7	16	4
1986-1990	6	10	6	13	10	14	6

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1991-1995	8	10	10	9	14	14	8
1996-2000	8	11	12	6	-	11	6
2001-2005	5	9	10	14	19	12	5
2006-2010	8	8	5	12	-	16	5
2011-2015	5	8	7	9	10	14	5
2016-2020	10	7	10	13	-	-	7
2021-2025	11	10	8	9	-	-	8
Total	**4**	**6**	**5**	**6**	**7**	**11**	**4**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.19-12 General Overview of Offshore Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Maximum) mid of 2025

	IMO GHG Size Class (dwt)						
Year of Build Group	**1 0-1,999**	**2 2,000-9,999**	**3 10,000-59,999**	**4 60,000-99,999**	**5 100,000-149,999**	**6 150,000+**	**Total**
1970 & before	16	16	16	-	-	-	16
1971-1975	16	13	16	16	19	16	19
1976-1980	16	19	16	20	16	16	20
1981-1985	16	20	18	15	15	16	20
1986-1990	24	16	16	15	19	15	24
1991-1995	28	16	17	15	16	16	28
1996-2000	33	18	17	16	-	17	33
2001-2005	33	20	17	20	20	17	33
2006-2010	41	18	19	16	-	16	41
2011-2015	46	20	20	14	13	14	46
2016-2020	43	17	16	15	-	-	43
2021-2025	35	18	18	13	-	-	35
Total	**46**	**20**	**20**	**20**	**20**	**17**	**46**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.19-13 General Overview of Offshore Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Median) mid of 2025

	IMO GHG Size Class (dwt)						
Year of Build Group	**1 0-1,999**	**2 2,000-9,999**	**3 10,000-59,999**	**4 60,000-99,999**	**5 100,000-149,999**	**6 150,000+**	**Total**
1970 & before	12	14	13	-	-	-	14
1971-1975	12	11	16	15	16	16	16
1976-1980	12	12	14	16	14	15	16
1981-1985	12	13	14	15	15	16	16
1986-1990	12	13	15	15	14	15	15
1991-1995	12	14	15	14	15	16	16
1996-2000	13	13	14	14	-	16	16
2001-2005	13	14	14	15	20	16	20
2006-2010	12	14	14	14	-	16	16
2011-2015	13	13	13	12	12	15	15
2016-2020	13	13	14	13	-	-	14
2021-2025	30	13	13	12	-	-	30
Total	**30**	**14**	**16**	**16**	**20**	**16**	**30**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.19-14 General Overview of Offshore Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Speed (Modus) mid of 2025

	IMO GHG Size Class (dwt)						
Year of Build Group	**1 0-1,999**	**2 2,000-9,999**	**3 10,000-59,999**	**4 60,000-99,999**	**5 100,000-149,999**	**6 150,000+**	**Total**
1970 & before	12	14	...	-	-	-	14
1971-1975	12	11	16	...	16	16	16
1976-1980	12	12	10	19	...	...	19
1981-1985	12	12	15	15	15	...	15
1986-1990	11	12	15	...	...	...	15
1991-1995	12	14	14	...	19	16	19
1996-2000	12	12	15	14	-	15	15
2001-2005	12	15	14	15	20	16	20
2006-2010	12	14	15	12	-	16	16
2011-2015	12	12	12	12	...	...	12
2016-2020	12	13	14	13	-	-	14
2021-2025	30	13	13	12	-	-	30
Total	**30**	**15**	**16**	**19**	**20**	**16**	**30**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

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Table 12.19-15 General Overview of Offshore Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Average) mid of 2025

	IMO GHG Size Class (dwt)						
Year of Build Group	1 0-1,999	2 2,000-9,999	3 10,000-59,999	4 60,000-99,999	5 100,000-149,999	6 150,000+	Total
1970 & before	1180	2538	11253	-	-	-	1621
1971-1975	2061	3886	16262	26746	26989	-	4845
1976-1980	2079	4595	11287	19828	28832	29665	4108
1981-1985	1695	4661	10097	14403	24516	30082	3361
1986-1990	1647	4915	11137	11669	24530	20241	5739
1991-1995	2373	6612	10817	15557	23073	23503	7652
1996-2000	3035	5692	18161	18222	13861	25716	6441
2001-2005	3289	5745	14054	18489	22244	28426	5683
2006-2010	3318	5977	16817	31667	-	29390	5697
2011-2015	3591	6123	22635	43817	50383	89600	7932
2016-2020	3941	6054	17757	41533	-	61580	7754
2021-2025	3827	4679	12201	44364	12040	7720	7821
Total	**2980**	**5837**	**16593**	**32897**	**26962**	**29169**	**6440**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.19-16 General Overview of Offshore Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Minimum) mid of 2025

	IMO GHG Size Class (dwt)						
Year of Build Group	1 0-1,999	2 2,000-9,999	3 10,000-59,999	4 60,000-99,999	5 100,000-149,999	6 150,000+	Total
1970 & before	353	883	9194	-	-	-	353
1971-1975	441	1600	9708	18388	20975	-	441
1976-1980	315	1472	2080	1467	26478	26478	315
1981-1985	228	1681	3597	11952	16843	30082	228
1986-1990	184	1951	5549	10149	14828	20241	184
1991-1995	442	1740	7134	7240	20600	18285	442
1996-2000	628	2354	8562	12000	13861	20608	628
2001-2005	655	1240	8380	12000	21320	25480	655
2006-2010	660	960	3236	9000	-	29340	660
2011-2015	522	1193	3839	17400	17550	89600	522
2016-2020	810	1232	4412	29700	-	27160	810
2021-2025	700	700	2427	27000	12040	7720	700
Total	**184**	**700**	**2080**	**1467**	**12040**	**7720**	**184**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.19-17 General Overview of Offshore Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Maximum) mid of 2025

	IMO GHG Size Class (dwt)						
Year of Build Group	1 0-1,999	2 2,000-9,999	3 10,000-59,999	4 60,000-99,999	5 100,000-149,999	6 150,000+	Total
1970 & before	2710	4380	13901	-	-	-	13901
1971-1975	7000	6061	24000	45200	29840	-	45200
1976-1980	8826	13239	17578	29420	29420	33098	33098
1981-1985	8820	10879	15078	17284	34200	30082	34200
1986-1990	6620	15360	16499	15402	67200	20241	67200
1991-1995	5421	22960	14508	27000	28000	26103	28000
1996-2000	9000	13593	47325	25200	13861	27184	47325
2001-2005	9929	17280	37920	27949	23168	36937	37920
2006-2010	13809	18000	48000	46560	-	29444	48000
2011-2015	11520	16000	48000	48000	69600	89600	89600
2016-2020	11936	20880	46560	48000	-	96000	96000
2021-2025	14400	13500	41220	53760	12040	7720	53760
Total	**14400**	**22960**	**48000**	**53760**	**69600**	**96000**	**96000**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.19-18 General Overview of Offshore Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Median) mid of 2025

	IMO GHG Size Class (dwt)						
Year of Build Group	1 0-1,999	2 2,000-9,999	3 10,000-59,999	4 60,000-99,999	5 100,000-149,999	6 150,000+	Total
1970 & before	1178	2560	10665	-	-	-	10665
1971-1975	1765	4074	15078	21698	27949	-	27949
1976-1980	1655	4120	12826	20595	29420	29420	29420
1981-1985	1471	4501	10732	13974	22506	30082	30082
1986-1990	1192	3600	11255	10562	19466	20241	20241

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1991-1995	1883	4857	10590	13974	21223	24239	24239
1996-2000	2984	4854	13639	16843	13861	25487	25487
2001-2005	3089	4854	11842	17752	23168	25485	25485
2006-2010	2982	4920	14000	40320	-	29400	40320
2011-2015	3236	5520	17600	43740	64000	59430	64000
2016-2020	3356	4800	17600	42000	-	61580	61580
2021-2025	3243	4700	8800	48000	12040	7720	48000
Total	**3356**	**5520**	**17600**	**48000**	**64000**	**61580**	**64000**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

Table 12.19-19 General Overview of Offshore Fleet – by 4th GHG IMO Size Class by year of Build (Group) and Main kW (Modus) mid of 2025

	IMO GHG Size Class (dwt)						
Year of Build Group	**1** **0-1,999**	**2** **2,000-9,999**	**3** **10,000-59,999**	**4** **60,000-99,999**	**5** **100,000-149,999**	**6** **150,000+**	**Total**
1970 & before	1250	…	…	-	-	-	1250
1971-1975	2206	…	…	…	29420	-	29420
1976-1980	1655	…	…	29420	29420	…	29420
1981-1985	1655	4501	13540	…	…	30082	30082
1986-1990	1118	3092	11256	…	20124	20241	20241
1991-1995	1883	9000	…	…	21846	26103	26103
1996-2000	2942	2354	14315	19978	13861	25487	25487
2001-2005	2942	4008	9951	18660	…	25480	25480
2006-2010	5296	4920	20160	40320	-	29340	40320
2011-2015	3840	4412	48000	48000	…	…	48000
2016-2020	1790	4412	26400	42000	-	…	42000
2021-2025	4026	5313	4854	48000	12040	7720	48000
Total	**5296**	**9000**	**48000**	**48000**	**29420**	**30082**	**48000**

Source: ISL, based on data by Clarkson Research and WEB research by ship registers by class as well as WEB research

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