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## 2024 Report from the European Commission on $CO_2$ Emissions from Maritime Transport

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## 1. Introduction

Maritime transport is fundamental to the EU economy and one of the most energy-efficient modes of transport. However, it remains a major source of greenhouse gas emissions. The EU has made substantial progress towards its climate goals, with significant emission reductions in 2023 compared with 2022. This report highlights the importance of continuing to monitor the maritime sector's impact on greenhouse gas emissions.

This sixth annual report on carbon dioxide ($CO_2$) emissions from ships entering and leaving ports in the European Economic Area (EEA) presents data collected under the EU Regulation on the monitoring, reporting and verification of greenhouse gas emissions from maritime transport adopted in 2015[1] (the EU Maritime MRV Regulation). The report is based on data collected between 2018 and 2023. It provides a comprehensive comparison of data and an analysis of trends in emissions and energy efficiency over the years.

By examining the characteristics and energy efficiency of ships calling at EEA ports, this report also sheds light on the factors influencing $CO_2$ emissions from maritime transport.

## 2. Policy development

As part of the package to deliver the European Green Deal, the European Parliament and the Council adopted a series of measures in 2023 to ensure that the maritime transport sector contributes to the EU's climate ambitions. These include the revision of the **EU Emissions Trading System** (ETS)[2], which since 1 January 2024 has also covered $CO_2$ emissions from large ships entering EU ports, regardless of the flag they fly, and the **FuelEU Maritime Regulation**[3], which from 2025 will ensure that the greenhouse gas intensity of energy used on board ships is gradually reduced over time.

Compliance with the new obligations stemming from the extension of the EU ETS to maritime transport is enforced through the monitoring, reporting and verification system established by the **EU Maritime MRV Regulation**, which was revised in May 2023[4]. The updated monitoring and reporting rules, enabling the ETS to be implemented for shipping and incorporating methane and nitrous oxide emissions in the scope of MRV, came into effect on 1 January 2024.

In addition to legislative measures, the EU promotes shipping decarbonisation by providing **support for research and innovation**. Through the Innovation Fund, which is financed by the

[1] Regulation (EU) 2015/757 of the European Parliament and of the Council of 29 April 2015 on the monitoring, reporting and verification of carbon dioxide emissions from maritime transport, and amending Directive 2009/16/EC, OJ L 123, 19.5.2015, p. 55, http://data.europa.eu/eli/reg/2015/757/oj.
[2] Through Directive (EU) 2023/959, OJ L 130, 16.5.2023, p. 134, http://data.europa.eu/eli/dir/2023/959/oj.
[3] Regulation (EU) 2023/1805, OJ L 234, 22.9.2023, p. 48, http://data.europa.eu/eli/reg/2023/1805/oj.
[4] Regulation (EU) 2023/957,OJ L 130, 16.5.2023, p. 105, http://data.europa.eu/eli/reg/2023/957/oj.

EU ETS, the 2023 Call provided funding for six maritime projects and one marine fuel project with a total budget of more than EUR 200 million.

Moreover, the first EU-wide hydrogen auction for the production of renewable fuels of non-biological origin (RFNBOs) based on hydrogen allocated funding to six projects, including a world-leading green hydrogen and renewable ammonia project to produce maritime fuels. A second hydrogen auction was launched on 3 December 2024[5] and includes a dedicated budget of EUR 200 million for projects supplying their production to off-takers in the maritime sector.

While the Innovation Fund focuses on higher technology readiness levels (TRL) and deployment, the EU has also invested in lower TRL projects in 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, in five areas: use of sustainable alternative fuels, electrification, energy efficiency, design and retrofitting, digital and green ports.

The Commission is also committed to supporting global action to encourage the decarbonisation of the sector, notably at the **International Maritime Organization (IMO)**. In July 2023, a revised IMO strategy was adopted to reduce greenhouse gas (GHG) emissions from ships, which set the goal of net-zero emissions from ships by or around, i.e. close to, 2050. Following the strategy revision, the Commission continued throughout 2024 to support the development of a basket of mid-term GHG reduction measures to implement such targets, including both a technical element, in the form of a marine GHG fuel standard, and an economic element, in the form of a GHG pricing mechanism.

## 3. Maritime emissions decreased in 2023 to levels close to those of 2021 as economic and geopolitical uncertainties drove down maritime transport activity in Europe

The monitored voyages for the 2023 reporting year emitted **126.7 million tonnes of $CO_2$** into the atmosphere. These emissions were **7.9% lower** than those reported in 2022 and nearly the same (-0.1 million tonnes) as those reported for 2021, a year marked by the lingering effects of the pandemic. Compared with the reporting years preceding the COVID-19 pandemic (i.e. 2018 and 2019), which included emissions related to the United Kingdom, the emissions reported for 2023 were around 13% lower[6].

The emissions reported for 2023 were generated by a fleet of almost 12 300 ships, the second highest number recorded so far (5.4% lower than in 2022 but 2.9% higher than in 2021).

In 2023, the vast majority of ship types (12 out of 15) reported lower emissions than in 2022, which reflects the drop in **activity levels experienced by most subsectors of the maritime**

[5] https://climate.ec.europa.eu/eu-action/eu-funding-climate-action/innovation-fund/competitive-bidding_en.

[6] The granularity of the data reported under the EU Maritime MRV Regulation does not allow the MRV data to be recalibrated so as to exclude emissions resulting from the application of the Regulation to the United Kingdom for reporting years 2018, 2019 and 2020.

**industry**. This decline was largely driven by a decrease in the volume of goods handled in EU ports (-3.9% compared with 2022), mainly due to the restrictions on goods transport with Russia:

- The most significant absolute decrease in $CO_2$ emissions was reported in **bulk carriers** (-23% compared with 2022). This was the result of several factors, including a considerable decrease in the number of bulk carriers calling at EEA ports in 2023 (-12%), a reduction in the average distance travelled per ship (-8%), and slower speed (-4%).
- Russia's war of aggression against Ukraine continued to affect **energy imports**. While $CO_2$ emissions from liquified natural gas (LNG) carriers recorded a decrease (-11%) compared with 2022, they remained much higher than in previous years (+42% compared with 2021). $CO_2$ emissions from oil tankers fell slightly (-2%) compared with 2022.
- $CO_2$ emissions from **passenger ships** increased by 6% compared with 2022, reaching the highest level since 2018, confirming the full rebound of the sector after the COVID-19 years.
- **Container ships** recorded a 6% decrease in emissions for the second consecutive year, which reflects a general decline in container handling in the main EU ports (-3.8% in 2023 compared with 2022), a decrease in the average distance reported by container ships (-3%) and a reduction in the average speed of active container ships (-5%).

**Container ships, oil tankers and bulk carriers remained the highest emitters in 2023**. They were responsible for generating around 52% of all reported emissions in 2023. Container ships alone accounted for 28% of $CO_2$ emissions. Overall, the breakdown of most ship types by reported emissions remained stable in 2018-2023, but passenger ships, ro-pax ships, and LNG carriers continued to see an increase in their respective share of emissions. This trend has been evident since 2020, driven by energy market dynamics and the rebound of passenger traffic after COVID-19.

The breakdown in 2023 of the fleet's total $CO_2$ emissions by type of voyage and at berth remained largely unchanged compared with 2021, following the withdrawal of the United Kingdom from the EU. Voyages starting or ending outside the EEA continued to account for the bulk of $CO_2$ emissions (around two thirds). This was in line with the volume of inward and outward trade flows recorded by Eurostat, although the share of voyages decreased slightly in 2023 as a result of lower activity levels of the subsectors of the fleet most active on extra-EEA trade routes (bulk carriers and LNG carriers).

In terms of **fuel consumption**, the monitored ships used 41 million tonnes of fuel in 2023. Fuel consumption in 2018-2023 remained dominated by conventional fossil marine fuels (heavy fuel oil, light fuel oil, gas oil, diesel oil), which accounted for 91% of the total mass of fuels reported in 2023. The fuel data reported in 2023 confirmed the trends observed in fuel consumption reported since 2021, namely a decrease in the share of light fuel oil (accounting for 15.6% of reported fuel in 2023) and a corresponding increase in the use of heavy fuel oil (reaching 55.3% in 2023).

2023 saw the highest recorded level of LNG consumption by the fleet (around 11% more than in 2022, accounting for more than 8% of reported fuel in 2023). This is due to LNG being increasingly used by ships other than LNG carriers, with container ships, ro-pax ships and passenger ships making up the lion's share. The consumption of non-fossil bunker fuels remained negligible, as in previous years.

## 4. The monitored fleet: shipping routes, speed, technical and operational efficiency

According to Eurostat data, the total **volume of inward trade flows** in 2023 decreased by 3.7%. Compared with 2022, the inflow from the United States (East Coast), Norway, Brazil, Egypt, Nigeria, Libya, and Algeria increased in 2023, while inflows from the United Kingdom, Russia, Türkiye and China decreased. The total 2023 volume of **outward trade flows** decreased by 1.7%. Outflows to the four main partners (United Kingdom, United States, Türkiye and China) remained largely consistent with 2022 levels, and as in previous years, the main route of outflows was still to the UK.

MRV data for 2018-2023 shows no indication of a structural **reduction in speed** for the MRV fleet over this period. Ten out of 15 ship types recorded higher average speeds in 2023 than in 2018, with some experiencing significant increases, such as combination carriers (+32%), gas carriers (+20%), other ships (+19%), oil and chemical tankers (+14%), and passenger ships (+13%). Bulk carriers and container ships, which recorded the highest reduction in emissions in 2023, were among the few ship types that continued to decrease their speed compared with 2022, achieving reductions of 4% and 5% respectively.

A graphical analysis of key **technical and operational efficiency** indicators shows that no significant changes took place in 2018-2023. Container ships, ro-pax ships and oil tankers recorded the largest increases in the average size of active ships over this period.

Over the reporting period, the completeness and accuracy of the reported data improved. This is confirmed by increasing data correlation values between key technical and operational efficiency indicators[7] and the size of ships reporting under the EU Maritime MRV Regulation.

## 5. Implementation of the EU Maritime MRV Regulation in 2023

In terms of implementation of the EU Maritime MRV Regulation, the results indicate a continued improvement in the quality and completeness of the submitted data. However, more data were submitted late in 2023 than in 2022, which could be explained by the additional workload faced

[7] The Energy Efficiency Design Index (EEDI) and the Estimated Index Value (EIV) are assessed for the technical efficiency of ships. The Energy Efficiency Operational Indicator (EEOI) and the Annual Efficiency Ratio (AER) are assessed for their operational efficiency.

by shipping companies and verifiers as a result of the extension of the EU ETS to maritime transport and the application of the new monitoring and reporting rules.

## 6. Overall impact of maritime transport on the global climate and the environment

The fourth IMO greenhouse gas study[8] showed that GHG emissions (including carbon dioxide, methane and nitrous oxide) from shipping increased by 9.6% between 2012 and 2018 (from 977 million tonnes to 1 076 million tonnes). It also projected that, under a range of plausible long-term economic and energy scenarios, $CO_2$ emissions are on track to rise from about 90% relative to 2008 levels in 2018 to 90-130% relative to 2008 levels by 2050. Recent studies on trends in international shipping for the period 2018-2022 have found that in 2022, emissions did not decrease but remained around 2008 levels. Data reported under the IMO data collection system for 2023 shows only a minor (-1%) reduction in fuel consumption by the world's reporting fleet compared with 2022.

The fourth greenhouse gas study also highlighted the importance of black carbon emissions, which were found to represent around 7% of international shipping's GHG emissions.

[8] https://www.imo.org/en/OurWork/Environment/Pages/Fourth-IMO-Greenhouse-Gas-Study-2020.aspx.