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Report from the Commission

2025 Report from the European Commission on greenhouse gas emissions from maritime transport

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Executive Summary

Since 2018, the 'EU MRV Maritime Regulation',[1] requires shipping companies to monitor and report their fuel consumption, greenhouse gas emissions[2] and other key parameters for their ships when sailing to/from and between ports of the European Economic Area (EEA).

Every year, the European Commission publishes the reported aggregated data and prepares a report to analyse changes over the years. This report is the seventh one. It analyses the data from the period 2018-2024, following the release of the data in 2025.

The monitored voyages emitted **144.9 million tonnes of CO_2** into the atmosphere. These emissions, reported by a fleet of around 12 700 ships, were the highest recorded since the MRV system was set up. They were **12.9% higher** than those reported in 2023, and 5.7% higher than those reported pre-COVID-2019.[3] For the first time, ships also reported non-CO_2 emissions within the scope of the MRV system. These emissions amounted to an additional 3.7 million tonnes of CO_2-equivalent, with nitrous oxide (N_2O) emissions accounting for 2.2 million tonnes of CO_2-equivalent and methane (CH_4) emissions accounting for 1.6 million tonnes of CO_2-equivalent.

The increase in the reported CO_2 emissions occurred in a year when the volume of goods handled in EU ports remained almost unchanged (-0.2% compared with 2023), partly due to a drop in energy goods imports. However, 2024 was marked by a considerable increase in the total fleet activity as a consequence of the Red Sea crisis and the subsequent drop in transits through the Suez Canal and rerouting, which significantly increased the total distance travelled and time spent at sea (by 9.3% and 8.6%, respectively).

The **container ship** segment was the most affected, accounting **for most of the increase in emissions** (+46%, corresponding to 16.7 million tonnes of CO_2). The established routes connecting European ports with the Far East had to be rerouted around the Cape of Good Hope, substantially affecting the operational behaviour of the segment. More container ships within the scope of the MRV system had to be deployed (+8%) to meet the increased demand for transporting containerised goods in EU ports (+ 4.4%) and the need for longer travel distances (+29%) and higher speeds (+2.2%).

Apart from container ships, 8 out of the 14 remaining ship types recorded an increase in emissions compared with 2023. This was often driven by the higher emissions from extra-EEA voyages due to the Red Sea crisis, as in the case of oil tankers (+4%), chemical tankers (+7%), general cargo ships (+8%), and vehicle carriers (+4%). The most significant drop in reported emissions was recorded for liquefied natural gas (LNG) carriers (-24%), as European LNG imports returned to pre-2022 levels.

Container ships, oil tankers and bulk carriers were confirmed as the top emitters in 2024, as in all previous reporting years since 2018. The significant increase in emissions from container ships raised their share of total reported emissions to the highest level recorded (37%, up from the 30% yearly average for the period 2018-2023). The relative share for most

[1] Regulation (EU) 2015/757 of the European Parliament and of the Council of 29 April 2015 on the monitoring, reporting and verification of greenhouse gas emissions from maritime transport, and amending Directive 2009/16/EC, OJ L 123, 19.5.2015, p. 55–76.

[2] Following the entry into force of amendments to Regulation (EU) 2015/757 in June 2023, the Regulation is not limited to CO2 emissions anymore but also covers greenhouse gas emissions. The monitoring and reporting requirements are extended to non-CO2 gases only starting the reporting period 2024. The present report, which considers data reported over the period 2018-2022, therefore only covers CO2 emissions as reported within the EU MRV scope.

[3] Excluding the emissions resulting from the application of the EU Maritime MRV Regulation to the United Kingdom for the reporting years 2018-2020.

ship types remained stable, except for LNG carriers, whose contribution fell to 5% of total emissions, returning to the level before the 2022 Russian full-scale invasion of Ukraine.

The distribution of the fleet's total CO_2 emissions between the different types of voyages and within ports was deeply affected by the Red Sea crisis. The longer travel distances on extra-EEA trade routes increased the relative **share of emissions from extra-EEA voyages from 65.7% in 2023 to 70.6% in 2024**, the highest recorded since 2018. This trend is consistent with the increase in the activity of the fleet segments that are most active on extra-EEA trade routes.

In terms of **fuel consumption**, the monitored ships consumed 46.8 million tonnes of fuel in 2024. Fuel consumption over the period 2018-2024 remained dominated by conventional fossil marine fuels (heavy fuel oil, light fuel oil, gas oil, diesel oil) which accounted for over 91% of the total mass of fuels reported in 2024. As in previous years, the system recorded an increase in the consumption of heavy fuel oil, almost entirely offset by a decrease in the consumption of light fuel oil, the latter being driven by the increasing uptake of exhaust gas cleaning systems in the fleet.

In 2024 the fleet recorded the highest level of LNG consumption (around 1% higher than in 2023, accounting for 7.5% of the total fuel consumption reported in 2024). This increase was due to LNG being used by ships other than LNG carriers, with container ships, Ro-Pax (roll-on/roll-off passenger) ships, and passenger ships making up the lion's share. Liquified petroleum gas and methanol consumption considerably increased compared with 2023 (+38% and +428%), yet still representing a minor share of total consumption (0.1% each) by the monitored fleet. Other non-standard fuels accounted for 0.9% of the total fuel consumption reported (0.42 million tonnes), with 0.22 million tonnes reported as biodiesel.

In terms of maritime transport flows, Eurostat data[4] shows that the total gross weight of seaborne goods handled in EU ports slightly decreased by 0.2% in 2024.

Compared with 2023, the inflows from countries such as Ukraine, Canada, Türkiye and China increased in 2024, contributing to a 1.2% increase in the total volume of **inward trade flows**. The total 2024 volume of **outward trade flows** in 2024 decreased by 3.2%. The most significant decreases affecting outward flows concerned the United States (East Coast) and China.

MRV data for the period 2018-2024 shows **no indication of a structural reduction in speed** for the MRV fleet. In 2024, 10 out of 15 ship types recorded higher average speed than in 2018. Some types recorded considerable increases in speed, as in the case of combination carriers (+32%), gas carriers (+16%), other ships (+16%), and oil tankers (+13%). However, compared with 2023, 11 out of 15 ship types decreased their average speed in 2024. Both container ships and LNG carriers considerably increased it, by 2.2% and 2.4%, respectively.

A graphical analysis of key **technical and operational efficiency** indicators confirmed the gradual increase in data correlation values between key technical and operational efficiency indicators[5] and the size of the ships reporting under the EU MRV Maritime Regulation, thus highlighting the increased maturity of the MRV framework. Efficiency trends generally

[4] Eurostat. (2024). *Maritime transport of goods - annual data*. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Maritime_transport_of_goods_-_annual_data

[5] The Energy Efficiency Design Index, the Estimated Index Value, and the Energy Efficiency Existing Ship Index are assessed for the technical efficiency of ships. The Energy Efficiency Operational Indicator and the Annual Efficiency Ratio are assessed for their operational efficiency.

remained stable, especially among the fleet's top emitters, while some segments (e.g. container ships) showed improvements in the technical efficiency reported.

In terms of implementation of the EU MRV Maritime Regulation, the results confirm the robustness and completeness of the reported data. Both shipping companies and accredited verifiers coped well with the new reporting requirements brought in to support the ETS extension to maritime transport as from 2024. This is evidenced by the **improved punctuality** indicators (69%, up from 52% in 2023), despite an earlier deadline for the submission of annual reports.[6]

The **quality of the submitted data** remained generally consistent with the previous reporting period (2023). The share of reports with outliers only slightly increased to 0.5% of the total, still considerably lower than the average of 1.1% for the period 2018-2024.

The **MRV compliance checks** carried out during port state control inspections confirmed the improvements recorded in previous years. In 2025 only 2% of inspected ships failed to provide a valid document of compliance to demonstrate compliance with the EU MRV obligations in the previous year. The maturity of the implementation of the EU MRV Maritime system played a key role in ensuring high compliance with ETS maritime obligations, reflecting the sector’s adaptation to these requirements, as in 2025 shipping companies surrendered allowances by the legal deadline for more than 99% of surrendering requirements.[7]

[6] The deadline was moved from 30 April to 31 March, starting from the 2024 reporting period.

[7] Determined on the basis of figures reported by shipping companies in the Union Registry by 1 October 2025 in respect of 2024 emissions.

1. Introduction

This report has been prepared using data from the implementation of the EU Regulation on the monitoring, reporting and verification of greenhouse gas emissions from maritime transport (Regulation (EU) 2015/757), hereafter called the "EU MRV Maritime Regulation". All information was extracted on 1 October 2025.[8] Data provided or updated after this date is not reflected in this report.

1.1. The 2025 Annual Report: scope and objectives

This is the seventh report on GHG emissions from ships entering and leaving ports in the European Economic Area (EEA), collected under the EU MRV Maritime Regulation.

This Regulation requires shipping companies to monitor during the reporting period key indicators such as GHG emissions, fuel consumption and other relevant information. This data is then checked by independent verifiers accredited by national accreditation bodies. Shipping companies have an obligation to report relevant data once satisfactorily verified through the dedicated IT system, THETIS-MRV. The Commission subsequently publishes the verified data and analyses main trends in the form of an annual report.[9]

The currently available set of MRV data is contributing to an enhanced understanding of the GHG emissions originating from the maritime transport sector. The published raw data[10] represents a valuable asset to research organisations, public authorities, and other market actors for analyses and studies on the maritime transport sector and its energy and environmental performance. This data is important to support policy discussions and to support the implementation and track the effectiveness of climate policies. In addition, it constitutes an important input for the sector in order to take more effective and efficient climate measures.

The main objective of this report is to examine trends in emissions and energy efficiency characteristics over the seven available reporting cycles since the entry into force of the EU MRV Maritime Regulation.

This report is based on data from the EU MRV system over the period 2018-2024

The monitoring, reporting, and verification obligations apply since 2018 to ships above 5 000 gross tonnage (GT) while traveling to or from an EEA port to transport goods or passengers for commercial purposes. The Regulation is flag-neutral, which means that ships must monitor and report their emissions regardless of their flag.

The Regulation therefore covers the emissions of a ship travelling from Rotterdam to Shanghai (and vice versa). However, if a ship departs from Shanghai for Rotterdam and makes a stop at an intermediary port outside the EEA (e.g., port "A") for cargo or passenger operations, only the emissions related to the last leg of the voyage (in this case port A to Rotterdam) will be reported in the system. International voyages that take place within the EEA, such as a ship

[8] For the annual reports published for previous reporting periods (from 2018 to 2023) the same principle was applied, by which a cut-off date for the extraction of the dataset was selected during the third quarter of the year following the emissions period. For the purpose of this annual report, updated data as of 1 October 2025 has been used for all previous periods (2018 to 2023). This means that the years 2018-2023 figures presented in this report might slightly differ from those published in the relevant annual reports.

[9] A detailed description of the monitoring, reporting and verification process established under the EU MRV Maritime Regulation can found in the General Guidance Document no.1 on the EU ETS and MRV Maritime, at .

[10] The relevant datasets are available for download as spreadsheet on the THETIS-MRV webpage at https://mrv.emsa.europa.eu/#public/emission-report.

travelling from Le Havre to Rotterdam, are also covered, as well as domestic voyages, e.g., from Brest to Le Havre. Emissions produced by a ship in an EEA port are also covered, including when the ship is moored or anchored at a port whilst loading, unloading or hotelling.

The Regulation covers around 90% of all CO_2 emissions in the EU maritime transport sector, whilst only including around 55% of all ships calling into EEA ports. For reasons of proportionality and subsidiarity, military vessels, naval auxiliaries, fish-catching or fish-processing ships are excluded from the monitoring and reporting obligations under the MRV Maritime Regulation.

Over the seven reporting years, the Regulation has undergone a major revision[11] to prepare for the EU Emissions Trading System (EU ETS) extension to maritime transport starting 2024. The revision included the extension of the Regulation's MRV scope to additional greenhouse gases (i.e. nitrous oxide (N_2O) and methane (CH_4)) as of 1 January 2024, and, starting 1 January 2025, the application to offshore ships of 400 GT and above and to general cargo ships below 5 000 GT but not below 400 GT.[12]

In addition to the changes to the EU MRV system introduced starting 2024, it is worth noting that the seven reporting periods have been affected by different disruptive events impacting the shipping sector, such as the COVID-19 pandemic (from 2020 to 2022), the UK's withdrawal from the Union (from 2021), Russia's full-scale invasion of Ukraine (from 2022) and the Red Sea crisis, determining major disruptions to transits through the Suez Canal (from end 2023).

1.2. Context

1.2.1. 2024: The Red Sea crisis has driven an increase in maritime transport activity for the MRV fleet, despite a slight decrease in trade volumes at European ports

The two main trends affecting the operation of the MRV fleet in 2024 were the Red Sea crisis and the slight contraction of trade volumes in European ports.

Starting late 2023 and for the entire reporting period 2024, world maritime transport activity was disrupted by the security crisis in the Red Sea which made transit through the Suez Canal challenging and caused rerouting through the Cape of Good Hope for ships heading to or coming from EEA ports. By June 2024 the number of ship transits through the Suez Canal was down by half compared to May 2023 (UNCTAD, 2024).[13] The impact of this main geopolitical driver in 2024 deeply affected those segments of the fleet engaged in extra-EEA trade, as ships had to reroute away from the Red Sea, particularly on the East Asia-Europe trade route. That produced a 30% increase in voyage lengths for ships sailing around the Cape of Good Hope (UNCTAD, 2025), often accompanied by an increase in average speed and in the number of deployed vessels to support frequency.

A further key driver for maritime trade relevant to the MRV fleet was the slight decrease recorded for goods handled in EU ports, which declined by 0.2% in 2024 compared to 2023

[11] Through Regulation (EU) 2023/957, OJ L 130, 16.05.2023, p. 105–114: Regulation - 2023/957 - EN - EUR-Lex.

[12] Since the extension of application of the EU MRV system to small general cargo and offshore ships only affected data reported starting 1 January 2025, its effects are not reflected in the present annual report.

[13] In June 2024 around 1 000 ships transited through the Suez Canal, which was around 50% lower than the one recorded in Spring and Summer of 2023 (UNCTAD, 2024)

(Eurostat, 2025a).[14] Such a decrease, which diverged from the 2.2% increase[15] of maritime trade volumes at global level (UNCTAD, 2025), in fact hide disparities across the different types of handled goods, and therefore the different subsectors of the monitored fleet.

The bulk goods sector was heavily impacted, driven by the decrease in the volume of energy products handled in EU ports, as the demand for fossil fuel imports by sea decreased.[16] As a result, the number of bulk carriers making ports calls within the EEA was the lowest in the 2018-2024 period and about 12% lower than the peak in 2022.[17]

Other segments of the industry saw, on the contrary, an increase in traded volumes, as that was the case for some other bulk goods (chemical products increased by 11% and metal ores and other mining products by 4%), but also for containerised goods, as containers handled in the main EU ports increased by 4.4% compared to 2023 (Eurostat, 2025).

Furthermore, the passenger segments also recorded a positive trend, supported by the continued recovery of tourism following the negative consequences of the COVID-19 pandemic. In particular, cruise passengers increased both on Mediterranean and Non-Mediterranean Europe destinations (by 5.8% and 2% respectively) in 2024 as compared to 2023 (CLIA, 2025) and both passenger ships and Ro-pax ships recorded a peak number of port calls in EEA ports for the 2018-2024 period.

The combined effect of the above-described trends affecting the European economy resulted in 2024 in a considerable yet asymmetrical increase in the activity levels of the MRV fleet, despite a slight contraction in the volume of goods handled in EU ports.

1.2.2. EU regulatory and policy progress in the decarbonisation of maritime transport

Stemming from the 2021 ‘Fit for 55’ package of proposals to deliver the EU’s 2030 climate targets, the decarbonisation of shipping is now firmly embedded in the EU’s regulatory framework as most of the elements of the ‘basket of EU measures’ to decarbonise the sector have been adopted through 2023 and have entered into full implementation in 2024 and 2025.

With the extension of the EU ETS[18] to maritime transport, the EU became the first jurisdiction to include shipping emissions into a cap-and-trade system, resulting in a price signal on shipping emissions. Since 1 January 2024, the EU ETS covers CO_2 emissions from all large ships (of 5 000 gross tonnage and above) entering EEA ports, regardless of the flag they fly. The system covers the entirety (i.e. 100%) of emissions that occur between two EEA ports and when ships are within EEA ports, but only half (i.e. 50%) of emissions from voyages starting or ending outside of the EEA, thus allowing third countries to decide on appropriate action for the remaining share of emissions. Starting in 2026, the EU ETS for maritime transport will also cover greenhouse gases beyond CO_2, namely methane (CH_4) and nitrous oxide (N_2O).

Starting from the reporting period 2024, shipping companies have to purchase and surrender EU ETS emission allowances for each tonne of reported CO_2 (or, from 2026, CO_2-equivalent)

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[14] This figure refers to the gross weight of all goods handled in EU ports, irrespective of whether of intra-EU or extra-EU origin or destination.

[15] In transported million tonnes.

[16] The category ‘Coal and lignite; crude petroleum and natural gas’ saw a decrease of 8.4% compared to 2023, still accounting for 19% of total goods handled. The category ‘Coke and refined petroleum products’ decreased by 1.1% and accounted for 16,4% of total goods handled in 2024. (Eurostat, 2025b)

[17] Port call data mentioned throughout this Report is sourced from MARINFO and covers ships above 5 000 GT calling at EEA ports. Port call data before 2021 are adjusted to exclude port calls in the United Kingdom.

[18] Through Directive (EU) 2023/959, OJ L 130, 16.5.2023, p. 134: EUR-Lex - 02023L0959-20230516 - EN - EUR-Lex.

emissions in the scope of the EU ETS system following a phase-in approach.[19] The amount of due allowances is determined on the basis of the monitoring and reporting system established by the EU MRV Maritime Regulation, corrected by specific rules and derogations established under the ETS Directive.[20]

In addition to the EU ETS extension to shipping, the FuelEU Maritime Regulation[21] started full implementation on 1 January 2025. The Regulation will ensure that the greenhouse gas intensity of energy used on-board ships gradually decreases over time, along with an obligation for passenger and container ships to use onshore power supply while moored at the quayside in major EU ports as of 2030.

Together, the EU ETS and FuelEU Maritime Regulation represent the primary EU policies towards the decarbonisation of maritime transport, and both are based on the EU MRV system established under Regulation (EU) 2015/757. Other elements of the 'Fit for 55' package to decarbonise maritime transport include the Alternative Fuels Infrastructure Regulation (AFIR), which requires certain (larger) TEN-T ports to have OPS (Onshore Power Supply) and LNG refuelling infrastructure available and mandates Member States to develop national policy frameworks for alternative fuels, and the revision of Renewable Energy Directive (RED), introducing more ambitious sector-specific targets in transport, including sub-targets for advanced biofuels and renewable fuels of non-biological origin.

In addition to legislative measures, the EU is further supporting the successful implementation of shipping decarbonisation through support to research, innovation, and deployment of innovative solutions. The Innovation Fund, which relies on 20 million EU allowances[22] up to 2030 for projects to decarbonise the maritime sector, covers, among others, the production and use of sustainable fuels, the electrification of the maritime transport system, and the building and/or retrofitting of low- and zero carbon vessels. At the time of writing, and after just two calls for proposals, the Innovation Fund supports 21 maritime projects for a total of EUR 1.03 billion, including EUR 365.3 million through auctions for hydrogen-based fuels and EUR 202.3 million for projects related to construction and/or retrofitting of vessels. The outcome of the latest Call (IF24) published in November 2025 included 3 maritime projects,[23] and 2 marine fuel related projects.[24] The latest selected projects add to the existing Innovation Fund project portfolio which was already supporting projects related with the maritime sector, specifically, on the production and or commercialization of fuels such as methanol, ammonia, e-fuels, e-SAF, e-methane, bio-fuels and projects focusing on the use of renewable energy in ports or innovative propulsion systems (e.g. fuel cell and wind sail).

While the Innovation Fund focuses on higher Technology Readiness Level (TRL) and deployment, the EU also has invested in lower TRL projects for the maritime sector through Horizon Europe, in particular the Zero-Emission Waterborne Transport Partnership. Under this partnership, the EU will invest up to EUR 530 million until 2027, primarily in six areas related to shipping, including use of (i) sustainable alternative fuels, (ii) electrification, (iii) energy efficiency, (iv) design & retrofitting, (v) digital and (vi) green ports. Cohesion policy also

[19] Companies are required to surrender allowances corresponding to 40% of their emissions for 2024 and 70% for 2025.

[20] A detailed explanation of reporting requirements for ETS Maritime and the interlinkages with the MRV system is available in Section 2.3 and 5.2 of the General Guidance Document no.1 on the EU ETS and MRV Maritime Implementation, at https://climate.ec.europa.eu/document/download/31875b4f-39b9-4cde-a4e2-fbb8f65ee703_en?filename=policy_transport_shipping_gd1_maritime_en.pdf .

[21] Regulation (EU) 2023/1805, OJ L 234, 22.9.2023, p. 48, http://data.europa.eu/eli/reg/2023/1805/oj.

[22] Corresponding to €1.5 billion based on a carbon price of €75/tonne.

[23] These included the projects eSeaRiverBarge, MAGHYC, MCC2Hub, PP2XH, RjukanLH2 and LUXIA https://ec.europa.eu/commission/presscorner/detail/en/ip_25_2564

[24] IF24 Auction: https://cinea.ec.europa.eu/news-events/news/six-winners-2024-innovation-fund-hydrogen-auction-sign-grant-agreements-advancing-renewable-hydrogen-2026-01-20_en. The renewable hydrogen produced by these projects is intended for sale with the primary targeted offtake in the European maritime sector. The projects are engaging with local and international maritime operators and aims to establish long-term supply agreements to provide zero-emission marine fuel, to support shipping companies compliance with the EU decarbonisation framework.

contributes to shipping decarbonisation by supporting investments that reduce air pollutant emissions and improve air quality in port cities.[25] Finally, State aid frameworks[26] include provisions for State support to fleet renewal and/or retrofitting investments in the maritime transport sector, thus contributing to the decarbonisation efforts of shipping.

1.2.3. Developments at the International Maritime Organization

Throughout 2025, the Commission maintained its support for ambitious progress at international level to reduce greenhouse gas emissions from shipping through effective global measures. Following the adoption in July 2023 of a revised IMO strategy on reduction of GHG emissions from ships, work has progressed towards developing a basket of mid-term GHG reduction measures involving:

1. a technical element, namely a goal-based marine fuel standard regulating the phased reduction of marine fuel's GHG intensity; and
2. an economic element, on the basis of a maritime GHG emissions pricing mechanism.

To this end, the IMO Marine Environment Protection Committee (MEPC) approved draft amendments to MARPOL Annex VI during the 83rd session of April 2025. The so-called “IMO Net-zero framework” introduces a global GHG intensity standard combined with alternative compliance options. The formal adoption of the IMO Net-zero framework was expected in October 2025, followed by the development of detailed implementation guidelines until 2027, before entry into force of the framework. However, the extraordinary MEPC session in October 2025 voted to adjourn for one year the discussion on the adoption of the IMO Net-zero framework.

Meanwhile, MEPC 83 completed the first phase of the review plan of IMO short-term GHG measures which, in force since 2023, were to undergo a first review by 1 January 2026. These measures, aiming at reducing the carbon intensity of international shipping in 2030 by at least 40%, compared to 2008 levels, include:

1. The Energy Efficiency Existing Ship Index (EEXI), requiring all ships of 400 GT and above to meet technical standards comparable to the Energy Efficiency Design Index (EEDI) requirements that already apply for newbuild ships.
2. The Carbon Intensity Indicator (CII) implementing since 2023, a carbon intensity rating system for ships, with the objective to improve the operational performance of ships, including through a performance follow-up within the Ship Energy Efficiency Management Plan (SEEMP).

MEPC 83 also adopted the CII reduction factors (indicating how much carbon intensity needs to be reduced by ships over this period to meet targets) for the period 2027-2030 as well as amendments to improve the accessibility for the public to the IMO’s data collection system (IMO DCS).

A second phase of the review of short-term GHG reduction measures will run from spring 2026 to spring 2028. The review will, according to the work plan adopted at MEPC 83, consider the development of the enhanced SEEMP framework, consider the development of other CII

[25] For the 2021–2027 period, Cohesion policy programmes have allocated EUR 880 million to non-fossil fuel investments in TEN-T seaports and EUR 148 million to other seaports, notably in less developed and outermost regions.

[26] Such as: Commission Regulation (EU) No 651/2014 of 17 June 2014 declaring certain categories of aid compatible with the internal market in application of Articles 107 and 108 of the Treaty. The General Block Exemptions Regulation (GBER) is currently under review; and the Communication from the Commission – Guidelines on State aid for climate, environmental protection and energy 2022, C/2022/481. Both these instruments take into account Commission Delegated Regulation (EU) 2021/2139 of 4 June 2021 supplementing Regulation (EU) 2020/852 (EU Sustainable Finance Taxonomy). The taxonomy regulation is currently under review with new criteria expected to be published later in 2026

metrics and of proposals to ensure synergies between the IMO carbon intensity/energy efficiency framework and the IMO Net-zero framework.

2. GHG emissions and related fuel consumption from the monitored fleet

2.1. The Fleet: emissions and number of ships

In 2024, 12 730 ships submitted an emissions report for a total of 144.9 million tonnes of CO_2 emissions (see Figure 1).[27]

In order to compare the evolution of total CO_2 emissions from the MRV fleet across the 2018-2024 period, a correction coefficient[28] has been estimated and applied to the emissions for 2018-2020, so to exclude the emissions resulting from the application of the EU MRV Maritime Regulation to the United Kingdom.[29]

The results, as shown in Figure 1, highlight that 2024 recorded the highest emissions on record, 12.9% higher than in 2023, and 5.7% higher than in pre-COVID 2019.

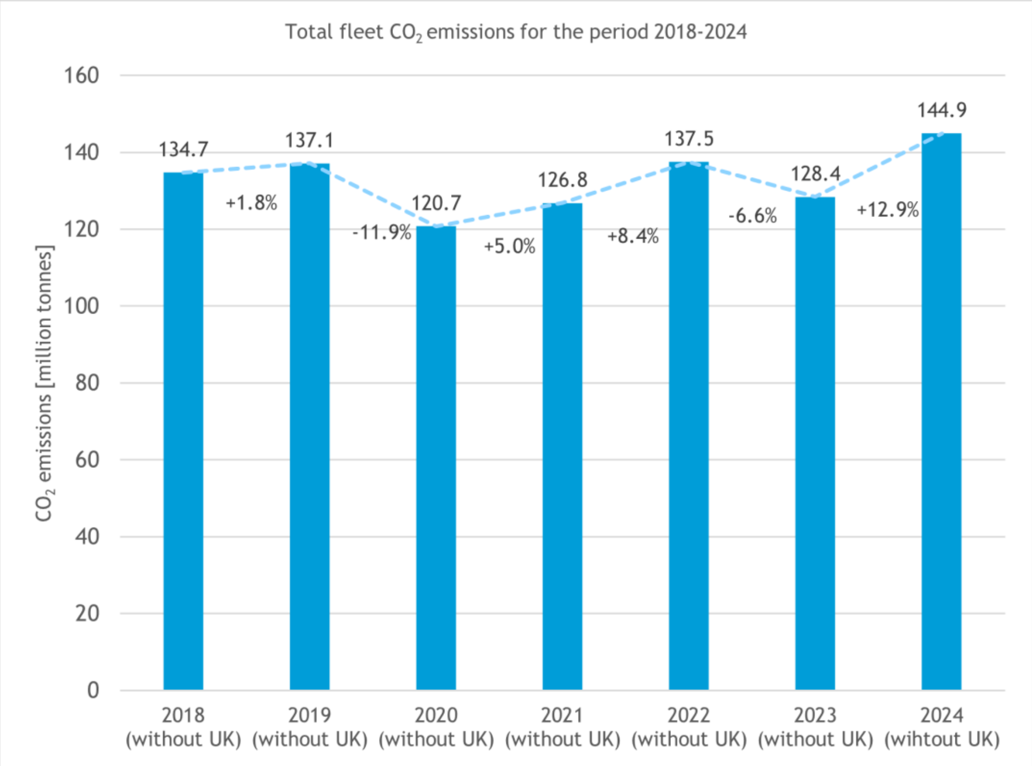

Figure 1: Total fleet CO2 emissions, 2018-2024, adjusted for UK's withdrawal from EU

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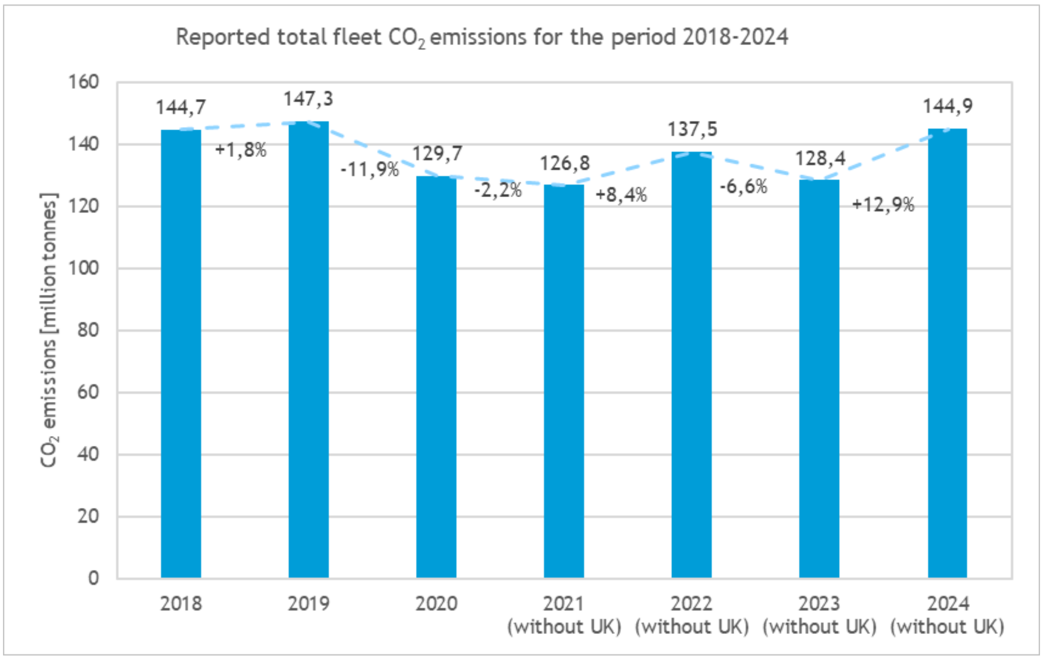
[27] Emissions reports of ships declaring zero emissions and no fuel consumption under the MRV scope have been discarded from this Report. The relevant figures and analysis from previous reporting years have been adjusted accordingly. The number of ships reporting zero emissions had been decreasing from 2018 to 2023, from 638 to 184. These however considerably increased in 2023 to 1195 reports, of which 89 were partial emissions reports.

[28] A correction coefficient of 0.931 was determined to estimate the amount of emissions under MRV scope for the years 2018 to 2020 adjusted to reflect the new scope of EU MRV following the departure of the United Kingdom (UK) from the EU. The value was produced by identifying relevant activities between the UK and worldwide destinations and estimating relevant CO_2 emissions for the year 2019 based on distance and fleet statistics.

[29] The EU MRV system does not require shipping companies to report emissions at voyage level. Therefore, it was only possible to apply the correction coefficient to exclude the emissions resulting from the application of the EU MRV Maritime Regulation to the United Kingdom to total reported emissions, while it was not possible to recalculate other relevant reported parameters (e.g. on fuel consumption, fleet composition, or energy efficiency), which would require adjustments on the reported data on a per-voyage basis.



The following

Figure 2 shows total reported emissions including emissions reported from the application of the EU MRV system by the United Kingdom before 2021.

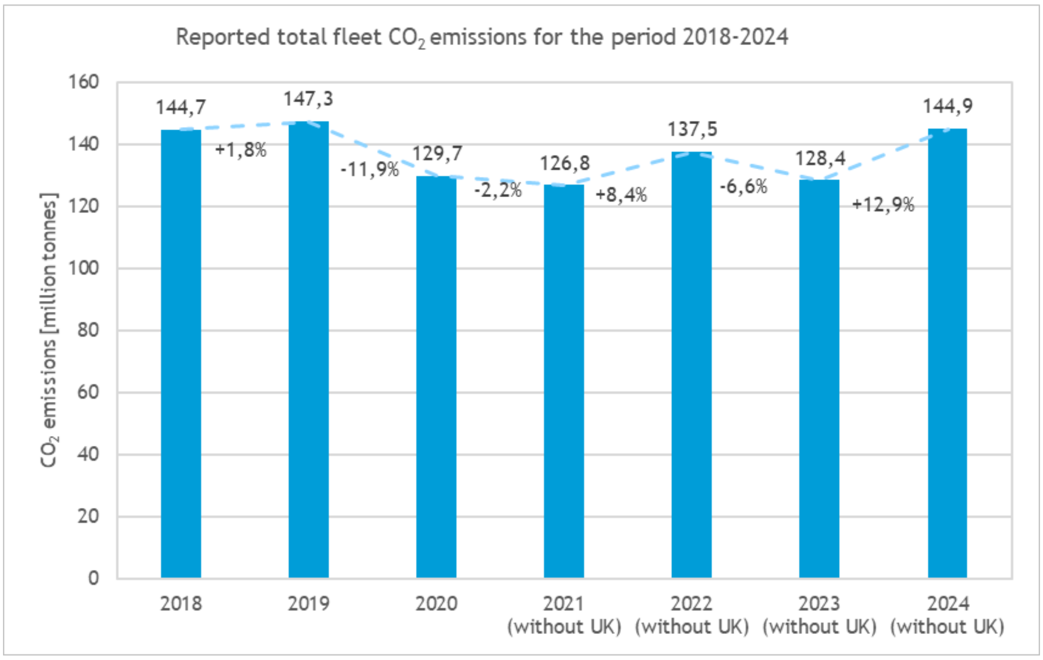


Figure 2: Total fleet CO_2 emissions, 2018-2024

First reporting year for methane and nitrous oxide emissions

In 2024 ships reported their non-CO_2 emissions for the first time, as required by the amendments to the EU MRV system adopted the previous year. The ships under MRV scope reported a total of 3.7 million tonnes of CO_2-equivalent of non-CO_2 emissions, corresponding to 2.5% of total reported GHG emissions (148.6 million tonnes CO_2-equivalent). Methane emissions amounted to 1.6 million tonnes CO_2-equivalent and nitrous oxide emissions to 2.2 million tonnes CO_2-equivalent. More details on the split of non-CO_2 emissions by ship type is provided in section 2.3.[30]

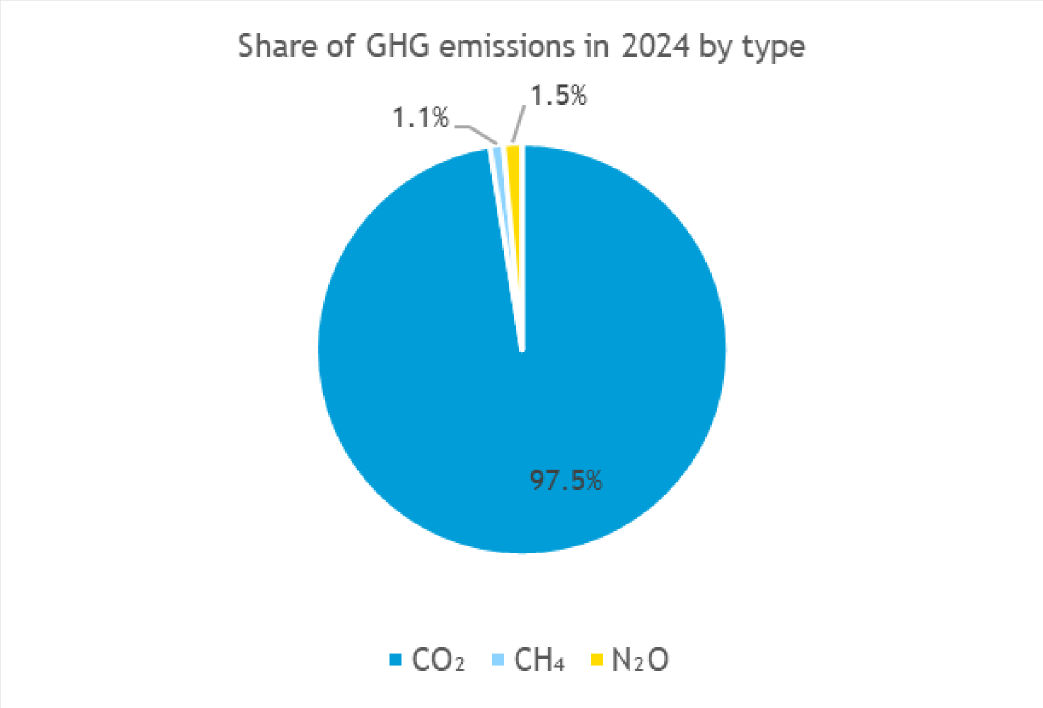


Figure 3: Share of reported GHG emissions in 2024 by type

The total number of ships active under MRV scope which submitted emissions reports for the reporting year 2024 was the second highest on record and about 1% higher than 2023. Compared to 2018, a year in which nearly the same total emissions were reported, almost 10% more ships were active under scope in 2024.

[30] To ensure compatibility of emissions and energy efficiency data with previous reporting periods, this Annual Report limits the analysis of non-CO_2 data to section 2.3. Emissions in the rest of the Report are meant as CO_2-only.

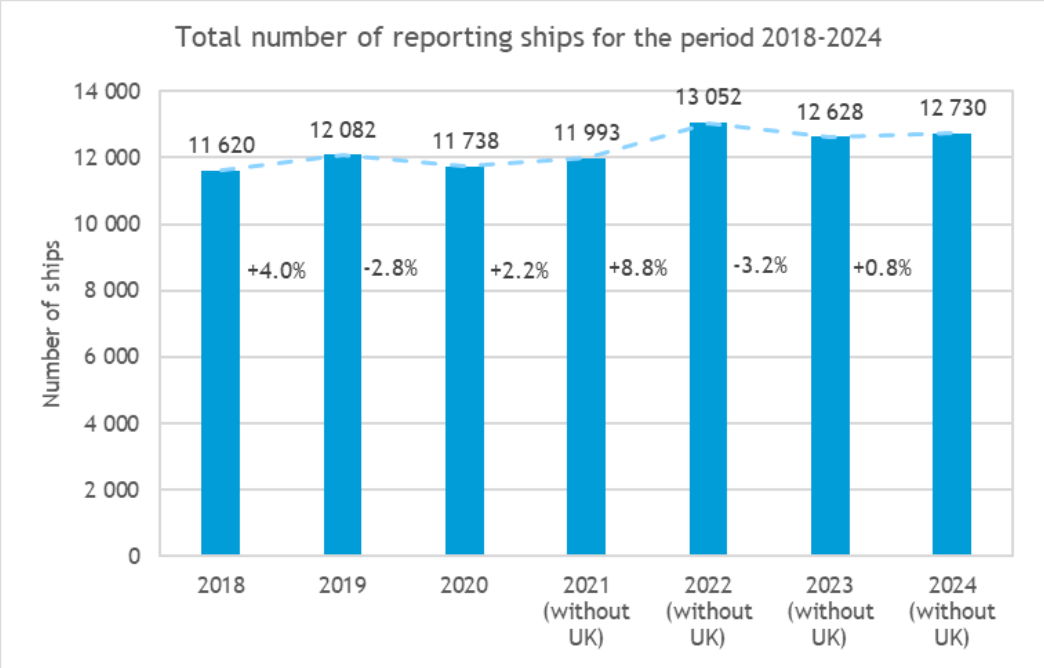


Figure 4: Total number of ships for which full year's emissions report has been submitted; 2018-2024

2024 was the first full year of application of the requirement of partial emissions reports, as introduced by the 2023 revision of the EU MRV Maritime Regulation for cases of changes of shipping company during the reporting period. 926 partial emissions reports were submitted in the year 2024 for a total of 912 unique ships.[31]

The analysis of the composition of the fleet reporting under MRV over the period 2018-2024 reveals that in 2024, there were many more ships submitting a full year emissions report for the first time in the MRV system compared to previous years (10% of total reports in 2024 against an average of around 5% during the period).

The distribution of the fleet's total CO_2 emissions over the different types of activities (i.e. voyage, by geographical scope, or within port)[32] is shown in the following Figure 5.

[31] The average duration in the period of responsibility from partial emissions reports in 2024 was 216 calendar days. Of the total 926 partial emissions reports, the highest share was reported by bulk carriers (34%) followed by oil tankers (18%), container ships (13%), chemical tankers (12%) and general cargo ships (8%).

[32] The requirement to report separately emissions within port has been introduced by the 2023 revision of the EU MRV system and applied for the first time to the reporting period 2024. Emissions within port result from the sum of emissions at berth and emissions from movements within port while not at berth in EEA ports. To ensure comparability with previous reporting periods since 2018, emissions within port have been back calculated for each reporting period preceding 2024 as the difference between total aggregated reported emissions and the sum of the different partials (i.e. extra-EEA voyages incoming and outgoing, and intra-EEA voyages).

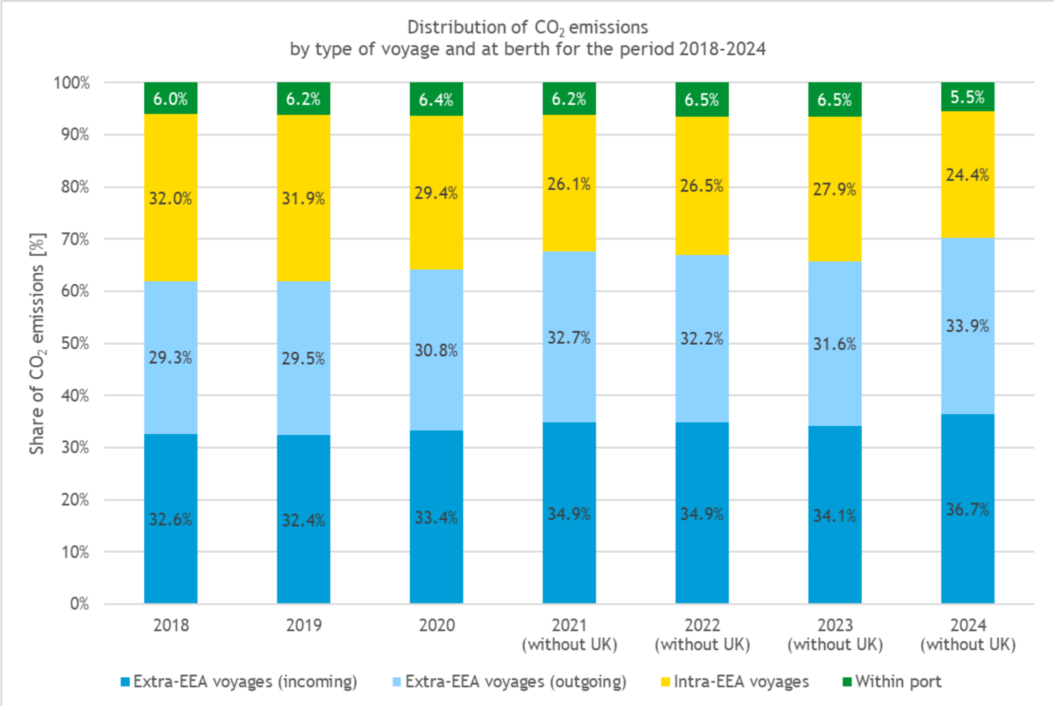


Figure 5: 2018 to 2024 share of fleet emissions per voyage type and within port

The reported data over the period highlights an increase in the share of extra-EEA voyages in 2024, which passed from 65.7% in 2023 to 70.6% in 2024 (sum of extra-EEA incoming and outgoing), as a consequence of longer distances being travelled following the Red Sea crisis by those segments of the fleet more sensitive to extra-EEA routes (i.e. containerships and tankers). Conversely, the relative share of intra-EEA activities, both intra-EEA voyages and within EEA ports emissions, reached a record low. In absolute terms, the emissions released during extra-EEA voyages increased by 20.6% in 2024 compared to 2023 while emissions from intra-EEA voyages decreased by 1.4%.

2.2. Ship types: emissions and number of ships

For most of the ship types reporting under the EU MRV Maritime Regulation, the highest emission levels were recorded in the years preceding COVID-19 and the UK's withdrawal from the EU, i.e. before 2020.[33] Five ship types recorded their highest reported levels after 2020: emissions of bulk carriers and LNG carriers peaked in 2022, as a consequence of the disruption to regional trade and energy markets caused by the Russian war of aggression on Ukraine. Emissions of passenger ships recorded the highest values in 2023 while the category 'other ship types' reached its highest value in 2024. Emissions recorded in the MRV system for containerships were on the other hand decreasing each year since 2018 however spiked to 53 million tonnes in 2024, 16% higher than the previous peak of 2018.

In the year 2024, container ships remain the ship type releasing the most CO_2 emissions, followed by oil tankers and bulk carriers (Figure 6). These ship types are also the most numerous in the MRV system (see Figure 11). In 2024 most ship types showed an increase in emissions compared to 2023, except bulk carriers which remained stable, LNG carriers which decreased by almost 24% and passenger ships, gas carriers and Ro-ro ships which

[33] Data presented in section 2.2 have not been corrected for the UK's withdrawal from the EU, i.e. data for the period 2019 to 2020 include emissions on voyages from non-EEA port to and from UK ports.

slightly decreased (see Figure 6). Emissions from refrigerated cargo carriers also decreased by 17%.

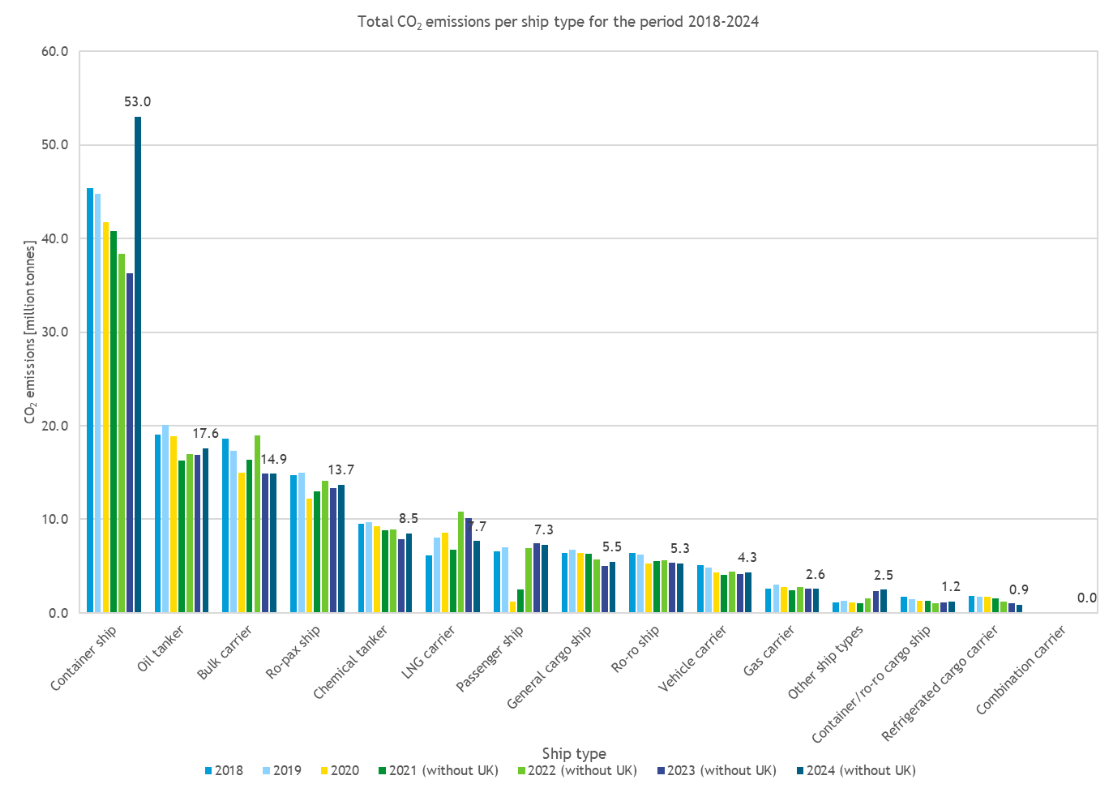


Figure 6: Total emissions per ship type; 2018 to 2023; descending 2022 order; levels given for 2024 (without UK)

The most significant absolute increase in emissions can be seen in container ships (by 16.7 million tons, i.e.+46%) which also recorded a considerable increase in the levels of active ships in 2024 (+8%, see Figure 11). General cargo ships, chemical tankers, vehicle carriers, oil tankers and other ship types recorded increases of reported emissions of between 4% and 8%.

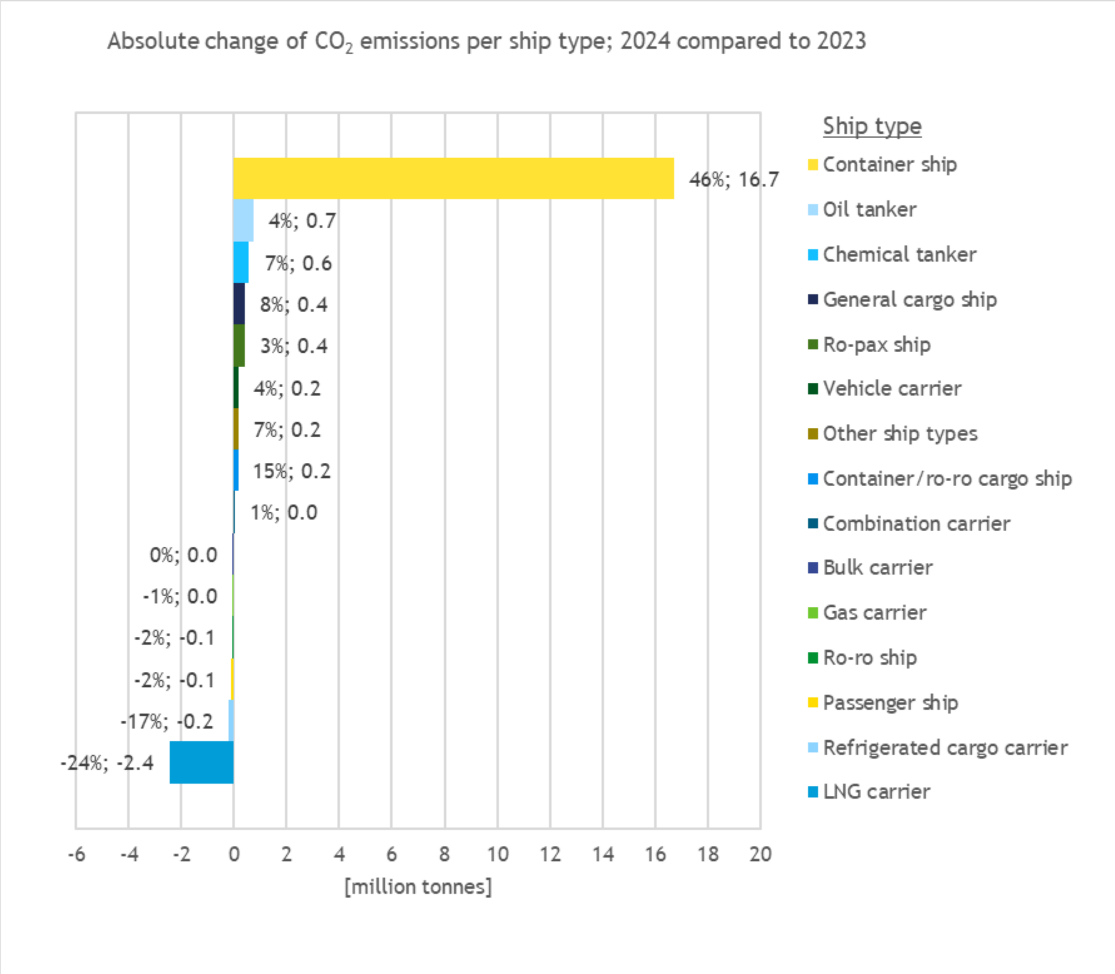


Figure 7: Change of emissions in 2024 compared to 2023 per ship type, in absolute and relative terms

Differences in the allocation of reported emissions by type of voyage between ship types can be explained by the trading characteristics of different ship segments. Ship types transporting raw material imports to EEA ports, such as oil tankers, bulk carriers, and LNG carriers are mainly deployed in extra-EU trade activities, traveling from/to an extra-EEA port to/from one single port in the EEA, rather than on voyages across multiple EEA ports. On the other hand, passenger ships and Ro-pax ships are more likely to be deployed on services connecting different ports within Europe. Other ship types such as chemical tankers show a more balanced split between emissions on incoming, outgoing and intra-EEA voyages. For containerships, the majority of emissions also derive from extra-EEA voyages however emissions from intra-EEA voyages are also considerable as these ships typically call multiple EEA ports as part of their scheduled services which may start or end outside of Europe.

The analysis of changes by ship and voyage type (including a differentiation between CO_2 emitted at sea and at berth) between 2023 and 2024 highlights the outstanding increase of emissions on extra-EEA voyages by container ships which spiked in 2024 (+58% extra-EEA incoming and +70% extra-EEA outgoing) as a consequence of route diversion following the Red Sea crisis, while intra-EEA and at berth emissions remained overall stable (+1.3% and –2.6% respectively). Figure 8 illustrates changes in emissions voyage type for all other ship types. Significant increases compared to 2023 can be observed from oil tankers, bulk carriers and chemical tankers on incoming extra-EEA voyages. On the other hand, emissions from LNG carriers decreased significantly for extra-EEA voyages (both incoming and outgoing voyages) as well as at berth. Bulk carrier emissions for outgoing extra-EEA voyages also recorded a notable decrease. For most ship types, emissions on intra-EEA voyages or at berth decreased in 2024 compared to 2023, in particular for bulk carriers. However, a moderate increase in emissions from container/ro-ro cargo ships and chemical tankers on intra-EEA voyages and a slight increase of emissions at berth from Ro-pax ships can be observed.

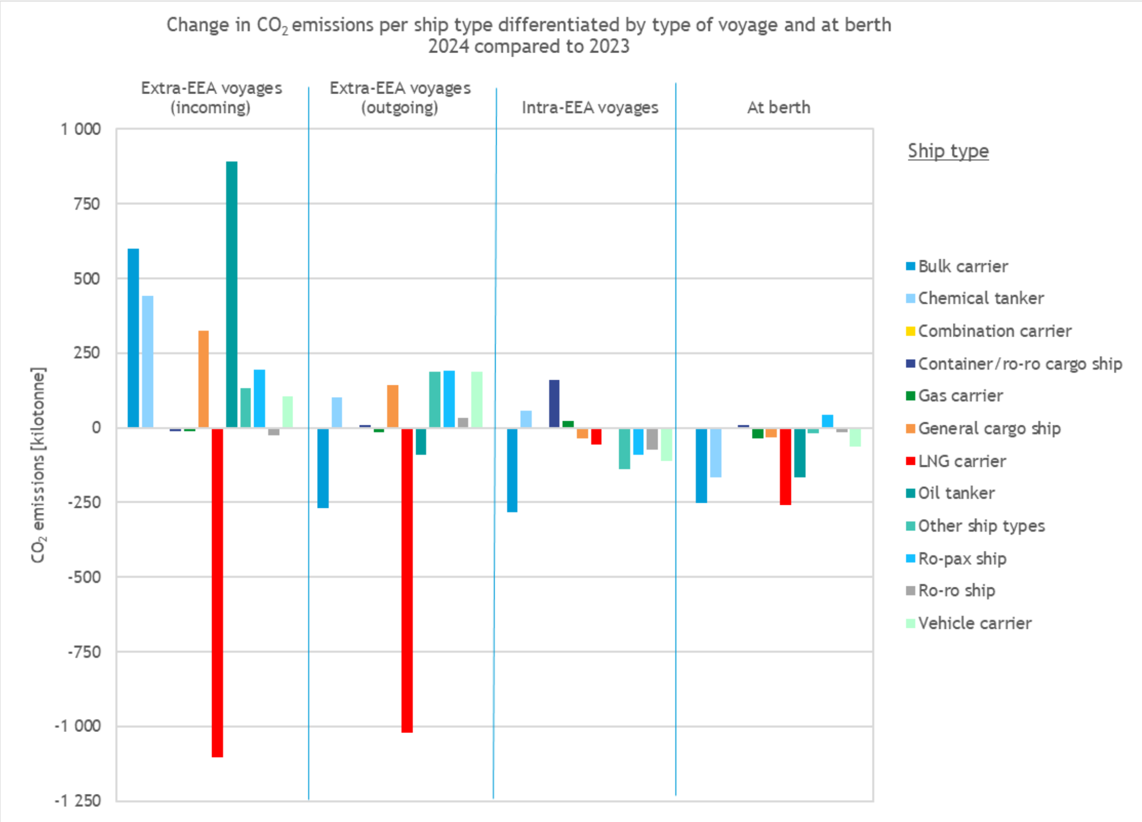


Figure 8: Change in emissions by ship type, excluding container ships differentiated by type of voyage; 2024 (without UK) on 2023 (without UK); ship types sorted by change of total emissions.

As illustrated in Figure 9, container ships remain by far the top emitters in the MRV system. Taken together, the three main emitters by ship type (i.e. container ships, oil tankers and bulk carriers) still account for more than half of all reported emissions, at 59% of total MRV emissions (the same share of the peak recorded in 2020, compared to 2023 when these ships recorded a share of 53% of the total, the lowest share recorded).

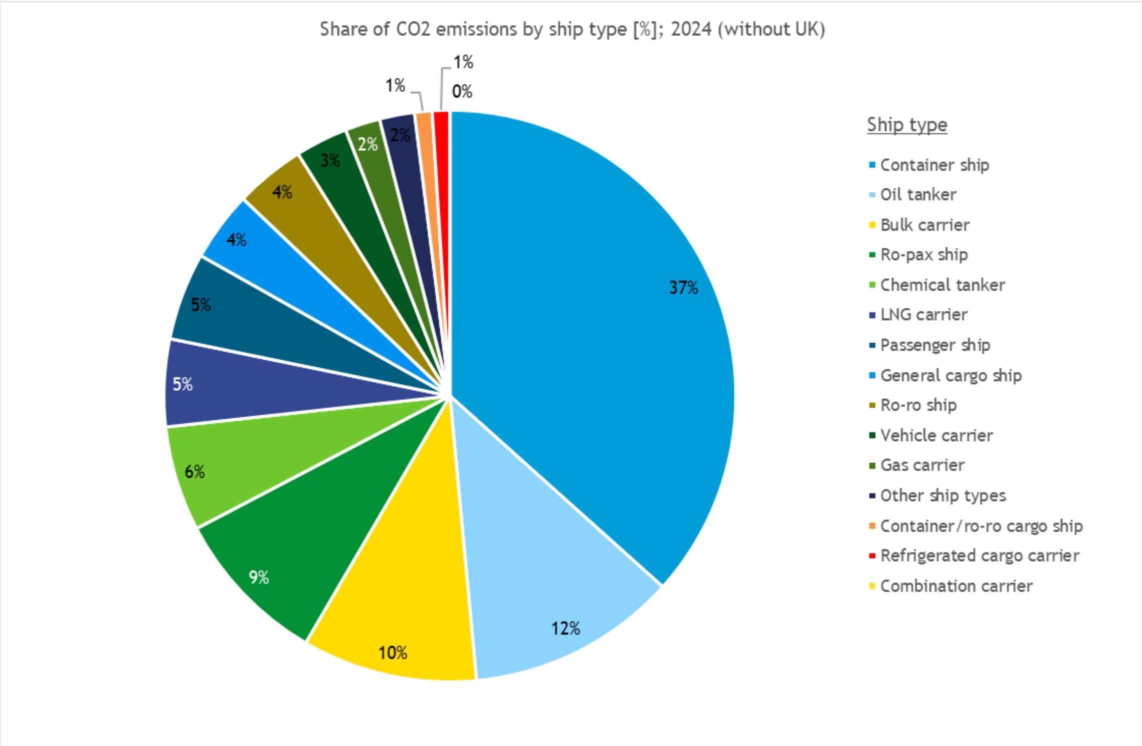


Figure 9: Share of overall fleet CO_2 emissions by ship type; 2024 (without UK), in %

As illustrated in Figure 10, the significant increase in emissions from container ships impacted their share on total reported emissions, which reached the highest level on record (at 37%, up from the 30% yearly average for the period 2018-2023). While the relative share of most ship types remained stable, the share of emissions from oil tankers and bulk carriers reduced slightly while the share of emissions from LNG carriers reduced to 5% following their heightened share of total emissions directly following the Russian full-scale invasion of Ukraine.

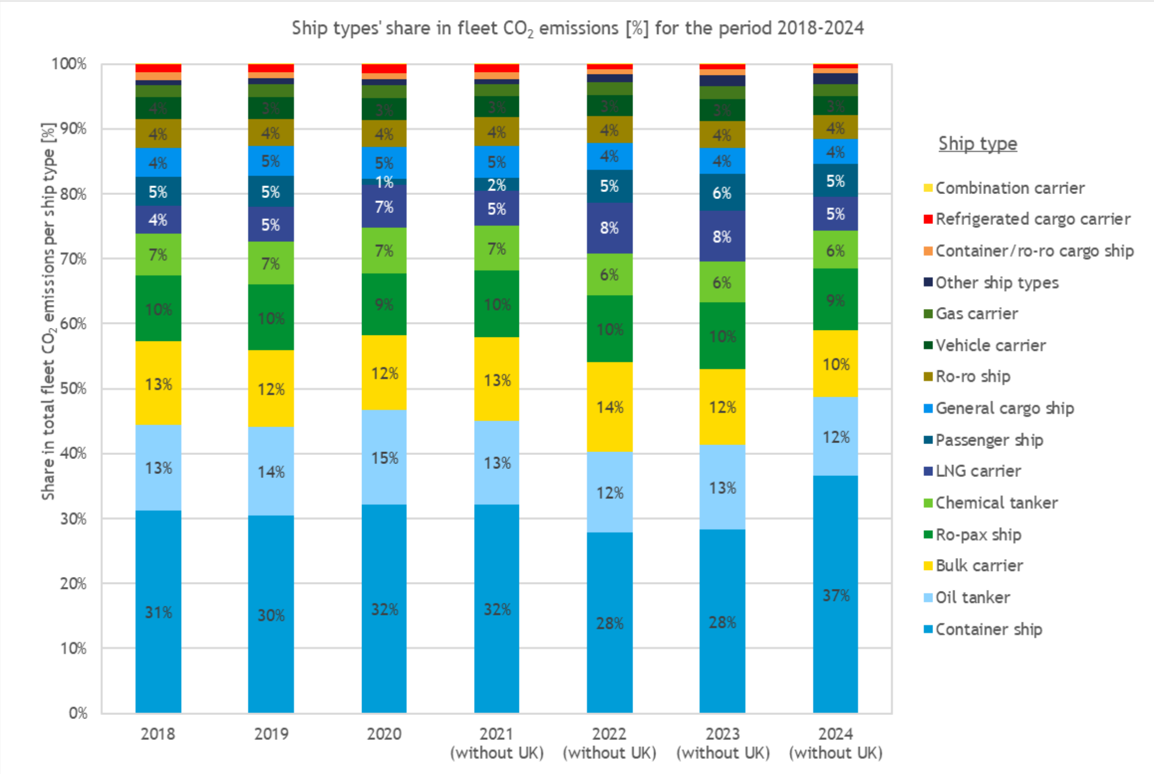


Figure 10: Ship types' share in fleet CO_2 emissions; 2018 - 2024

In terms of number of ships active in the EU MRV system, 5 ship types keep representing the lion's share (see Figure 11): bulk carriers (26%), oil tankers (13%), container ships (15%), chemical tankers (10%) and general cargo ships (9%) account for over 70% of emissions reports submitted in 2024. The total number of ships submitting emissions reports for the reporting year 2024 was the second highest on record and 1% higher than 2023. In absolute terms, the greatest increase in the number of active ships between 2023 and 2024 was from container ships (+8% or 152 ships), general cargo ships (+6% or 71 ships) and other ship types (+6% or 20 ships). The number of combination carriers also increased by 43% however the total number of ships of this type in the 2018-2024 is very small, never exceeding 15 ships. The number of active container ships in 2024 was by far the highest ever recorded in the MRV system. The number of general cargo ships, other ship types and passenger ships in 2024 was also the highest ever recorded.

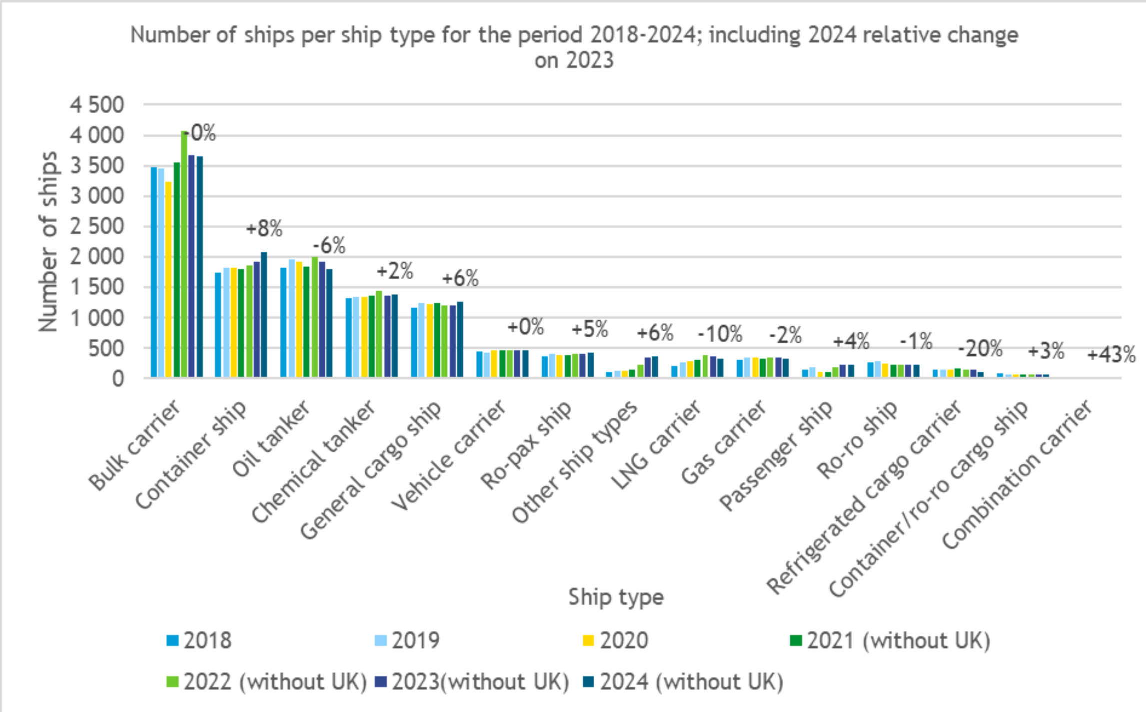


Figure 11: Number of ships per ship type; 2018 to 2024; descending 2024 order; percentage change in 2024 compared to 2023

Out of the six ship types recording a decrease in the number of reporting ships in 2024, the three types standing out are oil tankers (-6% or 118 ships), LNG carriers (-10% or 36 ships), and refrigerated cargo carriers (-20% or 27 ships). The number of reporting oil tankers was in fact the lowest on record (around 2% less than the oil tankers which reported in 2018 and 2021). The number of reporting refrigerated cargo carriers was also the lowest on record (110 ships) which is a number that has been decreasing each year since 2021. A possible reason for this is that certain refrigerated cargoes can also be carried as reefer containers on container ships instead of on dedicated refrigerated cargo carriers. However, the number of reporting LNG carriers remained the third highest on record behind 2023 and 2022 when the number of reporting LNG carriers peaked as a consequence of the disruption to regional trade and energy markets caused by the Russian war of aggression on Ukraine.

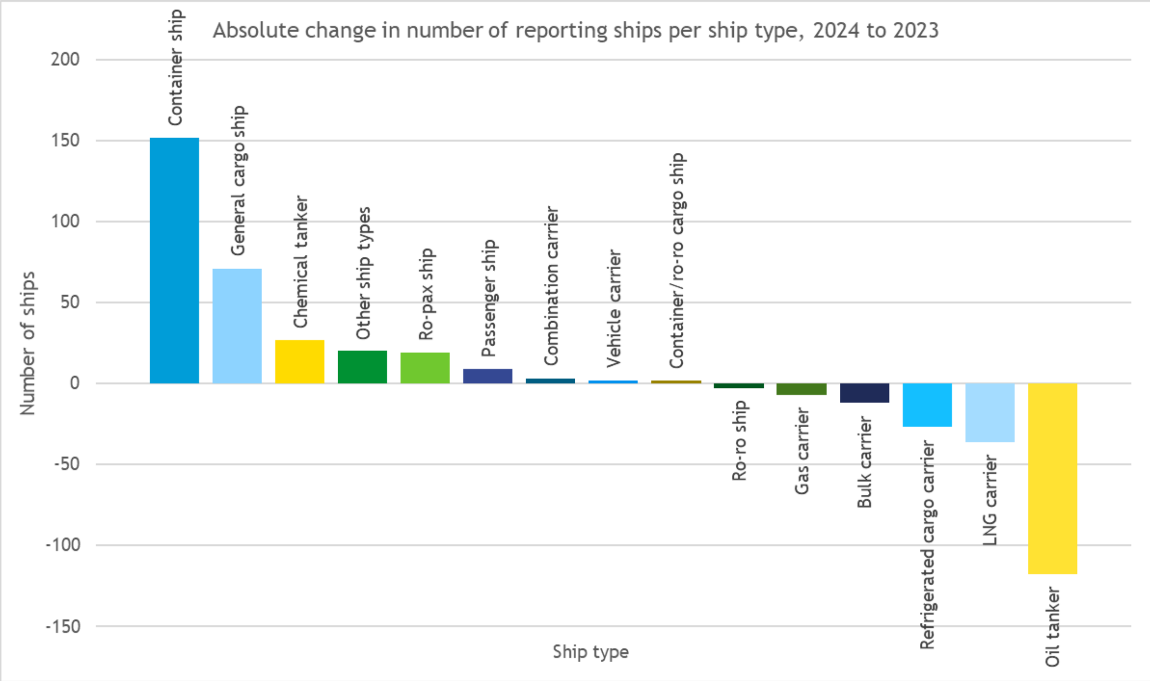


Figure 12: Change in number of ships per ship type; 2024 (without UK) on 2023 (without UK)

2.3. Analysis of 2024 methane and nitrous oxide emissions

In 2024 ships reported non-CO_2 emissions under the MRV for the first time, as required by the amendments to the EU MRV system adopted the previous year. Figure 13 shows that, for most ship types, non-CO_2 emissions accounted for around 2% of total reported GHG emissions in 2024. However, the share was significantly higher for LNG carriers (11%) and slightly higher for passenger ships (4%) as well as Ro-pax ships and gas carriers (3%).

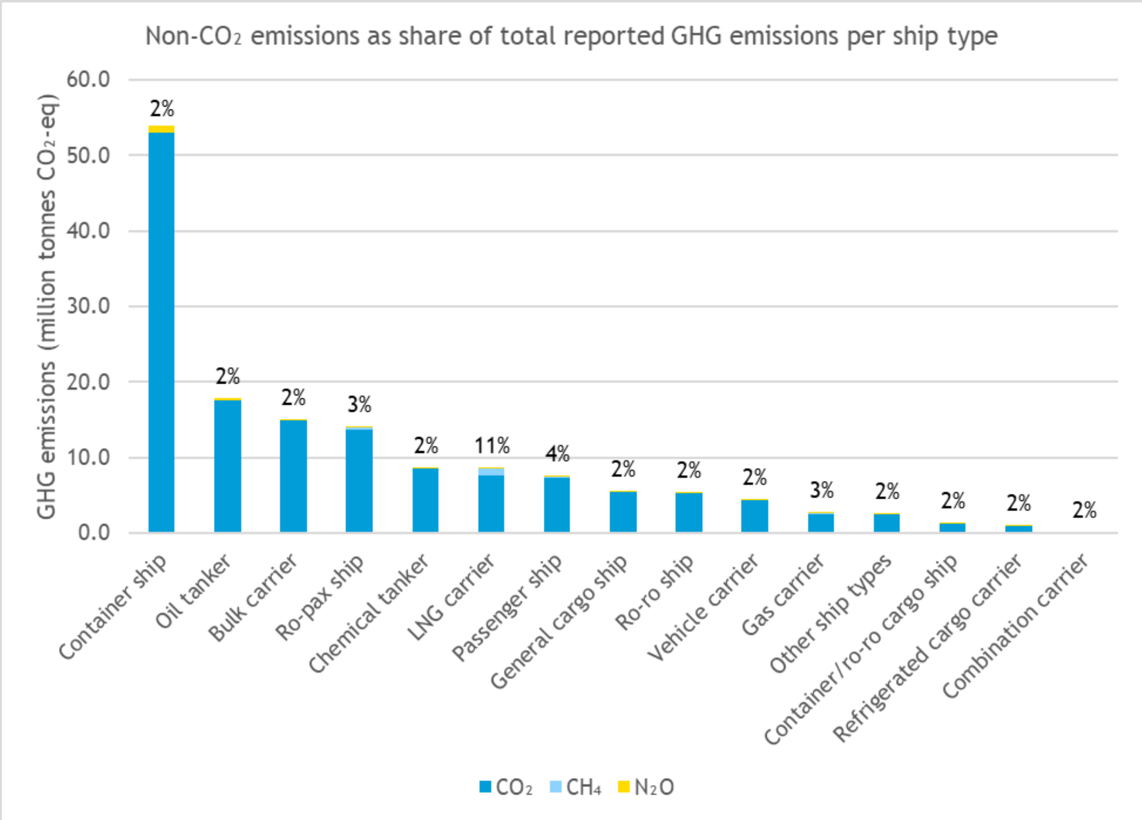


Figure 13: Non-CO_2 emissions as share of total reported GHG emissions per ship type. The share of non-CO_2 emissions is labeled as percentage

The higher share of non-CO_2 emissions for the above four ship types is explained by a higher contribution of methane (CH_4) emissions in total non-CO_2 GHG emissions (see Figure 14), as those ship types reported higher consumption of LNG.[34]

[34] Ships reporting consumption of LNG as a fuel under MRV are likely to report higher methane emissions due to the slippage of uncombusted LNG.

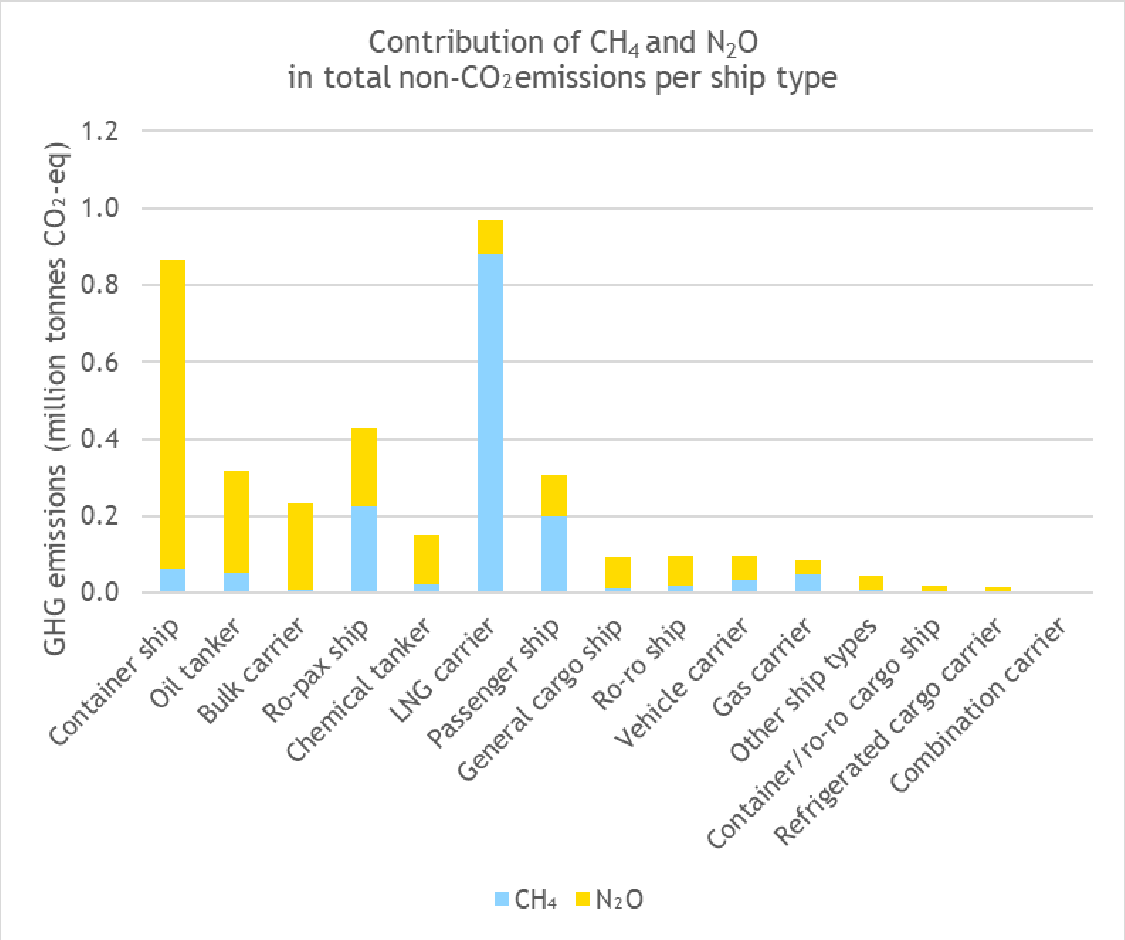


Figure 14: Contribution of CH_4 and N_2O in total non-CO_2 emissions per ship type

2.4. Further analysis of CO_2 emissions

In principle, the annual reported fleet CO_2 emissions can vary over time due to four main factors, the last three of which also have an impact on the average emissions per ship:

1. **More/fewer ships** active within the scope of the EU MRV Maritime Regulation (i.e. more/fewer ships submitting an emissions report during the year);
2. Active ships within the scope of the Regulation are **used to a different degree** (i.e. more or less distance is travelled during the year);
3. Active ships within the scope of the Regulation are **more/less energy efficient** (i.e. more/less emissions per distance travelled);
4. Active ships within the scope of the Regulation use **energy carriers** that are more/less carbon intensive (i.e. higher/lower CO_2 emissions per gram of combusted fuel).

Below, changes in CO_2 emissions are further analysed for specific ship types, first focussing on the latest developments (2024 compared to 2023), followed by an analysis of identified trends in the first seven reporting periods (2018 to 2024).

2.5. 2024 compared to 2023

The analysis of key changes in emissions per ship type in reporting year 2024 compared to 2023 focuses on the two ship types which recorded the most significant changes in emissions (container ships and LNG carriers) as well as oil tankers and bulk carriers, which recorded a considerable variation in activity levels compared to the previous year.

Table 1 Analysis of 2024 CO_2 emissions compared to 2023

Selected ship types and indicators

Ship type	Total CO_2 emissions	Number of reporting ships	Average change of CO_2 emissions per ship	Average change of nautical miles per ship	Average speed	Total travelled nautical miles
Bulk carriers	0%	+15%	-13%	+3.7%	-0.4%	+3%
LNG carriers	-24%	-10%	-17%	-5.6%	+2.4%	-14%
Container ships	+46%	+8%	+32%	+19.3%	+2.2%	+29%
Oil tankers	+4%	-6%	+5%	+11.6%	-1.0%	+5%

Analysing the emissions trends for these 4 ship types, it can be concluded that:

1. Total emissions from bulk carriers remained stable in 2024 even as the number of reporting ships (+15%) and total travelled nautical miles increased (+3%) compared to 2023. The slight decrease in average speed sailed by bulk carriers, as shown in Figure 29, played a role in keeping the total emissions from bulk carriers stable as the average amount of emissions per ship considerably dropped (-13%).[35]
2. The significant decrease (-24%) in overall emissions from LNG carriers between 2023 and 2024 can be explained by the decrease in activity for this segment following the decrease of LNG imports in Europe, in a year when European LNG imports declined to their lowest level since 2021 (IGU, 2025). This further resulted in the decrease of active LNG carriers (-10%) and of the average nautical miles sailed per ship (-6%). As a whole, the total travelled nautical miles by LNG carriers in the MRV system in 2024 decreased by 14%. On the other hand, the average sailing speed of LNG carriers in the MRV system in 2024 increased by 2.4% which was in fact the biggest increase in speed as compared to 2023 for all ship types, followed by the increase in speed by container ships.
3. The significant increase in emissions from container ships (+46%) is explained by the increase in total travelled nautical miles by container ships in 2024 compared to 2023 (+29%). Container ships were significantly affected by tensions in the Red Sea in 2024: compared to 2023, transits through the canal by container ships decreased 70% which was the biggest decrease by a ship segment behind LNG carriers, car carriers and passenger ships (Suez Canal Authority, 2025). In the same period the average speed of container ships also increased by 2.2% while the total number of reporting container ships also increased by 8%.
4. Total emissions from oil tankers increased 4% compared to 2023 even as the number of reporting ships decreased by 6%. The increase in emissions is explained by an

[35] Bulk carriers are an example of a ship type most often engaged in tramp trade without a fixed schedule. For this reason, an increase in the number of reporting ships does not always imply an increase in overall activity of these ships under the MRV: an individual bulk carrier may for instance perform only a single voyage within the scope of the MRV during a reporting year and carry out the rest of its voyages in other regions of the world outside the scope of the MRV.

increase in total distance sailed by the reporting ships (on average 12% more than in 2023). During 2024, the transport of cargoes by tanker was also affected by tensions in the Red Sea. Compared to 2023, the number of transits through the Suez Canal by tankers decreased 41% in 2024 (Suez Canal Authority, 2025); total EU imports of petroleum oils decreased by 2.4% (in terms of volume) with imports (in terms of value) decreasing from Saudi Arabia and Iraq while imports increasing from Kazakhstan, the US, and Guyana. (European Commission, 2025).

2.6. Analysis over the period 2018-2024

2024 was the EU MRV Maritime's seventh reporting period. An analysis of the data reported in the period 2018 to 2024 potentially allows to identify certain trends over time. An analysis of trends is, however, limited due to two orders of factors: first, the composition of the active fleet within the scope of the EU MRV system changes annually[36] and, second, different major disruptive events have marked the years after 2019[37].

At aggregate level, the trend of total reported emissions can be assessed against the volume of goods handled in EU ports over the period 2018-2024. Figure 15 highlights the consequences of routes diversion following the Red Sea crisis, as in 2024 the total emissions from the MRV fleet considerably increased compared to 2023, despite the volumes of goods handled in EU ports[38] slightly decreased, the latter being an indication for the overall aggregate transport work for the cargo activity of the fleet.

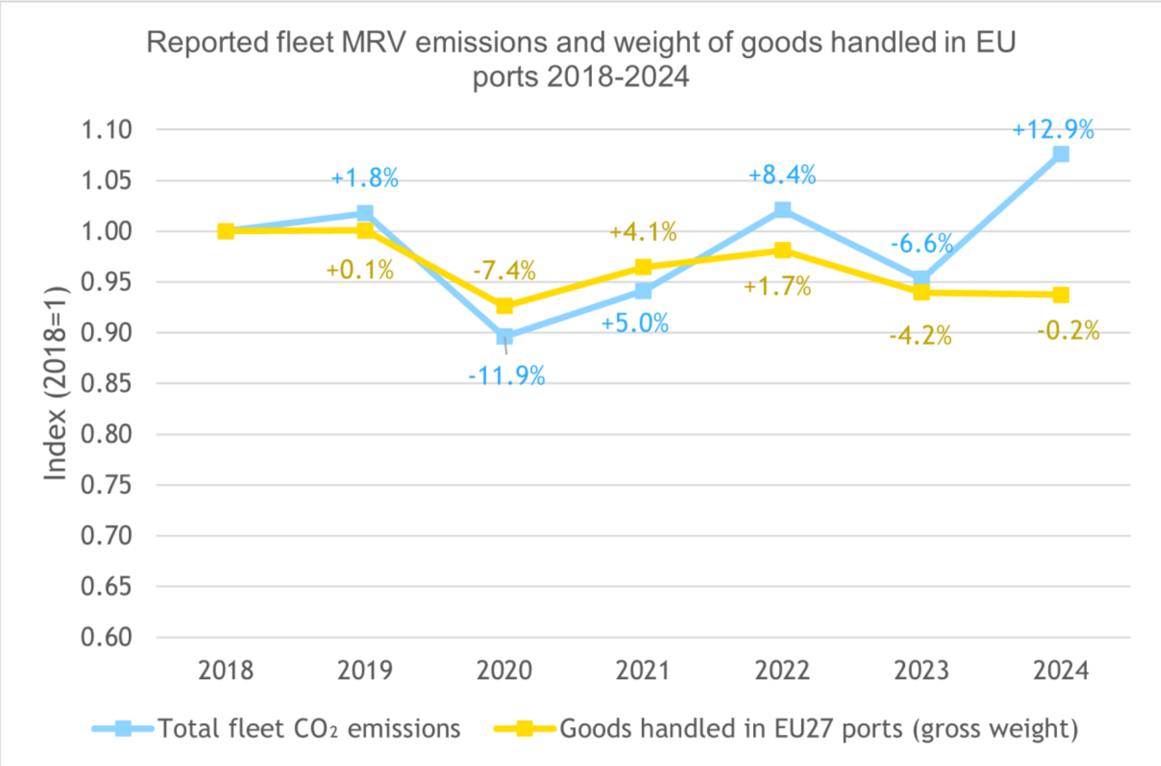


Figure 15: Reported aggregate MRV emissions and weight of goods handled in EU ports 2018-2024 and change on previous year, adjusted for UK's withdrawal from EU

An analysis of the average annual CO_2 emissions per ship type (see Figure 16) reveals a cluster of 9 ship types with similar average emissions of between 4 000 and 9 000 tonnes CO_2 per ship in 2024. The remaining 6 ship types feature much higher average annual CO_2 emissions, ranging from 18 030 tonnes CO_2 for container/ro-ro cargo ships to 32 780 tonnes for passenger ships in 2024. Average annual CO_2 emissions of LNG carriers, Ro-pax ships

[36] To date, only 4 034 ships have reported in each of the seven reporting periods which corresponds to between 32% and 39% of the total number of ships for which a report has been submitted in a year.

[37] This is the case of the economic consequences of COVID-19 (starting 2020), of the United Kingdom's withdrawal from the EU (since 2021) which impacted the geographical scope of the EU MRV Maritime Regulation, and of Russia's full-scale invasion of Ukraine (since 2022).

[38] Gross weight of goods handled in all ports as in Eurostat database. The data includes both intra and extra-EE trade in all ports. Figures include EU27, Norway, and Iceland.

and especially of passenger ships show strong fluctuations over time, an indication that the relevant market segments have been affected by disruptive trends in the period (such as the COVID-19 economic downturn and the Russia's full-scale invasion of Ukraine).[39] Average annual CO_2 emissions of container ships had been continuously decreasing in the period 2018-2023 however spiked again in 2024.

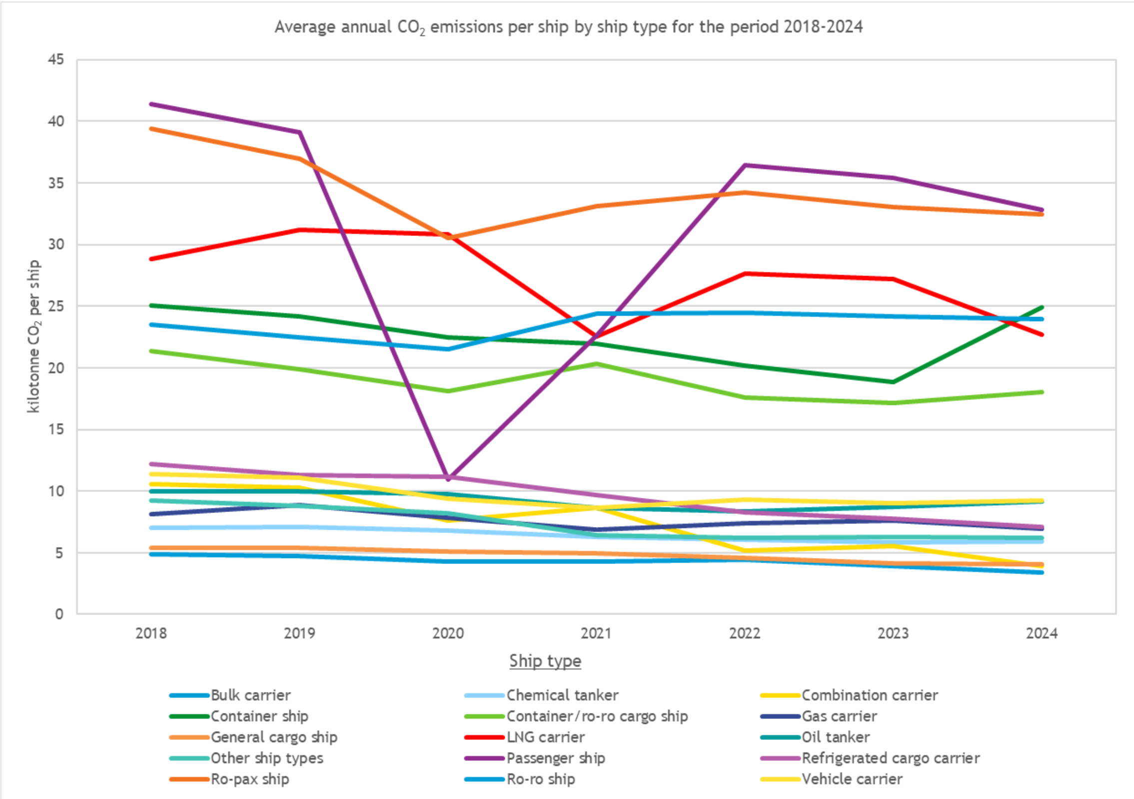


Figure 16: Average annual CO_2 emissions per ship per ship type

The analysis of the emissions per nautical mile at aggregate level of the MRV fleet (expressed as $tonCO_2/nm$) reveals a very marginal decrease in 2024 (0.01%), well below the average annual reduction of 1% for the period 2018-2023. While emissions per nautical mile decreased for most ships in 2024 compared to 2023, especially, for LNG carriers (-11.3%) a significant increase was recorded by container ships (13.5%).

[39] The average CO_2 emissions per ship within the scope of the EU MRV Maritime Regulation may vary over time for three, not mutually exclusive reasons: the activity of the ships (i.e. fuel consumption, which mainly depends on distance travelled), the energy efficiency of the ships, and the carbon intensity of the energy used onboard ships.

2.7. Fuel consumption

In 2024, the EU MRV fleet consumed in total 46.8 million tonnes of fuel within the geographical scope of the EU MRV Maritime Regulation, 13% more than in 2023 (Figure 17).

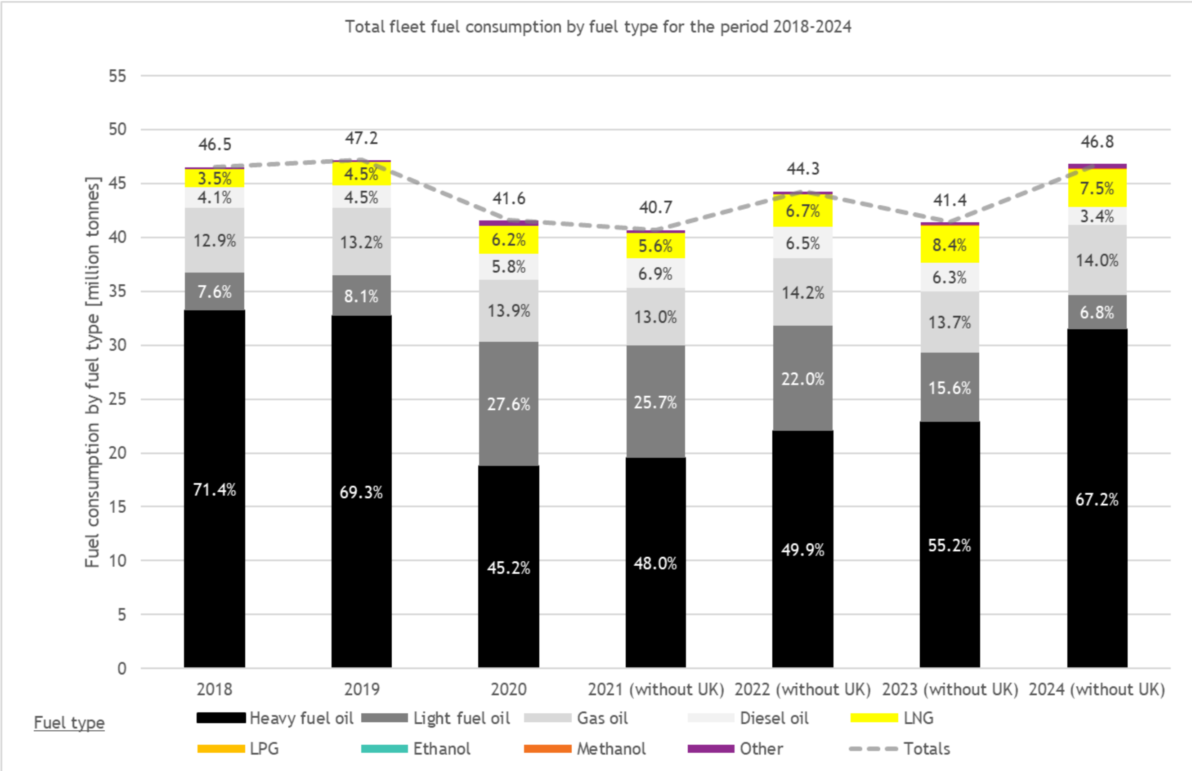


Figure 17: 2018 to 2024 total fuel consumption of EU MRV fleet and shares per fuel type

The analysis of the amount and type of fuel reported over the period 2018-2024 highlights the change in 2020 triggered by the application of MARPOL Annex VI Regulation 14, which set limits on the sulphur content of bunker fuel oils and in particular of some of its requirements becoming stricter at the beginning of 2020,[40] leading to a large reduction in the use of Heavy Fuel Oil (HFO) and a significant increase in the use of Light Fuel Oil (LFO), which continued affecting in the following reporting periods. The year 2024, however, further amplified a trend recorded since 2021, namely a gradual increase in the consumption of HFO, almost entirely met by the decrease in the consumption of LFO. In 2024, the consumption of Marine Diesel Oil (MDO) also decreased to the lowest level in the 2018-2014 period and made up only 3.4% of all consumed fuel. Different factors may be driving such a trend, including price changes for marine fossil fuels after the 2022 energy crisis or the increasing uptake of exhaust gas cleaning systems in the fleet, which makes possible the use of HFO within the latest IMO sulphur regulations.[41]

[40] Outside Emission Control Areas, the maximum allowed sulphur content of the fuel has been reduced from 3.5% to 0.5% m/m. To comply with this sulphur limit, ships can either use energy carriers with a lower sulphur content (Very low sulphur fuel oil (VLSFO), low sulphur marine gas oil, LNG, LPG, methanol or ethanol) or can keep on using heavy fuel oil in combination with an exhaust gas cleaning system.

[41] In January 2023 Clarksons Research estimated that scrubbers were fitted on over 4 942 ships in the global fleet (including pending retrofit), equivalent to 25.1% of total GT(Clarksons Research, 2023). By July 2024 the estimate for ships equipped with scrubbers increased to 5 838, equivalent to 28.3% of total tonnage.(Clarksons Research, 2024).

In 2024, 91.4% of the total mass of fuels reported were conventional marine fuels (HFO, LFO, MGO or MDO), the rest being LNG (7.5%)[42] and very small shares of other fuels (1.1%).[43] For all ship types, except LNG carriers,[44] Heavy Fuel Oil (HFO) is the fuel type with the highest share of total 2024 fuel consumption. The year 2024 shows a continued uptake of LNG consumption in the MRV fleet, which increased by around 1% compared to 2023, far lower than the 16% increase recorded between 2022 and 2023. As a result, the share of LNG in the fuel consumption of the entire fleet decreased in 2024 (7.5%) compared to 2023 (8.4%). Nonetheless, the amount of LNG consumed by the fleet over the period 2018-2024 more than doubled (i.e.+116%). Increasing consumption of LNG in the global and MRV fleet is likely to continue in the coming years as more LNG-capable ships currently on the orderbook[45] across different segments enter into operation.

In 2024 the fuel consumption of LNG carriers, which usually use for propulsion part of the LNG transported as cargo, remained highly dominated by LNG (77% of total fuel consumption in tonnes for the type, the highest share on record). However, the share of total LNG consumed by LNG carriers in 2024 decreased to 61%, significantly lower than previous reporting years where the share was consistently above 79% as shown in Figure 18. In total the consumption of LNG-by-LNG carriers also decreased by 22.5% in 2024 compared to 2023. This is explained by the sharp decrease in LNG carriers active in the MRV system in 2024 compared to 2023 (-10%). Indeed, in 2024 European LNG imports declined to their lowest level since 2021 (IGU, 2025). Figure 18Figure 18 shows that the decreased consumption of LNG-by-LNG carriers was met by an increase of LNG consumption from non-LNG carriers. As a result, total consumption of LNG in the MRV fleet remained slightly above 2023 levels.

[42] LNG refers to LNG of fossil origin. In 2024, ships reported the consumption of 9 000 tonnes of bio-LNG, here accounted under the category ‘Other fuels’.

[43] These included (fossil) LPG, (fossil) methanol, and fuels of the type ‘Other fuels’.

[44] For LNG carriers, LNG accounts for 77% of total reported fuel consumption, followed by HFO (17%), and gas oil (4%).

[45] As of August 2025, there were 966 ships on order with the ability to use LNG as propulsion fuel, of which 343 LNG carriers, 359 container ships, 106 car carriers, 90 tankers, 25 cruise ships, and 16 bulk carriers. Measured in gross tonnage, 51.1% of ships on order are designed to be able to operate on alternative fuels (i.e. fuels different from HFO, LFO, MGO or MDO), compared to 8.9% of ships currently in operation. In addition to LNG-capable ships, alternative fuel-capable ships on order include: 33 hydrogen-capable ships, 38 ammonia-capable ships, 128 LPG-capable ships, more than 336 methanol-capable ships, and 440 battery/hybrids ships (DNV, 2025).

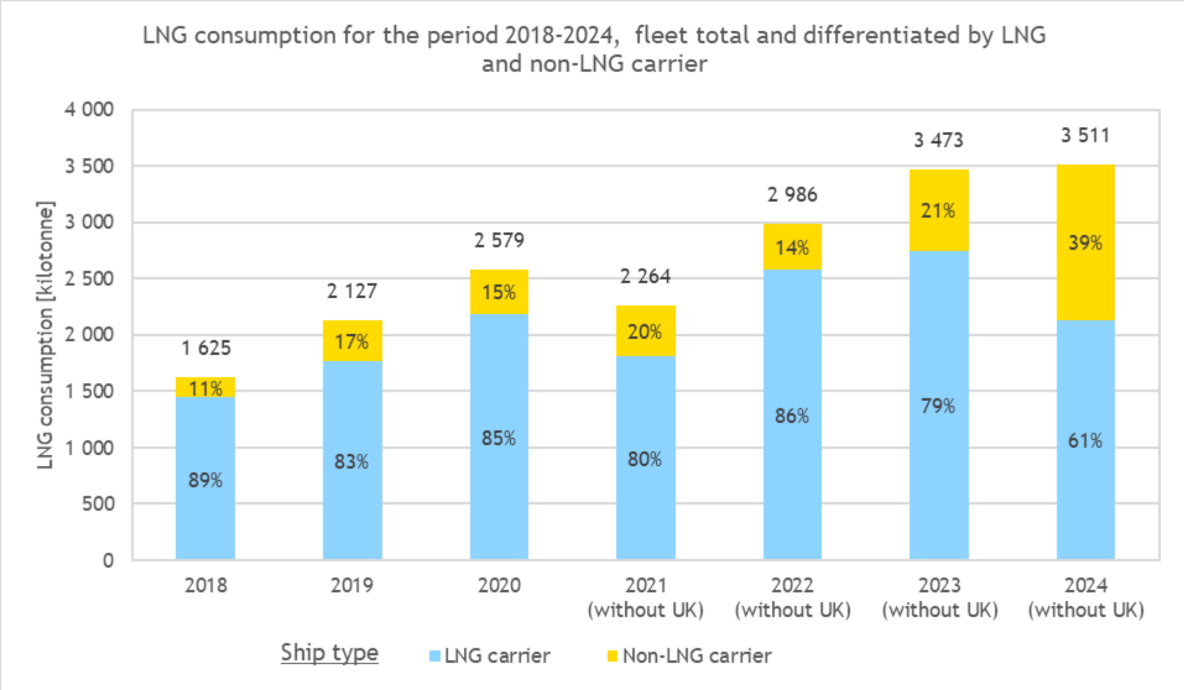


Figure 18: Total LNG consumption and distribution of the consumption over LNG and non-LNG carriers

As shown in Figure 19, beyond LNG carriers all remaining ship types, with the only exception of container/Ro-ro cargo ships reported some LNG consumption in 2024. The total increase in LNG consumption compared to 2023 was most prominent for container ships (+159%), vehicle carriers (+293%), Ro-ro ships (+161%) and oil tankers (+135%). Different factors can explain the increased use of LNG in 2024, one being the lower LNG price in 2023 and 2024 after the market tension experienced in 2022, and another one being the increased use of dual fuel engines that allow ships to be operated on either LNG or conventional liquid marine fuels. In terms of LNG share in the fuel mix by type of ship, after LNG carriers (77%), LNG plays the larger role for gas carriers (14%), followed by passenger ships (10%), vehicle carriers (7%), Ro-pax ships (6%), Container ships (3%), Oil tankers (3%), and Ro-ro ships (2%). All other ship types reported LNG consumption of 1% or less on their total fuel consumption.

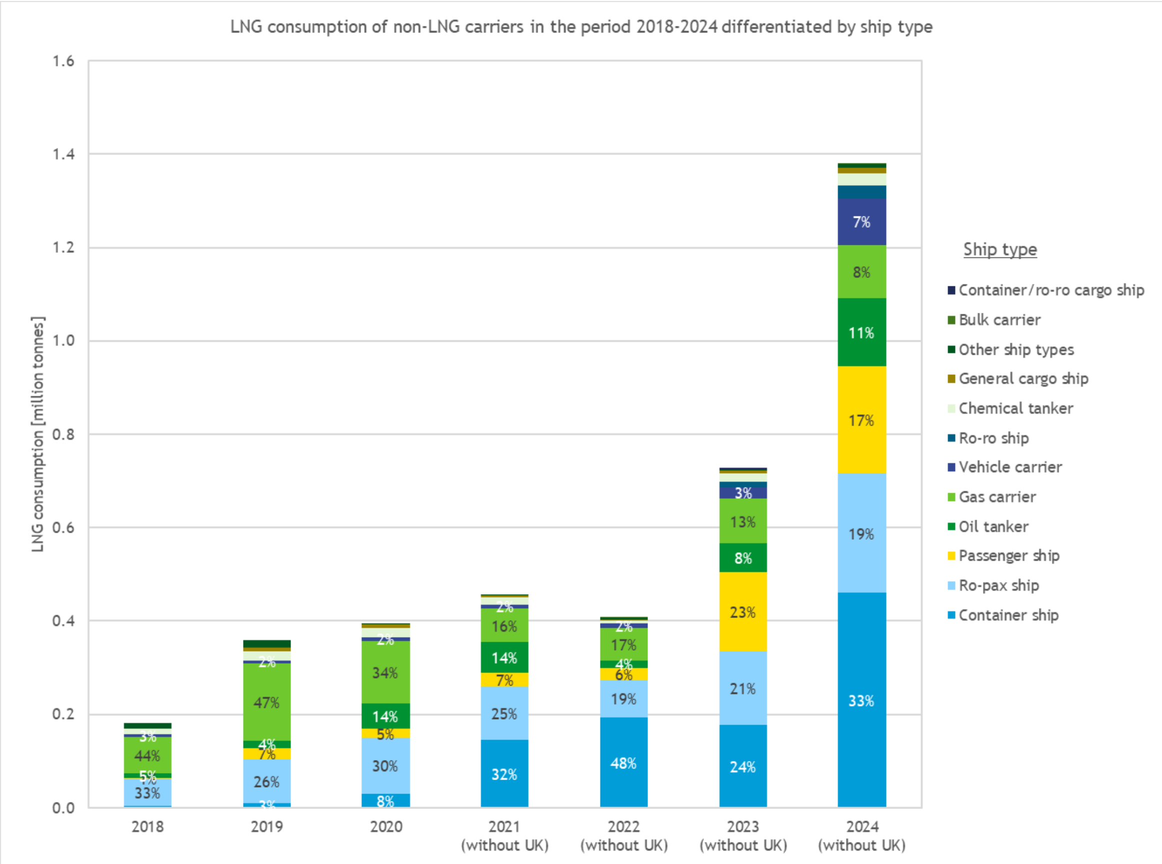


Figure 19: LNG consumed by ship types other than LNG carriers

Besides marine traditional fossil fuels (HFO, LFO, MGO or MDO) and LNG, the ships active under MRV in 2024 have reported the use of LPG (0.1% of total consumption), methanol (0,1% of total consumption), and other fuels[46] (0.9% of total consumption). No ethanol consumption was reported in 2024.

Consumption of Liquefied petroleum gas (LPG), either as butane or propane, has increased by around 38% on the previous year and is continuously on the rise since 2020. However, in relative terms on the overall fuel mix of the MRV its role remains very limited, representing around 0.1% of all fuel consumed in 2024 (33 000 tonnes). As shown in Figure 20, the increase in LPG use is mainly due to consumption of the fuel by gas carriers carrying LPG as a cargo, and to a smaller extent by oil tankers.

[46] Ships can report under the category ‘Other fuel types’ any alternative fuel which do not match the other standard categories. 2020 remains to date the year in which most fuel was reported under this category (0.49 million tonnes), followed by 2024 with 0.42 million tonnes, i.e. around 0.9% of total reported fuel in the year.

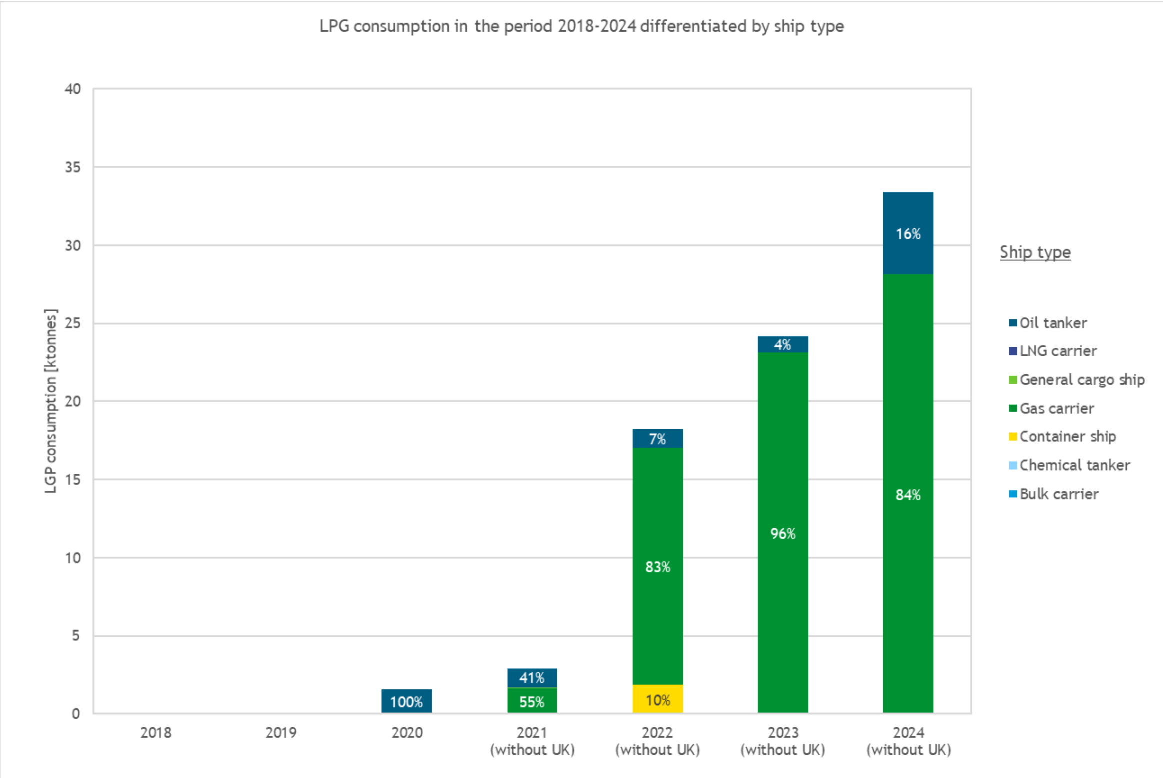


Figure 20: LPG consumption per ship type

The amount of methanol consumption peaked in 2024 at 37 000 tonnes,[47] which represents an increase by around 428% compared to 2023, yet still accounting only for 0.1% of total fuel consumption in the MRV system. The fleet reporting methanol consumption remains limited but is growing. Whereas in 2022, 21 ships reported consumption of methanol and 17 in 2023, the number of ships increased to 53 in 2024. In 2024 the fleet reporting consumption of methanol included 28 container ships (accounting for 39% of total reported methanol) and 20 chemical tankers (accounting for 47% of total reported methanol). Methanol consumption was also reported by 3 oil tankers, 1 bulk carrier and 1 vehicle carrier. As methanol-capable ships of different types are currently on order, methanol consumption is expected to increase further in the coming years, in particular for the container ship, bulk carrier, and vehicle carrier segments.[48]

[47] The amount only includes fossil methanol. An additional 5 000 tonnes have been reported in 2024 as bio-methanol.

[48] As of August 2025, there were 210 methanol-capable container ships on order as well as 59 bulk carriers and 23 vehicle carriers. (DNV, 2025)

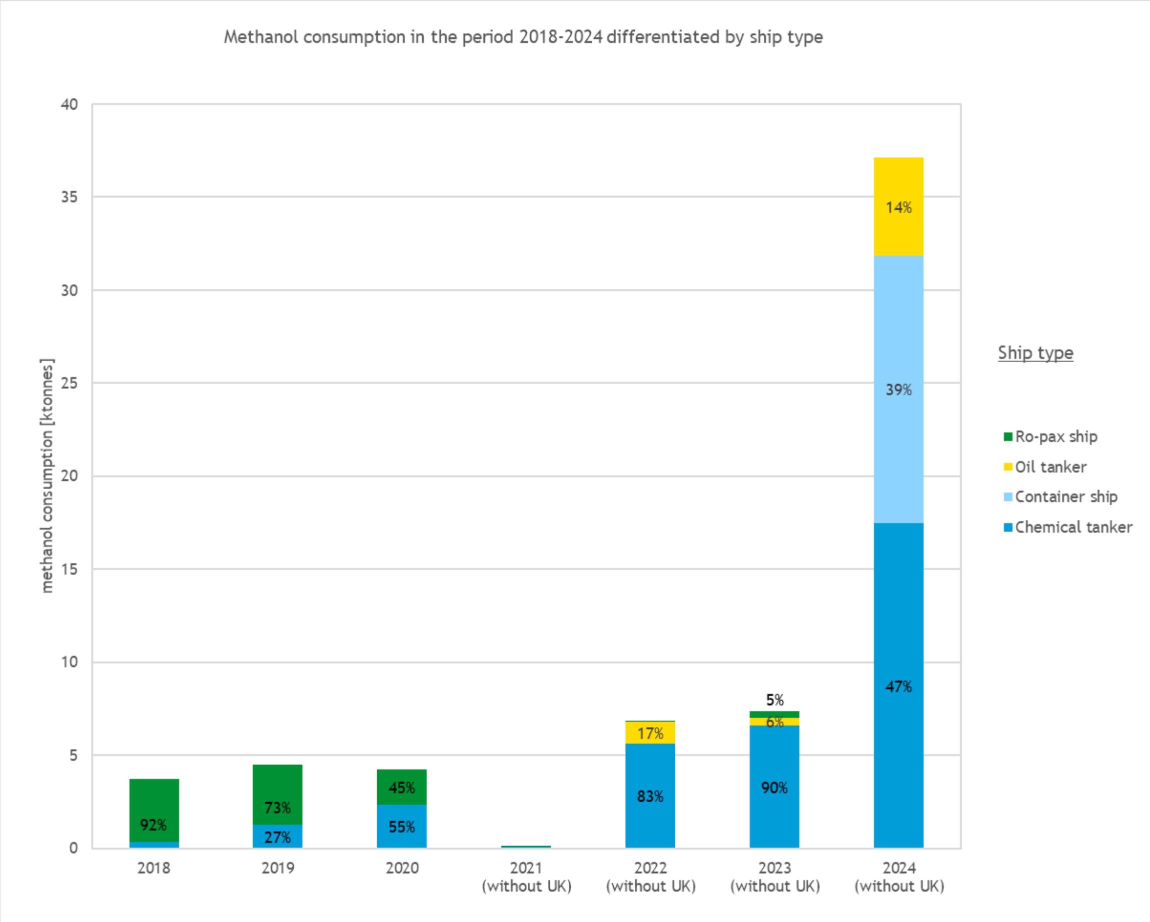


Figure 21: Methanol consumption per ship type[49]

The consumption of other fuels, not included in any of the standard marine fuel types mentioned above (i.e. HFO, LFO, MGO, MDO, LNG, LPG, or methanol), totalled 0.42 million tonnes, representing 0.9% of total fuel consumption in 2024, 40% higher than what reported in 2023 but still 13% lower than the volumes reported in 2020, the year in which the reporting of the type ‘other fuel’ peaked for the period 2018-2024. 2024 was the first reporting period during which ships reported fuels according to the new fuel categorisation introduced by the 2023 revision of the EU MRV Maritime Regulation,[50] which allows more granularity in the description of consumed fuels. In 2024, 59% of the 0.42 million tonnes reported as other fuels were biofuels, the vast majority being biodiesel (0.22 million tonnes).[51]

[49] In 2021 methanol consumption was negligible and limited to 8 ships in total (mostly Ro-pax ships and chemical tankers)

[50] The 2023 revision of the EU MRV Maritime Regulation, through amendments to Annex I to Regulation (EU) 2015/757 established 23 standard fuel types under three fuel classes (Fossil, Biofuels, Fuels of Non-Biological Origin/e-fuels) for the ships to report their consumption at a higher degree of granularity. The reporting period 2024 was the first one to allow for the reporting of non-fossil fuels by type of fuel.

[51] Other reported biofuels included bio-LNG (9 000 tonnes), Hydrotreated Vegetable Oil – HVO (9 000 tonnes), bio-methanol (5 000 tonnes).

3. The monitored voyages at a glance: shipping routes, speed, time spent at sea and distance travelled

3.1. Main shipping routes

Similar to what was reported in the previous annual emissions reports, Eurostat data show a high demand for waterborne transport services between the EU and non-EU countries such as the United States, China, and neighbouring non-EU countries such as the United Kingdom, Norway, Morocco, and Türkiye while the total gross weight of seaborne goods handled in all EU ports slightly decreased by 0.2% in 2024 (Eurostat, 2025a). This in contrast to a large increase in total emissions from the MRV in 2024 compared to 2023 (+12.9%).

Table ***6*** in Annex 3 provides the 20 main extra EU-27 flows by gross weight handled (in millions of tonnes) in main ports in the years 2018 to 2024.

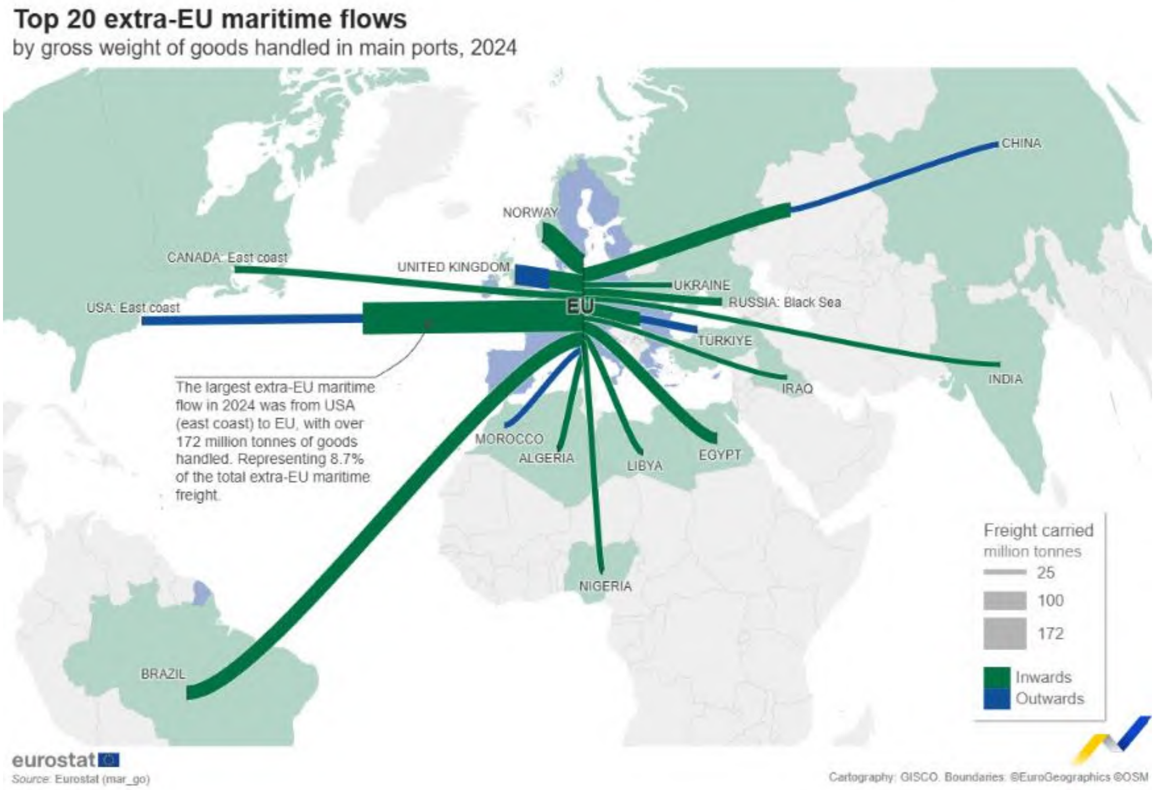


Figure 22: Top 20 extra EU flows; Source: (Eurostat, 2024)

The 20 countries related to these flows remained fairly stable over the last seven years. However, 2024 records a significant increase in inward flows from Canada, being the highest on record in this period. The position of other countries within the top 15 in terms of annual volume of the flow also varies over time. In 2024, inward flows from China and Brazil were equal while in 2023 more flows were recorded from Brazil. A strong increase in inward flows from Ukraine can also be noted since 2022. Moreover, inward flows from Norway have been moderately increasing each year since 2020 while those from the UK have been decreasing since 2022.

Concerning outwards flows, the volumes of goods handled in EU ports towards the UK and Morrocco moderately increased compared to 2023. Outward flows to Morocco 2024 were in fact the highest ever recorded in the 2018-2024 period. However outward flows to China and Türkiye in 2024 were the lowest recorded in the 2018-2024 period while outwards flows to the USA (East Coast) were the second lowest in the same period. Total EU outflows in 2024 remained dominated by the outward flow to the UK.

3.2. Time spent at sea

In total for the MRV fleet in 2024, the recorded time spent at sea increased 8.6% compared to 2023. As shown in Figure 23, the total time that the MRV fleet spent at sea was highest in the years 2018 and 2019 after which it decreased. However, in 2024 the MRV fleet recorded the third longest total time spent at sea in the 2018-2024 period, driven by the disruptions to maritime activity throughout the year – notably the security crisis in the Red Sea.

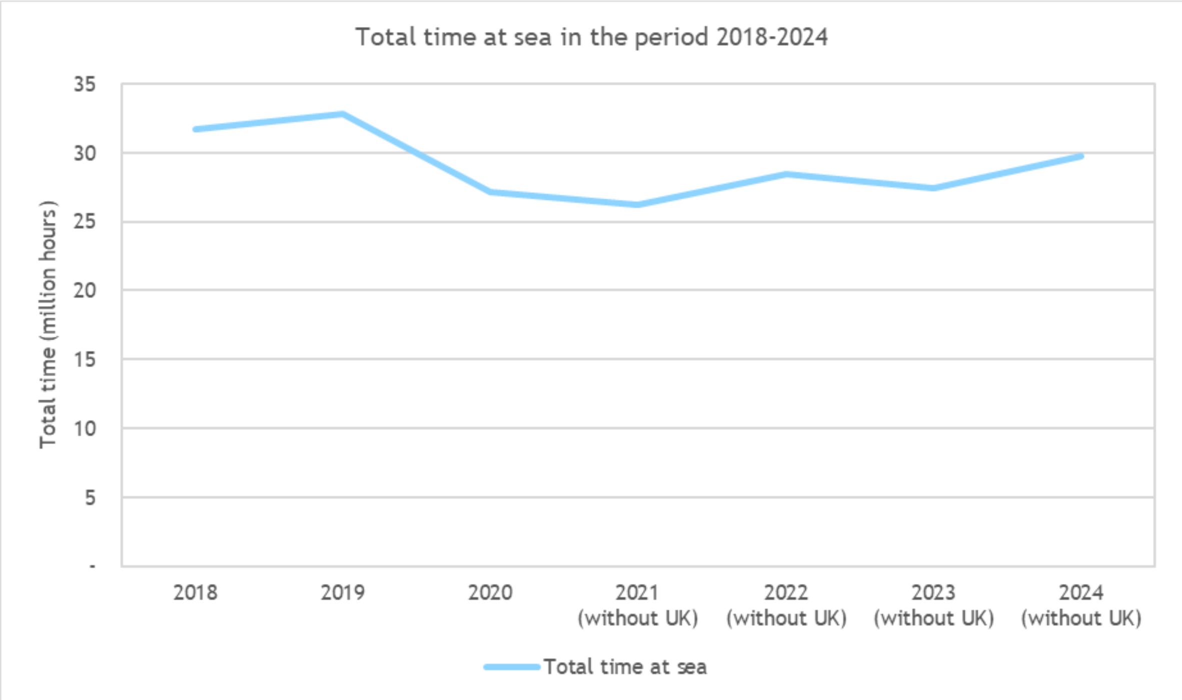


Figure 23: MRV fleet total time spent at sea 2018-2024

The time that ships are active within the scope of the EU MRV Maritime Regulation during a reporting period can be expected to differ between ship types due to their different operational profiles. These differences in operating profiles are visible by comparing the average time at sea (see Figure 24): ship types that often sail according to a regular schedule (such as container ships, passenger ships, Ro-ro/Ro-pax ships) show a higher average time at sea, while ships types which are most often engaged in tramp trade without a fixed schedule or route (such as bulk carriers and tankers) spend a lower average time at sea within the scope of the EU MRV.

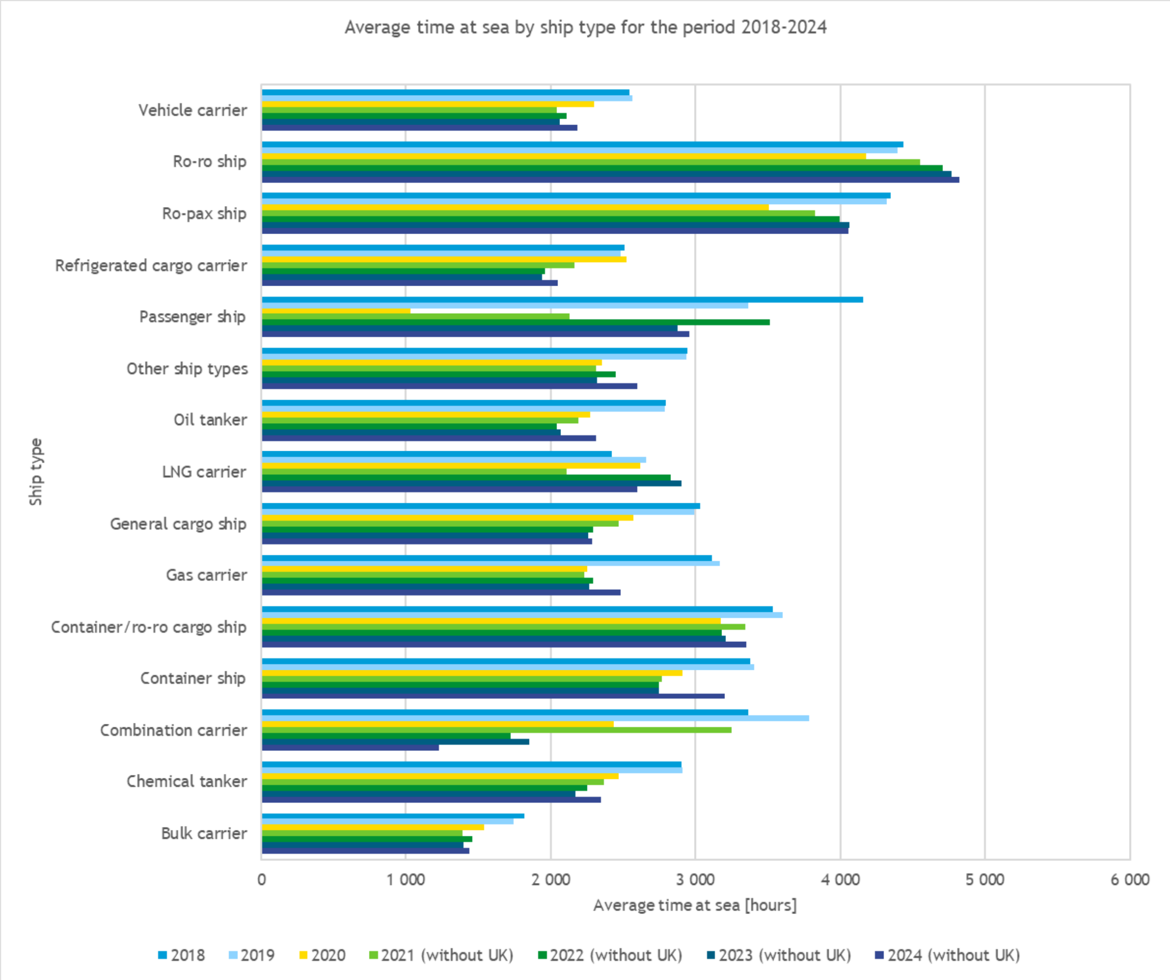


Figure 24: Average time at sea by ship type; 2018-2024; sorted by 2024 average time at sea

Goods shipped by dry bulk carriers are often traded on the spot market, leading to a high fluctuation in the number of individual bulk carriers that are used for trade to/from Europe as well as a high variety in the specific bulk carrier that actually performs the voyage. For instance, a specific bulk carrier may only be chartered for a few voyages to an EEA port in a given year and the rest of the time trade or wait for contracts in other regions of the world.

Lower average time at sea does not only depend on the frequency of port calls in EEA countries, but also on time spent in ports: the longer time a ship may wait in an EEA port in between voyages, the lower the time at sea reported under the MRV system.

In this respect, bulk carriers are most likely to spend days in port without transport activity, as they wait for the next assignment in between short-term contracts. In contrast, ships like Ro-ro, Ro-pax, and, to a lesser extent, passenger ships are more likely to consistently call the same (EEA) ports as part of a timetabled route, which does not foresee much idle time/days over the year.

As a result, individual bulk carriers have the lowest average time spent at sea in the EU MRV system[52] whereas Ro-ro ships have the highest average time spent at sea in all reporting years. On the other hand, because bulk carriers are one of the most numerous ship types in the MRV fleet and the long voyages associated with transporting bulk good from all areas of

[52] Except for 2020 when COVID-19 led many passenger ships to lie idle for long periods of time due to leisure travel restrictions. and 2024 when combination carriers recorded the lowest average time spent at sea.

the world, the aggregate total time at sea of the entire bulk carrier fleet is still the highest of all ship types after container ships.

Changes in the average time at sea for the different ship types across the reporting years can be related to different factors: the amount of idle time,[53] shifts in trade patterns within the scope of the EU MRV (e.g. trade on shorter intra-EEA routes), and/or shifts in activity outside of the EU MRV (i.e. an increase in activities falling outside the EU MRV scope will negatively affect the average time at sea reported under the EU MRV scope). Such shifts can be linked to the UK's withdrawal from the EU and/or shifts in the economic activities between regions.

Between 2023 and 2024 the average time spent at sea within the scope of the EU MRV increased slightly (6% or less) for 7 out of the 15 ship types (see Figure 24). For chemical tankers (+8%), gas carriers (+10%), oil tankers (+12%) and other ship types (+12%) the increase was more significant. Meanwhile, for container ships the increase in average time spent at sea reached 16%. For 3 ship types, the average time spent at sea decreased: for Ro-pax ships the decrease was less than 1% while for LNG carriers the decrease was 10%. For combination carriers the decrease was nearly 34%. The number of ships covered in this ship category is small, never exceeding 15 in the 2018-2024 period, which may explain why the average time spent at sea is among the most variable for this ship type.

3.3. Distance travelled

In 2024, the MRV fleet as a whole recorded to the highest ever total distance travelled in the 2018-2024 period as shown in Figure 25. Compared to 2023, the total distance travelled by the MRV fleet in 2024 increased by 9.3% compared to the previous year, due to the diversions away from the Suez Canal.

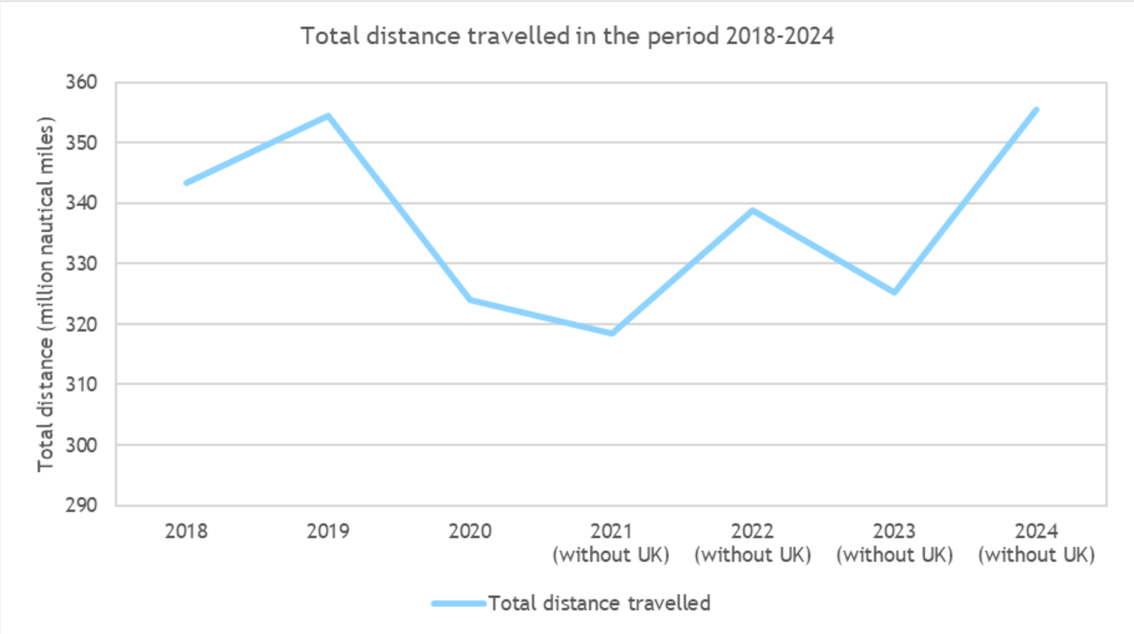


Figure 25: MRV fleet total distance travelled 2018-2024

Figure 26 presents the average distance travelled per ship by type for the period 2018-2024. As for the average time spent at sea, differences are due to the different operational profile by ship type: ships that often sail according to a regular schedule show a higher average distance travelled, while ship types which are most often engaged in tramp trade without a fixed schedule show a lower average distance travelled. During the 2018-2024 period, Ro-pax and

[53] Time at anchorage is not part of the time at sea.

Ro-ro ships consistently recorded the highest average distance per ship within the scope of the EU MRV Maritime Regulation (above 60 000 nautical miles in all years except 2020). This is because these ships are likely sailing on a fixed service between EEA ports throughout the year, so all the distance travelled in the year is reported under the EU MRV Maritime Regulation. In contrast, bulk carriers have had the lowest average distance travelled for all years (except 2020 when many passenger ships lay idle because of COVID-19) because the voyages of bulk carriers serving the tramp market are unpredictable. A given bulk carrier is more likely to be redeployed for service outside Europe during a reporting period and only the distances travelled on voyages to/from EEA ports will be reported under the EU MRV Maritime Regulation. In 2024 the lowest average distance travelled was recorded by combination carriers (just under 14 000 nautical miles), slightly less than bulk carriers (just over 15 000 nautical miles).[54]

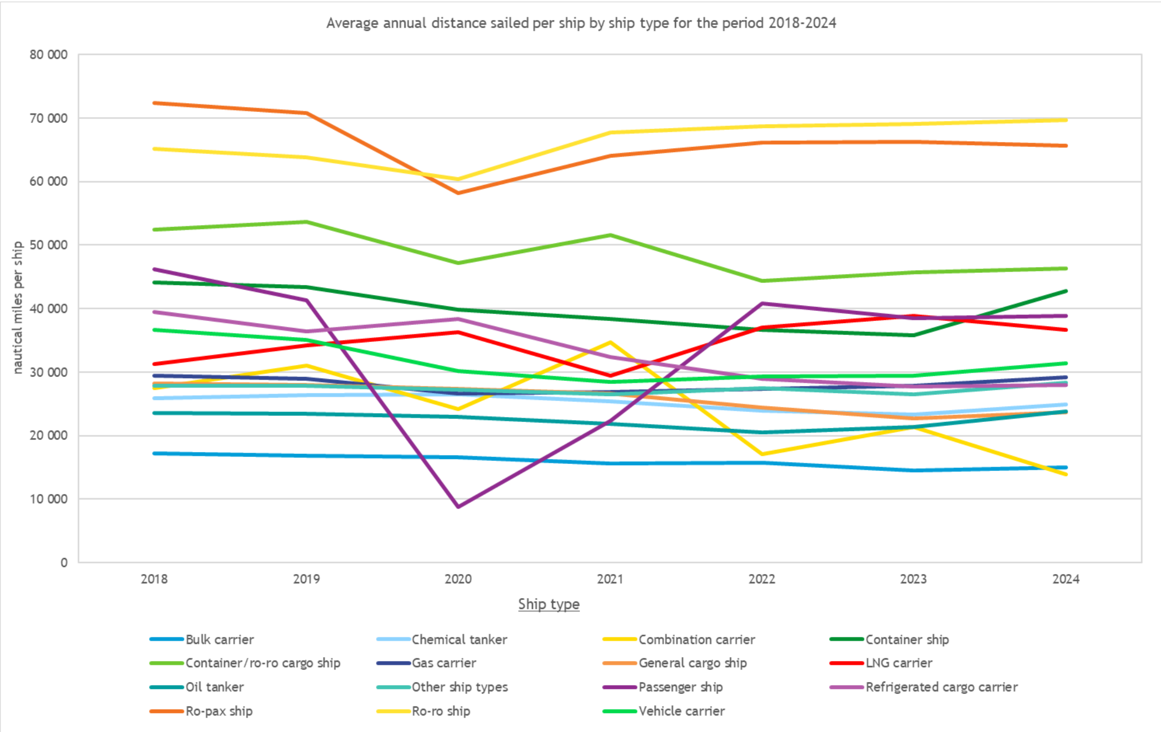


Figure 26: Average annual distance travelled under MRV scope per ship by type of ship for the period 2018-2024

In terms of total aggregated distance sailed by ship type, Figure 27 clearly shows that container ships, bulk carriers and oil tankers have consistently recorded the longest total distances travelled during the 2018-2024 period.

[54] Similarly to bulk carriers, combination carriers carry dry or liquid bulk cargos, usually without a fixed schedule.

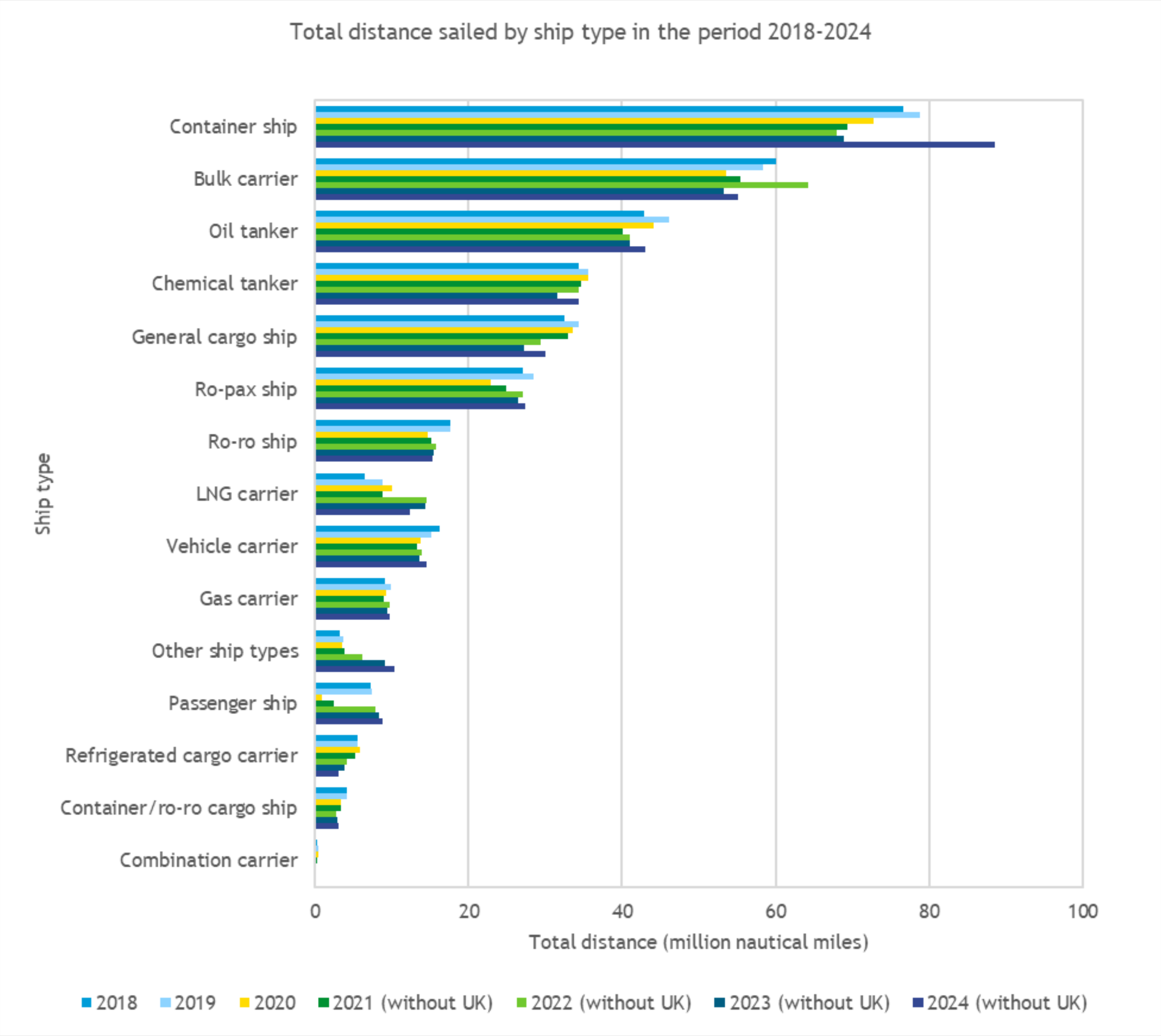


Figure 27: Total distance sailed per ship type 2018-2024

3.4. Fleet speed

The speed at which a ship sails is an important determinant of the ships' operational energy efficiency. By reducing their speed, ships can significantly reduce the fuel consumption of their main engines. Reduced power demand leads, in many cases, to a net reduction of the ships' fuel consumption, and therefore CO_2 emissions, even if the fuel consumption of the ships' auxiliary engines may increase due to longer transit times and/or extra ship capacity has to be used to carry out the same amount of transport work. The CO_2 reduction benefits of reduced speed are likely to be highly variable per ship type and individual ship design but in general, a reduction of the speed of ships can, per unit of time, reduce the energy consumption of the propulsion engines significantly – a 10% speed reduction can, for example, reduce the main engine energy consumption by approximately 27% per hour (CE Delft, 2022).[55] Speed is a parameter which is difficult to compare between different ship types since ships have different designs and serve different markets.[56] Figure 28 shows the average speeds across ship types for the year 2024.

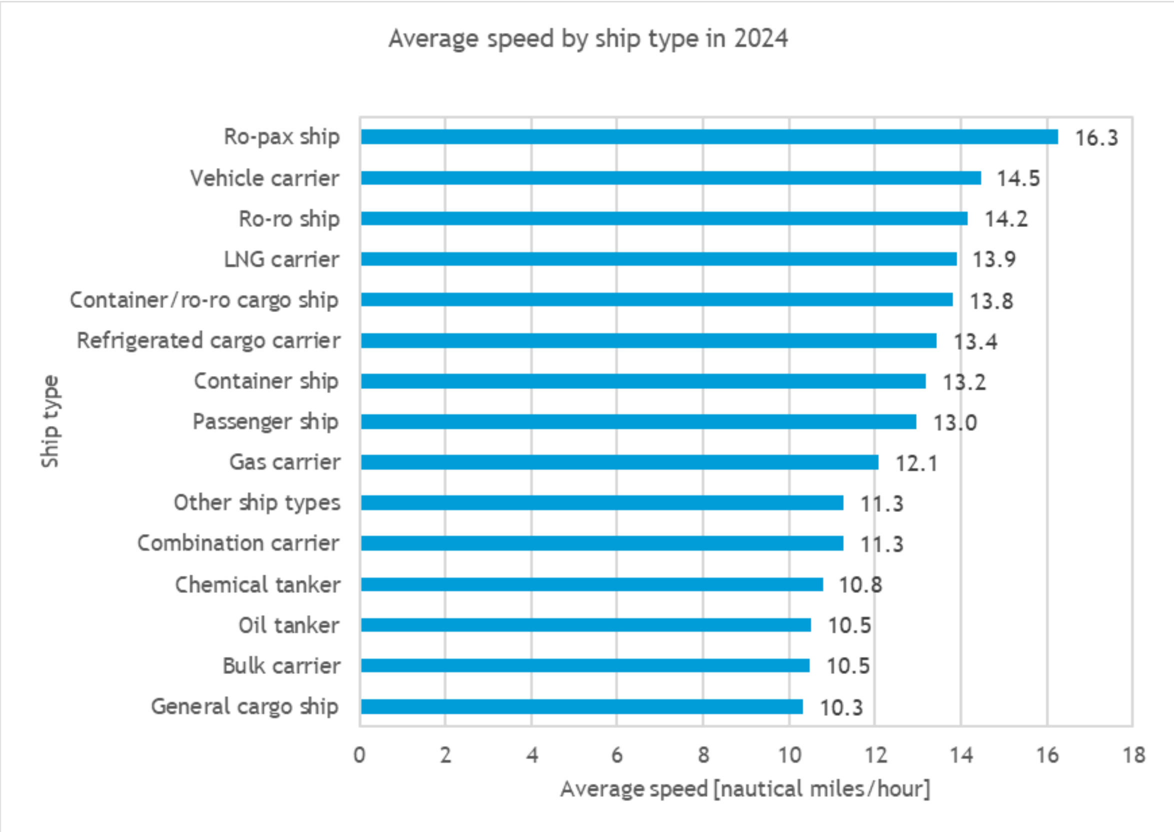


Figure 28: Average speed by ship type; 2024 (without UK); sorted by average speed

[55] It has to be considered, however, that due to the lower speed, ships need more time to cover a certain distance, reducing the main engine energy savings and increasing the energy consumption of the auxiliary engines per voyage. For an exemplary share of the auxiliary energy consumption of 5%/10%/20% in the overall energy consumption, a 10% speed reduction then translates into an overall energy saving of approximately 18%/16%/13%.

[56] Ro-Pax ships and refrigerated cargo ships are, for example, known to sail fast compared to oil tankers or bulk carriers as they serve very different needs.

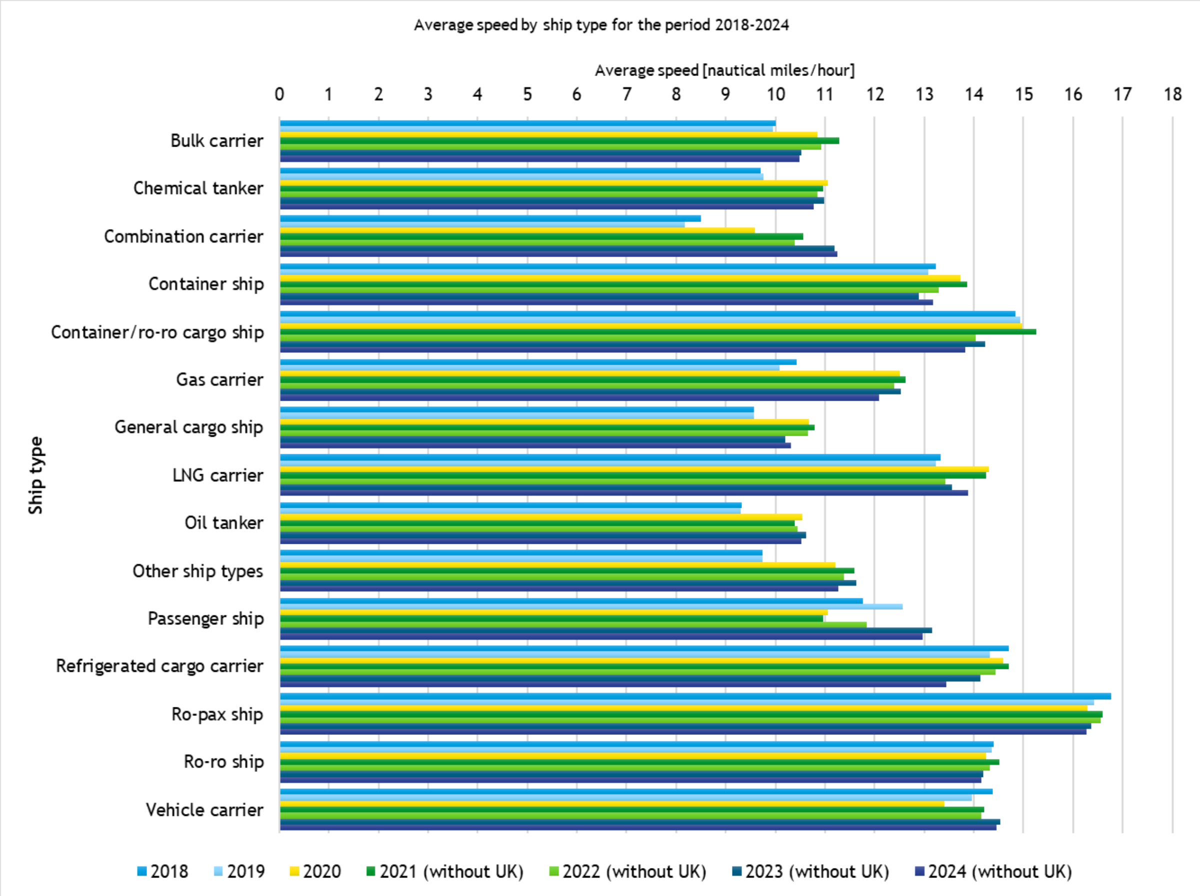


Figure 29: Average speed by ship type; 2018-2024; alphabetical order

Speed variation over time is a relevant indicator to understand the evolution of operational energy efficiency over the analysed period. In this context, the average speed by ship type was calculated based on figures reported by the monitored fleet (time spent at sea and distance travelled). The average speed by ship types over the period 2018-2024, as illustrated in Figure 29, shows that there is no indication of the MRV fleet structurally slowing down during the period. On the contrary, most ship types (10 out of 15 types) recorded higher average speed in 2024 compared to 2018, with some having considerably increased speed, as in the case of combination carriers (+32%), gas carriers (+16%), other ship types (+16%). Oil tankers, chemical tankers and passenger ships also recorded an increase in speed of more than 10%. Over the seven available reporting years, the largest difference between the highest and lowest average speeds was observed for gas carriers and combination carriers as these two ship types considerably increased speed after 2019 (by more than 2.5 knots), while the smallest difference was recorded for Ro-ro ships and refrigerated cargo carriers (less than 0.6 knots).

The comparison of the average speed recorded in 2024 on the year 2023 highlights a moderate decrease in speed (in the range of 1-3%) for most ship types while for gas carriers (-4%) and refrigerated cargo carriers (-5%) the decrease was more significant. The types with the highest increase in speed in 2024 on the previous year were container ships (+2%) and LNG carriers (+2%). General cargo ships and combination carriers also recorded a small increase in average speed of around 1%.

4. Technical and operational efficiency of the monitored fleet

The energy/carbon efficiency of ships can be measured in terms of technical or operational efficiency and by means of various indicators. Technical efficiency indicators aim at measuring the energy consumption/the emissions of a ship, depending on its design, whereas operational efficiency indicators also account for how a ship is operated. For all the indicators in this section, the lower the value, the higher the efficiency of the ship.

The year 2024 represents the seventh reporting year of the EU MRV system. As such, a substantial amount of data on reporting ships has become available, allowing for an assessment of the evolution of both the technical and operational efficiency of the monitored fleet, and also the robustness of the reported data.

As in previous years, such an analysis was carried out by means of a graphical analysis, plotting the relevant indicators per ship type against the cargo carrying capacity. This year's analysis confirmed the gradual increase in data correlation values from the monitored fleet over the period, thus highlighting the increased maturity of the MRV framework. Overall energy efficiency data quality has improved over time as the number of outliers detected through regression calculation declined. Efficiency trends remain stable especially for top emitters segments of the fleet as confirmed by the overlap of the regression curves for different reporting periods and the increase in correlation values compared to 2018 for most of the reporting ship types, as detailed in Annex 4.

In conclusion, the seventh MRV reporting year confirms the consistency of reported data, and therefore the increasing robustness of the monitoring, reporting, and verification framework for maritime transport. At the same time, the year 2024 recorded the shift to more accurate technical efficiency reporting for existing ships[57] as well as the start of reporting by new subtypes[58] to further support data granularity.

4.1. Technical efficiency

4.1.1. Overview

The EU MRV Maritime Regulation requires ships to report their technical efficiency. This can be done through three indicators depending on the type and year of build of the ship: the Energy Efficiency Design Index (EEDI), the Energy Efficiency Existing Ship Index (EEXI) or the Estimated Index Value (EIV).[59]

The EEDI is an energy efficiency measure implemented at the IMO level with the aim to improve the technical energy efficiency of newbuild ships. Newbuild ships built after 1 January 2013 or 1 January 2015[60] need to meet the minimum EEDI requirements in terms of CO_2 per capacity nautical mile (CO_2/t*nm). The EEDI requirements become more stringent over time, also depending on ship type and size. From January 2023, the EEXI applies to all ships in international shipping of 400 GT and above. The EEXI is implemented at the IMO level and is similar to the EEDI in terms of the formula used to calculate the index, however, the EEXI

[57] Thanks to the increasing reporting of the Energy Efficiency Existing Ship Index (EEXI) by the monitored fleet.

[58] This is the case of offshore and cruise passenger ships, as subtypes of 'Other ship' and 'Passenger ships' respectively. Trends analysis for these new subtypes was not possible this year due to limited data availability.

[59] A fourth, residual, possibility, i.e. report the entry 'not applicable', but only applies to a minority of ship types.

[60] Depending on the ship type and size.

applies to existing ships and not only newbuilds.[61] For ships that were previously subject to the EEDI from newbuilding, the attained EEDI value can be taken as the attained EEXI provided that it is equal or less than the required EEXI value for the ship type and size.[62] The EEDI required values can be less strict than the required EEXI values, depending on the date of construction and corresponding EEDI phase.

The EIV is a simplified version of the EEDI and EEXI to be reported for certain ship types which are out of scope of EEDI or EEXI.

Specific EU MRV reporting requirements regarding the technical carbon efficiency of ships are as follows (European Commission, 2024)[63]:

- The attained EEDI and EEXI has to be reported where required by and in accordance with MARPOL Annex VI, Regulations 22 and 23.[64]
- The EIV has to be reported for ships not covered by the EEDI or the EEXI (for example due to ship size) but which are ship types as listed in:
    - MEPC.231(65), paragraph 3: bulk carrier, gas carrier, tanker, container ship, general cargo ship, refrigerated cargo carrier, combination carrier, Ro-ro cargo ship, Ro-ro cargo ship (vehicle), Ro-ro passenger ship and LNG carrier.
    - MEPC.233(65), paragraph 5: cruise passenger ships having non-conventional propulsion, including diesel-electric propulsion, turbine propulsion, and hybrid propulsion systems.
- Ships of ship types not covered by the above MARPOL Annex VI Regulations or MEPC Resolutions are not required to report their technical efficiency which explains why for some ships the 'not applicable' value was entered in the technical efficiency section.

In 2024, a total of 2 862 ships reported their EEDI, 9 286 reported their EEXI and 2 276 reported their EIV (with an additional 388 'not applicable' reports). Compared to 2023, significantly more ships reported their EEXI value (6 091 in 2023) while the number of ships reporting their EIV decreased (2 924 in 2023). The increase in ships reporting the EEXI extends a trend first noted in 2023 and can be explained by the introduction of the EEXI measure that year. This led many ships to report the more recent EEXI value instead of the EEDI while ships which previously reported their EIV (being a ship type covered by the EEDI but delivered before the IMO requirements started) also reported their EEXI instead.

4.1.2. Evolution of the Technical Efficiency of the monitored fleet

The technical efficiency of the monitored fleet was further analysed by means of a graphical analysis,[65] by plotting EEDI and EIV values[66] against a ship's capacity (DWT or Gross Tonnage). Regression curves with R2-values have then been calculated. Similarly to previous years, technical efficiency trends did not significantly change, as shown by the different reporting periods' regression curves shown in Annex 4. These overlap for the most

[61] This is required for ships subject to the EEXI requirement on the basis of MARPOL, Annex VI, Chapter 4, Regulations 22.

[62] See Marpol Annex VI Regulation 23.3 (Attained EEXI).

[63] General Guidance Document for shipping companies (Guidance Document no.1), published under the section 'Documentation' at the following page: https://climate.ec.europa.eu/eu-action/transport/reducing-emissions-shipping-sector_en#documentation.

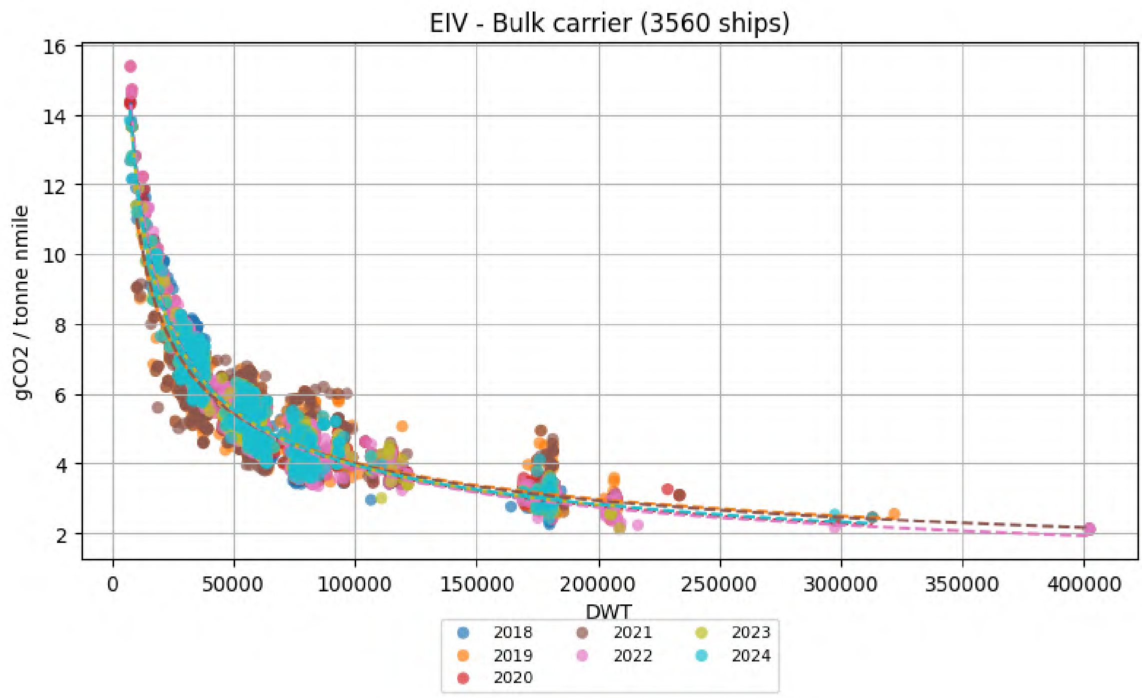
[64] Regulation 19 (Application) and Regulation 20 (Attained EEDI) are part of Chapter 4 (Regulations on energy efficiency for ships) of Annex VI of the IMO MARPOL Convention.

[65]In the presented graphs the scattered points represent the Energy Efficiency indicator (Y) against the Ship Size (X). The dashed line represents the Power Regression curve (Y=a·X^b).

[66] EEXI values were not part of the graphical analysis since 2023 was the first year in which EEXI was reported.

representative ship types in the monitored fleet[67], for which a high correlation between the technical efficiency index value and the carrying capacity was recorded. In addition, an improvement in correlation values is visible for the overall period 2018-2024, across different ship types.

As a representative example, the graph below shows the EEDI graphical analysis for bulk carriers. Robust R^2 correlation values were calculated (above 0.6) for a total of nine ship types, representing 77% of total emissions reported in 2024. The graphs produced for this analysis, showing the most significant values, are presented in Annex 4.



	2018	2019	2020	2021	2022	2023	2024
R^2	0.896	0.825	0.903	0.824	0.916	0.917	0.897

Figure 30: Plot and table of attained EIV values for bulk carriers over the reporting years and associated trendlines

4.3. Operational efficiency

4.3.1. Overview: EEOI and AER

According to the EU MRV Maritime Regulation, ships have to monitor their average operational energy efficiency by using at least four indicators:

1. Fuel consumption per distance;
2. Fuel consumption per transport work;[68]

[67] The analysis of reported EEDI in some segments highlighted improvements in most recent years, as in the case of EEDI values for container ships represented in Figure 38.

[68] Transport work expresses the product of distance travelled per the amount of cargo carried over the period. For an overview of the metrics applied under the EU MRV to the different ship types, see Table 10 in Annex 4.

3. CO_2 emissions per distance;
4. CO_2 emissions per transport work (also referred to as Energy Efficiency Operational Indicator (EEOI)).

which are calculated as follows:

1. $\text{Fuel consumption per distance} = \frac{\text{Total annual fuel consumption}}{\text{Total distance travelled}}$

2. $\text{Fuel consumption per transport work} = \frac{\text{Total annual fuel consumption}}{\text{Total transport work}}$

3. $\text{CO}_2 \text{ emissions per distance} = \frac{\text{Total annual CO}_2\text{ emissions}}{\text{Total distance travelled}}$

4. $\text{CO}_2 \text{ emissions per transport work} = \frac{\text{Total annual CO}_2\text{ emissions}}{\text{Total transport work}}$

The metric for the transport work can thereby differ, depending on the ship type (see Commission Implementing Regulation (EU) 2023/2449),[69] e.g. depending on whether cargo or passengers or both are transported. The majority of the ships applies a metric which uses the mass of the cargo transported, measuring their transport work in tonne nautical miles. (see Table 8 in the Annex for more details about the indicators reported per ship type).

The Energy Efficiency Operational Indicator (EEOI) is defined, in its most simple form, as the ratio of mass of CO_2 emitted per unit of transport work. As it varies according to the actual cargo carried, this indicator reflects the carbon intensity of the transport service rendered by each individual ship. Thus, it is highly influenced by the actual loading of ships (including ballast voyages). Keeping everything else equal, ships with higher payload utilisation will therefore benefit from a lower EEOI.

The principal challenge with regards to the operational efficiency of ships lies in the fact that there are various factors that have an impact on the operational efficiency of a ship. Some of these factors, such as the speed of a ship, can be determined by the operator, while others, like voyage conditions (wind, waves etc.), cannot. Analysing operational efficiency at ship type level and on an annual basis allows to average out factors such as voyage conditions and for ships, like liner ships or ferries, which operate on the same/comparable routes in the different years, a change of the ships' operational efficiency between the years will likely be mainly linked to a change in the operation of the ship, like a speed reduction.

Based on the data reported by the companies, an additional operational efficiency indicator, the AER (Annual Efficiency Ratio) can be determined. This indicator works with a proxy for the ships' transport work, i.e. the deadweight tonnage, resulting in the following metric: g CO_2/(dwt*nautical miles). Comparing the different indicators, the AER features comparably less variation, since the proxy for the ships' transport work, i.e. the deadweight tonnage, is constant.

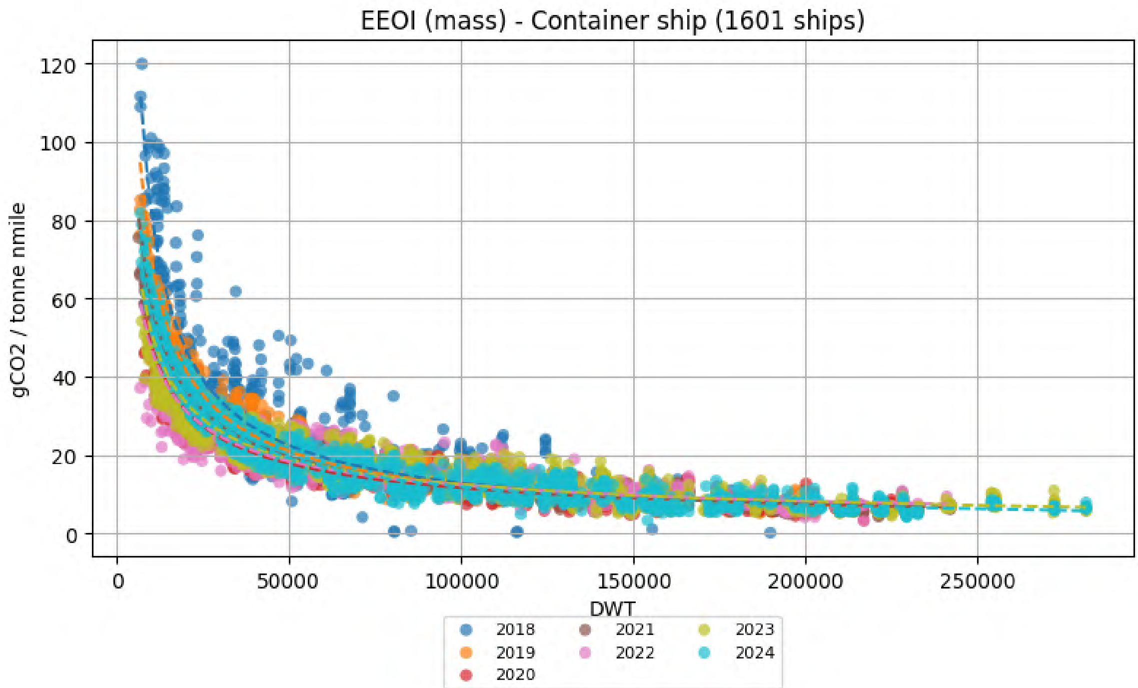
[69] Commission Implementing Regulation (EU) 2023/2449 of 6 November 2023 laying down rules for the application of Regulation (EU) 2015/757 of the European Parliament and of the Council as regards templates for monitoring plans, emissions reports, partial emissions reports, documents of compliance, and reports at company level, and repealing Commission Implementing Regulation (EU) 2016/1927 OJ L, 2023/2449, ELI: http://data.europa.eu/eli/reg_impl/2023/2449/oj

4.3.2. Evolution of the operational efficiency of the monitored fleet

The evolution of the operational efficiency of the fleet was analysed by means of a graphical analysis, applied to both EEOI and AER indicators. To this end, the AER and EEOI per ship type have been plotted against the cargo carrying capacity (in DWT, GT or both). Regression curves with R^2-values have then been calculated.

The analysis highlights that, also in 2024, the operational efficiency trends did not significantly change, as shown by the different reporting periods' regression curves overlap as thirteen ship types have shown robust R^2 correlation values (above 0.6), representing 95% of total reported emissions in 2024. The graphs for the most significant ones are grouped in Annex 4.

As a representative example, the graph below shows the EEOI graphical analysis for container ships.



	2018	2019	2020	2021	2022	2023	2024
R^2	0.708	0.913	0.844	0.916	0.81	0.858	0.918

Figure 31: Plot and table of attained EEOI values of container ships over the reporting years and associated trendlines

5. Assessing the implementation of the EU MRV Maritime Regulation

With the aim of continuous improvement in the implementation of the EU MRV Maritime Regulation, the Commission and the European Maritime Safety Agency support shipping companies and verifiers through different means, including guidance documents, FAQs, webinars, and dedicated functional helpdesks. Periodic meetings are also organised through the year in which outstanding issues concerning the Regulation's implementation can be discussed.

5.1. Quality and completeness of submitted data

Some of the verified emissions reports include a few outliers, i.e. relatively easily identifiable, obvious mistakes.[70] Figure 32 shows that the number of emissions reports with one or more outliers had been decreasing over the first 6 compliance cycles of the MRV. Whereas in 2018 there were 272 emissions reports with one of more outliers (2.34% of all emissions reports), the number of emissions reports with outliers decreased each year down to 44 in 2023 (0.35% of all emissions reports). However, in 2024, the number of emissions reports with outliers was for the first time higher than the previous reporting year.

In 2024, 62 emissions reports had one or more outliers (0.49% of all emissions reports). The increase in outliers in 2024 as compared to 2023 is mainly caused by reports where the sum of reported emissions per geographical scope substantially deviates[71] from the ship's reported total emissions. It is likely that this mismatch is caused by the new geographical differentiation that was introduced in the 2024 reporting system, to the extent that emissions "within ports" were added as a new reporting parameter for the emissions under scope from 1 January 2024.[72] Prior to 2024, ships only had to report separately port emissions under a Member State's jurisdiction "at berth", while the emissions in port while not at berth had to be aggregated in total reported emissions only. Compared to 2023, in 2024 there were also more emissions reports with outliers concerning an implausibly high average speed during the reporting period[73] (11 emissions reports in 2024 compared to 3 in 2023).

Although the number of emissions reports with outliers increased in 2024, the affected reported emissions were still relatively lower than in previous years. This is because most outliers were primarily found in reports with fewer reported emissions. 2024 was still the reporting year with the second lowest number of emissions reports with identified outliers throughout the 2018-2024 period. Figure 32 also shows that emissions reports with outliers account for only a small share of total emissions reported under the MRV system. Since 2020, the share of reports containing outliers has been 1% or less of the total reported emissions each year.

[70] Across the whole present report, in view of ensuring the accuracy of data, clear outliers identified during the analytical process have been discarded, as in previous years.

[71] For the purpose of this analysis, a deviation of more than 5% was considered to be an outlier.

[72] See Annex II, Part D, point 7 of Commission Implementing Regulation (EU) 2023/2449.

[73] The limit value for this outlier is an average speed of 30 knots during the reporting period.

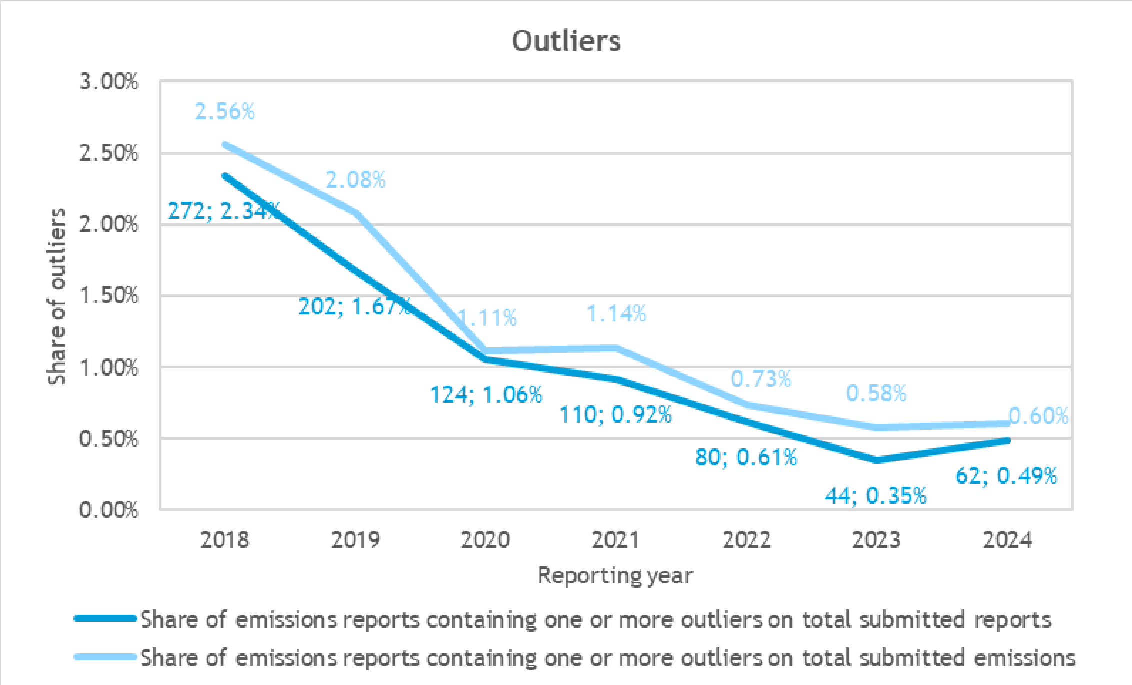


Figure 32: Quality of submitted data, impact of outliers

5.2. Punctuality

Starting the reporting period 2024, shipping companies had to submit their verified emissions report[74] to the Commission and the Administering Authority by 31 March of the year following the year of emissions, instead of 30 April, as during previous years. The share of reports submitted by the deadline increased in the last year to its highest level, reaching 69.1%, up from 52% for the reporting period 2023 (lowest year on record in terms of submission punctuality) and 64.5% for the reporting period 2021 (second highest year on record in terms of submission punctuality). The share of reports which verifiers had successfully verified as satisfactory at the end of March also considerably improved, reaching 76.5% up from 60.8% for the reporting period 2023 (lowest year on record in terms of submission punctuality) and 74.6% for the reporting period 2021 (second highest year on record in terms of submission punctuality).

The considerable improvement of punctuality indicators in respect of the reporting period 2024, despite the kick in of the earlier reporting deadline of end of March, can be explained by the need for companies to aggregate their ship-level emissions reports to meet the reporting deadlines at company level in the Union Registry to comply with their EU ETS obligations. As in previous years, it is still possible for shipping companies to submit their ship-level emissions reports after the deadline of 31 March, which still allows companies to obtain a valid MRV document of compliance by 30 June and surrender the due EU allowances in the Union Registry by 1 October.

[74] To ensure comparability with previous reporting period, only ship-level emissions report are considered. For the reporting periods before 2024, the deadline of 31 March is considered to produce the punctuality rate.

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Annex 1 Abbreviations and definitions

Table 2 Abbreviations and definitions

Abbreviation	Meaning
AER	Annual Efficiency Ratio
AFIR	Alternative Fuels Infrastructure Regulation
BDN	Bunker Delivery Note
CII	Carbon Intensity Indicator
DCS	Data Collection System
DoC	Document of Compliance
dwt	Deadweight tonnage
EC	European Commission
EEA	European Economic Area (EU-27 + Norway, Iceland, Liechtenstein)
EEDI	Energy Efficiency Design Indicator
EEOI	Energy Efficiency Operational Indicator
EEXI	Energy Efficiency Existing Ship Index
EIV	Estimated Index Value
EMSA	European Maritime Safety Agency
ER	Emissions Report
EU	European Union
GHG	Greenhouse Gas
GT	Gross tonnage
HFO	Heavy Fuel Oil
IGU	International Gas Union
IMO	International Maritime Organization
LFO	Light Fuel Oil

LNG	Liquefied Natural Gas
LPG	Liquefied Petroleum Gas
LRIT	Long Range Identification and Tracking
MARINFO	EMSA's internal database fed by information bought from commercial providers
MARPOL	International Convention for the Prevention of Pollution from Ships
MEPC	Marine Environmental Protection Committee
m/m	Mass per mass
MP	Monitoring Plan
MRV	Monitoring, Reporting, Verification
MS	Member State
NAB	National Accreditation Body
n miles	Nautical miles
Pax	Passenger
PSC	Port State Control
RED	Renewable Energy Directive
Ro-ro ship	Roll-on/roll -off ship
Ro-pax ship	Roll-on/roll-off passenger ship (ship built for freight vehicle transport along with passenger accommodation)
SEEMP	Ship Energy Efficiency Management Plan
TEN-T	Trans-European Transport Network
THETIS-MRV	EMSA web-based application established for the implementation of the EU MRV Maritime Regulation (e.g. to be used by companies to generate emissions reports).
UNCTAD	UN Trade and Development
VLSFO	Very Low Sulphur Fuel Oil

Annex 2 Outcomes of the seventh compliance cycle

A.2.1. Fuel/emissions monitoring methods

Under the EU MRV Maritime Regulation, companies can apply four different fuel/emission monitoring methods: Bunker Fuel Delivery Note (BDN) and period stock takes of fuel tanks (Method A), bunker fuel tank monitoring on-board (Method B), flow meters for applicable combustion processes (Method C) and direct CO_2 emissions measuring (Method D). Ships can also apply a combination of these methods.

Table 3 Fuel monitoring methods

Share of ships that have applied method A-D alone or in combination; 2018 to 2024

	2018	2019	2020	2021	2022	2023	2024
A	48%	51%	51%	51%	54%	56%	53%
B	34%	32%	32%	31%	29%	33%	34%
C	33%	30%	31%	31%	31%	30%	36%
D	0%	0%	0%	0%	0%	0%	0%
Ships applying one method only	85%	86%	87%	87%	87%	82%	76%
Ships applying more than one method	15%	14%	13%	13%	13%	18%	24%
Ships applying methods A and B	3%	3%	3%	2%	2%	3%	2%
Ships applying method C only	21%	20%	20%	20%	20%	15%	15%

A.2.2. Verifiers and National Accreditation Bodies

In the reporting period 2024, 22 different accredited verifiers performed verification activities required for the shipping companies' compliance with the EU MRV Maritime Regulation. The five verifiers responsible for most of the submitted reports covered around 72% of all the emissions reports that were submitted in 2024, a figure fully in line with the one recorded for the previous reporting periods since 2018. Seven different national accreditation bodies (NABs) have accredited the 22 verifiers active in the 2024 reporting period. Four of these NABs have accredited more than one verifier.

4 of the 22 verifiers are not located in an EEA country (see Table 5) and the highest number of verifiers is located in Greece (8 out of the 22).[75]

Table 4 Number of verifiers accredited per National Accreditation Body

Number of verifiers accredited per National Accreditation Body in 2018 to 2024*

National Accreditation Body	2018	2019	2020	2021	2022	2023	2024
ACCREDIA – IT	1	2	1	1	1	2	2
COFRAC - FR	3	3	2	2	2	2	2
Croatian Accreditation Agency – HR	1	1	1	1	0	0	0
German Accreditation Body (DAkkS) – DE	5	5	5	5	5	5	6
The Danish Accreditation Fund (DANAK) – DK	0	0	0	1	0	0	0
Dutch Accreditation Council (RvA) - NL	1	1	1	1	1	1	1
Hellenic Accreditation System (ESYD) – EL	6	5	5	5	6	6	9
Polish Centre for Accreditation (PCA) – PL	1	1	1	1	1	1	1
Portuguese Institute for Accreditation (IPAC) – PT	1	1	1	1	1	1	1
Swedish Board for Accreditation and Conformity Assessment (Swedac) - SE	1	1	1	1	1	1	0
The United Kingdom Accreditation Service (UKAS) - UK	1	1	1	1	1	0	0
Total	**24**	**21**	**19**	**20**	**19**	**19**	**22**

*Verifiers with the same accreditation number are considered as one verifier.

[75] It should be noted that due to the mutual recognition of accreditation, an accredited verifier under the Maritime MRV system can be accredited by any EU NAB, irrespective of its country of establishment.

Table 5 Number of verifiers

Number of verifiers per country in 2018 to 2024

Country	2018	2019	2020	2021	2022	2023	2024
Croatia	1	1	1	1	0	0	0
Cyprus	0	0	0	0	0	0	1
France	2	2	2	2	2	2	2
Germany	3	3	3	3	3	3	4
Greece	6	5	5	5	6	6	8
Italy	1	1	1	1	1	1	1
Poland	1	1	1	1	1	1	1
Portugal	1	1	1	1	1	1	1
Sweden	1	1	1	1	1	1	0
United Kingdom	4	2	0	0	0	0	0
China	1	1	1	1	1	1	1
India	1	1	1	1	1	1	1
Japan	1	1	1	1	1	1	1
Republic of Korea	1	1	1	1	1	1	1
Russian Federation	0	0	0	1	0	0	0
Total	**24**	**21**	**19**	**20**	**19**	**19**	**22**

A.2.3. Port State Control inspections

According to Article 19(2) of the EU MRV Maritime Regulation (2015/757) each Member State shall ensure that any inspection of a ship in a port under its jurisdiction carried out following Directive 2009/16/EC includes checking that a valid MRV Document of Compliance (DoC) is carried on board. Figure 33 provides an overview of the number and the outcome of the inspections of the MRV DoC during Port State Control (PSC) inspections in EEA Member States for the period 2019-2025, which refers to the seven compliance years associated to the reporting years 2018-2024.

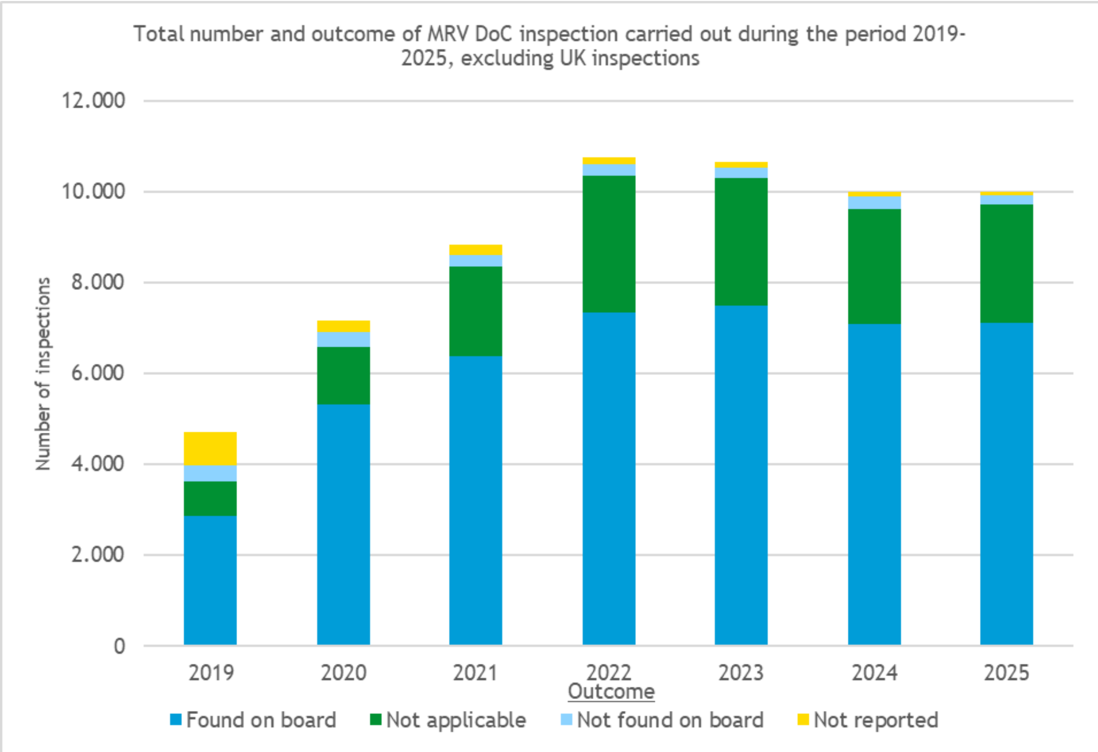


Figure 33: Total number and outcome of MRV DoC inspection as part of PSC inspection over the period 2019-2025

During the compliance checks carried out in respect of the first seven reporting years, 62 104 ships were inspected to confirm the presence of valid MRV DoC on board the ship. 70% of these ships were able to present a valid DoC, while 24% of the ships were not required to carry a valid MRV DoC onboard. On aggregate, over the seven compliance cycles, only 3% of the inspected ships could not produce a valid DoC.[76] The yearly share of ships for which a valid DoC was not found onboard has considerably decreased after the first two compliance years, during which much higher values were registered (7.4% in 2019 and 4.3% in 2020) and reached its lowest rate in 2025 at 2%.

[76] The value ‘not reported’ refers to cases where the PSC inspector did not declare the outcome of the inspection with respect to the MRV DoC. Those accounted for around 3% of inspected ships over the entire period 2019-2025, but has been rapidly decreasing over time, from 15.6% in 2019 to only 0.8% in 2025.

Annex 3 Main extra-EU flows

Table 6 provides the top 15 extra EU-27 flows by gross weight handled in main ports over the years 2018 to 2024, in millions of tonnes. The 15 countries related to these flows remained fairly stable over the last seven years. However, 2024 records a significant increase in inward flows from Canada, being the highest on record in this period. The position of other countries within the top 15 in terms of annual volume of the flow also varies over time. In 2024, inward flows from China and Brazil were equal while in 2023 more flows were recorded from Brazil. A strong increase in inward flows from Ukraine can also be noted since 2022. Moreover, inward flows from Norway have been moderately increasing each year since 2020 while those from the UK have been decreasing since 2022.

Concerning outwards flows, the volumes of goods handled in EU ports towards the UK and Morrocco moderately increased compared to 2023. Outward flows to Morocco were, in 2024, the highest ever recorded in the 2018-2024 period. However outward flows to China and Türkiye in 2024 were the lowest recorded in the 2018-2024 period while outwards flows to the USA (East Coast) were the second lowest in the same period. Total EU outflows in 2024 remained dominated by the outward flow to the UK.

The top maritime flows in goods were, in declining order, inward flows of goods from the East Coast of the United States – East Coast (8.7% of the total extra-EU seaborne transport in 2024), the outward flow to the United Kingdom , the inward flows from Norway (each 5.5%), the United Kingdom (4.8%), China, Brazil (each 4.0%), Türkiye (3.9%), Egypt (3.2%), the outward flow to the East Coast of the USA (2.4%), and the inward flow from the Black Sea area of Russia (2.2%).

Table 6 Top 15 extra EU-27 flows by gross weight handled in main ports

Inward and outward flows from/to EU-27 ports (million tonnes)

	2018	2019	2020	2021	2022	2023	2024
Inward flows to EU ports from non-EU ports							
USA: East coast	91.3	106.4	100.0	106.0	147.4	174.5	172.4
NORWAY	85.7	89.9	80.7	81.8	89.7	107.8	109.4
UNITED KINGDOM	109.3	107.7	108.9	101.1	106.5	98.7	96.2
CHINA	61.5	65.4	61.6	72.1	79.1	75.7	79.1
BRAZIL	86.6	76.2	68.5	74.6	76.3	77.7	79.1
TÜRKIYE	73.2	82.2	81.3	92.2	88.7	72.3	78.5
EGYPT	50.0	54.2	47.6	44.4	54.1	64.3	64.2
RUSSIA: BLACK SEA	78.7	81.3	83.2	79.3	71.6	44.2	44.7
Canada: East coast	34.4	34.8	32.7	33.5	34.8	34.9	39.0
LIBYA	28.1	28.0	9.1	32.9	26.3	35.9	36.3
ALGERIA	25.7	28.4	27.6	27.8	25.1	36.1	34.9
NIGERIA	35.0	46.4	39.4	34.4	32.7	39.5	33.3
UKRAINE	28.9	32.5	23.8	23.3	13.9	16.6	27.2
INDIA	19.3	21.4	16.9	23.6	22.0	26.2	26.0
IRAQ	18.9	21.3	13.4	12.8	18.7	27.1	25.4
Outward flows from EU ports to non-EU ports							
UNITED KINGDOM	114.4	108.7	101.6	117.7	109.9	108.3	110.4
USA: East coast	52.9	53.4	47.5	57.1	54.2	53.6	48.5
TÜRKIYE	46.1	48.0	48.9	49.2	45.5	43.0	42.5
MOROCCO	20.4	25.0	27.5	26.9	25.8	29.4	33.8
CHINA	39.7	49.2	57.4	53.7	41.2	40.9	32.6

Source: (Eurostat, 2024)

Annex 4 Technical and operational efficiency of the monitored fleet

A.4.1. Technical efficiency (related to Section 4.1.1.)

Table 7 gives an overview of the number of ships that, per ship type, have reported, the EEXI, the EEDI, the EIV or 'not applicable' as technical efficiency indicator.

Table 7 Number of ships which reported their technical efficiency indicators or 'not applicable' in 2024

Technical efficiency indicators reported per ship type

Ship type	# of ships which reported their EEDI in 2024	# of ships which reported their EEXI in 2024	# of ships which reported their EIV in 2024	# of ships that reported 'Not applicable' in 2024
Bulk carrier	1 178	2 814	680	33
Chemical tanker	395	878	251	22
Combination carrier	0	6	5	0
Container ship	278	1 821	155	3
Container/Ro-ro cargo ship	14	24	33	0
Gas carrier	81	281	27	4
General cargo ship	153	923	326	18
LNG carrier	122	172	63	1
Oil tanker	502	1 364	230	12
Other ship types	11	24	121	234
Other ship types (offshore)	0	0	6	0
Passenger ship	22	175	7	13
Passenger ship (cruise passenger ship)	9	5	0	4
Refrigerated cargo carrier	4	83	39	1
Ro-pax ship	17	234	153	43

Ro-ro ship	18	167	59	0
Vehicle carrier	58	315	121	0
Total	**2 862**	**9 286**	**2 276**	**388**

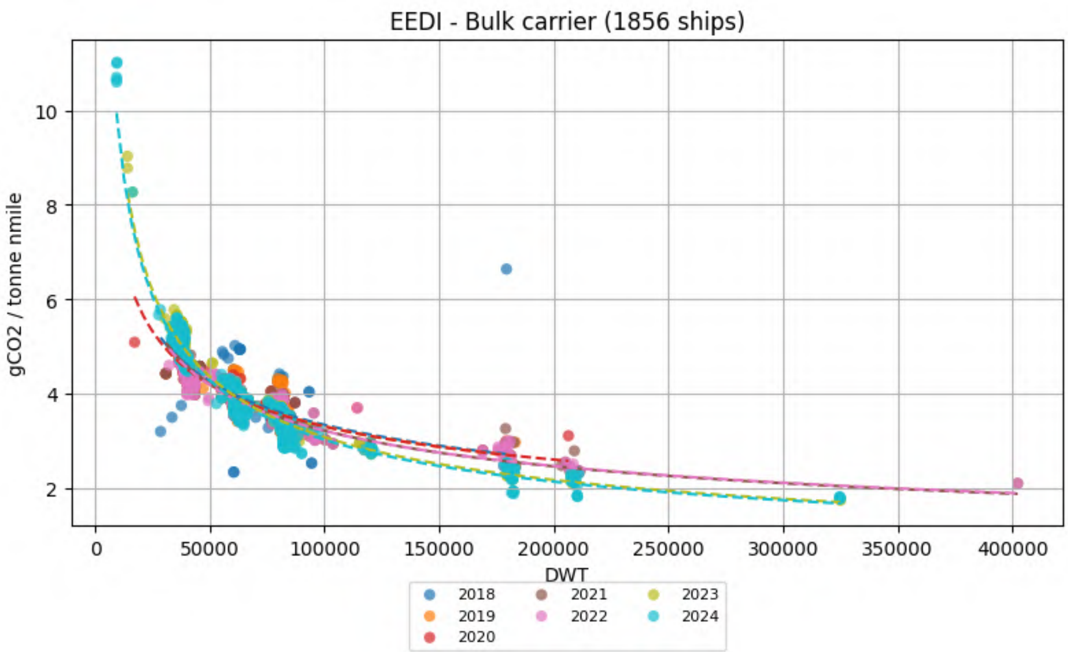
Evolution of the Technical Efficiency of the monitored fleet – graphical analysis

The figures below plot the Estimated Index Value (EIV) and Energy Efficiency Design Index (EEDI) values for the reporting ships over the seven reporting years (2018 to 2024) against the size of the relevant ships measured in deadweight tonnage (see dots with a different colour per year).

The EIV/EEDI trendlines for 2018 to 2024 for the following ship types clearly overlap, which indicates that the technical efficiency of these subsegments of the fleet has not significantly changed. The graphical analysis presents the results for nine unique ship types,[77] representing in emissions terms 77% of total reported emissions in 2024 (up from 74% in 2023). The correlation values are generally increasing over the years, as nearly all ship types show a higher correlation value in 2024 than in 2018.

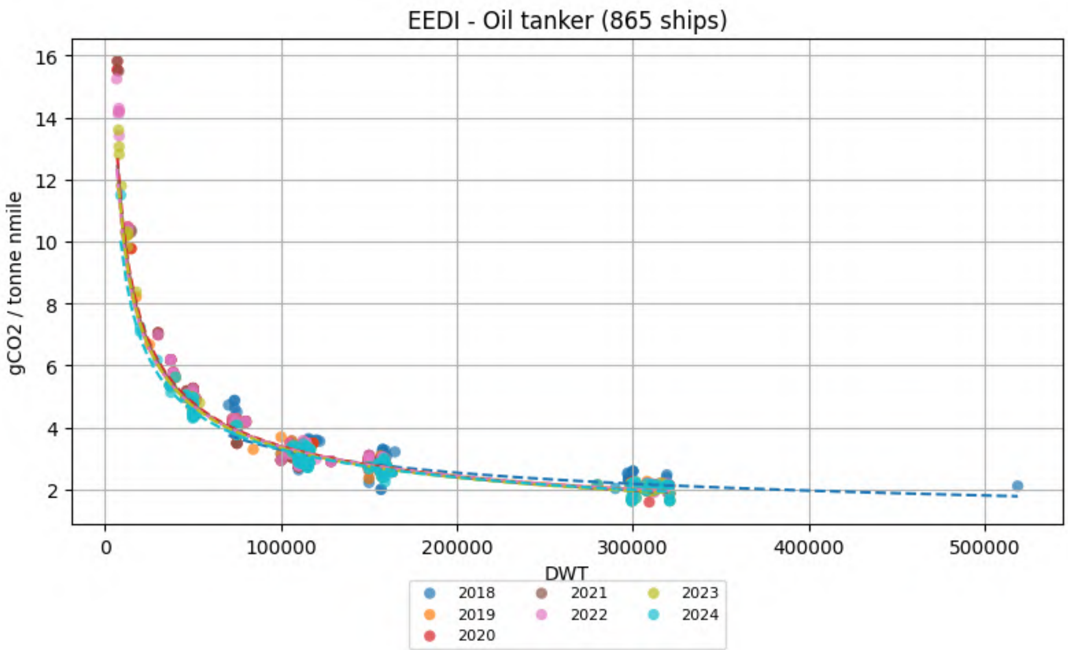
A significant development in 2024 was the transition from EIV (Estimated Index Value) to EEXI (Energy Efficiency Existing Ship Index) reporting as the share of ships reporting EIV declined significantly after 2022, while EEXI data appeared consistently for the first time in 2023 and 2024. Importantly, EEXI data showed strong regression fits (often $R^2 > 0.95$), indicating that EEXI is being reported with high reliability. Since only the last two years are currently available for EEXI reported values, the relevant graphical analysis is not included in the present report.

[77] As in previous annual reports, only graphs with robust R2-indicator (>0.6) for the correlation between EEDI/EIV and the respective cargo carrying capacity have been included in this report. The ship types for which the sample is too small (below 25 occurrences) or the regression line not reliable enough to draw conclusions (e.g. due to high variability/scatter) have not been shown.



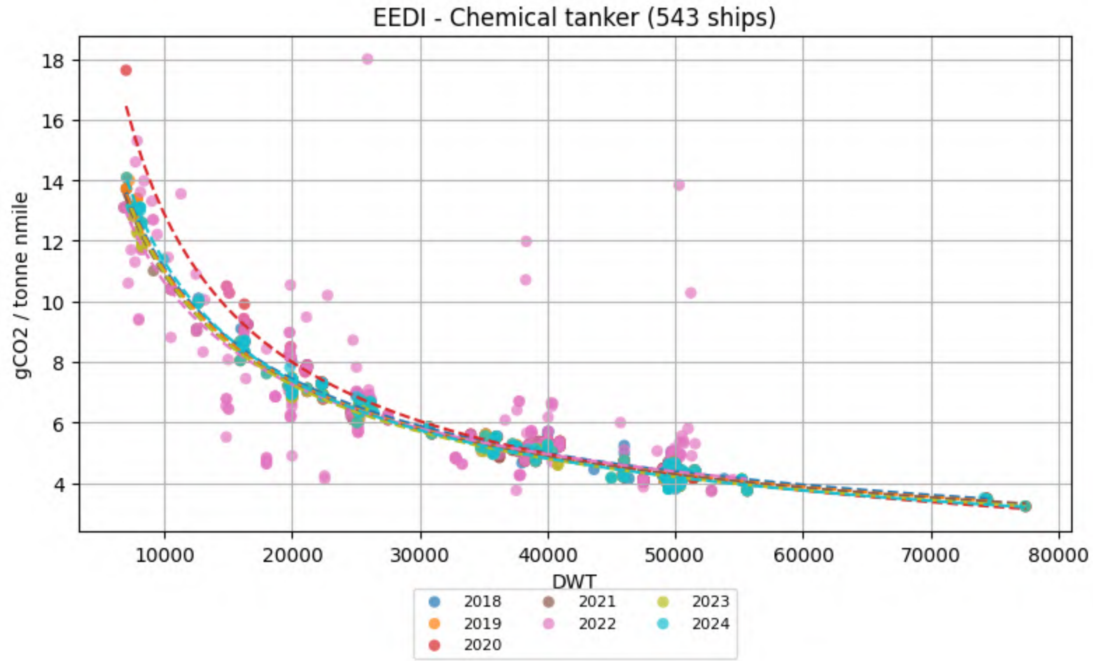
	2018	2019	2020	2021	2022	2023	2024
R^2	0.584	0.803	0.84	0.922	0.893	0.955	0.94

Figure 34: Plot and table of attained EEDI values of bulk carriers over the reporting years and associated trendlines



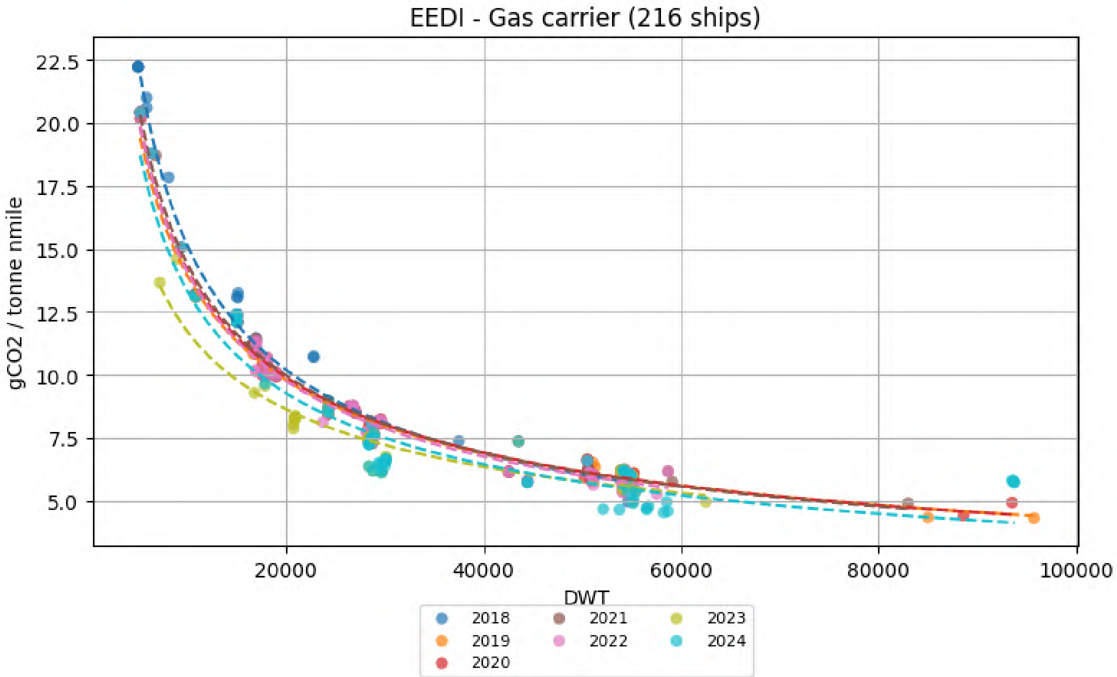
	2018	2019	2020	2021	2022	2023	2024
R^2	0.747	0.944	0.948	0.942	0.95	0.958	0.936

Figure 35: Plot and table of attained EEDI values of oil tankers over the reporting years and associated trendlines



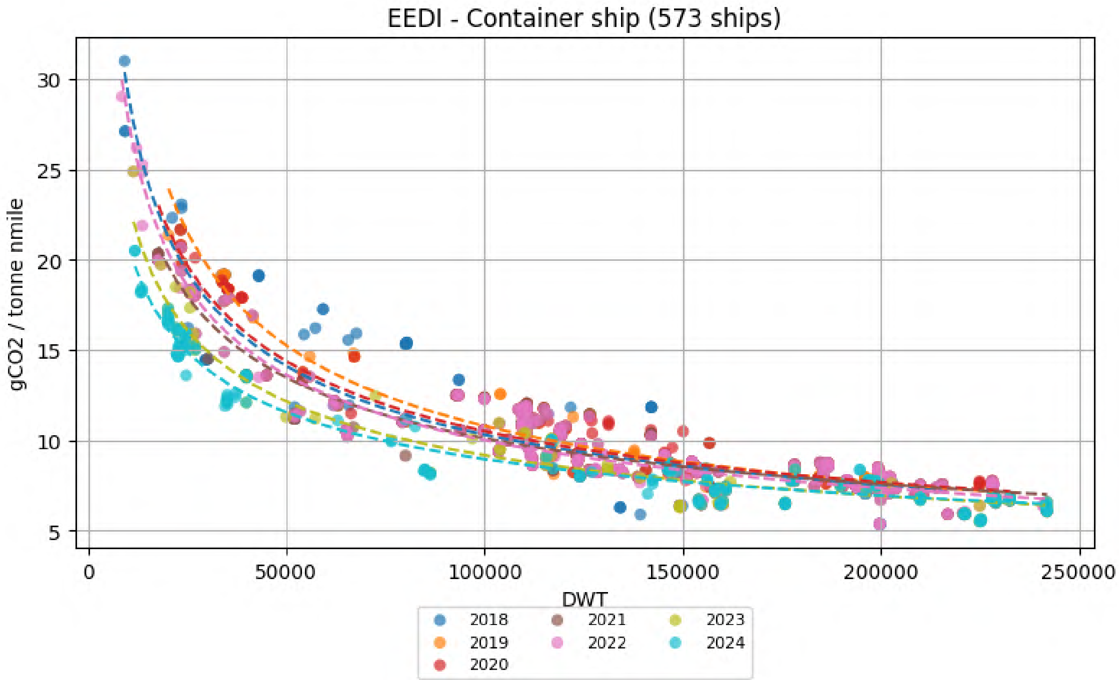
	2018	2019	2020	2021	2022	2023	2024
R^2	0.95	0.972	0.965	0.967	0.802	0.982	0.983

Figure 36: Plot and table of attained EEDI values of chemical tankers over the reporting years and associated trendlines



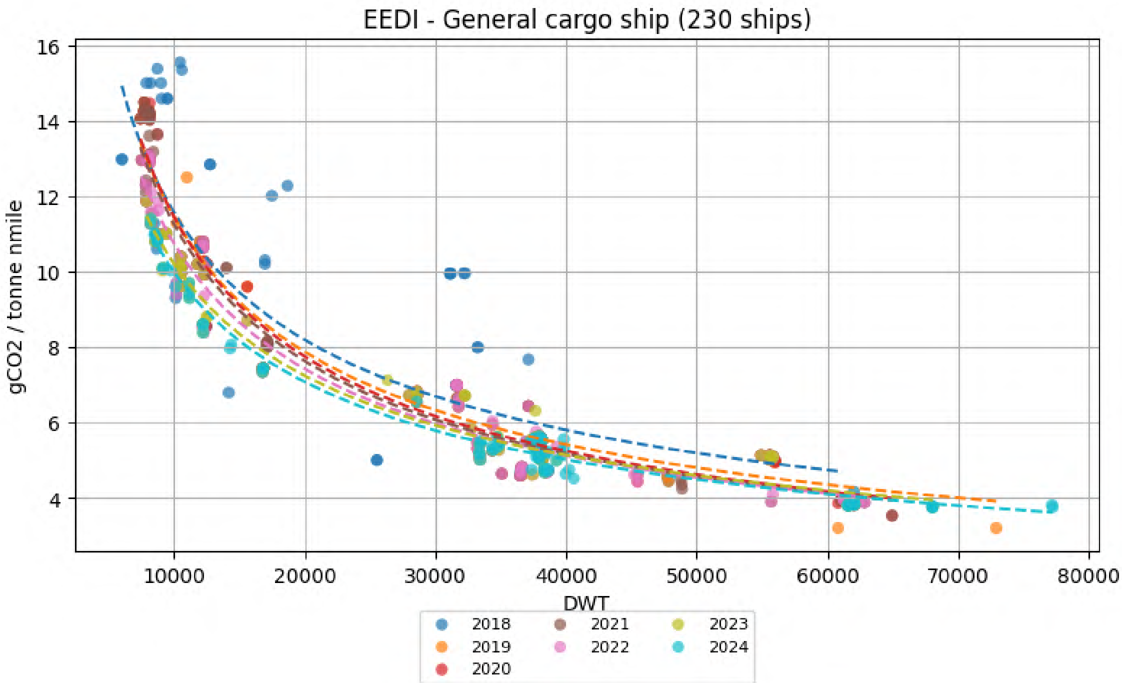
	2018	2019	2020	2021	2022	2023	2024
R^2	0.981	0.988	0.988	0.983	0.964	0.854	0.846

Figure 37: Plot and table of attained EEDI values of gas carriers over the reporting years and associated trendlines



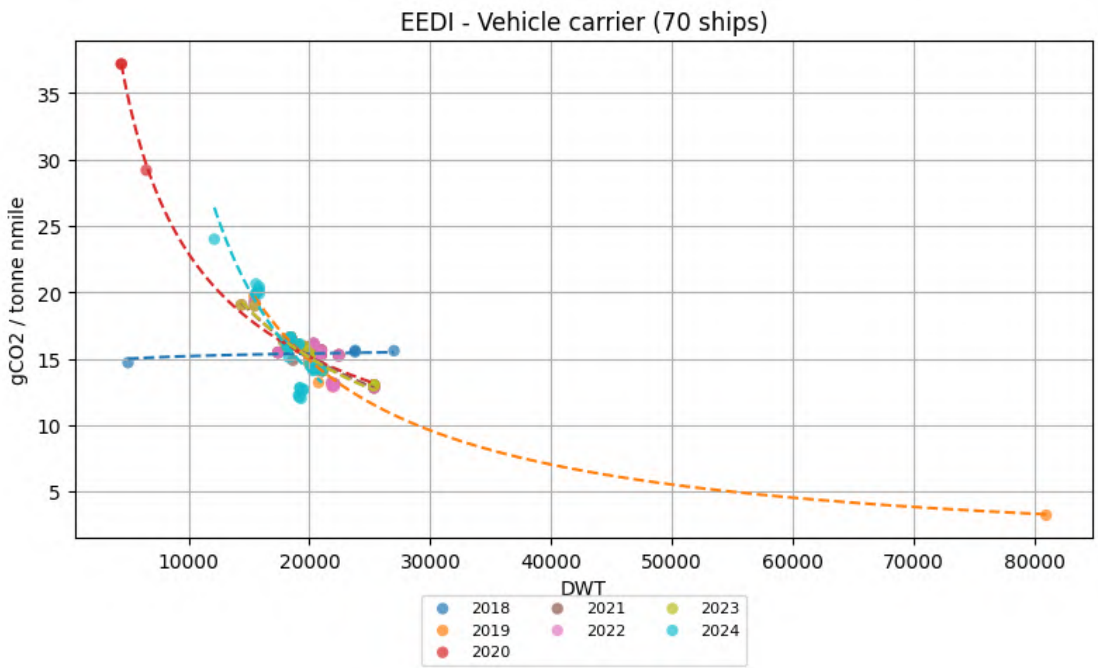
	2018	2019	2020	2021	2022	2023	2024
R^2	0.825	0.922	0.891	0.823	0.846	0.923	0.944

Figure 38: Plot and table of attained EEDI values of container ships over the reporting years and associated trendlines



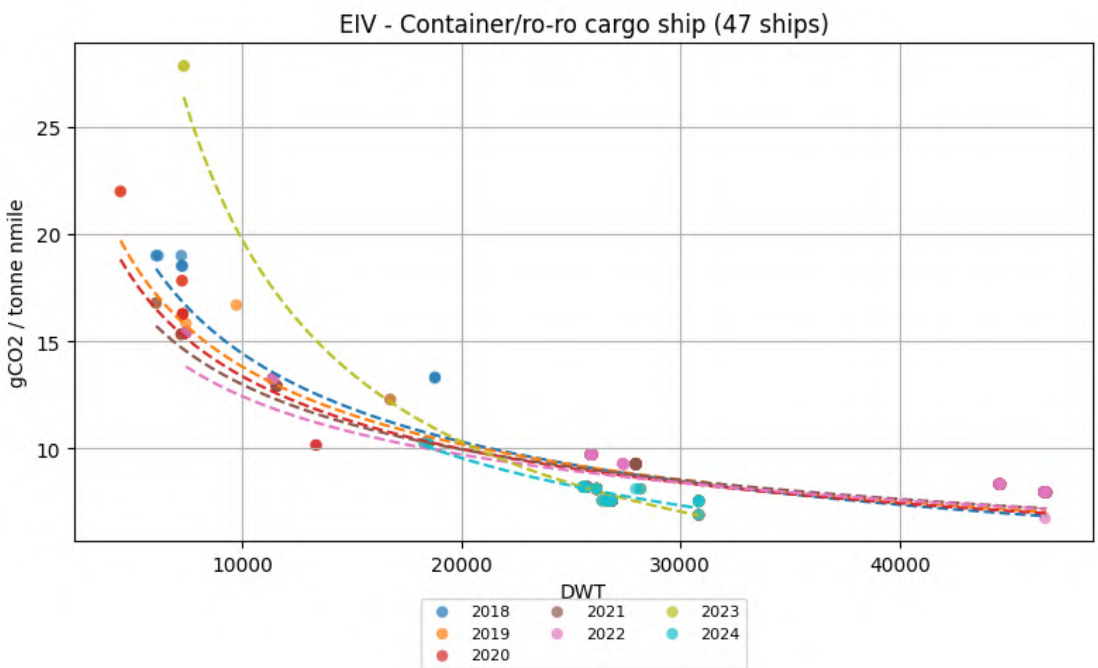
	2018	2019	2020	2021	2022	2023	2024
R^2	0.748	0.947	0.951	0.957	0.949	0.955	0.97

Figure 39: Plot and table of attained EEDI values of general cargo ships over the reporting years and associated trendlines



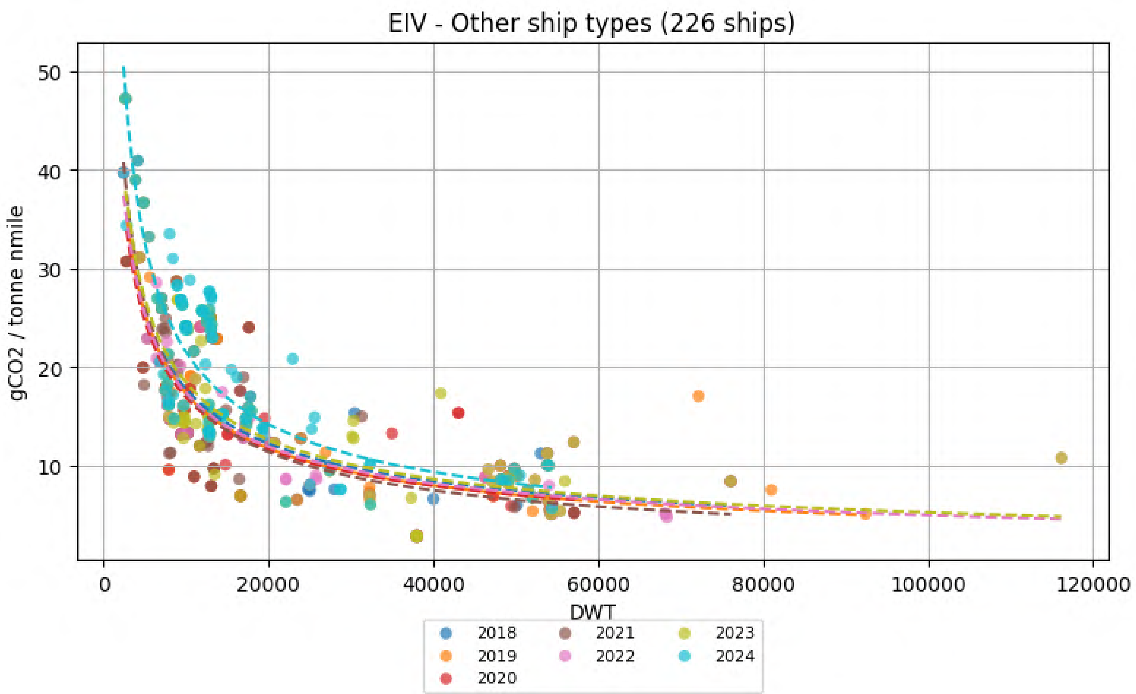
	2018	2019	2020	2021	2022	2023	2024
R^2	0.021	0.976	0.977	0.778	0.747	0.909	0.712

Figure 40: Plot and table of attained EEDI values of vehicle carriers over the reporting years and associated trendlines



	2018	2019	2020	2021	2022	2023	2024
R^2	0.787	0.868	0.824	0.777	0.616	0.977	0.87

Figure 41: Plot and table of attained EIV values of container/ro-ro cargo ships over the reporting years and associated trendlines



	2018	2019	2020	2021	2022	2023	2024
R^2	0.573	0.573	0.504	0.609	0.664	0.577	0.695

Figure 42: Plot and table of attained EIV values of other ship types over the reporting years and associated trendlines

A.4.2. Operational efficiency (related to Section 4.2.)

Operational efficiency indicators

The majority of the ships (have to) apply a metric which uses the mass of the cargo transported, measuring their transport work in tonne nautical miles. In contrast, container/Ro-ro cargo ships and LNG carriers apply a metric which uses the volume of the cargo transported, measuring their transport work in cubic metre nautical miles. Passenger ships naturally determine their transport work in terms of passenger nautical miles. Ro-pax ships, which transport cargo and passengers, report two indicators, one in terms of passenger nautical miles and the other in terms of tonne nautical miles for the freight transported. Three categories of ship types (general cargo ships, vehicle carriers, other ship types) can, instead of mass of the cargo transported, alternatively determine their transport work by means of 'deadweight carried'.[78]

Table 8 gives an overview of the different operational efficiency indicators and metrics that were reported in 2024. The table hereunder only shows the CO_2 efficiency indicators. The corresponding energy efficiency indicators are not presented in the table, but the same metrics hold (kg fuel/n miles instead of kg CO_2/n mile etc.) and have been reported by the same ship types.

Table 8 Operational efficiency indicators

Indicators reported by ship type

Operational efficiency indicator	Indicator Units	Indicator reported by…
Annual average CO_2 emissions per distance	[kg CO_2 / n mile]	All ship types
Annual average CO_2 emissions per transport work (mass distance)	[g CO_2 / (m tonnes · n miles)]	All ship types except • Container/Ro-ro cargo ship, • LNG carrier, • Passenger ships, • Ro-pax ships
Annual average CO_2 emissions per transport work (volume)	[g CO_2 / (m³ · n miles)]	Container/Ro-ro cargo ship LNG carrier
Annual average CO_2 emissions per transport work (dwt carried)	[g CO_2 / (dwt carried · n miles)]	Mainly General cargo ships and Other ship types; very few ships of other types.
Annual average CO_2 emissions per transport work (pax)	[g CO_2 / (pax · n miles)]	Passenger ships Ro-pax ships
Annual average CO_2 emissions per transport work (freight)	[g CO_2 / (m tonnes · n miles)]	Ro-pax ships

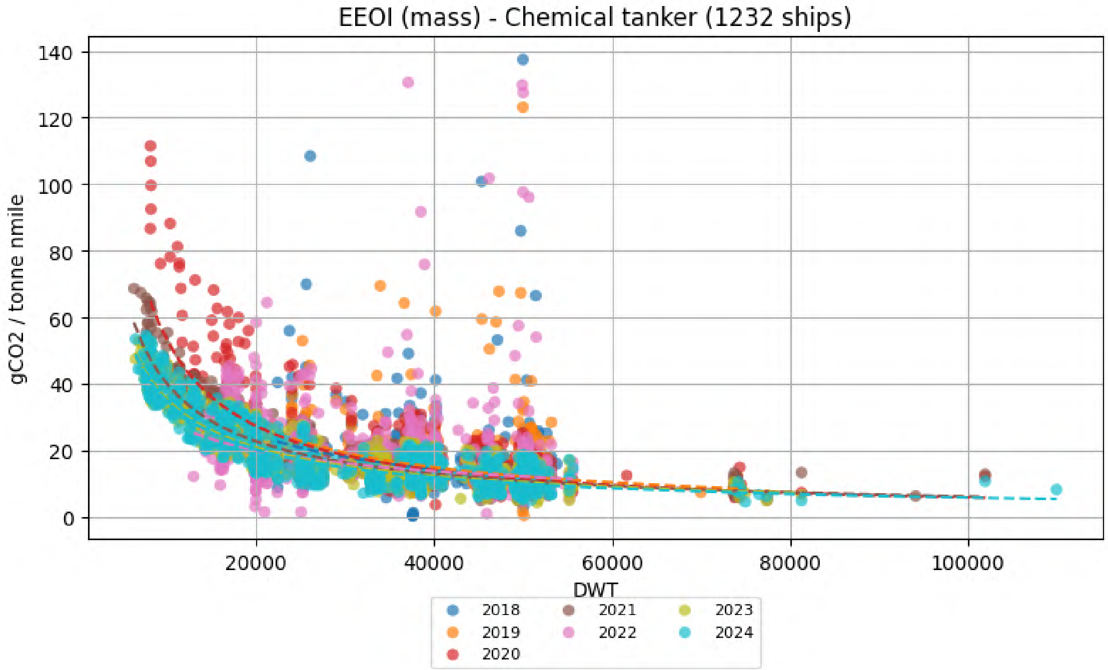
[78] According to Implementing Regulation 2016/1928, deadweight carried (in metric tonnes) is the volume displacement multiplied with the water density, with the mass of fuel and lightweight subtracted.

Evolution of operational efficiency – a graphical analysis

The figures below plot values for the Energy Efficiency Operational Indicator (EEOI) and the Annual Efficiency Ratio (AER) for reporting ships in the seven reporting years (2018 to 2024), against their size - measured in deadweight tonnage or gross tonnage (see dots with a different colour per year).[79]

The EEOI/AER trendlines for 2018 to 2024 for most ship types clearly overlap, which indicates that the operational efficiency of these subsegments of the fleet has not significantly changed. The ship types included in this graphical analysis cover thirteen out of the fifteen unique ship types reporting under the EU MRV system, representing 95% of total reported emissions in 2023 (up from 84% in 2023).

The correlation values are generally increasing over the years, with almost all ship types showing a higher correlation value in 2024 than in 2018. The ship types for which the sample is too small (<25 occurrences), or the regression line is not reliable enough to draw conclusions (e.g. due to high variability/scatter), have not been shown.[80]

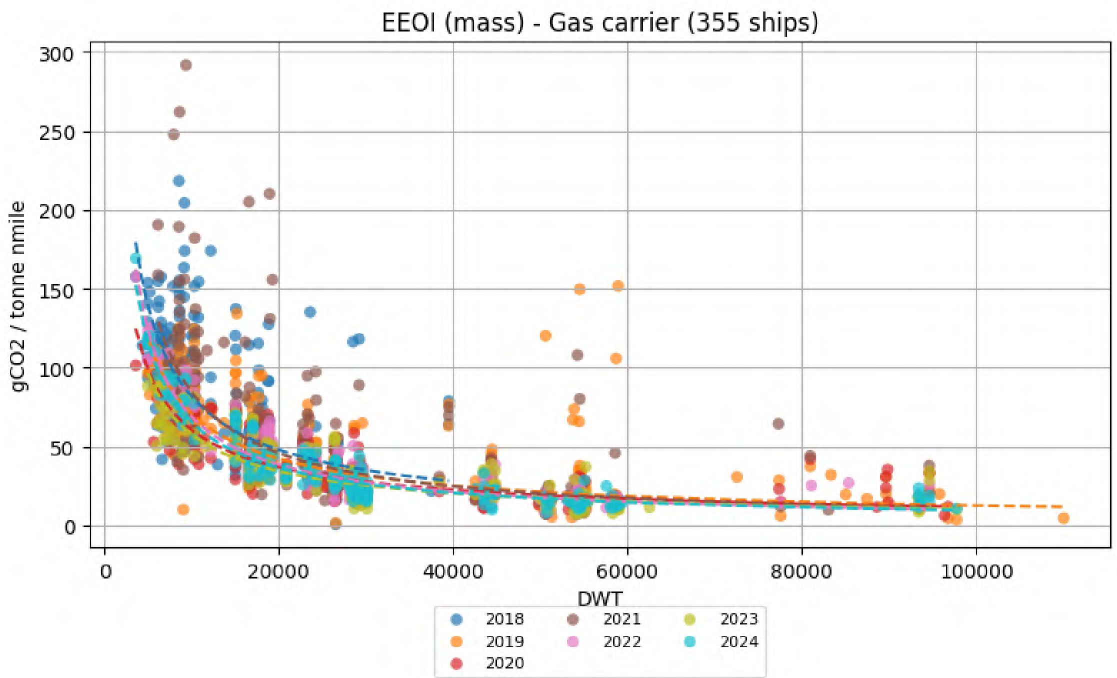


	2018	2019	2020	2021	2022	2023	2024
R^2	0.122	0.19	0.583	0.739	0.199	0.739	0.741

Figure 43: Plot and table of attained EEOI values for chemical tankers over the reporting years and associated trendlines

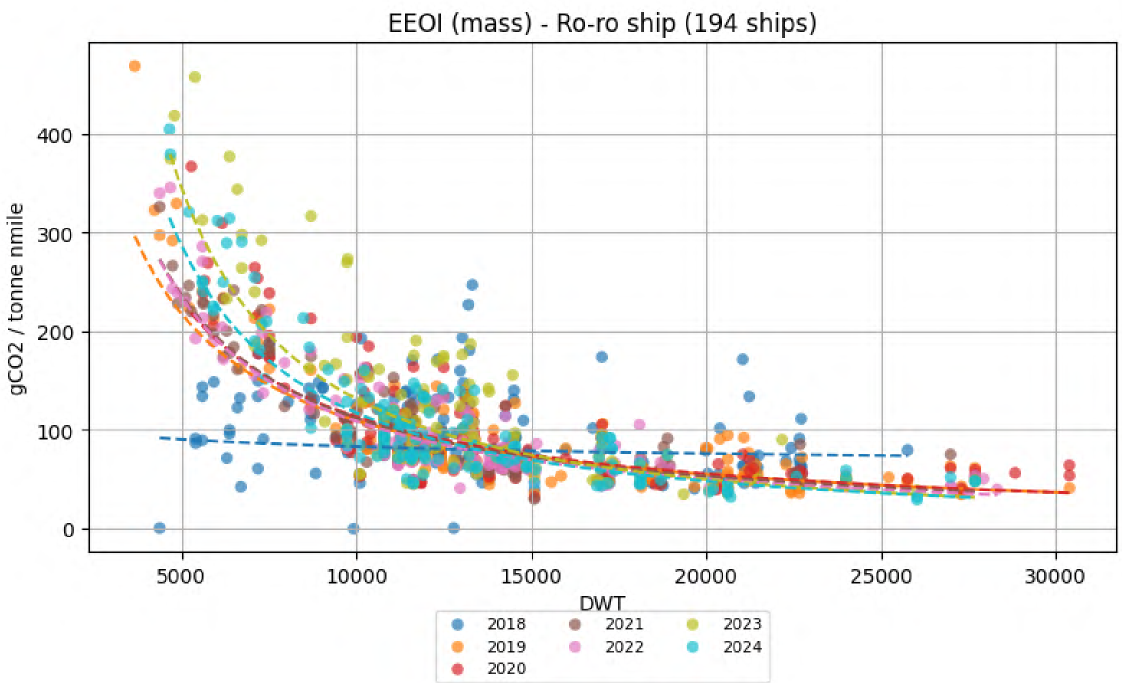
[79] As in previous annual reports, only graphs with a robust R2-indicator (>0.6) for the correlation between EEOI/AER and the respective cargo carrying capacity have been included in this report.

[80] For passenger ships (cruise liners) and Ro-Pax vessels no EEOI/AER regression curve is presented since the long-lasting effects of the COVID-19 pandemic impacting the period 2020-2022 resulted in higher and more fluctuant EEOI and AER values for these types of vessels, limiting therefore the interest of applying a regression analysis.



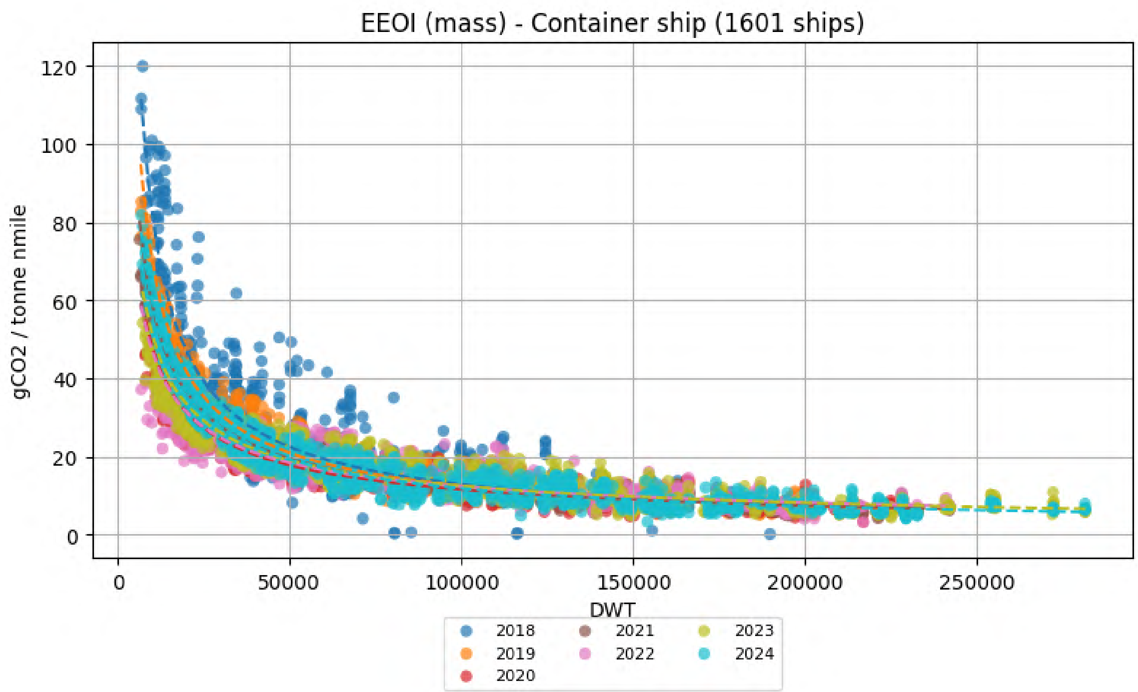
	2018	2019	2020	2021	2022	2023	2024
R^2	0.443	0.541	0.683	0.615	0.817	0.725	0.835

Figure 44: Plot and table of attained EEOI values for gas carriers over the reporting years and associated trendlines



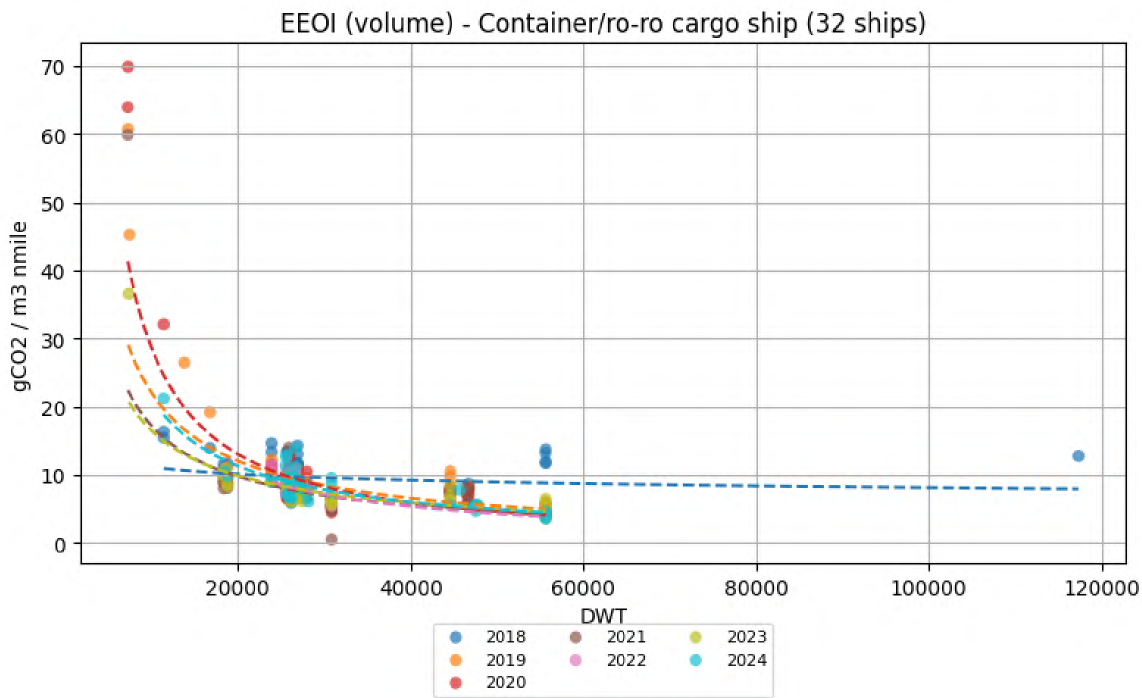
	2018	2019	2020	2021	2022	2023	2024
R^2	0.003	0.698	0.607	0.72	0.739	0.642	0.76

Figure 45: Plot and table of attained EEOI values for Ro-ro ships over the reporting years and associated trendlines



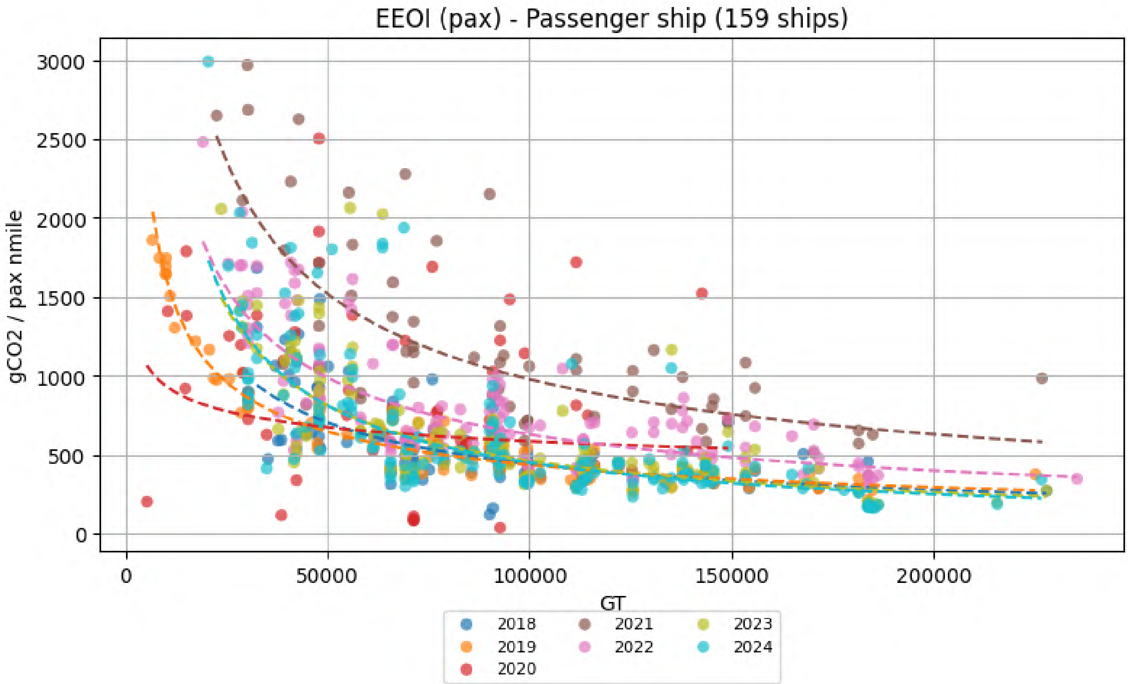
	2018	2019	2020	2021	2022	2023	2024
R^2	0.708	0.913	0.844	0.916	0.81	0.858	0.918

Figure 46: Plot and table of attained EEOI values for container ships over the reporting years and associated trendlines



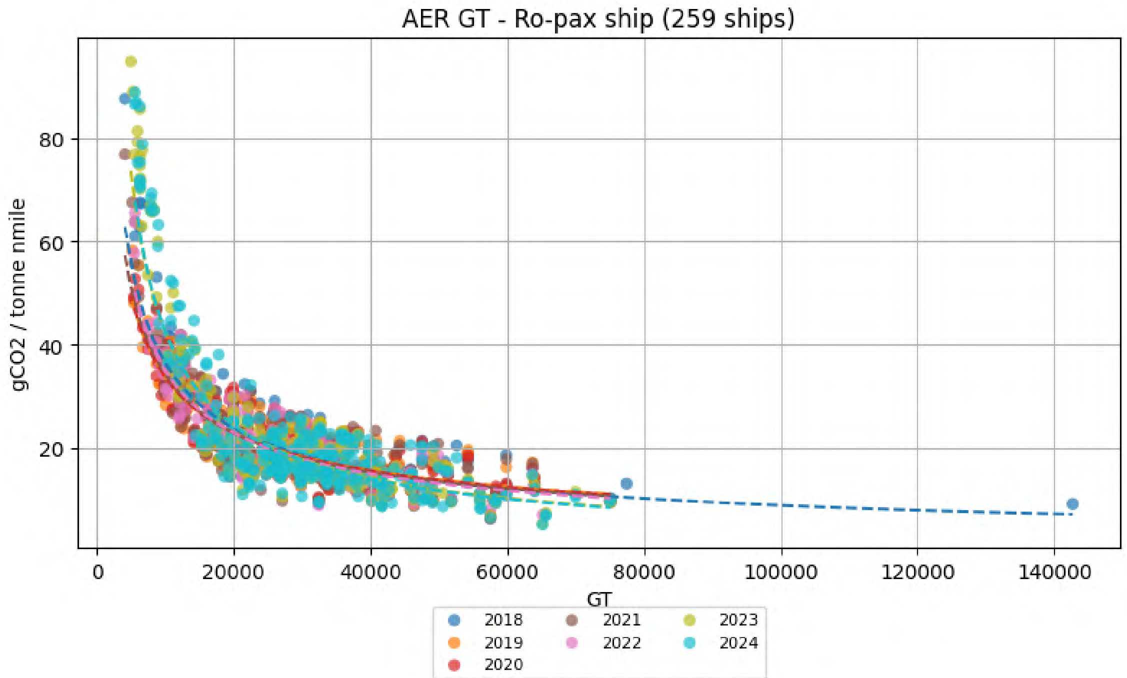
	2018	2019	2020	2021	2022	2023	2024
R^2	0.037	0.647	0.743	0.316	0.476	0.688	0.729

Figure 47: Plot and table of attained EEOI values for container/ro-ro cargo ships over the reporting years and associated trendlines



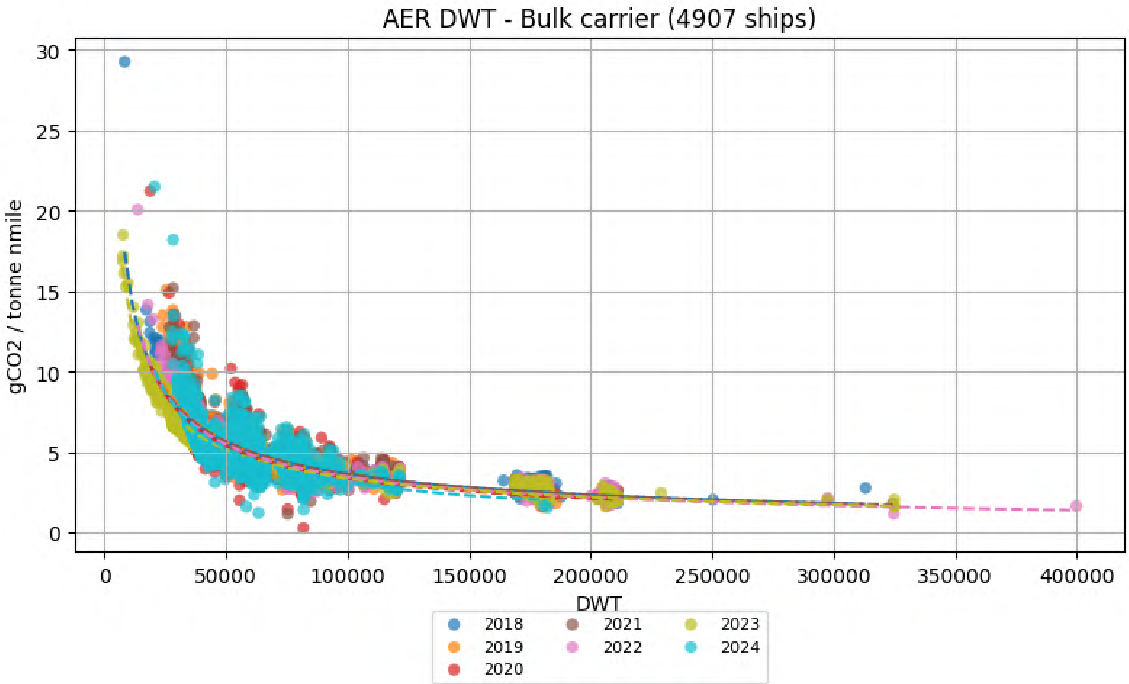
	2018	2019	2020	2021	2022	2023	2024
R^2	0.476	0.848	0.026	0.563	0.619	0.626	0.629

Figure 48: Plot and table of attained EEOI values for passenger ships over the reporting years and associated trendlines



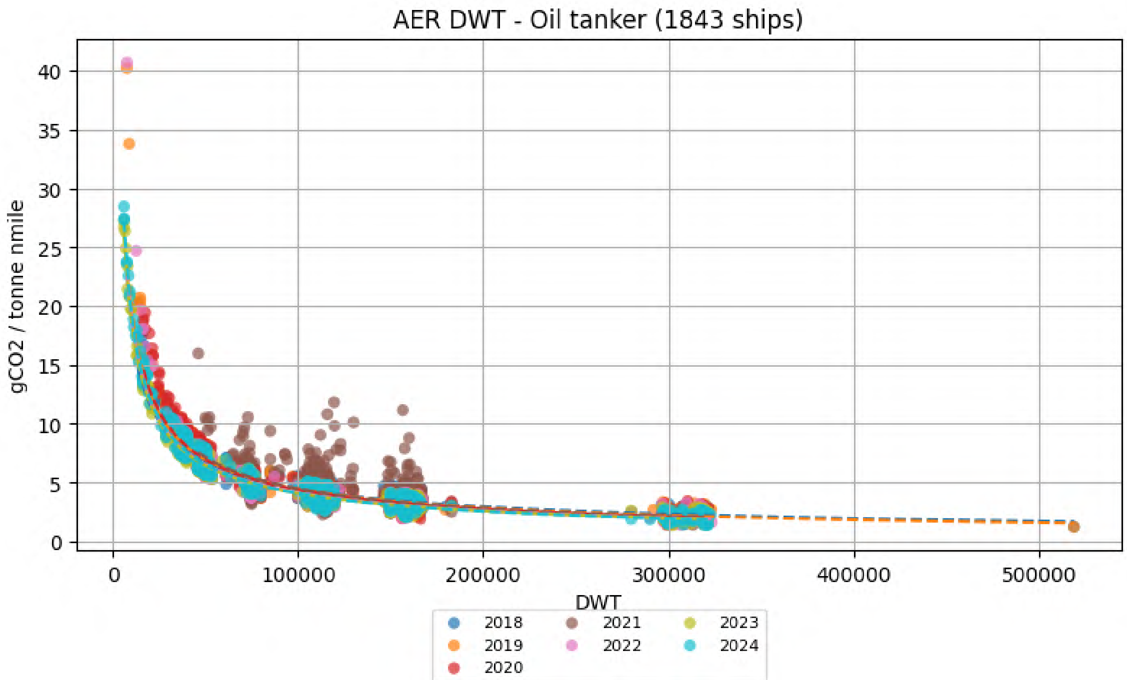
	2018	2019	2020	2021	2022	2023	2024
R^2	0.683	0.656	0.687	0.641	0.701	0.788	0.749

Figure 49: Plot and table of attained AER values for Ro-pax ships over the reporting years and associated trendlines



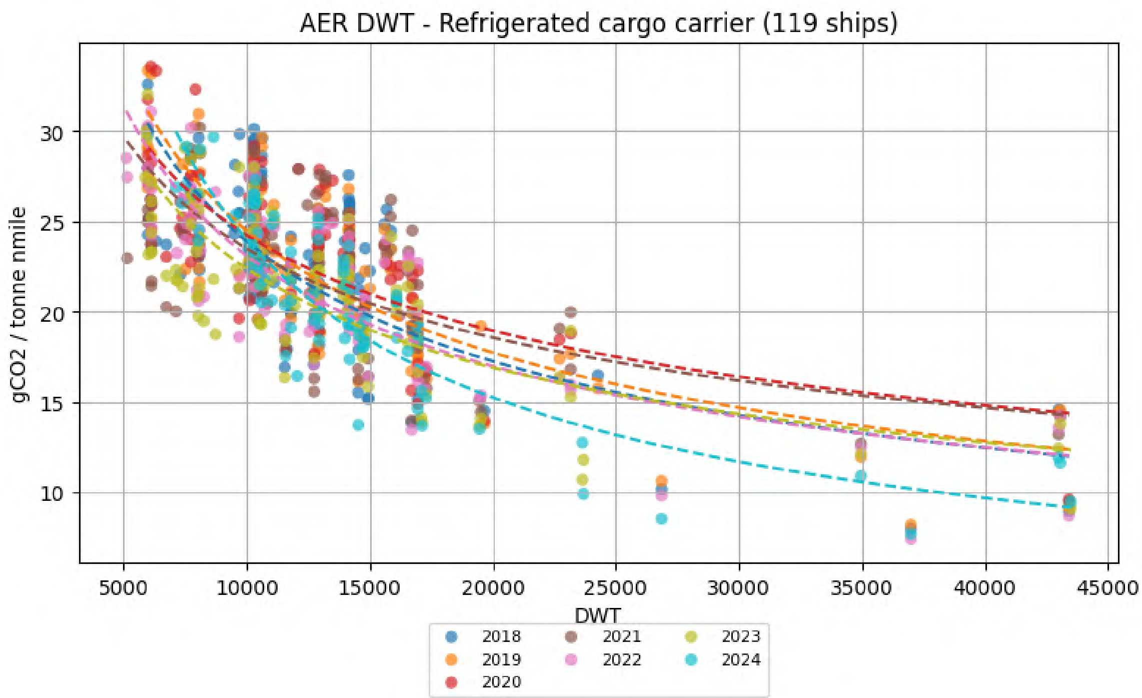
	2018	2019	2020	2021	2022	2023	2024
R^2	0.871	0.809	0.718	0.788	0.859	0.878	0.658

Figure 50: Plot and table of attained AER values for bulk carriers over the reporting years and associated trendlines



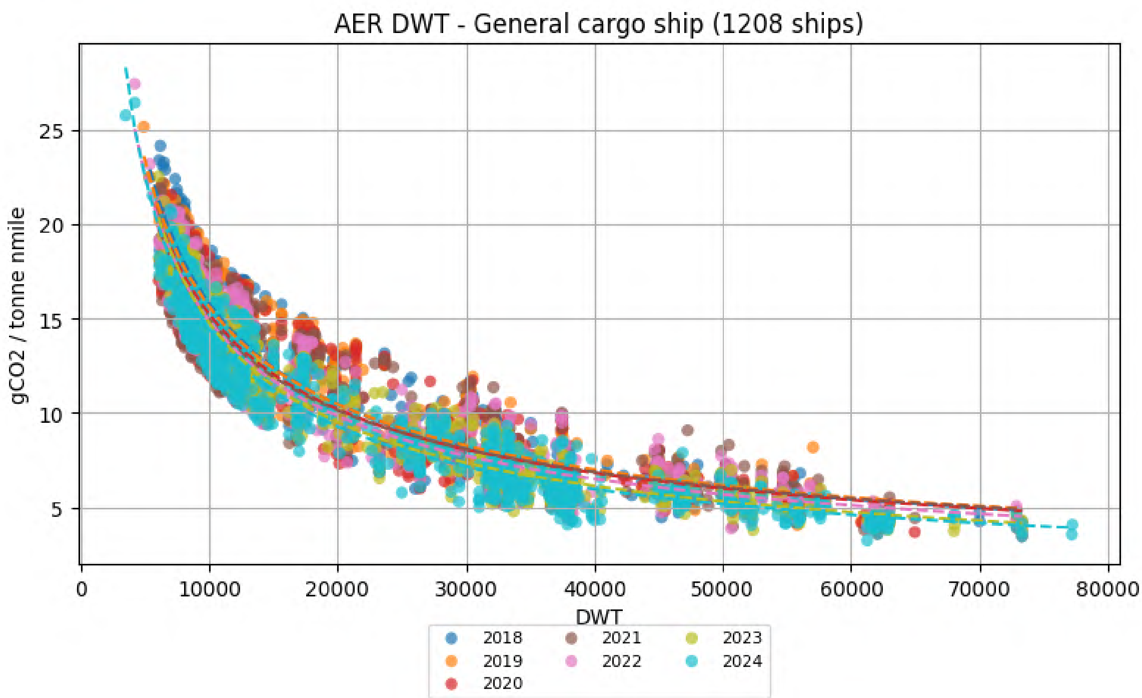
	2018	2019	2020	2021	2022	2023	2024
R^2	0.855	0.856	0.868	0.465	0.885	0.918	0.928

Figure 51: Plot and table of attained AER values for oil tankers over the reporting years and associated trendlines



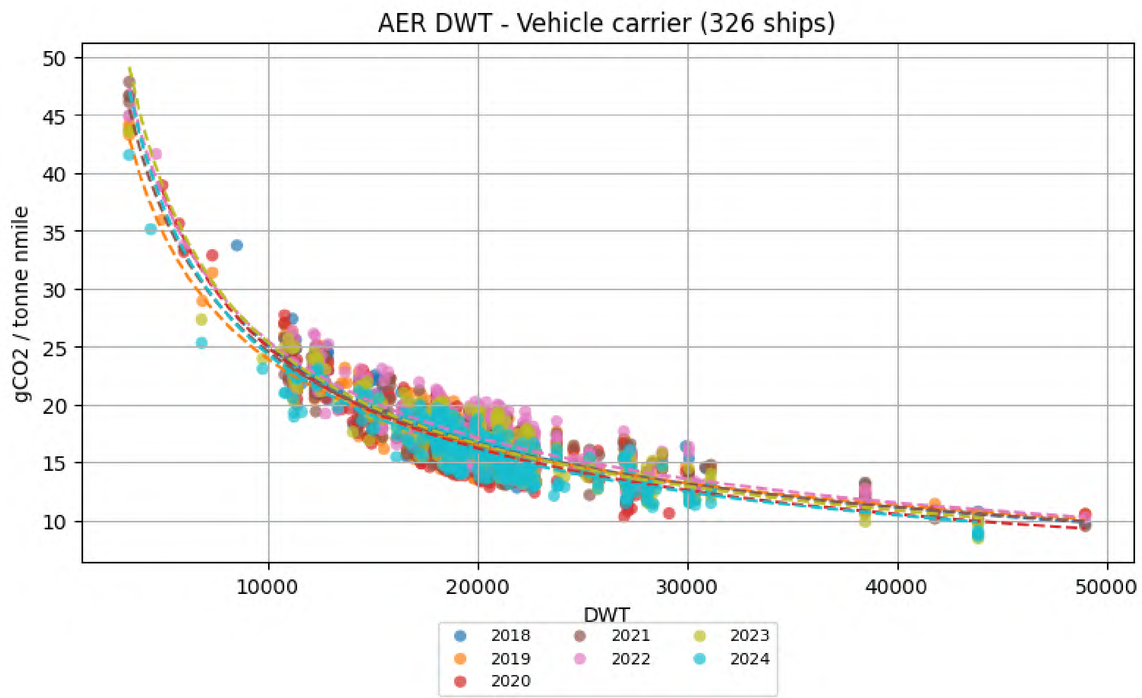
	2018	2019	2020	2021	2022	2023	2024
R^2	0.501	0.667	0.462	0.445	0.644	0.608	0.787

Figure 52: Plot and table of attained AER values for refrigerated cargo carriers over the reporting years and associated trendlines



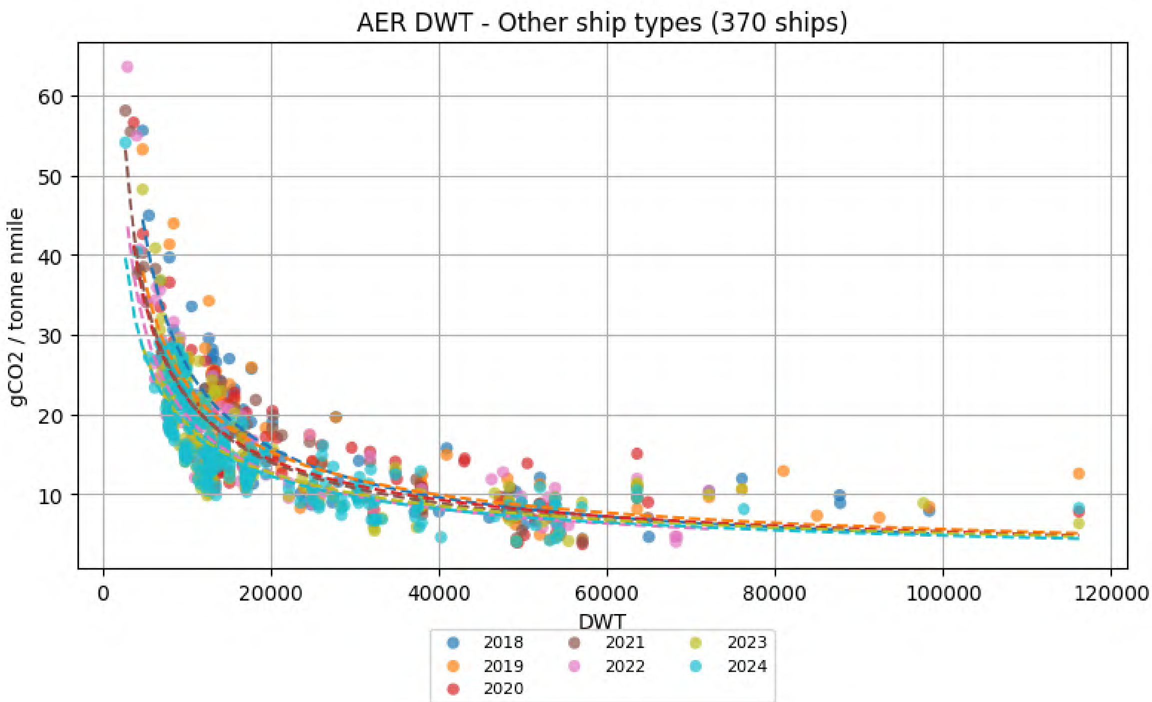
	2018	2019	2020	2021	2022	2023	2024
R^2	0.889	0.888	0.871	0.875	0.909	0.934	0.925

Figure 53: Plot and table of attained AER values for general cargo ships over the reporting years and associated trendlines



	2018	2019	2020	2021	2022	2023	2024
R^2	0.709	0.753	0.727	0.771	0.774	0.8	0.793

Figure 54: Plot and table of attained AER values for vehicle carriers over the reporting years and associated trendlines



	2018	2019	2020	2021	2022	2023	2024
R^2	0.757	0.677	0.692	0.834	0.78	0.674	0.735

Figure 55: Plot and table of attained AER values for other ship types over the reporting years and associated trendlines