ETC CM Report 2024/09

# Trends and projections in the EU ETS in 2024

## The EU Emissions Trading System in numbers

Authors:
Christian Nissen, Johanna Cludius, Sabine Gores, Hauke Hermann, Nora Wissner (Öko-Institut)

EEA project managers:
Melanie Sporer

European Environment Agency
European Topic Centre
Climate change mitigation

Cover design: EEA
Cover image Pixabay. Free for commercial use, no attribution required
Layout: Tom Dauwe [VITO]

**Publication Date:** November 2024

**EEA activity:** climate change mitigation and adaptation



**ETC CM coordinator:** Vlaamse Instelling voor Technologisch Onderzoek (VITO)

**ETC CM partners:** AETHER Limited, Citepa, Czech Hydrometeorological Institute (CHMI), EMISIA, Stiftelsen NILU (NILU), Öko-Institut e.V. Institut für Angewandte Ökologie, Öko-Recherche GmbH - Büro für Umweltforschung und -beratung, Rijks Instituut voor Volksgezondheid en Milieu (RIVM), Gauss International Consulting S.L., Transparency for life (T4L), Klarfakt e.U., Exergia S.A., Transport & Mobility Leuven (TML), Umweltbundesamt GmbH (UBA).



**DOI:** 10.5281/zenodo.14062099

More information on the European Union is available on the Internet (http://europa.eu).

European Topic Centre on
Climate change mitigation
https://www.eionet.europa.eu/etcs/etc-cm
etccm@vito.be

# Contents

## Figures

## Tables

# Summary

## About this report

The annual 'Trends and projections in the EU ETS' report analyses current and future greenhouse gas emissions trends under the European Union (EU) Emissions Trading Scheme (ETS). It is based on ETS data and information provided by the European Commission and Member States as of July 2024 and projections data from September 2024. The data on verified emissions and compliance of operators under the EU ETS for the years up to 2023 are based on an extract from the EU Transaction Log of July 2024.[1]

This report is divided into three sections: historical and current emission trends, future emissions projections up to 2030 and 2050, and the recent inclusion of maritime transport in the EU ETS. The scope covers all EU ETS Member States, including the EU-27, Iceland, Norway, and Liechtenstein. Although the UK has left the EU ETS, electricity generators in Northern Ireland remain part of the system and are therefore included in this report.

## Main findings

In May 2023, the revised ETS Directive entered into force (EU 2023b). The revision is intended to make the EU ETS fit for contributing to reaching the overall EU target of a 55% net reduction in greenhouse gas emissions by 2030 compared to 1990 levels. The revision led to a significant tightening of the ETS cap, increasing the ETS reduction target from 43% to 62% by 2030 compared to 2005. Maritime transport is included since the beginning of 2024. A Carbon Border Adjustment Mechanism (CBAM) will be introduced from 2026 onwards, while free allocations will be phased out gradually.

A new EU-wide emissions trading system for distributors that supply fuel to the buildings, road transport and certain other sectors (ETS-2) will be introduced from 2027, but without an immediate link to ETS-1. Analysis of the ETS-2 data will become part of the annual 'Trends and projections in the EU ETS' report once it becomes available.

***Stationary Installations show lowest emissions to date***

In 2023, emissions from stationary installations decreased by 17% compared to the previous year, with verified emissions falling from 1,313.2 Mt $CO_2$-eq in 2022 to 1,095.9 Mt $CO_2$-eq. The power sector saw substantial reductions, driven by a shift toward renewable energy sources and a decline in electricity demand. Reduced electricity production from hard coal and lignite power plants played a significant role in this reduction. The industrial sector also contributed, particularly in the cement and lime, and iron and steel sectors, which saw notable decreases in emissions.

Since 2005, emissions from stationary installations covered by the EU ETS have dropped by 52%. This decline, although occasionally marked by volatility, highlights the system's overall effectiveness in reducing emissions. The year 2023 recorded the lowest emissions under the EU ETS to date, underscoring the continuing impact of regulatory and market-driven measures.

***Aviation Sector emissions rebound close to pre-pandemic levels***

Aviation emissions increased by 9% in 2023 as the sector rebounded from the COVID-19 pandemic, reaching 53.2 Mt $CO_2$-eq. This recovery in emissions reflects a broader resurgence in flight activity, with air travel reaching 92% of 2019 levels. Aviation emissions are expected to increase further during the next

(1) due to different cut-off times, there may be different values compared to other publications

years and reach or surpass pre-pandemic levels. As a result, aviation companies are likely to continue purchasing allowances from other sectors to cover their emissions.

The aviation sector faces significant structural changes related to the EU ETS. Free allocation, which covered 41% of aviation emissions in 2023, is set to be phased out by the end of 2025, with full auctioning of allowances becoming the norm.

***Significant step towards regulating maritime sector emissions***

The EU ETS scope was extended to include maritime transport at the beginning of 2024, as part of the broader "Fit for 55" package. $CO_2$ emissions from large ships (of 5,000 gross tonnage and above) operating within EU waters and on (50% of) international routes connected to EU ports are covered. Initially, only a portion of verified emissions will be subject to the surrender obligation, with 100% of verified emissions and other greenhouse gases (methane, nitrous oxide) to be covered by 2026. Since 2018, $CO_2$ emissions data on EU-related maritime transport has been available through the EU shipping MRV system. Specific emissions data for the ETS scope will be available in 2025 and will then be incorporated in next year's report. The expansion of the EU ETS to the maritime sector is a significant step toward addressing previously unregulated emissions in international maritime transport.

***Highest annual allowance price since EU ETS launch***

The Market Stability Reserve (MSR) continues to play a crucial role in maintaining market balance within the EU ETS by removing excess allowances from circulation. By the end of 2023, the Total Number of Allowances in Circulation (TNAC) had declined to 1.11 billion, reflecting the system's capacity to adjust to supply-demand dynamics effectively. The supply of allowances saw a modest increase of 3% in 2023, primarily due to a rise in auctioned allowances, though free allocation decreased slightly. Over time, mechanisms like the MSR have managed the surplus of allowances, contributing to a more balanced market that supports a steady increase in allowance prices. In 2023, the price of EU Allowances (EUAs) reached an average of €83.60, marking the highest annual average price since the system's inception.

Allowance prices have been volatile, influenced by external factors such as geopolitical events and disruptions in the energy market. The energy crisis sparked by Russia's invasion of Ukraine has contributed to fluctuating gas prices and broader uncertainty in the market. Despite this adaptation to external pressures, the EU ETS remains a key instrument in driving emissions reductions across Europe.

***Member States' projections fall short of 62% target by 2030***

In 2024, updated greenhouse gas projections from eleven EU Member States reveal a slight increase in projected stationary ETS emissions for 2030, up by 2% from 2023 projections under existing policies (WEM scenario), while long-term projections show a 3% decrease in projected emissions by 2050. With additional measures (WAM scenario), projected emissions for 2030 remain similar to previous projections, while projected emissions in 2050 are 8% lower compared to previous projections. For Denmark, Estonia, Germany, and Italy projected emissions in 2030 are higher than compared to last year's projections. This results from an expected higher output from gas-fired electricity generation due to intensified electricity demand. These projections, while factoring in revised EU ETS policies and higher energy and $CO_2$ prices amid recent geopolitical events, fall short of the EU's overall target to reduce EU ETS emissions by 62% by 2030, underscoring the need for stronger measures to align with the EU's 2030 climate goals.

***Conclusion***

The EU ETS continues to deliver on its goal of reducing emissions across key sectors, with substantial reductions in emissions from stationary installations compared to the previous year and a partial recovery in aviation emissions towards pre-COVID-19 levels. The system's market mechanisms, including the MSR, have been effective in balancing supply and demand, while allowance prices have a new annual high.

Looking forward, the EU ETS will remain a critical tool in achieving Europe's climate objectives, though it will need to navigate challenges posed by market volatility and external geopolitical events.

While the current projections for emissions reductions in the EU ETS sectors indicate progress, they fall short of the necessary ambition to meet the EU's climate targets for 2030 and 2050. The anticipated reductions under both the WEM and WAM scenarios remain insufficient to achieve the overall EU ETS target of a 62% reduction by 2030 and the longer-term goal of climate neutrality by 2050. Furthermore, the projected increases in emissions from sectors like aviation and from specific Member States underscore the need for intensified efforts.

# 1 Historical and current trends in the EU ETS

This section describes the historical and current trends in emissions, and the supply of allowances within the scope of the EU-ETS-1. A distinction is made between stationary installations - split between the combustion and industrial sectors - and aviation emissions. Maritime emissions will first be shown in the next ETS-Report in 2025, when verified emissions will be available. Data from emitters within the scope of the ETS-2 will also be shown as soon as the system is operational.

## 1.1 Stationary installations

**Decrease in EU ETS Emissions in 2023:** Stationary EU ETS emissions decreased by 17% in 2023 compared to the previous year, with significant reductions in combustion emissions (-21%) and industrial emissions (-8%).

**Supply of Allowances and Price Increase**: The total supply of allowances in 2023 increased by 3% compared to 2022, and the average price of European Union Allowances (EUAs) rose by 4%, reaching €83.6 per EUA. The Market Stability Reserve (MSR) withheld a substantial number of allowances from auction, stabilizing the market.

**Power Sector Emission Reductions:** Emissions from power plants, especially coal-fired plants, saw a significant reduction, with Germany and Poland accounting for 61% of this decrease. Renewable energy sources contributed to lower fossil fuel reliance, while the increase in nuclear power generation was primarily due to a rebound from unusually low production in the previous year and does not reflect a long-term trend.

**Industrial Sector Emissions:** Emissions from industrial sectors also declined, with notable reductions in sectors like cement and lime, as well as iron and steel. Reduced output, rather than technological advancements, was the primary cause of these reductions.

### *1.1.1 Overview*

In 2023, stationary EU ETS emissions decreased by 17% compared to the previous year (see Table 1-1). Emissions decreased from both combustion installations (-21%) and industrial activities (-8%).

The total supply of allowances in 2023 increased by 3% compared to the year 2022, amounting to 1055 million allowances. This amount includes free allocation and auctioned allowances. The supply of allowances allocated for free was 1% lower than in 2022.

In 2022, 323 million allowances were placed in the MSR instead of being auctioned, which is about 38% of the initial auctioning quantity.

**Table 1-1 EUA demand, supply and price (stationary installations), 2022-2023**

| | 2022 | 2023 | Change 2022-2023 |
|---|---|---|---|
| Verified emissions (Mt $CO_2$-eq.) | 1313.2 | 1095.9 | -17% |
| Combustion emissions | 828.4 | 651.2 | -21% |
| Industrial emissions | 484.8 | 444.7 | -8% |
| Total supply of allowances (millions of EUAs) | 1024.0 | 1054.9 | 3% |
| Free allocation (incumbents, new entrants) | 542.5 | 537.3 | -1% |
| To existing installations | 542.5 | 537.3 | -1% |
| To new entrants and capacity extensions | 0.0 | 0.0 | |
| Auctioned amounts | 481 | 518 | 7% |
| Supply/demand balance (millions of EUA) | -289.2 | -41.0 | -86% |
| | | | |
| MSR intake* (millions of EUA) | -369 | -323 | |
| EUA price (EUR) | 80.2 | 83.6 | 4% |

**Notes:** Based on data from July 1st 2024.
* Calculated based on TNAC publications. A third of the MSR intake takes place during the same year the respective TNAC is published (September to December). Two thirds of the MSR intake takes place during the following year (January to August).

**Sources:** EC (2023b) and previous TNAC publication , EEA (2024), EEX (2024), EU (2024).

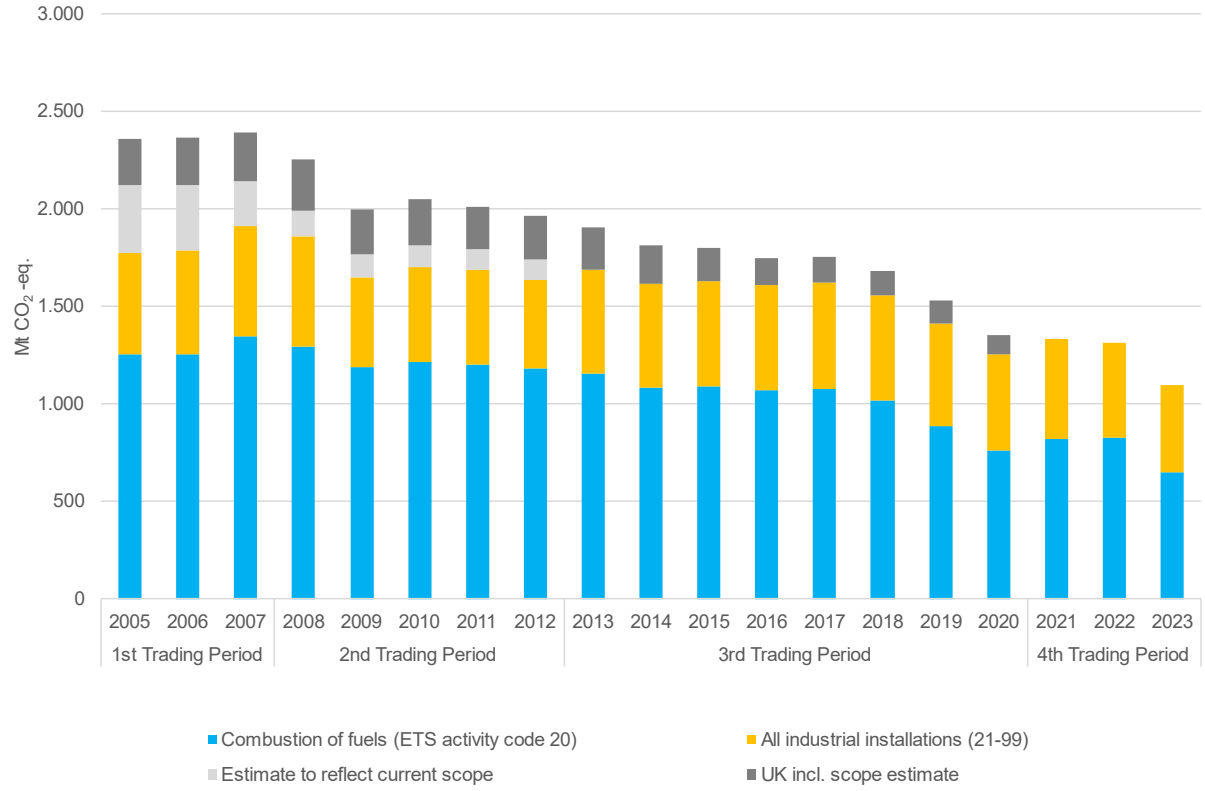
### *1.1.2 Emission trend*

Figure 1-1 illustrates the trend in verified emissions from stationary installations under the EU ETS over time. Since 2005, emissions have decreased by 52%. This figure excludes emissions from UK installations that are no longer part of the EU ETS, except for combustion installations in Northern Ireland, which remain in the system despite being part of the UK, and includes a correction for the changes in ETS scope over time. While the year 2023 recorded the lowest emissions within the EU ETS to date at 1,095.9 Mt $CO_2$-eq, representing a decrease of 217.3 Mt $CO_2$-eq compared to the previous year, emissions in the preceding years were more volatile. In 2020, during the COVID-19 pandemic, emissions dropped to 1,253 Mt $CO_2$-eq, but increased in 2021 and 2022 before falling to the all-time low in 2023. The corresponding values can be found in 0.

The reduction in emissions was primarily driven by the "combustion of fuels" category, which includes most fossil fuel power plants and heat production not covered by the industrial activities, resulting in a decrease of 177 Mt $CO_2$-eq in this category. Industrial installations also contributed to the overall reduction, cutting emissions by 40 Mt $CO_2$-eq.

The majority of emissions covered by the EU ETS is $CO_2$ (99.8%). Other greenhouse gases only represent a very small share of total emissions. The share of $N_2O$ emissions from the nitric acid and adipic acid was 0.15% (2 Mt $CO_2$-eq.) and the share of PFC emissions was 0.03% (0.4 Mt $CO_2$-eq.) in 2022 (EC 2024b).

**Figure 1-1** **Verified emissions (stationary installations) in million tonnes $CO_2$-eq, 2005 – 2023, covering all EU ETS member states**




**Note:** The estimate to reflect current scope takes into account emissions (not split by activity) for those countries, sectors and activities that have not been part of the EU ETS since its inception in order to provide a consistent time series. Emissions from the United Kingdom exclude electricity generators in Northern Ireland but include other ETS installations located there. Electricity generators from Northern Ireland are included under the 'Combustion of fuels' category.

**Sources:** EEA (2024).

The following table gives an overview of the new installations that started to report emissions since the year 2021. In total these 354 installations emitted 6.44 million t $CO_2$ -eq in 2023. The majority (81%) of the new installations report their emissions under category 20 (combustion installations) and represent a small share of total emissions (~ 0.5% of total stationary emissions).

**Table 1-2 New Entrants 2021 - 2023 in million t $CO_2$-eq**

| | Year of First Emission | Verified Emissions 2021 | Verified Emissions 2022 | Verified Emissions 2023 |
|---|---|---|---|---|
| **Combustion** | 2021 | 0.46 | 2.56 | 2.73 |
| | 2022 | - | 0.43 | 1.50 |
| | 2023 | - | - | 0.71 |
| **Industry** | 2021 | 0.35 | 0.40 | 0.40 |
| | 2022 | - | 0.39 | 0.96 |
| | 2023 | - | - | 0.15 |

**Notes:** Table includes all installations with given "Year of first Emissions". Occasionally, existing accounts are merged or split into new accounts. In such cases, these are not considered 'new entrants' and have been excluded where identified. As a result, these values are for indicative purposes only, as not every single one of those cases might have been identified.

**Sources:** EEA (2024).

### *Combustion/Power Sector*

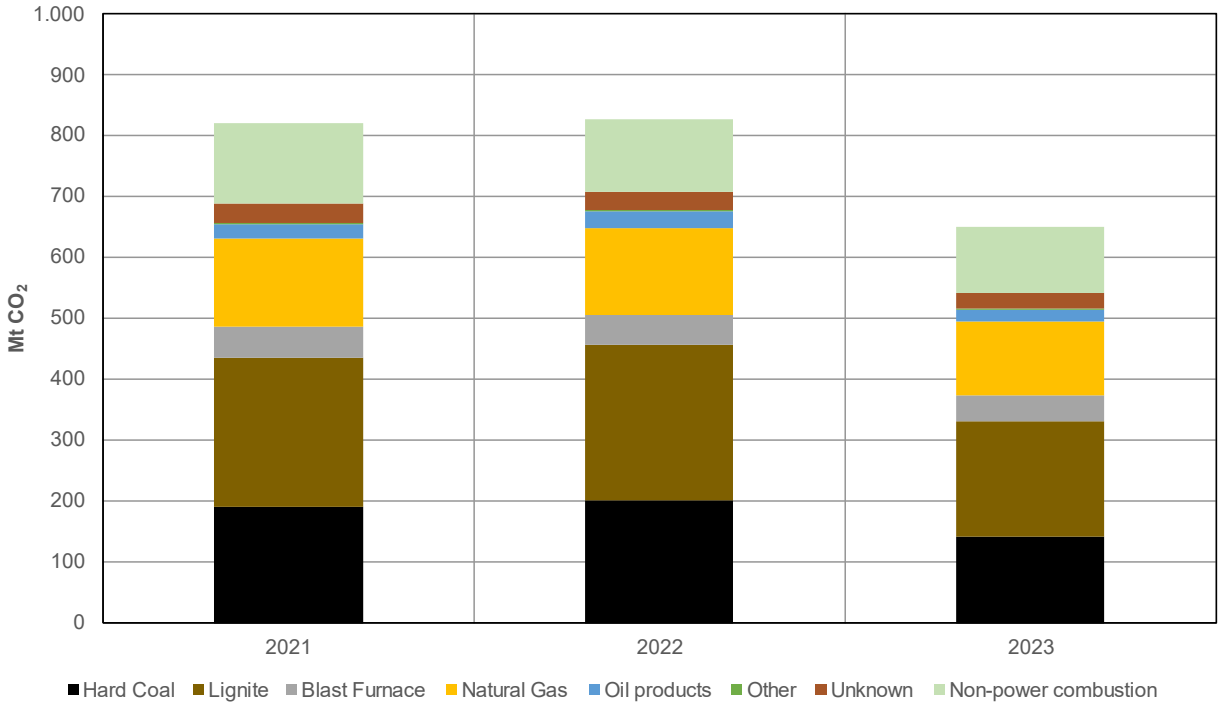
In 2023, combustion installations emitted a total of 651 Mt $CO_2$-eq (Figure 1-1). Figure 1-2 offers a more detailed view of emissions from these installations (activity code 20), which are predominantly driven by power plants, accounting for around 80% of the emissions in this category.

Since official data does not specifically identify power plants in the EUTL, they were manually identified (see methodology from Hermann et al. 2021). Figure 2.2 presents the emissions trend for combustion installations, broken down into power plants and other combustion installations not classified as power plants. These other combustion installations include heating plants in district heating networks and installations producing heat for industrial use in sectors that are not covered by an industrial activity code, e.g heat production in the food industry.

Emissions declined across all power plant fuel types and also for other combustion installations:

- Overall emissions from power plants decreased by 165 Mt $CO_2$, with about 76% of the reduction attributed to coal-fired power plants. Lignite-fired power plants saw a reduction of 66 Mt $CO_2$ and emissions from hard coal power plants dropped by 59 Mt $CO_2$ compared to the previous year.
- Emissions from combustion installations not producing electricity fell by roughly 51 Mt $CO_2$ in 2023 compared to 2022.

**Figure 1-2 Emissions of combustion installations 2021-2023**

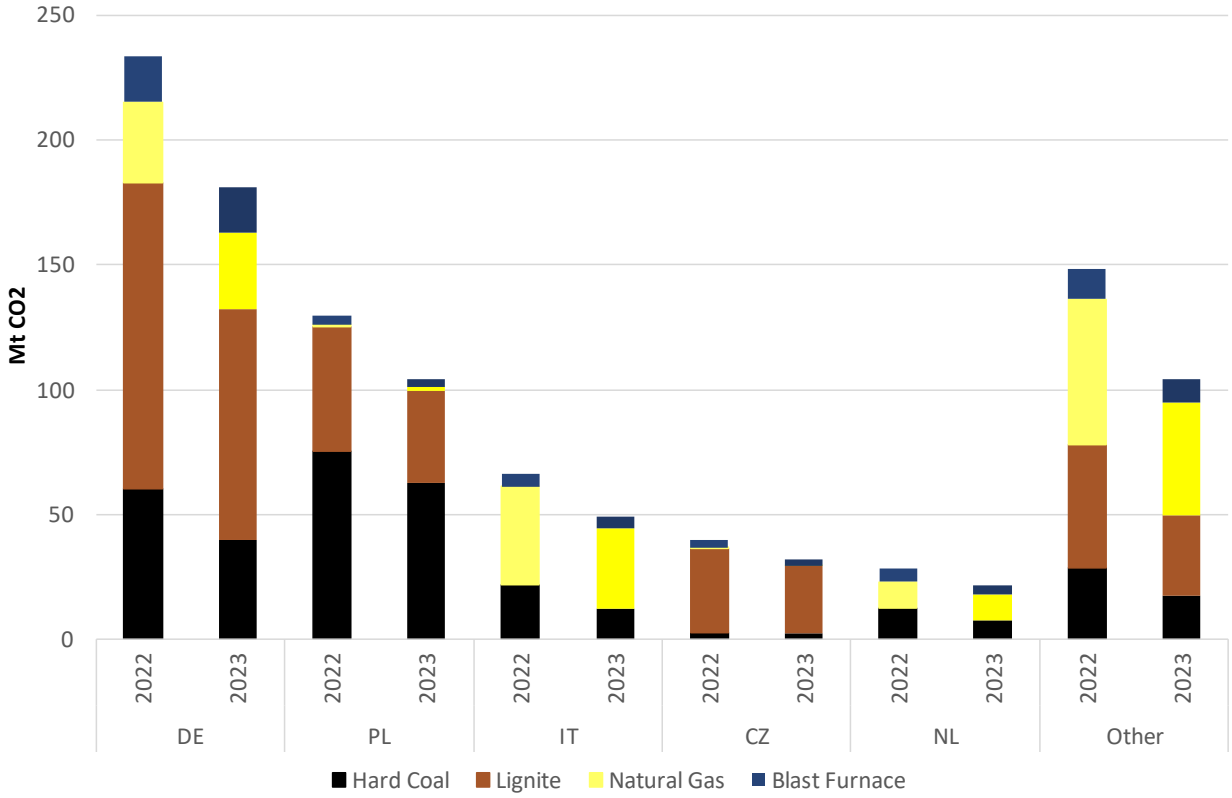



**Notes:** The corresponding values can be found in 0.

**Source:** EU (2024) based on methodology developed in Hermann et al. (2021).

Figure 1-3 examines the changes in emissions from power plants in the countries with the highest power-related emissions. Five countries accounted for nearly 80% of $CO_2$ emissions from all power plants within the EU ETS. Emission reductions were observed across all these countries. In Germany and Poland, emissions from coal-fired power plants were reduced by 76 Mt $CO_2$, representing 61% of the total emission reduction from coal-fired plants. For a more detailed analysis of emission trends from power plants in other countries, refer to Figure 1-4.

**Figure 1-3 $CO_2$ emissions from power plants by fuel in selected Member States, 2022-2023**




**Note:** Iceland, Liechtenstein and Norway had no identified power plants in 2024.
The corresponding values can be found in 0.

**Source:** EU (2024) based based on methodology developed in Hermann et al. (2021).

Table 1-3 provides context for the decrease in power generation emissions in 2023. In 2022, the increase in emissions caused by the gas price crisis, led to more generation from more emissions-intensive coal-fired power plants. The trend reversed in 2023, showing a significant reduction of 221 TWh from fossil fuelled power generation. Several key factors contributed to this reduction:

- Increased production from renewable energies: Generation from wind and solar grew by 90 TWh, and generation from hydro power plants rebounded to 60 TWh in 2023. Hydro generation had been low in the previous two years due to reduced precipitation.
- Increased nuclear power production: nuclear power generation rose by 10 TWh compared to the previous year, driven by improved availability in the French nuclear fleet and the commissioning of the Olkiluoto 3 nuclear power plant in Finland. However, this increase was partially offset by the nuclear phase-out in Germany.
- Reduced electricity demand: Electricity demand decreased by 77 TWh.

**Table 1-3 Change in emissions from electricity generation, electricity consumption and generated amounts by fuel, 2022-2023**

| | Change in emissions 2023 vs. 2022* | Consumption 2023 vs. 2023 [TWh] | Net electricity generation [TWh] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Total | of which | | | | | | | Net Import |
| | | | | Thermal | of which ** | | Nuclear | Hydro | Wind | Solar | |
| | | | | | Coal | Gas | | | | | |
| Total | -21,4% | -76,9 | -61,2 | -221,5 | -114,7 | -82,1 | 10,0 | 59,1 | 56,9 | 32,9 | |
| EE | -52,1% | -0,4 | -2,7 | -2,8 | N/A | N/A | N/A | 0,0 | 0,0 | 0,1 | 2,3 |
| BG | -43,1% | -0,1 | -9,1 | -9,5 | -9,0 | -0,1 | -0,3 | -0,7 | 0,1 | 1,3 | 8,9 |
| FI | -37,5% | -1,8 | 8,9 | -4,5 | -2,3 | -0,4 | 8,5 | 1,7 | 2,9 | 0,3 | -10,8 |
| PT | -36,5% | 0,8 | 0,6 | -7,3 | N/A | -6,3 | N/A | 6,0 | 0,0 | 2,0 | 1,0 |
| GR | -30,1% | -1,2 | -2,9 | -4,4 | -1,1 | -3,5 | N/A | 0,1 | 0,1 | 1,3 | 1,5 |
| AT | -26,1% | -3,5 | 4,2 | -3,3 | 0,0 | -3,3 | N/A | 5,1 | 0,8 | N/A | -8,8 |
| ES | -24,2% | -5,4 | -9,8 | -28,2 | -3,9 | -22,8 | -1,7 | 8,8 | 1,4 | 9,9 | 5,8 |
| FR | -23,2% | -14,8 | 48,9 | -17,6 | -3,3 | -14,4 | 41,5 | 9,3 | 12,8 | 3,0 | -65,3 |
| DE | -22,0% | -21,8 | -59,3 | -52,9 | -49,4 | -2,1 | -26,0 | 1,6 | 17,4 | 0,6 | 36,2 |
| BE | -21,4% | -3,4 | -12,8 | -6,0 | -0,4 | -4,5 | -10,4 | 0,0 | 3,1 | 0,4 | 9,2 |
| IT | -21,2% | -10,7 | -19,4 | -35,4 | -2,4 | -24,2 | N/A | 10,0 | 3,0 | 3,0 | 8,3 |
| DK | -20,3% | 0,5 | -1,2 | -2,7 | -1,9 | -0,2 | N/A | 0,0 | 0,4 | 1,2 | 1,8 |
| IE | -20,2% | 0,7 | -2,3 | -3,4 | -1,3 | -1,2 | N/A | 0,3 | 0,4 | 0,4 | 3,1 |
| PL | -18,6% | -5,0 | -10,3 | -18,3 | -23,9 | 5,0 | N/A | 0,7 | 4,1 | 3,3 | 5,4 |
| NL | -18,4% | -1,7 | -0,2 | -10,4 | -6,3 | -2,0 | -0,2 | 0,0 | 8,0 | 2,3 | -1,4 |
| CZ | -18,3% | -3,2 | -7,8 | -7,5 | -6,6 | -0,6 | -0,6 | 0,3 | 0,1 | -0,1 | 4,3 |
| LU | -17,6% | -0,3 | 0,1 | -0,2 | N/A | 0,0 | N/A | 0,1 | 0,2 | 0,0 | -0,3 |
| HU | -14,1% | -1,0 | -0,3 | -2,4 | -0,5 | -1,4 | 0,1 | 0,0 | 0,0 | 1,9 | -1,1 |
| RO | -12,8% | -2,3 | 1,9 | -3,1 | -2,0 | -0,9 | 0,2 | 4,4 | 0,6 | -0,1 | -4,2 |
| NO | -3,8% | 2,1 | 8,0 | 0,3 | N/A | N/A | N/A | 8,6 | -0,8 | N/A | -5,2 |
| SK | -3,0% | -1,7 | 3,2 | 0,0 | -0,3 | 0,2 | 2,2 | 1,1 | 0,0 | 0,0 | -4,8 |
| SI | -3,0% | -0,8 | 2,1 | 0,0 | 0,0 | 0,0 | 0,0 | 1,9 | 0,0 | 0,2 | -3,0 |
| SE | -1,9% | -1,2 | -6,6 | -1,8 | 0,0 | 0,0 | -3,4 | -3,8 | 1,3 | 1,1 | 4,7 |
| CY | -1,6% | 0,1 | 0,1 | -0,1 | N/A | N/A | N/A | N/A | 0,0 | 0,2 | N/A |
| HR | -0,9% | 0,2 | 3,1 | 0,0 | -0,2 | 0,4 | N/A | 2,7 | 0,2 | 0,2 | -3,1 |
| MT | 0,1% | 0,0 | 0,1 | 0,0 | N/A | 0,1 | N/A | N/A | N/A | 0,2 | 0,0 |
| LT | 0,1% | -0,8 | 0,8 | -0,1 | N/A | 0,1 | N/A | 0,0 | 1,0 | 0,0 | -1,6 |
| LV | 1,5% | -0,3 | 1,2 | 0,0 | N/A | 0,2 | N/A | 1,0 | 0,1 | 0,0 | -1,5 |
| IS | 18,8% | 0,1 | 0,1 | 0,0 | N/A | N/A | N/A | 0,0 | 0,0 | 0,0 | N/A |
| LI | | | | | | | | | | | |
| XI*** | -27% | | | | | | | | | | |

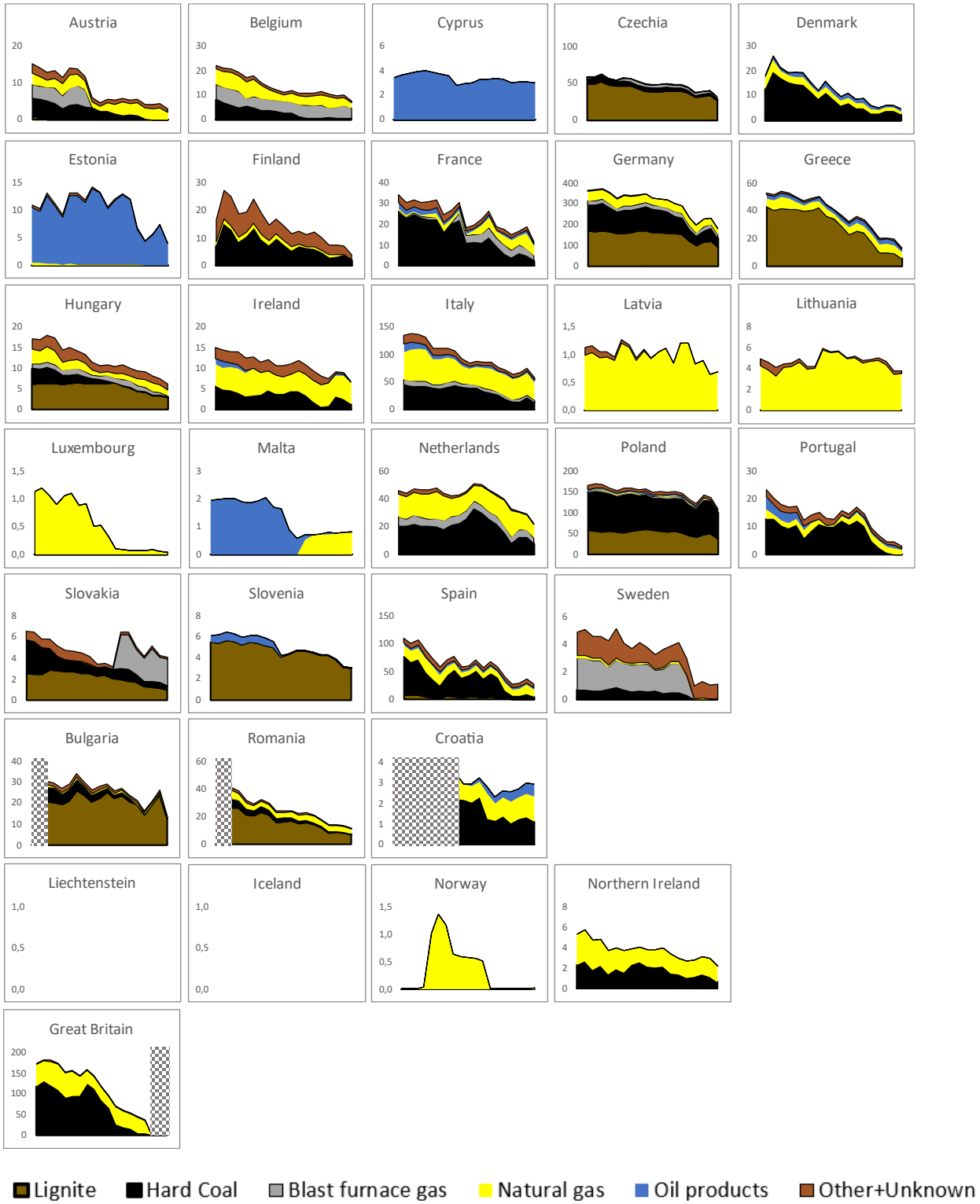
**Note:** * Combustion installations (Activity Code 20).
** Additional thermal electricity generation is reported by Eurostat from oil, renewable and non-renewables, which are not shown here.
*** No data for Liechtenstein (LI) and Northern Ireland (XI) available.

**Source:** EEA (2024), Eurostat (2024).

Figure 1-4([2]) illustrates the long-term development of ETS emissions from power plants by fuel type and country since 2005. The emission trends vary significantly between countries. Some countries, such as Luxembourg and Portugal, have achieved reductions of over 80% since 2005. Austria, Denmark, Finland, Greece, Romania, Spain, and Sweden have also seen substantial reductions, with decreases of more than 70% over the same period. In contrast, other countries have experienced relatively modest reductions, with emissions from power plants in Cyprus decreasing by 12% and in Poland by 34% since 2005.

(2) See Hermann et al. (2021) for methodology.

**Figure 1-4 ETS emissions of power plants by fuels and by country from 2005-2023 (Mt $CO_2$)**




**Note:** No fossil power plants in Iceland and Liechtenstein. Bulgaria and Romania joined in 2007, Croatia in 2013. Great Britain left in 2020 but Northern Ireland remained in the EU-ETS. Since 2020 Sweden reports the emissions from the blast furnace power plant under activity code 24.

**Source:** EU (2024) based based on methodology developed in Hermann et al. (2021).

Table 1-4 highlights the 30 largest power plants covered by the EU ETS, which collectively emitted approximately 203 Mt $CO_2$ in 2023—a reduction of the emissions of these 30 power plants of about 26% compared to 2022. Thus, the emission reduction by the top 30 power plants is substantially higher than for combustion installations overall (-21%). Between 2022 and 2023, the average reduction in emissions for the top 30 power plants by fuel type was -27% for lignite, -26% for hard coal, and -11% for blast furnace gas.

The top 30 plants accounted for around 31% of total combustion emissions in 2023. The highest-emitting installations in the EU ETS are lignite-fired power plants, primarily located in Poland and Germany. The largest emitter is the Bełchatów lignite power plant in Poland, which emitted 36 Mt $CO_2$ in 2023, a 25% reduction from 2022. Following Bełchatów, the next five top emitters are lignite-fired power plants in Germany.

The number of power plants using blast furnace gas on the top 30 list has increased to 5 compared to only 3 in the previous year. This shows that other areas (such as the use of coke in blast furnaces) will play a greater role in the future against the backdrop of significant emission reductions in the coal-fired power plant sector.

**Table 1-4 Top 30 emitters in 2023 (power plants)**

| Rank 2022-2023 | | EUTL ID | Company | Power Plant | Main Fuel | Verified Emissions 2023 ($MtCO_2$) | Change 2022-2023 | Emission intensity 2023* ($tCO_2/MWh$) |
|---|---|---|---|---|---|---|---|---|
| 1 | = | PL 1 | PGE | Bełchatów | Lignite | 26.2 | -25% | 1.18 |
| 2 | = | DE 1606 | RWE | Neurath | Lignite | 16.5 | -32% | 1.10 |
| 3 | ↑(4) | DE 1456 | LEAG | Jänschwalde | Lignite | 14.0 | -9% | 1.20 |
| 4 | ↓(3) | DE 1649 | RWE | Niederaußem | Lignite | 13.3 | -22% | 1.14 |
| 5 | ↑(11) | DE 1459 | LEAG | Schwarze Pumpe | Lignite | 9.7 | 1% | 1.14 |
| 6 | ↓(5) | DE 1607 | RWE | Weisweiler | Lignite | 9.2 | -38% | 1.26 |
| 7 | = | PL 4 | ENEA | Kozienice | Hard coal | 8.9 | -25% | 0.93 |
| 8 | ↑(12) | PL 2 | PGE | Opole | Hard coal | 8.9 | -2% | 0.85 |
| 9 | ↓(8) | PL 3 | PGE | Turów | Lignite | 8.8 | -21% | 1.16 |
| 10 | ↓(6) | DE 1460 | LEAG | Lippendorf | Lignite | 7.4 | -38% | 0.96 |
| 11 | ↓(9) | DE 1454 | LEAG | Boxberg Werk IV | Lignite | 6.8 | -39% | 1.03 |
| 12 | ↑(13) | DE 1453 | LEAG | Boxberg Werk III | Lignite | 6.2 | -22% | 1.19 |
| 13 | ↑(16) | PL 5 | Enea | Połaniec | Hard coal | 5.1 | -29% | 0.75 |
| 14 | ↑(15) | BG 9 | Contour Global | Maritsa East 3 | Lignite | 4.7 | -35% | 1.12 |
| 15 | ↓(10) | BG 50 | TPP | Maritsa East 2 | Lignite | 4.3 | -61% | 1.10 |
| 16 | ↑(20) | CZ 124 | Sev.en | Elektrarna Pocerady | Lignite | 4.1 | -20% | 1.03 |
| 17 | ↑(25) | ES 201 | EDP | Aboño 1 | Hard coal | 4.0 | -12% | 1.39 |
| 18 | ↑(27) | DE 1376 | Uniper | Kraftwerk Schkopau | Lignite | 3.9 | -10% | 1.29 |
| 19 | ↑(34) | PL 209933 | Enea | Kozienice Block 11 | Hard coal | 3.8 | 5% | 0.85 |
| 20 | ↑(21) | BE 750 | Electrabel | Knippegroen | Blast furnace gas | 3.8 | -23% | - |
| 21 | ↑(29) | NL 188 | Nuon Power Generation B.V. | Velsen | Blast furnace gas | 3.6 | -7% | - |
| 22 | ↑(41) | CZ 129 | ČEZ | Elektrarna Tusimice 2 | Lignite | 3.6 | 5% | 0.92 |
| 23 | ↑(32) | IT 511 | Taranto Energia | Taranto | Blast furnace gas | 3.5 | -6% | - |
| 24 | ↓(17) | DE 1380 | Großkraftwerk Mannheim | Mannheim | Hard coal | 3.4 | -43% | 1.02 |
| 25 | ↓(18) | GR 15 | ΔΕΗ AE | Dimitrios | Lignite | 3.3 | -43% | 1.61 |
| 26 | ↓(19) | IT 439 | ENEL | Torrevaldaliga Nord | Hard coal | 3.3 | -38% | 1.02 |
| 27 | ↓(14) | IT 521 | ENEL | Brindisi Sud | Hard coal | 3.3 | -56% | 0.99 |
| 28 | ↓(22) | DE 1457 | EnBW | RDK Karlsruhe | Hard coal | 3.2 | -33% | 0.85 |
| 29 | ↑(36) | DE 1132 | Salzgitter AG | Kraftwerk Hallendorf | Blast furnace gas | 3.2 | -11% | - |
| 30 | ↑(42) | PL 31 | TAMEH Polska | Zaklad Wytwarzania Nowa | Blast furnace gas | 3.1 | -3% | - |

**Note:** All installations are power plants reporting under the activity code combustion in the EUTL.
Values in brackets show the ranking from the previous year.
*Emisson intensity of blast furnace installations not calculated due to unclear electricity generation data.

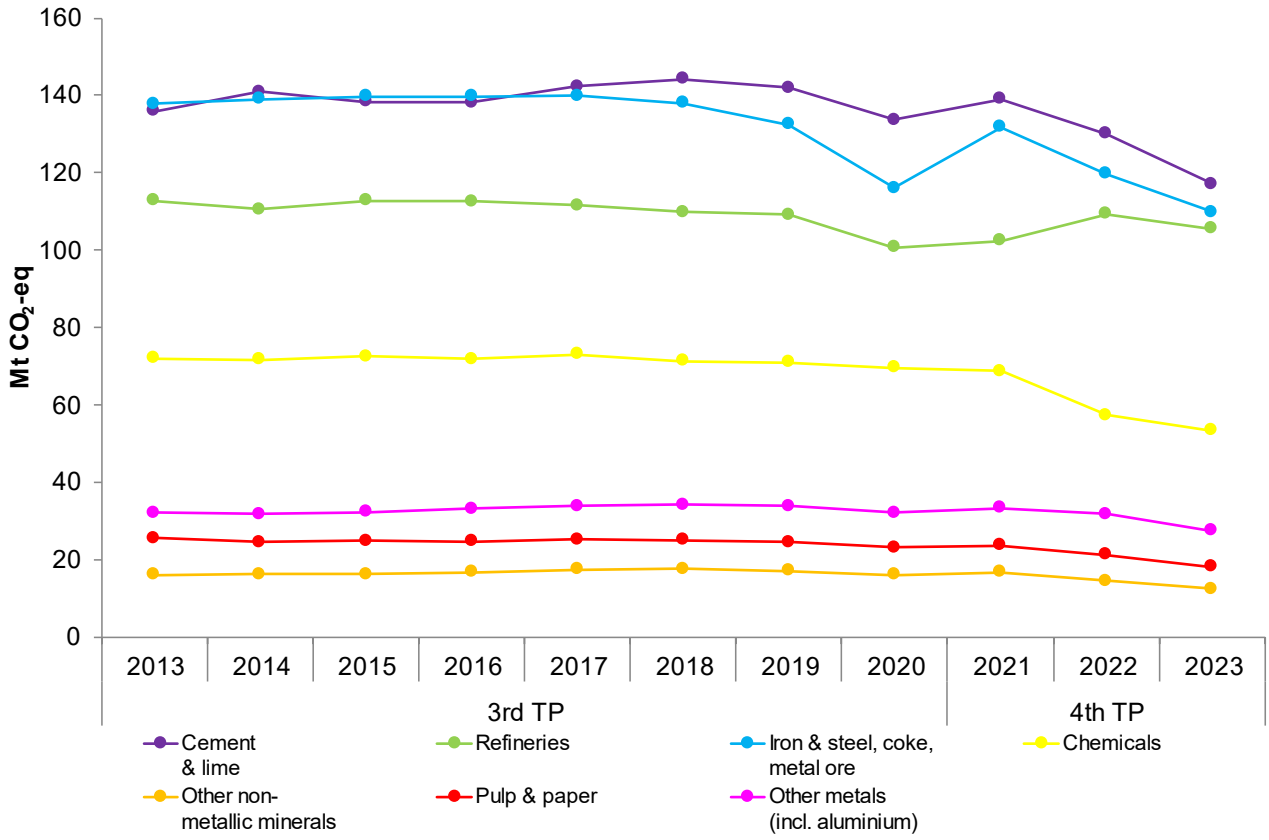
**Sources:** EU (2024) based on methodolgy from Hermann et al. (2021), ENTSO-E (2024).

***Industry***

Since 2013, emissions in industrial sectors have remained relatively stable until 2019 (Figure 1-5). Emissions dropped in 2020 due to the COVID-19 pandemic, rebounding in 2021. However, starting at the end of 2021, rising natural gas prices caused significant emission reductions across these sectors. The decline of 40 Mt CO2-eq in both 2022 and 2023, compared to previous years, was largely due to reduced industrial output rather than shifts to cleaner technologies. This trend was evident across all industrial sectors.

In 2023, the largest relative reductions compared to 2022 were seen in the pulp and paper sector (-15%) and the other metals sector (-14%). In absolute terms, the cement and lime sector contributed the most to emission reductions, with a decrease of 12.9 Mt $CO_2$ -eq compared to 2022, followed by the iron and steel sector, which reduced emissions by 10 Mt $CO_2$-eq compared to 2022.

**Figure 1-5 EU ETS emissions by main industrial activity in the EU-ETS***

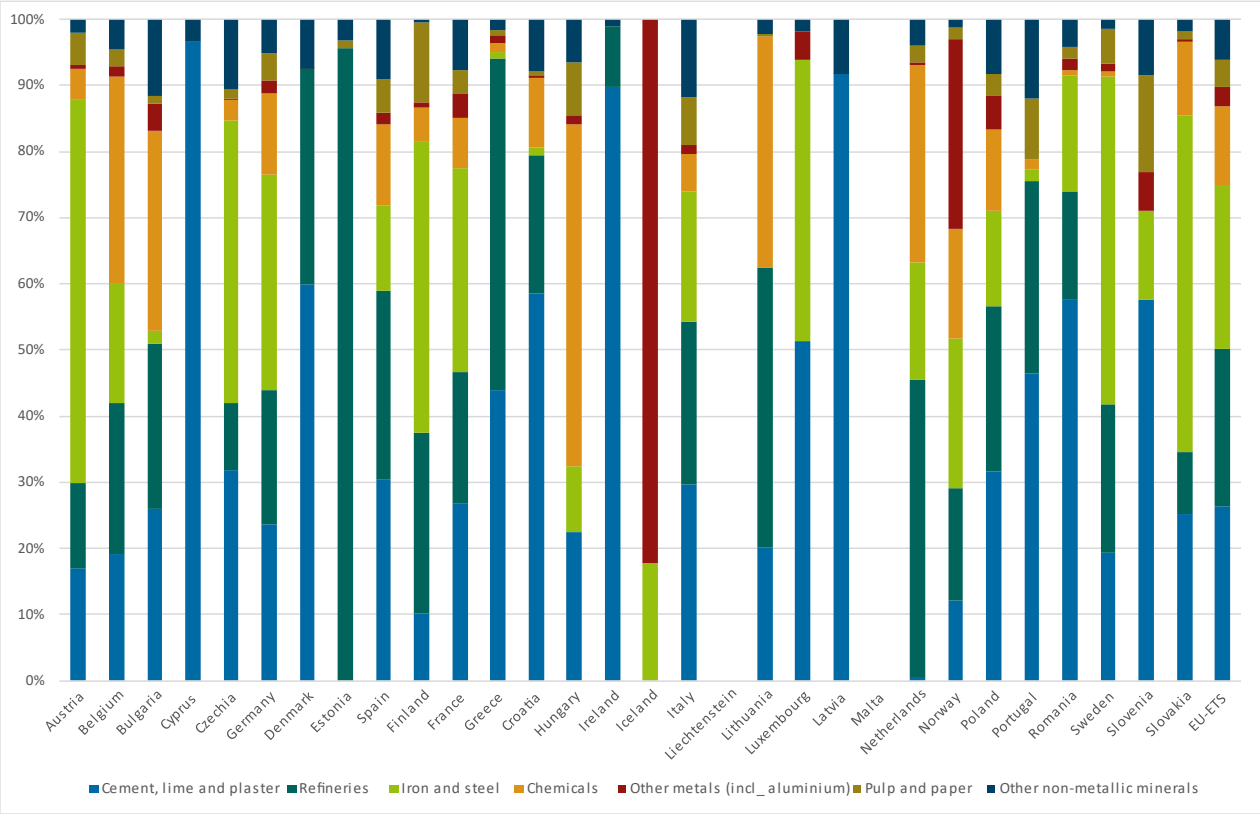



**Note:** ETS activity codes have been aggregated for certain sectors (refer to Annex IV).
*without UK.

**Source:** EEA (2024).

Figure 1-6 illustrates the distribution of EU ETS industrial emissions by country in 2023. No EU ETS industrial emissions were reported in Liechtenstein and Malta for 2023. Installations in the cement and lime sector are present in most countries and represent a significant portion of industrial emissions across the board. Refineries contribute a large share of emissions, particularly in Estonia, Greece, and the Netherlands. In Austria and the Czech Republic, the iron and steel sector dominates industrial emissions. The chemical industry also plays a major role in emissions, especially in Belgium, Bulgaria, Hungary, Lithuania, and the Netherlands.

**Figure 1-6 EU ETS industrial emissions by sector in 2023**




**Note:** No EU ETS Emissions from Industry in Liechtenstein and Malta.

**Source:** matching based on EEA (2024).

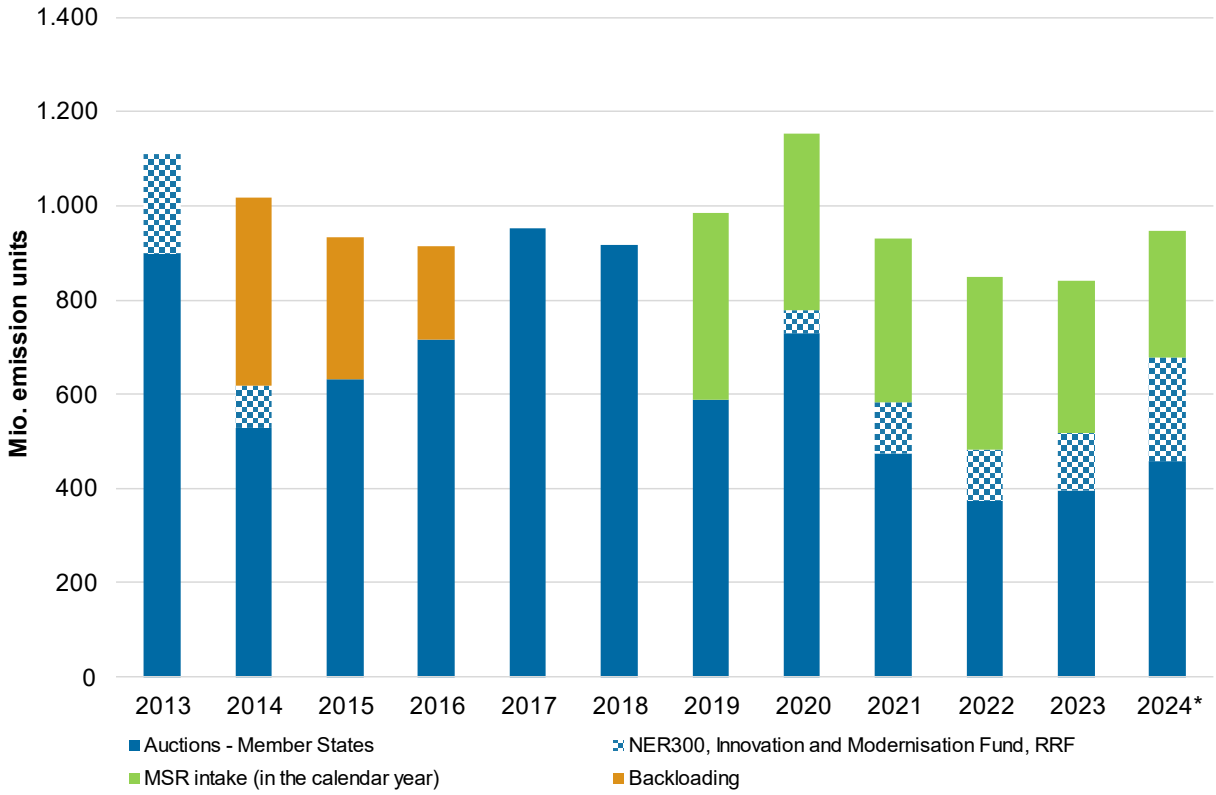
### *1.1.3 Supply of allowances*

The supply of allowances in the EU ETS is made up of free allocation (Figure 1-8) and the auctioning of allowances (Figure 1-7).

***Auctioned allowances and MSR intake***

The following graph illustrates EU ETS auctions for the stationary sector since 2013. In 2023, a total of 481 million allowances were auctioned, which included 123 million allowances where proceeds are allocated to various funds. The number of allowances auctioned in the EU ETS is influenced by the Market Stability Reserve (MSR), which adjusts the auction volume based on the surplus of the Total Number of Allowances in Circulation (TNAC). To date, the MSR has withheld allowances from auction in each year, as the TNAC was above the upper threshold. In 2023, the MSR intake amounted to 369 million allowances.

**Figure 1-7 EUA auction quantities and MSR intake, 2013-2024**




**Note :** * planned auctions in 2024.
MSR intake that has actually taken place in the respective calendar years.
Auctioned amouts according to the Auctioning Calender and TNAC publication.

**Source :** EC (2024c), EEX (2024), ICE (2021) .

The quantities auctioned for the Innovation and Modernisation Funds have increased in recent years. The respective quantities are shown in Table 1-5. In 2024, the auctioned amounts for funds will be twice as high compared to the year 2021. The main reason for these increased quantities are auctions for the Recovery and Resilience Facility (RRF). The revenues are used to finance measures for the green transition and to phase out Russian fossil fuels as part of the REPowerEU program. The RRF leads to a frontloading of auctions initially planned for the second half of the trading period 2021 to 2030.

**Table 1-5 Auctions for funds, 2020-2024**

| | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|
| Modernisation Fund | - | 69 | 68 | 67 | 97 |
| Innovation fund | 50 | 40 | 40 | 21 | 35 |
| Recovery and Resilience Facility (RRF) | - | - | - | 35 | 87 |
| **Total** | **50** | **109** | **108** | **123** | **219** |

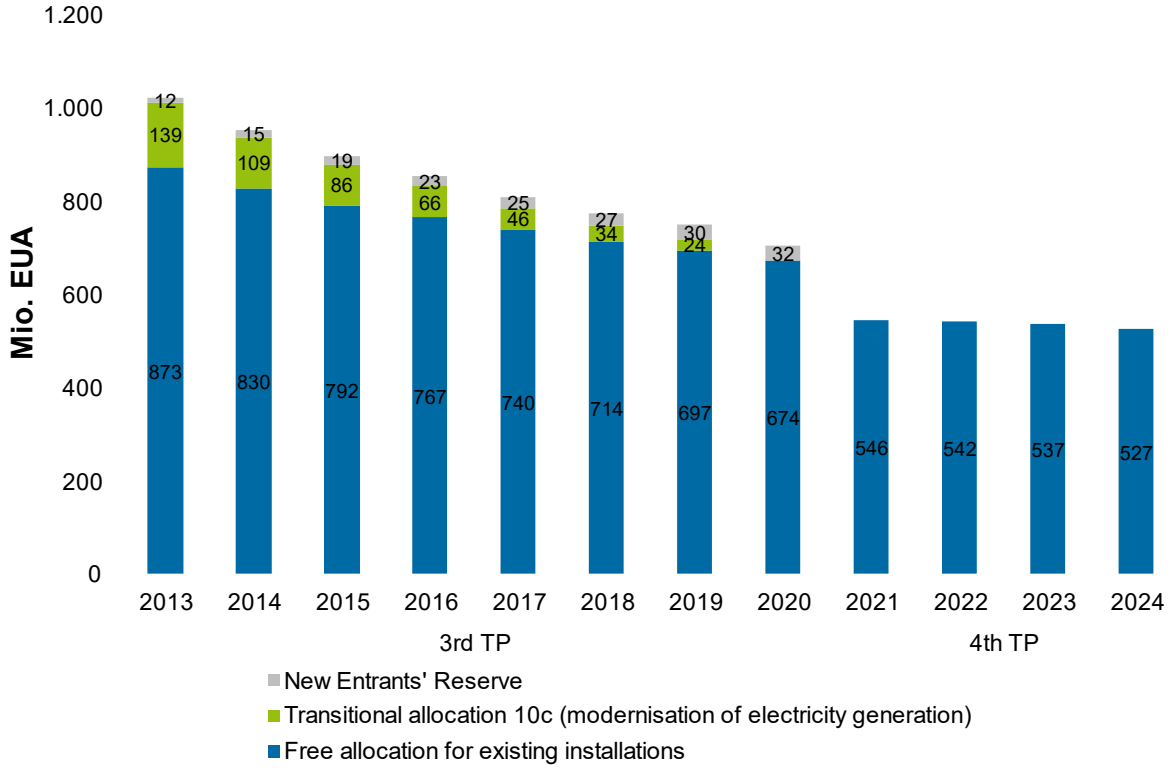
**Sources:** EEX (2024).

***Free allocation***

In the EU ETS, the majority of allowances are auctioned and in particular electricity generation does not receive any free allocation. For sectors other than electricity, free allocation is based on historical production and product benchmarks. Only sectors at risk of carbon leakage receive 100% of free allocation, while non-carbon leakage sectors receive a declining share of the benchmark allocation.

Free allocation has decreased significantly since 2013 (Figure 1-8). However, since the start of the fourth trading period, the level of free allocation has remained relatively stable. In 2023, 537 million allowances were allocated for free, which is 1% less than in 2022. In 2026 free allocation will decrease as updated benchmarks will be used. To ensure a level playing field between new entrants and incumbents, a New Entrants Reserve (NER) is available also in the fourth trading period. The NER consists of 200 million allowances sourced from the Market Stability Reserve, as well as allowances that remained unallocated at the end of Phase 3. While the number of allowances allocated for free from the New Entrants' Reserve increased between 2013 and 2020, no stationary plants have received allocations from the NER in the fourth trading period so far.

**Figure 1-8 Free allocation of EUAs from 2013 to 2024**




**Source :** EEA (2024).

Article 10c of the ETS Directive provides a derogation from the general rule that allowances should no longer be allocated for free to electricity generation (EU 2023b). This derogation applied to ten eligible Member States ([3]). During the fourth trading period, that started in 2021, eligible countries can allocate a maximum of 40% of their regular allowances to the Article 10c derogation. Of the eligible countries only Bulgaria, Hungary and Romania will continue to apply article 10c, while the other eligible countries chose to either auction these allowances or transfer them to the Modernisation Fund (EC 2022b). Table 1-5

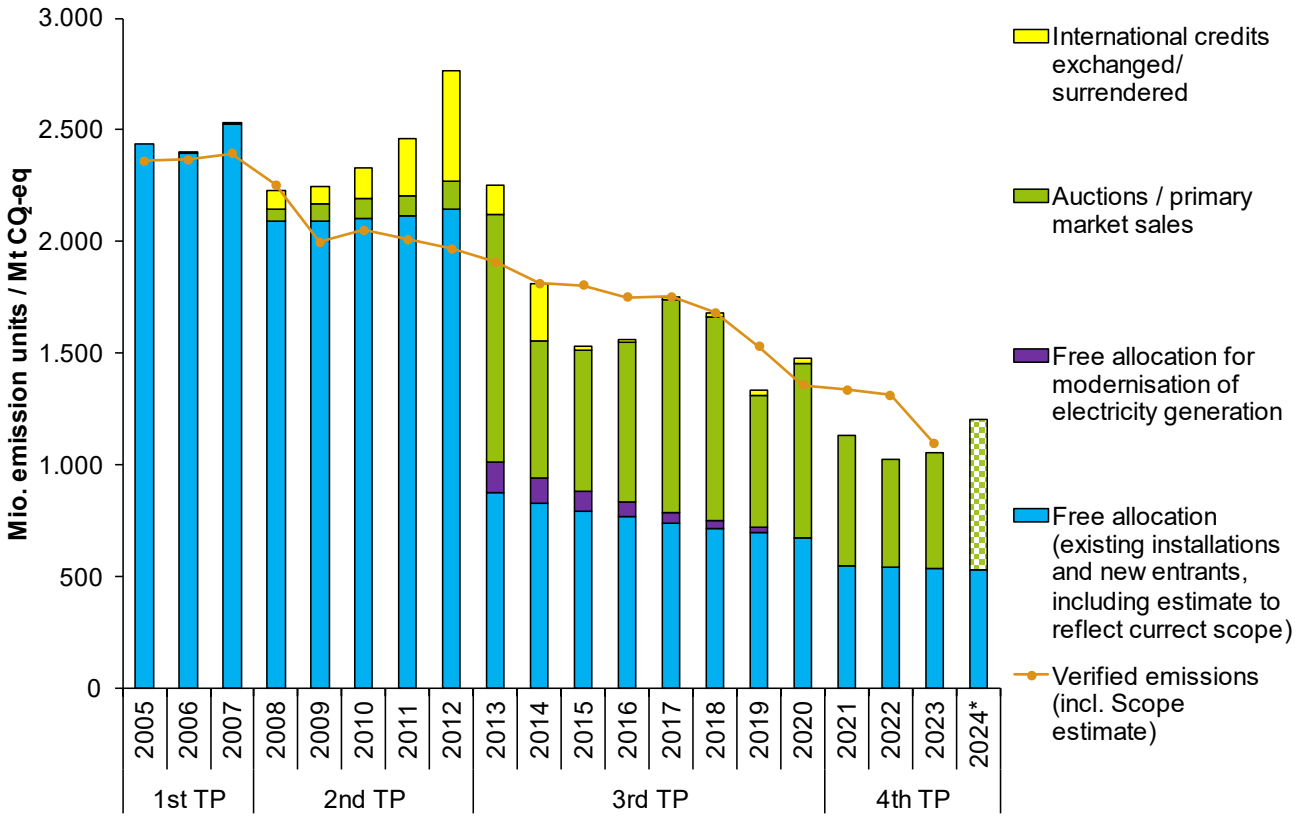
([3]) Bulgaria, Cyprus, Czechia, Estonia, Hungary, Latvia, Lithuania, Malta, Poland and Romania.

shows the volumes auctioned for the Modernisation Fund (Article 10d). The fund is supported by both the transferred 10c amounts of the relevant countries, as well as 2% of the cap (Article 10). So far, no allowances have been allocated for free under Article 10c during the fourth trading period, as the respective countries still need to establish national frameworks.

***Supply and demand for allowances and impact on the allowance price***

Figure 1-9 illustrates the supply and demand for allowances. In each year since 2021, verified emissions have exceeded the number of allowances made available to the market, resulting in a reduction of the surplus of allowances. The primary driver of this reduction was the Market Stability Reserve (MSR), which removed allowances from the market through reduced auction supply. However, in 2023, verified emissions were only slightly higher than the available allowances. This was influenced by a reduction of the demand of allowances (due to the high emission abatement) and an increases supply of allowances compared to the previous year (due to an increase in auctioned allowances due to additional quantities made available for funds). Looking ahead to 2024, auctions are expected to increase further due to the inclusion of shipping in the EU ETS and additional allowances allocated to various funds. At the same time, demand for allowances remains uncertain. With further emission reductions likely in the power sector (Euroelectric 2024) it is possible that supply in 2024 may again exceed demand.

**Figure 1-9 Supply and demand balance for stationary installations, 2005-2023**



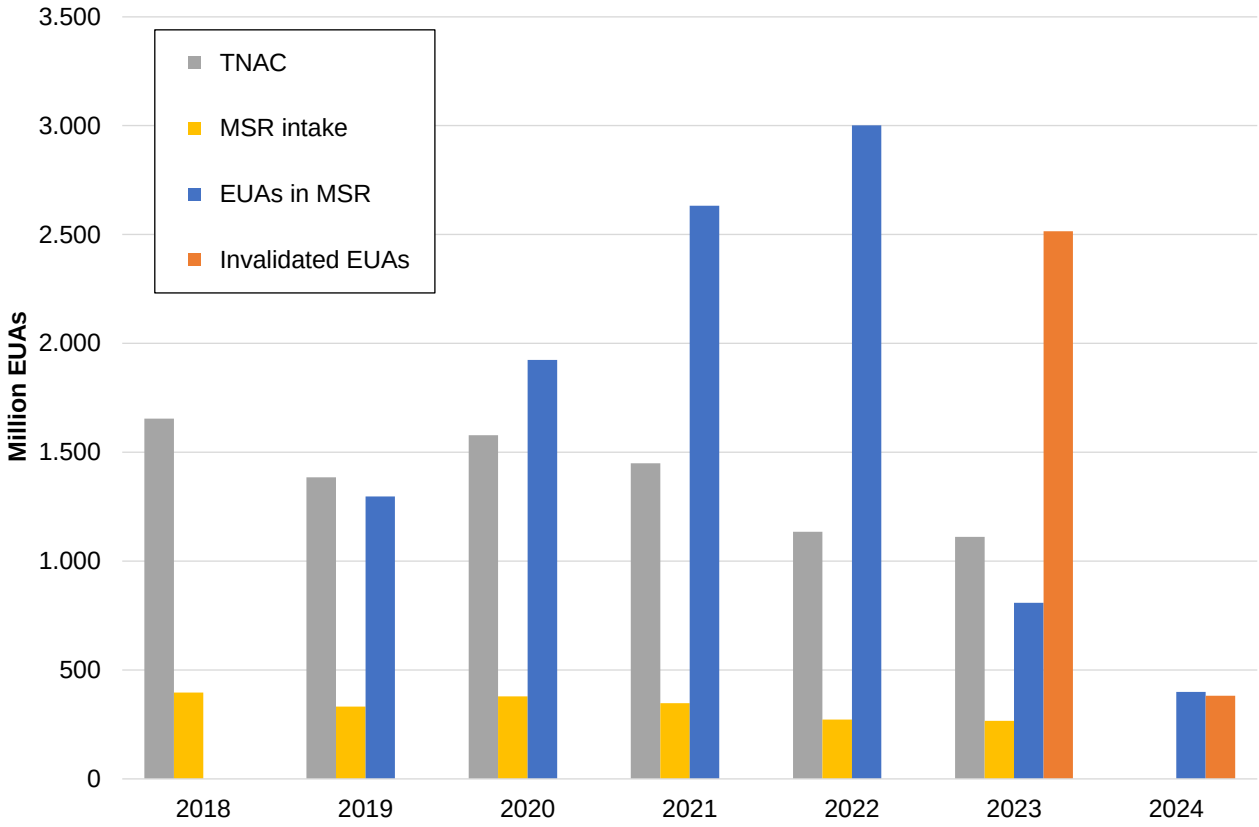

**Note:** including UK until 2020.
*Auctions: to be auctioned in 2024.

**Source:** EEA (2024).

Figure 1-10 shows the development of key MSR indicators and values since 2018. The intake depends on the surplus of allowances in the EU ETS (measured by the total number of allowances in circulation, TNAC). Since 2018, the TNAC fluctuated around 1.5 billion allowances, but started to decline in 2021. The TNAC

at the end of 2023 amounts to EUA 1.11 billion allowances (EC 2024c). The MSR will absorb 24% of this TNAC (267 million EUA), and the auction volumes will be reduced accordingly in the period from 1 September 2024 to 31 August 2025. Since the beginning of 2023, the amount of emission allowances in the MSR is limited. In 2023 the limit corresponded to the quantity of auctions in 2022. From 2024 onwards and according to the revised ETS Directive, the maximum quantity of allowances that the MSR can contain was set at 400 million. Quantities in the MSR exceeding this limit are invalidated.

**Figure 1-10 Key MSR indicators and values, 2018-2024**




**Note:** Number of allowances in the MSR at the end of the year, except for 2024, where values are given for the beginning of the year. TNAC for 2024 is not yet available and will be published 1 June 2025.

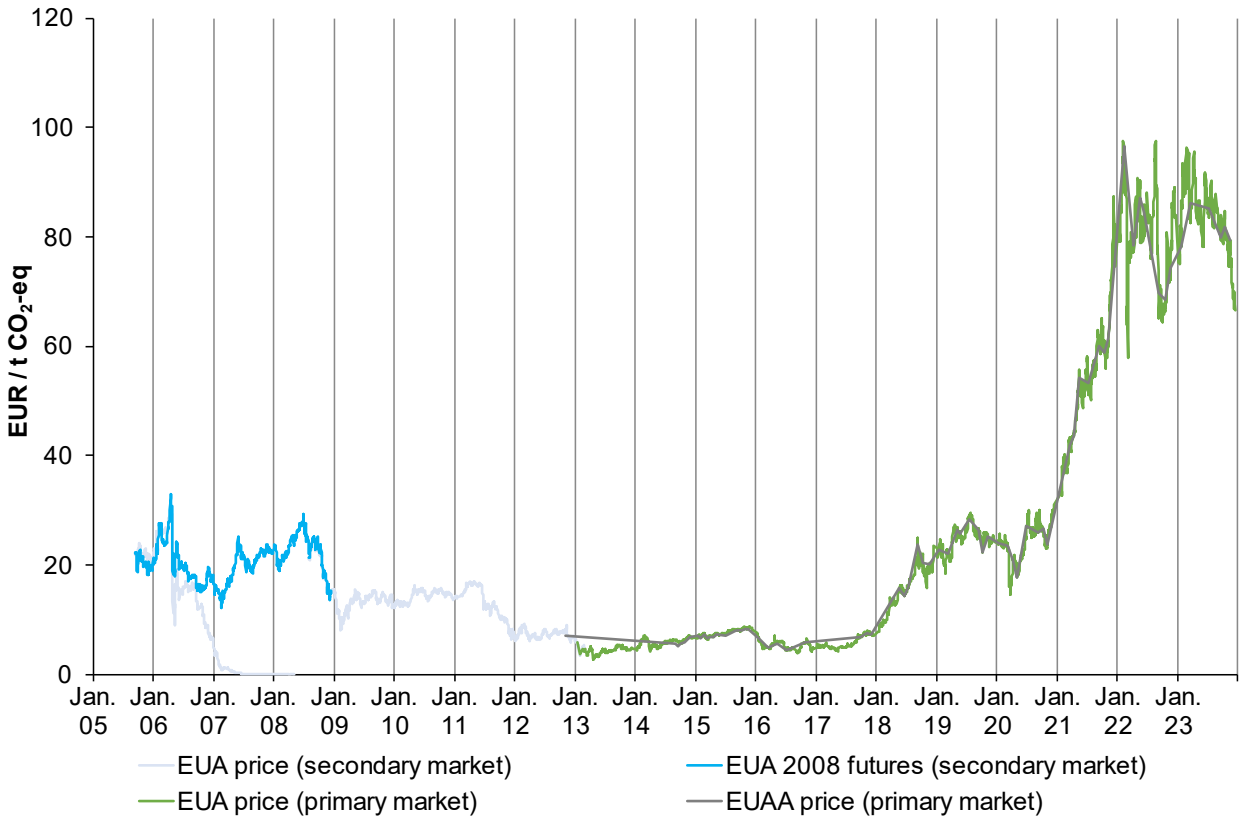
**Source :** EC (2024c), EC (2023b) and previous TNAC publications.

Figure 1-11 illustrates the price trends of EUAs since the inception of the EU ETS. After a decade of relatively low prices, the price of allowances started increasing in 2018, driven by various factors. In 2023, the average price of European Union Allowances (EUAs) reached €84 per EUA, marking the highest annual average price since the system's establishment.

The rise in prices can be linked to the revision of the EU ETS Directive for the fourth trading period, as part of the "Fit for 55" package. The revision involved a stricter cap on emissions, which is anticipated to necessitate higher abatement efforts at increased costs compared to previous periods.

While the overall price level has increased, the price of EUAs has exhibited considerable volatility since the beginning of 2022, ranging between €60 and €97 per EUA. This volatility has been influenced by several factors, including the energy crisis triggered by Russia's invasion of Ukraine, the release of additional allowances to fund the REPowerEU initiative, and a decreased demand for allowances due to the increased adoption of renewable energy.

**Figure 1-11 Price trends for allowances and certified emission reductions (2005-2023)**




**Sources:** Point Carbon (2012), EEX (2024), ICE (2021).

Since the beginning of 2021 EUAs and European Union Aviation Allowances (EUAAs) have become fully fungible, leading to only minor differences in their respective prices.

## 1.2 Aviation

**Aviation Emissions in 2023**: Aviation emissions under the EU ETS increased by 9% in 2023 compared to 2022, reaching 55.6 Mt $CO_2$-eq. A significant portion of emissions was covered by purchasing allowances from the stationary sector.

**Concentration of Emissions among Aviation Operators:** A small number of airlines and aviation entities are responsible for a significant share of aviation emissions under the EU ETS. The top 10 aviation operators collectively account for 72% of total emissions.

**Free Allocation and Auctioning:** Free allocation of aviation allowances in the EU ETS is set to phase out by 2026, transitioning to full auctioning. Free allowances currently cover 41% of emissions, with auctioning playing an increasingly important role to support sustainable aviation initiatives.

### *1.2.1 Overview*

In 2023, ETS emissions from aviation continued to rebound, showing a 9% increase compared to the previous year, as outlined in Table 1-6. Total emissions (including aviation emissions covered by the Swiss ETS) reached 55.6 Mt $CO_2$-eq, a rise that corresponds to the resurgence in aviation activities. Eurocontrol (2024) reports that the number of flights in 2023 recovered to 92% of 2019 levels. As aviation emissions

continue to increase and the cap for the aviation sector decreases annually in line with the linear reduction factor the aviation sector is covering nearly half of its emissions with allowances from the stationary sector.

**Table 1-6 EUAA demand, supply and price (aviation operators), 2022-2023**

| | 2022 | 2023 | Change2022-2023 |
|---|---|---|---|
| Total demand (Mt $_{CO2}$-eq.) | 50.8 | 55.6 | **9%** |
| Aviation emissions EU-ETS | 48.7 | 53.2 | **9%** |
| Reported in Swiss-ETS for EU-ETS scope | 0.8 | 0.9 | **14%** |
| Reported in EU-ETS for Swiss-ETS scope | 0.5 | 0.7 | **41%** |
| Reported in Swiss-ETS for Swiss-ETS scope | 0.8 | 0.8 | |
| Total supply (millions of EUAAs) | 27.8 | 29.3 | **5%** |
| Aviation free allocation | 22.4 | 21.8 | **-3%** |
| Aviation free allocation (NER) | 0.2 | 0.2 | **-2%** |
| Auctioned amounts | 3.7 | 5.7 | **55%** |
| Allocation in Swiss-ETS for EU-ETS scope | 0.4 | 0.4 | |
| Allocation in EU-ETS for Swiss-ETS scope | 0.4 | 0.5 | |
| Allocation in Swiss-ETS for Swiss-ETS scope | 0.5 | 0.5 | |
| Swiss auctioned amounts | 0.2 | 0.2 | |
| Annual supply-demand balance (millions of EUAAs) | -28.4 | -33.8 | |
| | | | |
| EUAA price* (EUR) | 79.86 | 82.33 | **3%** |

**Notes:** NER, New Entrants Reserve.

**Sources:** EC (2023b), EEA (2024), EEX (2024), BAFU (2024).

**Box 1 Swiss Linking**

Since the beginning of 2020, the EU Emissions Trading System (ETS) has been linked to the Swiss ETS, allowing companies subject to emissions trading to use Swiss allowances alongside EUAs and EUAAs to meet their compliance obligations. The allowances are fully interchangeable between the two systems, meaning that Swiss allowances can be used in the EU ETS and vice versa. However, due to the relatively small scale of the Swiss ETS, its impact on the EU ETS remains minimal (see ICAP 2021).

Aviation is integrated into this system, with flights from the EEA to Switzerland covered by the EU ETS and flights from Switzerland to the EEA falling under the Swiss ETS. Aircraft operators benefit from a "one-stop shop" approach, where a single competent authority—whether from an EU ETS Member State or Switzerland—oversees their compliance. Only one operator holding account is required for both schemes.

In 2023, aircraft operators administered by an EEA Member State received 0.46 million free allowances from the Swiss ETS for activities within the Swiss system, reporting 0.71 Mt $CO_2$-eq in emissions. The "one-stop shop" also works in reverse: aircraft operators managed by Switzerland reported 0.86 Mt $CO_2$-eq in emissions for flights covered by the EU ETS, receiving 0.38 million free EUAA allowances for these flights (BAFU 2024).

### 1.2.2 Emission trend and free allocation

Table 1-6 illustrates that part of the aviation emissions covered by the EU ETS is reported under the Swiss ETS. Table 1-7 focusses on emissions and free allocation for the EU ETS scope reported in the EUTL. In 2023, these aviation emissions amounted to 53.2 Mt $CO_2$ of which 41% were covered by free allocation. The biggest emitter in the aviation sector is Ryanair, which accounted for 10.3 Mt of $CO_2$-eq in 2023, representing nearly one-fifth of total aviation emissions. When grouping individual airlines under their parent companies, the top 5 emitters in the aviation sector under the EU ETS emit 31 Mt $CO_2$-eq in 2023. Similar to the large lignite and coal fired power plants in the sector of stationary installations, only a small number of companies and operators is therefore responsible for a significant share of the emissions. The top 10 aviation companies account for 72% of total aviation emissions under the EU ETS, highlighting the critical importance of ambitious climate protection efforts by these companies.

**Table 1-7 Top 10 emitters in aviation in 2023**

| | Verified Emissions EU ETS Mt $CO_2$-eq | Compared to 2022 | Allocated EU ETS millions of EUAAs | Share of free allocation 2023 |
|---|---|---|---|---|
| Ryanair | 10.3 | +11% | 3.4 | 33% |
| Lufthansa Group* | 7.0 | +14% | 2.6 | 36% |
| Air France-KLM | 5.2 | +5% | 2.5 | 49% |
| International Airlines Group | 5.0 | +12% | 2.2 | 45% |
| Easyjet | 3.5 | +8% | 1.7 | 50% |
| Wizz Air Group | 2.8 | +19% | 0.6 | 21% |
| SAS | 1.7 | +29% | 1.1 | 66% |
| TAP Air Portugal | 1.1 | +15% | 0.5 | 42% |
| Finnair | 1.0 | +9% | 0.4 | 44% |
| EAT Leipzig | 1.0 | -2% | 0.3 | 30% |
| Other | 14.7 | +4% | 6.4 | 44% |
| **Total Aviation** | **53.2** | **+9%** | **21.8** | **41%** |

**Notes:** * Lufthansa Group: Deutsche Lufthansa, Austrian Airlines, Brussels Airlines, Lufthansa Cargo, Air Dolomiti, Eurowings, EW Discover, Edelweis Air, Luftahnsa Technik, Swiss Air.
Air France-KLM: Air France, KLM, Transavia Airlines.
International Airlines Group: Vueling Airlines, British Airways, Iberia, Aer Lingus.
Edelweiss Air and Swiss Air report their emissions in the Swiss ETS. Their emissions are therefore not included here.

**Source:** EU (2024).

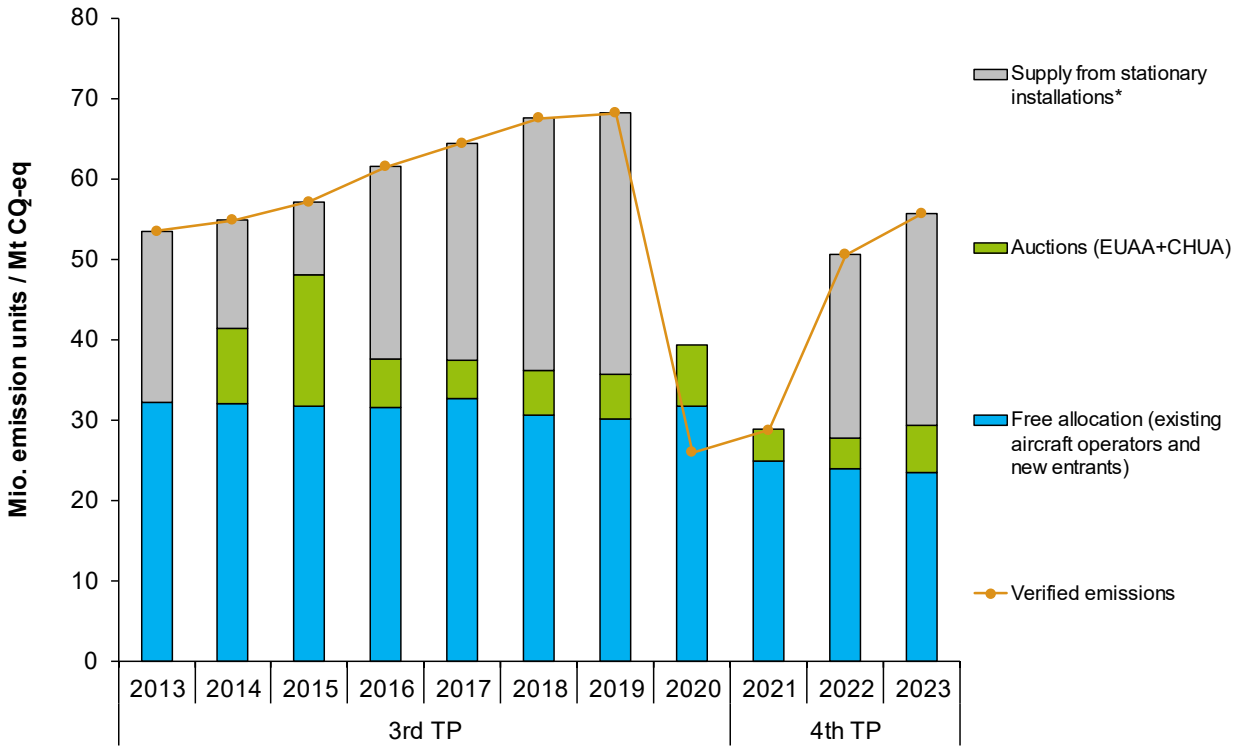
In 2023, free allocation was equal to 41% of aviation emissions. The free allocation for aircraft operators will be phased out gradually in 2024 and 2025, with full auctioning set to replace it entirely by 2026. The distribution of free allocation in 2024 and 2025 will be based on the proportion of verified emissions in year 2023 for each operator (EC 2024d). From the allowances to be auctioned up to 20 million allowances will be allocated free of charge to promote sustainable aviation fuel (Art. 3c (6) of the EU ETS directive). Additionally, 5 million aviation allowances will be allocated to the Innovation Fund (Art. 10a (8) of the EU ETS directive).

### 1.2.3 Supply and demand of allowances

Historically, the aviation sector has been a net buyer of allowances from the stationary sector. The year 2020 was an exception due to the COVID-19 pandemic, which led to a surplus of 11 million EUAAs. In 2021, supply and demand in the aviation sector were balanced. However, since 2022, the aviation sector has

returned to being a net buyer of allowances (Figure 1-12). In 2023, the aviation sector covered more than half of its emissions by purchasing 34 million EUAs from the stationary sector (refer to Table 1-6).

**Figure 1-12 Demand and supply balance for aviation allowances, 2012-2023**




**Notes:** Chart contains UK values until 2020 and Swiss-ETS values from 2020 onwards.
* Supply from stationary installations includes International credit use by aircraft operators in early years (compare ETC CM 2023).

**Sources:** EC (2021), EEA (2024), BAFU (2024).

Similar to the EUA price, the EUAA price has been on an upward trend since the beginning of 2018. The average price for 2023 was equal to 82 EUR/EUAA. As allowances from the stationary sector (EUAs) and allowances from the aviation sector (European Union Aviation Allowances (EUAAs)) are fully interchangeable, both have a similar price trend (Figure 1-11).

### *1.2.4 The changing scope for aviation covered by the EU ETS*

The scope of flights covered by the EU ETS has evolved over time. Following Brexit and since 2021, flights within the UK and from the UK to the European Economic Area (EEA) are no longer covered by the EU ETS but by the UK Emissions Trading System. However, flights from the EEA to the UK remain under the EU ETS, and flights from the EEA to Switzerland are covered since 2020.

Due to these changes in scope, aviation emissions covered by the EU ETS in 2019 are not directly comparable with emissions covered in 2023, which were 78% of 2019 levels, according to data from the EUTL. As the 2019 emission data is not available in the "current" scope, other sources are needed to determine the reduction or increase in emissions between 2019 and 2023.

Eurocontrol (2024) reports that the number of flights in 2023 recovered to 92% of 2019 levels. Thus, aviation emissions in 2023 are likely 5 to 10% below pre-pandemic levels (i.e. the 2019 level). For 2024,

the activity level (number of seats) in European aviation is expected to return to 2019 levels (BDL Berlin, 2024). Thus, it is likely that the aviation emissions in 2024 will have about the same emission levels as in 2019 (constant scope).

At the beginning of 2024, the scope of the aviation sector in the EU ETS was expanded further and now also includes certain flights to and from outermost regions (between an aerodrome located in an outermost region of a Member State and an aerodrome located in another Member State). The cap for the aviation sector in the year 2024 is equal to 29 Mt $CO_2$. This cap is reduced annually by 1.4 million EUAA (calculated with a linear reduction factor of 4.3%). From 2028 onwards, the linear reduction factor will be increased to 4.4% (EU 2023a).

# 2 Outlook until 2030 and 2050

This section discusses expected developments of emissions from stationary installations and aviation operators, covered by the EU ETS. For this purpose, the latest projections from the ETS countries submitted under Article 18 of the Governance Regulation are considered.

## 2.1 Stationary installations

**Projected Reductions in Stationary Emissions:** By 2030, stationary emissions in the EU ETS are expected to decrease by 54% under current measures, or by 59% if additional measures are implemented. However, this still falls short of the EU ETS target of a 62% reduction by 2030 compared to 2005.

**Challenges in Meeting the 2050 Climate Goals:** Even with additional measures, stationary emissions are projected to reduce by only 73% by 2050 compared to 2005 levels, which is not sufficient to meet the EU climate neutrality target for 2050. Some countries may even see rising emissions after 2030 due to increased electricity demand.

**Country-Specific Projections:** Emission projections vary widely across EU Member States. Some countries, such as the Netherlands and Germany, anticipate significant reductions until 2030. The effect of increased electricity demand without parallel increase of electricity production from renewable energy in scenarios with additional measures reduces projected emission reductions, which becomes visible in updated projections in Germany and Italy.

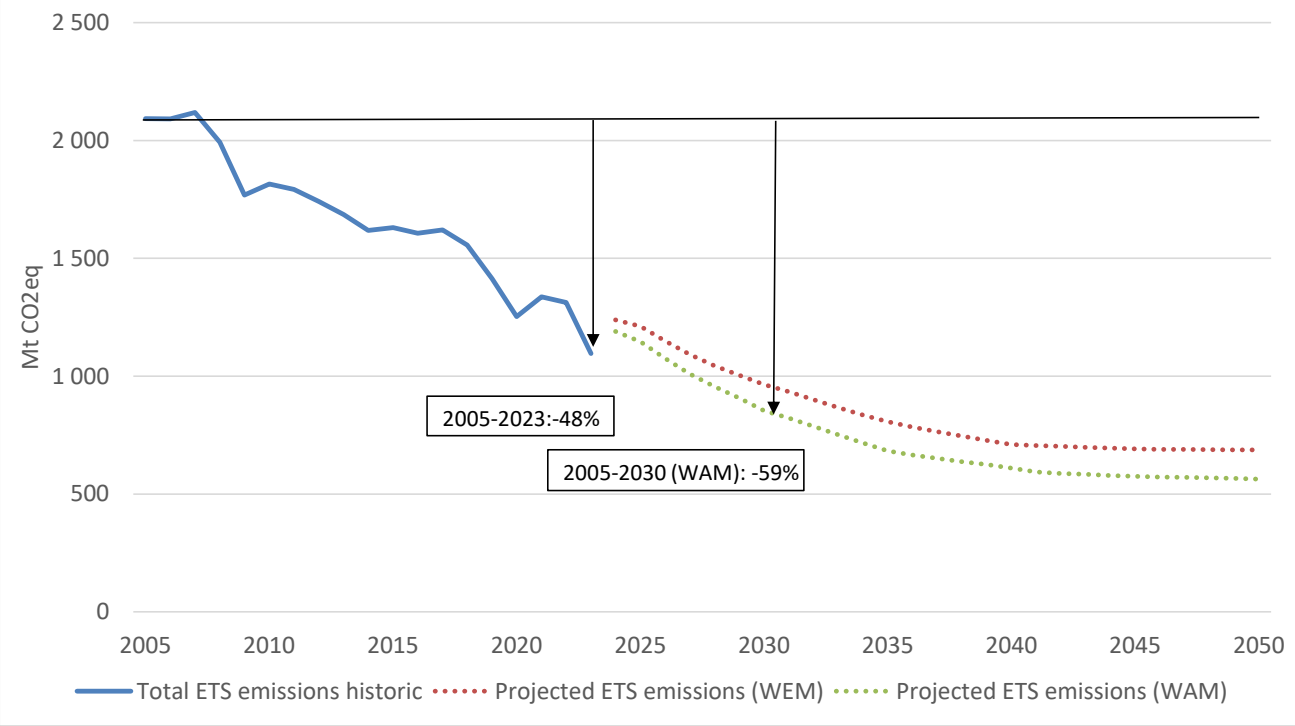
**Sector-Specific Trends**: The energy industry is projected to continue driving emissions reductions until 2030, though the pace of reduction will slow after that. Industrial processes and manufacturing are expected to see more modest declines in emissions, with little change projected after 2040.

**Future of the EU ETS Cap**: If the current linear reduction factor remains unchanged after 2030, the cap on ETS emissions could reach zero before 2040, but this scenario is not currently aligned with projections from all Member States, some of which forecast increasing emissions beyond 2030 (Romania, Hungary and Malta).

### *2.1.1 Overview*

According to the latest emission projections under the 'with existing measures' (WEM) scenario, stationary emissions in the ETS are projected to decrease until 2030 by 54% compared to 2005 levels. If additional measures are taken into account in projections ('with additional measures', WAM scenario), emissions in stationary EU ETS sectors are projected to decrease by 59% compared to 2005 (see Figure 2-1). This projected decrease is not sufficient to achieve the targeted reduction of 62% compared to 2005 levels for the overall EU ETS, considering that aviation emissions are projected to grow rather than contribute to the reduction (cf. Section 2.2).

**Figure 2-1** **Historic and projected ETS emissions in stationary installations under the EU Emissions Trading System**




**Sources:** EEA (2024), projections of EU Member States compiled by the European Topic Centre for Climate Change Mitigation (ETC CM) as of September 2024.

**Note:** WEM means 'with existing measures'; WAM means 'with additional measures'.

As Figure 2-1 shows, aggregated projections use 2022 as the starting year and do not take into account the significant decrease in emissions that happened between 2022 and 2023, leading to a considerable gap between the projected and actual emission values in the stationary sector for 2023. The actual decrease in emissions between 2022 and 2023 is equal to 217 Mt $CO_2$-eq in absolute terms, the annual emission reduction in the next seven years needs to be equal to 46 Mt $CO_2$-eq to reach the ETS reduction target in 2030. The average annual reduction since 2005 has been equal to 55 Mt $CO_2$-eq. Member State projections using the base year of 2022, on the other hand, project annual reductions of 35 Mt $CO_2$-eq and thus do not reach the 2030 target.

The difference between the WEM and WAM scenarios remains relatively stable between 2030 and 2050. If additional measures are considered, the total reduction until 2050 for ETS stationary installations adds up to 73% compared to 2005. This is neither in line with the expected ETS cap nor with the EU climate neutrality target for 2050. If the linear reduction factor in the ETS remains unchanged after 2030, the cap would be reduced to zero before the year 2040. Some Member States even project increasing ETS emissions after 2030.

### *2.1.2 Projection Methodology and Scenario Updates*

In 2024, eleven EU Member States submitted an update of Greenhouse Gas projections[4]. As in former years, country projections are aggregated to ETS-wide projections by the EEA and its ETC CM. If existing policies and measures are considered (WEM scenario), these updates lead to an overall increase of stationary ETS emissions in 2030 of +2 % compared to last year's projections, while projected emissions

([4]) Austria, Belgium, Denmark, Estonia, Germany, Ireland, Italy, Latvia, Lithuania, Luxembourg and Sweden.

are lower than in previous projections on the longer term, e.g. -3 % in 2050. With planned and additional measures (WAM scenario), there is virtually no change in ETS emissions projections for 2030 compared to last year and a decrease of -8 % in 2050.

This difference between the projections results from changes in different directions in updated projections: In Denmark, Estonia, Germany and Italy ETS emissions are higher than in last year's projections for 2030 with a remarkable increase in Germany of 14 Mt $CO_2$-eq compared to the WEM scenario of 2023. The difference is even higher for the WAM scenario (21 Mt $CO_2$-eq). This results from a higher electricity demand which is not balanced by an additional higher increase of electricity generation from renewable energy sources but from additional gas-fired generation.

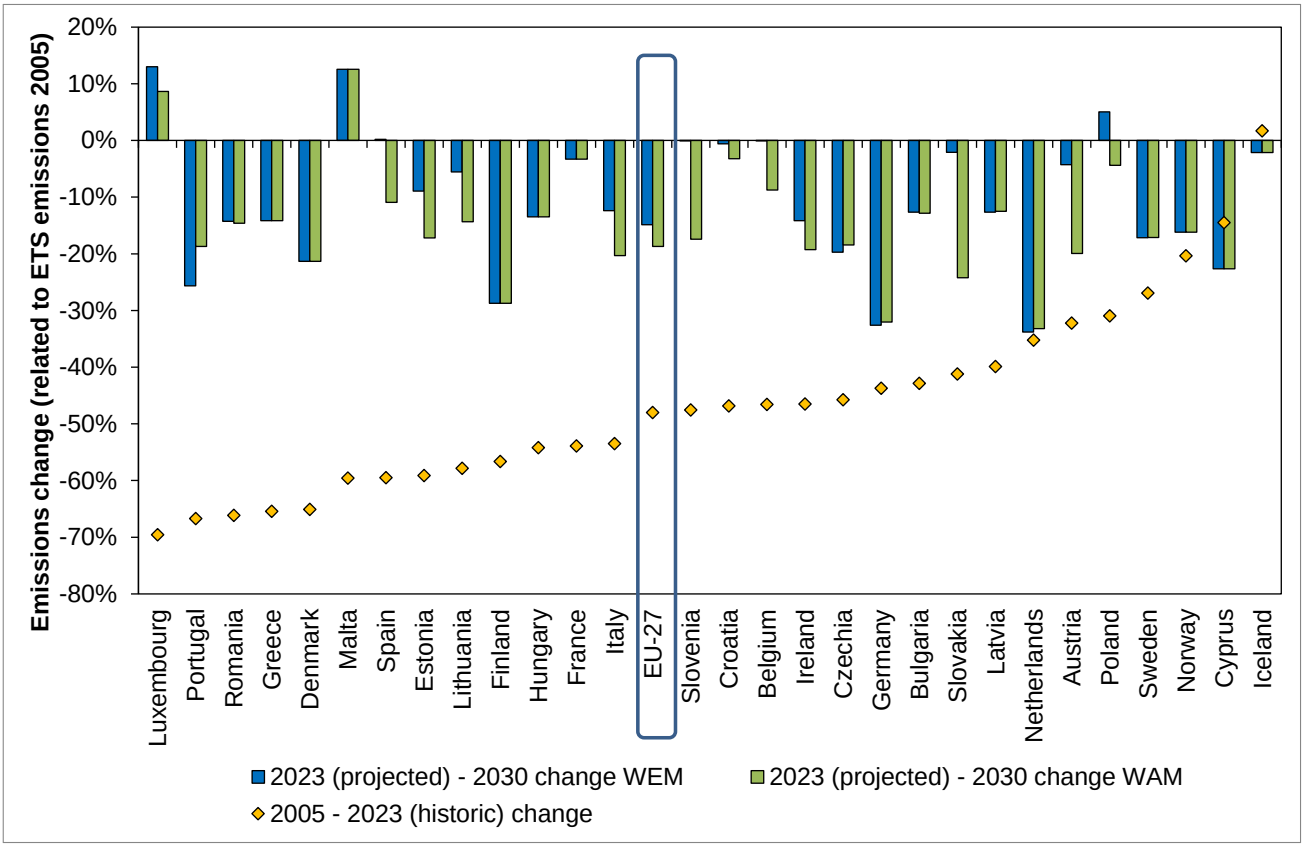
Projections were gap filled for emissions from Northern Ireland from 2024 onwards and for Norway from 2036 onwards with the application of an average reduction rate. For Liechtenstein, no projections from previous years exist and no ETS-emissions are reported since 2021, so no gap filling is carried out.

The projections are meant to take into account the EU-wide GHG target of a net 55% reduction by 2030 compared to 1990 levels. The proposal for a revised EU ETS was published by the European Commission in 2021 and trilogue discussions took place during the year 2022, with a provisional political agreement in December 2022. This means that emission projections partly take into account the latest revision of the ETS Directive in the WAM scenario, although the revision only entered into force mid-2023, after the submission of more than half of the projections. Recommended parameters for energy prices and $CO_2$ prices have been made available by the European Commission in April 2022 (EC 2022a). While not mandatory, Member States are encouraged to use them in the elaboration of their projections. These parameters considered higher gas prices especially in 2022 and 2023 due to the Russian invasion of Ukraine and the associated turmoil on global energy markets. This effect as well as the recovery from the COVID-19 pandemic led to higher uncertainties, especially for short-run projections. The $CO_2$ price proposed for 2030 is 80 EUR/EUA, for both the WEM and the WAM scenario. In the WEM scenario this price increases to 160 EUR/EUA in 2050 and in the WAM scenario this price increases to 410 EUR/EUA in 2050.

### *2.1.3 Emission trends by country*

In Figure 2-2, Member States, Norway and Iceland are sorted by historic changes of ETS emissions until 2023 in percent compared to ETS emissions in 2005 (yellow diamonds), with Luxembourg showing the highest reduction (due to the closure of its biggest natural gas power station) while Iceland had increasing ETS emissions (due to the construction of new industrial installations such as in primary aluminum production).

**Figure 2-2 Historic and projected changes until 2030 in EU ETS emissions relative to 2005 emission levels**



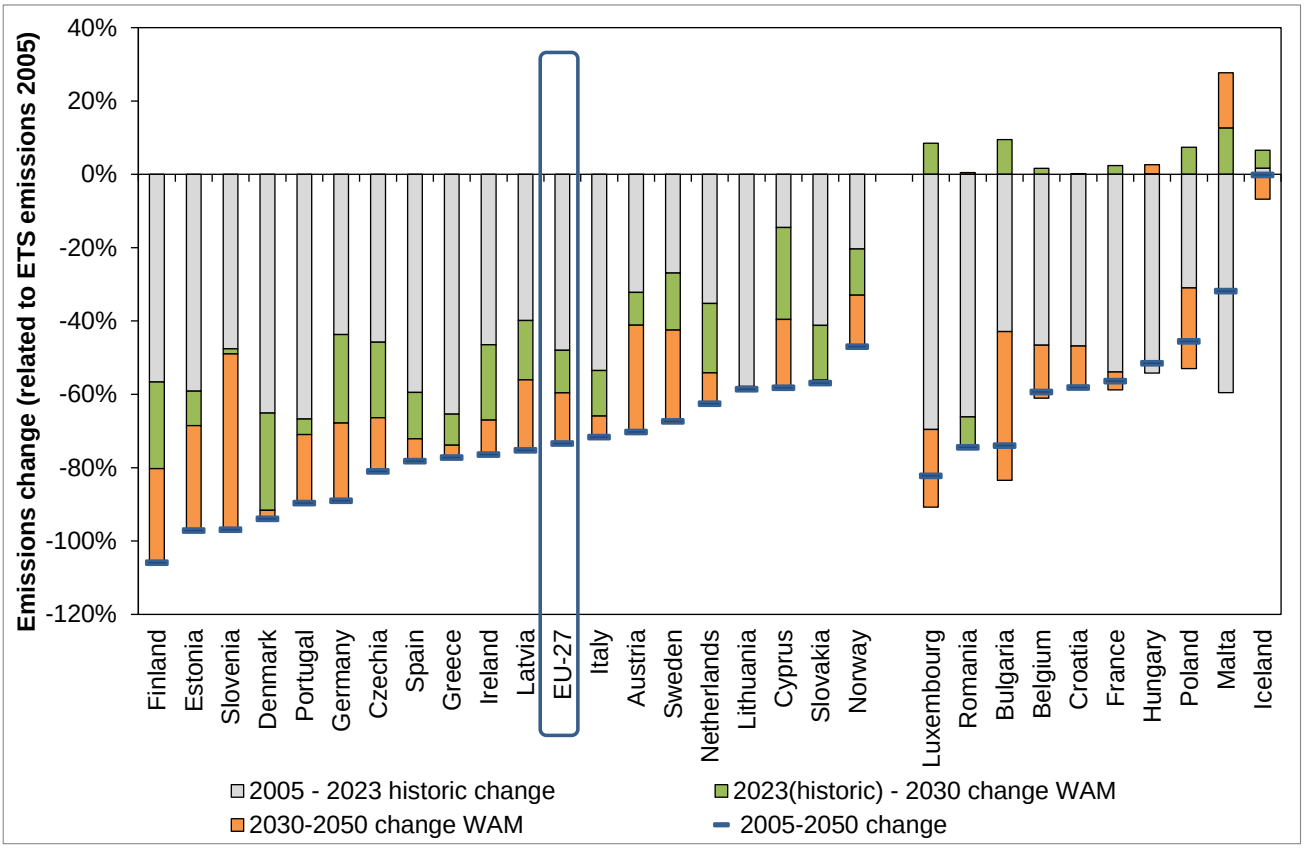

**Note:** Emissions of Liechtenstein decreased by 100% from 2005 to 2021 and are zero since then (not displayed).

**Sources:** EEA (2024), projections of EU Member States compiled by the European Topic Centre for Climate Change Mitigation (ETC CM) as of September 2024.

Additionally, the projected emission reductions from 2023 until 2030 are shown (blue and green bars). Under the WEM scenario, EU ETS emissions are expected to decline in most countries until 2030, with reductions ranging from 0.1% for Slovenia to 34% for the Netherlands. There are four countries that anticipate increases in their ETS emissions between 2023 (as projected) and 2030 based upon their WEM projections (Luxembourg, Malta, Poland and Spain). These developments are often related to the opening and closure of power plants, but also to the trend of increasing electricity demand. Only one country with increasing ETS emissions under the WEM scenario projects to decrease its EU ETS emissions with additional policies and measures (WAM) below their emission level in 2023 (Luxembourg). Malta projects an increase of EU ETS emissions under the WEM scenario and did not submit a WAM scenario. In four Member States (Czechia, Germany, Latvia, and the Netherlands) ETS emissions in the scenario with additional measures are higher than in the scenario with existing measures. This effect can be explained with a trend for increased electrification in the transport and buildings sector. If the higher demand for electricity is not accompanied with a respective increase of renewable power supply, emissions from fossil-fuelled power supply increase.

Figure 2-3 shows the historic development until 2023 as well as the projected development after 2030 in scenarios with additional measures (WAM scenario). With updated projections in 2024, more WAM projections are available from EU Member States than in 2023: Cyprus, Denmark, France, Greece, Hungary and Malta did not submit a scenario with additional measures. Norway did not submit projections after 2035 and no scenario with additional measures. For these countries, the result of scenarios with existing measures is shown. Overall, for the EU-27 in the WEM scenario a reduction of 67% below 2005 levels until 2050 is achieved.

**Figure 2-3 Historic and projected changes with additional measures (WAM) until 2050 in EU ETS emissions relative to 2005 emission levels**




**Note:** In this figure historic ETS emissions 2023 have been used, so that the total reduction until 2050 displayed by country informs about the development compared to historic ETS emissions 2023.

**Sources:** EEA (2024), projections of EU Member States compiled by the European Topic Centre for Climate Change Mitigation (ETC CM) as of September 2024.

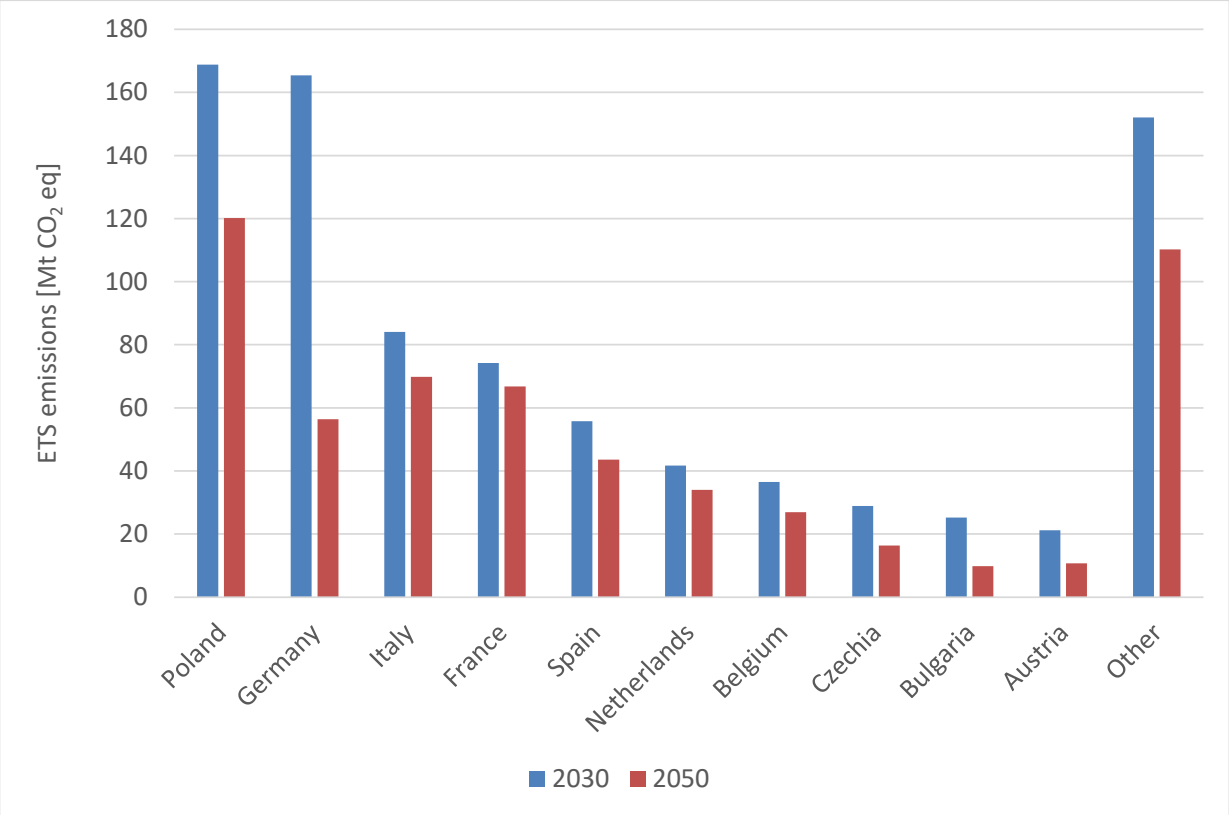
For countries with reductions in all three periods (2005-2023, 2023-2030 and 2030-2050), these can be added so that the aggregated bar in Figure 2-3 shows the total ETS reduction in 2050 compared to 2005 for the WAM scenario. Ten countries show increases in projected ETS emissions after 2023, these are shown on the right-hand side. For these countries, a blue line indicates their level of ETS emissions in 2050 compared to 2005. This picture slightly changed compared to last year's report: On the one hand due to updated projections, but also because he reduction of ETS emissions from 2022 to 2023 has been exceptional: For Bulgaria this led to a projected increase of ETS emissions until 2030, as 2023 emissions decreased by 36 % compared to 2022.

Three countries project increasing ETS emissions after 2030 (Hungary, Romania and Malta). The level of ETS emissions in Iceland in 2050 is projected to be similar to 2005 levels (1.8 Mt $CO_2$ eq.). Finland projects negative ETS emissions through the use of BECCS (Bioenergy with Carbon Capture and Storage) in its scenario with existing measures, no additional measures have been considered for emissions covered under the EU ETS. Denmark, Estonia and Slovenia show emission reductions of more than 90% compared to 2005 until 2050. Nine countries project high emission reductions above 20 percentage points after 2030: Austria, Bulgaria, Estonia, Finland, Germany, Luxembourg, Poland, Slovenia and Sweden.

Figure 2-4 displays absolute emissions projected for 2030 and 2050 (with additional measures) in those ten countries with the highest emissions in 2030 and they are then compared to an aggregation of all other countries. None of the countries with increasing projected emissions are included amongst the ten

countries with the highest absolute emissions. The biggest emissions reduction in absolute terms between 2030 and 2050 is projected to take place in Germany, followed by Poland.

**Figure 2-4 Absolute projected EU ETS emissions in the years 2030 and 2050 in the WAM scenario**




**Note:** Emissions of Liechtenstein decreased by 100% from 2005 to 2021 and are zero since then (not displayed).

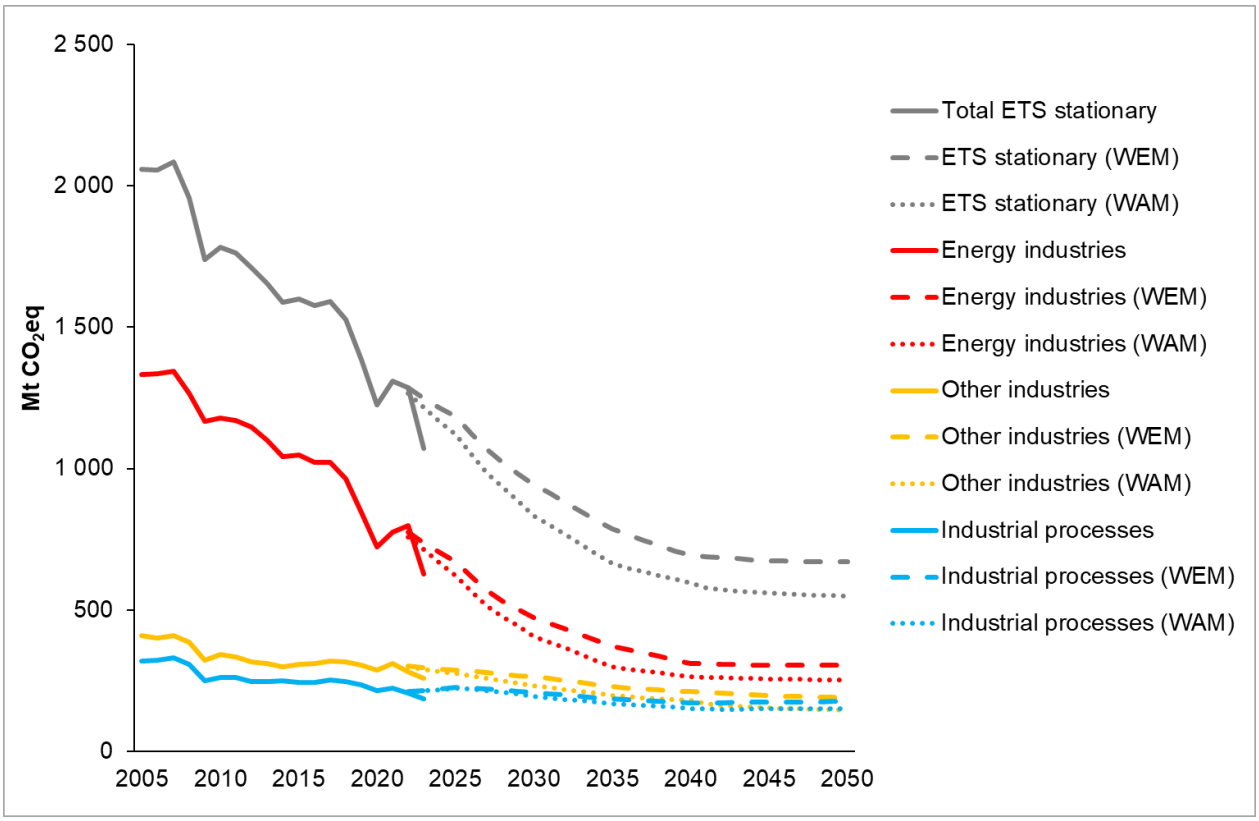
**Sources:** EEA (2024), ‚projections of EU Member States compiled by the European Topic Centre for Climate Change Mitigation (ETC CM) as of September 2024.

### *2.1.4 Emission trends by sector*

Aggregated sectorial results of EU ETS emissions are displayed in Figure 2-5. Reductions mainly took place in the sector of energy industries and this trend is projected to continue. After 2030, the emission decrease in the sector of energy industries is much lower with nearly no further change in emissions after 2040.

EU ETS emissions from industrial processes are projected to slightly increase until 2025 with a very small downward trend until 2030 and close to no change afterwards. Emissions from manufacturing and construction installations, shown as ‘other sectors’, are projected to decrease with a nearly linear trend but at a slower pace than in historical years until 2050.

**Figure 2-5 EU ETS historic and projected emissions between 2005 and 2050 for the EU-27, by inventory category**




**Notes:** Solid lines represent historical greenhouse gas emissions up to 2022. Dashed lines represent projections under the 'with existing measures' WEM scenario. Dotted lines represent projections under the 'with additional measures' (WAM) scenario. This figure refers to EU ETS emissions of EU-27 only. Historic emissions by sector were estimated based on the attribution of GHG emissions, reported by source categories in GHG inventories. 'Energy industries' cover CRF categories 1A1, 1B2 and 1C. 'Other industries' are related to CRF category 1A2 while 'industrial processes' are related to CRF category 2. The estimate of the share of ETS emissions in these sectors is based on relevant assumptions in national GHG projections.

**Sources:** EEA (2024), projections of EU Member States compiled by the European Topic Centre for Climate Change Mitigation (ETC CM) as of September 2024.

## 2.2 Aviation

**Rising Aviation Emissions Despite Regulations**: Projections show that aviation emissions will continue to rise until 2050 under both the WEM and WAM scenarios, which is not aligned with the goals of the ReFuelEU Aviation Regulation. This regulation aims to reduce CO2 emissions by around two-thirds by 2050 through increased use of sustainable aviation fuels (SAF).

**Historical and Projected Emission Trends**: ETS aviation emissions dropped sharply in 2020 due to the COVID-19 pandemic, but they are expected to increase steadily again. The recovery of aviation emissions post-pandemic has been slower than initially anticipated, with projections now adjusted accordingly.

**Inclusion of Additional Aviation Emissions**: From 2025 onwards, flights from outermost regions to other EEA countries will be included in the EU ETS, leading to an increase in aviation emissions covered by the system. A decision regarding the inclusion of non-CO2 aviation effects is expected by the end of 2027.

### 2.2.1 Overview

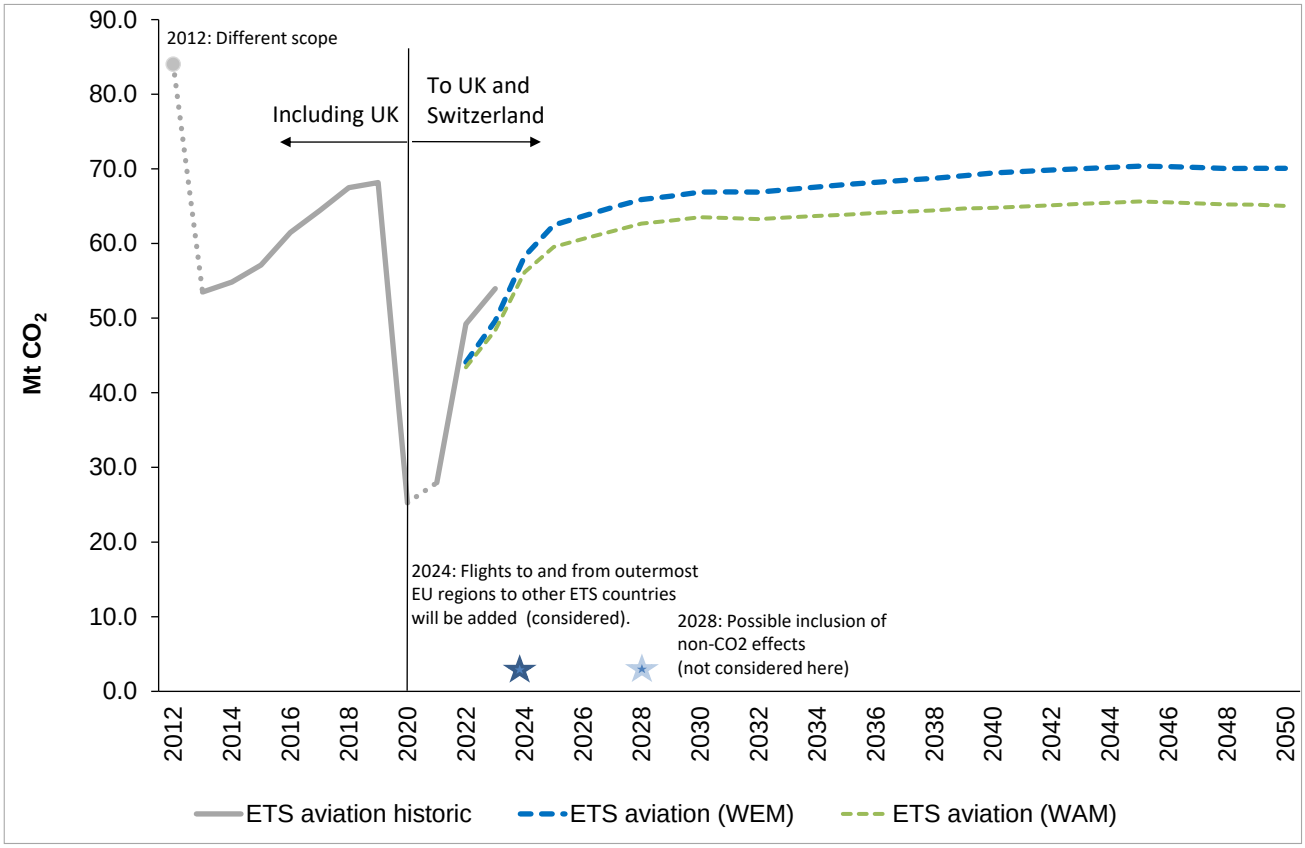
Emissions from aviation activities, as projected by Member States under the WEM and WAM scenario, are expected to rise continuously until 2050 (Figure 2-6). This is not in line with the ReFuelEU Aviation Regulation, which is expected to reduce $CO_2$ emissions by around two-thirds by 2050 compared to a 'no action' scenario (EC 2023a). The new rules under this regulation require fuel suppliers to blend sustainable aviation fuels (SAF) with kerosene in increasing amounts from 2025 onwards. Generally, continuously increasing emissions in this sector are also not in line with the overall EU wide GHG target to achieve climate neutrality in 2050.

### 2.2.2 Emission trend

By 2019, historical ETS aviation emissions were significantly higher than projections because GHG projections no longer include emissions of the United Kingdom. In 2020, emissions (still including the United Kingdom) dropped significantly due to the COVID-19 pandemic and the resulting decrease in aviation. Projections are aligned to aviation emissions in the year 2021, but a slower recovery from the pandemic was expected.

The ETS aviation emissions depicted in Figure 2-6 are calculated by the application of ETS shares on projected domestic and international aviation emissions. For domestic aviation emissions, a full inclusion into the EU ETS is assumed, while for international aviation a share has been applied which is taken from the historic data. With the inclusion of flights from outermost countries to other EEA countries, emissions covered under the EU ETS will increase. This is why the historic ETS share of 32 % has been increased to 36 %, based on Graichen and Wissner (2023). At the end of 2027, the European Commission shall publish a proposal if and how non-$CO_2$ aviation effects of aviation shall be included under the EU ETS (Article 14 (EU) 2023/959). A respective increase of the ETS share has not been considered here.

**Figure 2-6 EU ETS emissions for aviation between 2012 and 2050**




**Notes:** The sharp drop in aviation emissions from 2012 to 2013 reflects a change in the scope of aviation activities covered by the EU ETS. ETS aviation emissions can't be separated by countries, this is why for GHG projections the figure refers to all countries covered by the EU ETS in respective years.
Latest GHG projections no longer include the United Kingdom, which results in a systematic different level of projected ETS aviation emissions compared to historic emissions shown in this figure.

**Sources:** EEA (2024), projections of EU Member States compiled by the European Topic Centre for Climate Change Mitigation (ETC CM) as of September 2024.

# 3 Maritime transport in the EU ETS

**Inclusion of Maritime Transport in the EU ETS**: Since 2024 maritime transport has been integrated into the EU ETS. Ships of 5,000 GT and above will be required to surrender allowances for $CO_2$ emissions, with methane and nitrous oxide also being included starting in 2026.

**Geographical Scope**: The EU ETS covers 100% of emissions from intra-EEA voyages and 50% of emissions from voyages between EEA and non-EEA ports.

**Phased Implementation and Allowances**: From 2024-2026, shipping companies will progressively surrender allowances for their emissions, starting with 40% of emissions in 2024 and moving to 100% by 2026. No free allowances will be allocated; all allowances will be auctioned.

**Interaction with Global Measures**: The EU ETS for maritime transport may be amended to align with any global carbon pricing mechanisms introduced by the International Maritime Organization (IMO), with reviews and potential adjustments planned in the coming years to ensure coherence and environmental integrity.

## 3.1 Overview

The extension of the EU ETS to maritime transport is part of a larger effort in the 'Fit for 55' package to address a previously unregulated international sector. The extension to maritime transport required not only an amendment of the ETS Directive (EU 2023b) but also an adjustment of the EU Monitoring, Reporting and Verification (EU MRV) Regulation (EU 2015/757) (EU 2023c).

The maritime sector was integrated into the existing EU ETS at the beginning of 2024. The cap in the EU ETS was increased by 74.5 million in 2024. Allocation takes place entirely via regular auctions whereby there is a transition phase until 2026 where only a share of emissions is subject to the surrender obligation. $CO_2$ emissions from ships with a gross tonnage (GT) above 5,000 are covered by the EU ETS as follows: 100% in the ports and between ports within a Member State, 100% between ports of EU Member State, 50% on routes to/from EU ports from/to non-EU ports. From 2026 onwards also methane ($CH_4$) and nitrous oxide ($N_2O$) emissions will be covered.

## 3.2 Key elements of the ETS extension to maritime transport

### *3.2.1 Objective*

The main objective of the EU ETS extension to maritime transport is to address the GHG emissions of a sector which has so far not been addressed by any EU climate regulation. With the sector's consideration in the 'Fit for 55' package, the sector will contribute to the EU's 2030 climate target. Addressing emissions from maritime transport is a stepwise process which has already been initiated with the introduction of an emissions MRV system for maritime transport in 2018 (MRV Regulation EU 2015/757 (EU 2015)). The inclusion into the EU ETS is part of a package of measures to address the sector that also includes the FuelEU Maritime Regulation, the Alternative Fuels Infrastructure Development (AFIR) Regulation, the Renewable Energy Directive (RED), and potential amendments to the Energy Taxation Directive (ETD).

### 3.2.2 Scope

The maritime ETS covers voyages for the purposes of transporting cargo or passengers for commercial purposes and obliges shipping companies[5] to surrender allowances for $CO_2$ emissions from these voyages (later on also other GHG gases). This extension of the ETS does not include inland shipping/navigation. The following ship types are also excluded: warships, naval auxiliaries, vessels used to catch or process fish, timber vessels of simple design, vessels not propelled by machinery or state-owned vessels used for non-commercial purposes. At first, only $CO_2$ emissions from ships with 5,000 GT and above will be covered by the EU ETS on the following routes:

- 100% of the emissions in the port (berth) or between ports within Member States, Iceland and Norway,
- 100% of the emissions on intra-EEA voyages,
- 50% of the emissions on voyages from an EEA port to a third country port,
- 50% of the emissions on voyages from a third country port to an EEA port.

The geographical scope is based on the concept of a "port of call" as a starting and end point for voyages - which is a port where a ship (un)loads cargo and/or (dis)embarks passengers or the crew in case of offshore ships. Administratively, shipping companies will be assigned to the Member States (as competent 'administering authorities') based on their registration or port of call.

To counteract evasion, non-Union ports within 300 nautical miles of a Member State port, where the transshipment of containers accounts for a significant share of the total container traffic, are excluded from the port of call definition. Currently, the respective list of the European Commission encompasses Tanger Med (Morocco) and East Port Said (Egypt).

The EU ETS covers a smaller geographical and emissions scope than the EU MRV because the MRV covers 100% of emissions from ingoing and outgoing voyages. A comparison is depicted in the following table. From 2025 onwards, the EU MRV system for maritime transport will be extended to offshore ships[6] and smaller ship sizes. An example for ships with a size below 5,000 GT are container feeder ships connecting smaller harbours with the big European hubs. These ships typically have a length of about 100m.[7] Also ferries connecting smaller islands with the mainland regularly have a size below 5,000 GT.

Subsequently, the maritime ETS scope will be extended to other greenhouse gases starting in 2026 and offshore ships starting in 2027. A review of the maritime ETS due in 2026 will determine whether the ETS will also apply to smaller ships from 2027 onwards.

---

([5]) Definition shipping company: the owner of a ship or an organisation/person responsible that has assumed the responsibility for the operation of the ship from the shipowner and that, on assuming such responsibility, has agreed to take over all the duties and responsibilities imposed by the International Management Code for the Safe Operation of Ships and for Pollution Prevention, set out in Annex I to Regulation (EC) No. 336/2006 (Article 3(w) of 2003/87/EC)

([6]) Offshore ships are neither defined in the Emission Trading Directive nor in the EU MRV Regulation. According to the S&P shipcode system, offshore ships are work vessels which encompass, amongst others, tug and supply vessels for offshore platforms for oil and gas or wind farms, supply vessels to transport crews/supplies, drilling and construction vessels, pipe construction/support vessels: https://cdn.ihs.com/www/pdf/Statcode-Shiptype-Coding-System.pdf

([7]) The ship "FRANCISCA" has a gross tonnage of 4,015, a length of 99 m and an engine power of 4.9 MW. It can load 482 TEU (twenty-foot standard containers). https://www.balticshipping.com/vessel/imo/9113214. https://www.ship-db.de/nawbn.php?wbn_nr=MGSE10980

**Table 3-1 Overview EU MRV and EU ETS maritime transport scope**

| Scope | 2024 | 2025 | 2026 | 2027 |
|---|---|---|---|---|
| **EU MRV** | | | | |
| GHGs | $CO_2$, methane, nitrous oxide | | | |
| Ship types | Commercial cargo and passenger transport | | | |
| | | + offshore ships | | |
| Ship sizes | 5,000 GT and above | | | |
| | | + 400 GT and above of general cargo and offshore ships | | |
| **EU ETS maritime** | | | | |
| GHGs | $CO_2$ | | | |
| | | | + methane, nitrous oxide | |
| Ship types | Commercial cargo and passenger transport | | | |
| | | | | + offshore ships |
| Ship sizes | 5,000 GT and above | | | |
| | | | | *Potential extension to 400 GT and above* |

**Source:** Adapted from Wissner and Cames (2023).

There are several exemptions until 2030 where shipping companies do not have to surrender allowances for their emissions:

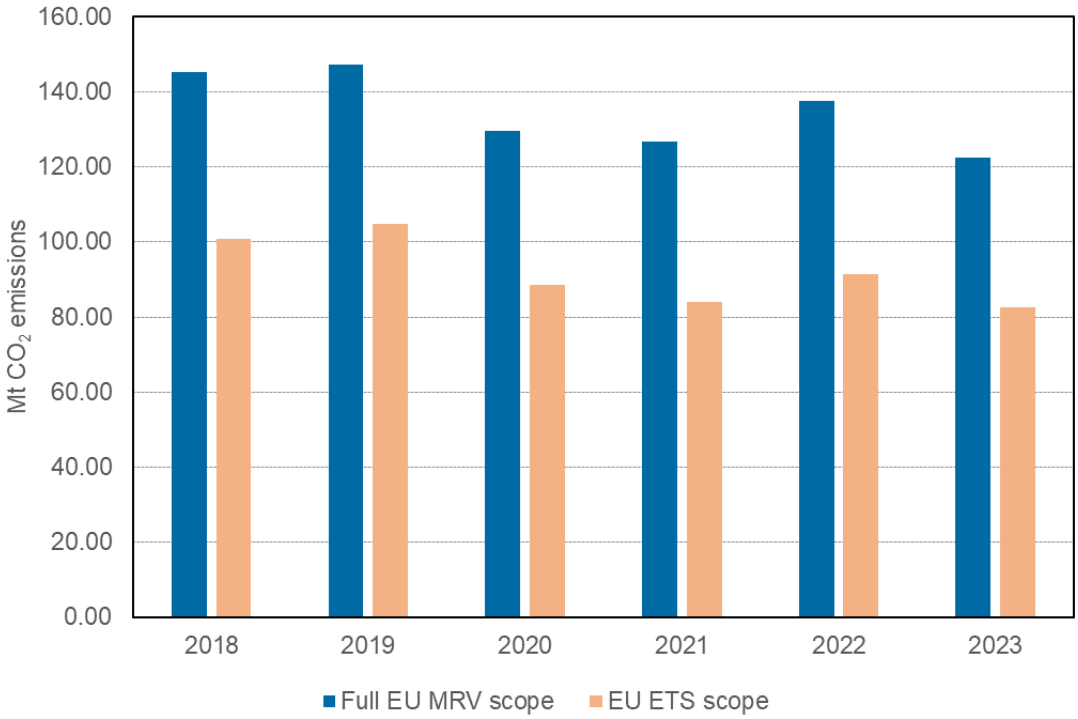
- Voyages between a port of Member State and its outermost region port, including ports within and between outermost regions of the same Member State and from port activities related to such voyages; and
- Voyages for passenger transport between a Member State with no land connection and other closest Member State in the context of a transnational public service contract/obligation and from port activities related to such voyages; and
- Voyages for passenger transport between (small) island ports of a Member State with no road or rail link with the mainland and with less than 200,000 permanent residents and that Member State as well as from port activities related to such voyages.

These exemptions likely represent only a small share of emissions compared to the total maritime ETS scope.

The $CO_2$ emissions covered under the EU MRV, and under the ETS respectively, did not fluctuate significantly during the last years. Figure 3-1 provides an overview of the development based on an estimated ETS scope[8]. Changes in emissions can be mainly attributed to the impact of the COVID-19 (Energy, COVID, and Climate Change,1st IAEE Online Conference,June 7-9, 2021 2021) pandemic, the UK's withdrawal from the EU and Russia's invasion of Ukraine.

([8]) Publicly available $CO_2$ emissions Data from THETIS MRV Database is presented for each of the following scopes for each ship in the data base: 100% of the emissions in the port (berth) or between ports within Member States, Iceland and Norway; 100% of the emissions on intra-EEA voyages; 100% of the emissions on voyages from an EEA port to a third country port; 100% of the emissions on voyages from a third country port to an EEA port. For the estimation of the ETS scope, the sum is calculated of 50% of the emissions provided for ingoing and outgoing voyages, and 100% of emissions from intra-EEA voyages and at berth/within a Member State.

**Figure 3-1 $CO_2$ emissions within the maritime EU MRV and the EU ETS scope**




**Notes:** ETS scope estimated based on 50% of emissions from ingoing voyages and 50% of outgoing voyages as reported in the THETIS MRV Database.

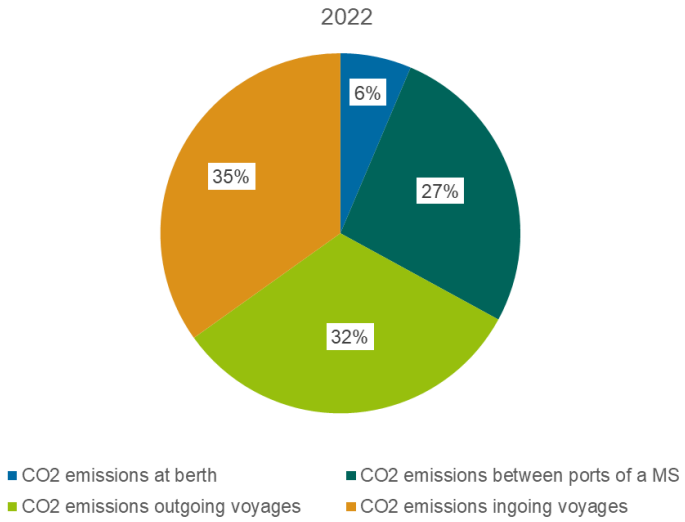
**Source:** EMSA (2024).

International voyages represent the largest share of emissions covered by the EU ETS with more than 50% (Figure 3-2). Although the emissions of maritime transport under the ETS (approx. 90 Mt $CO_2$ in 2022) are small compared to the emissions of the stationary sector (1,200 Mt $CO_2$ in 2022)[9], their relative importance is expected to increase as emissions in the stationary sector are likely to decline at a faster pace (Wissner and Graichen 2024).

The maritime transport sector is not only different to the other ETS sectors in terms of total emissions covered, but also in terms of its structure. While the ship owner is regarded as the default point of regulation of "shipping company" (see above), several entities are involved in operating a ship (e.g. owner, manager, charterer) requiring explicit contractual arrangements between these entities to clarify ETS compliance responsibilities. Data is reported at ship level under the EU MRV whereas shipping companies shall report verified emissions aggregated at company-level for the ETS compliance. For comparison, aircraft operators also have to submit data on emissions aggregated for all their flights/airplanes for ETS compliance, only fuel consumption is reported for each airplane individually. The total number of ships and shipping companies covered by the EU MRV has remained relatively stable over the existing reporting periods with approx. 13,000 ships and 1,600-1,700 shipping companies (EC 2024a). At 13,000 ships, this number is similar to the number of installations in the stationary sector with 12,700 emitters in 2023. There are many different ship types and sizes covered by the maritime ETS (Figure 3-3).

([9]) EEA ETS data viewer: https://www.eea.europa.eu/data-and-maps/dashboards/emissionstrading-viewer-1

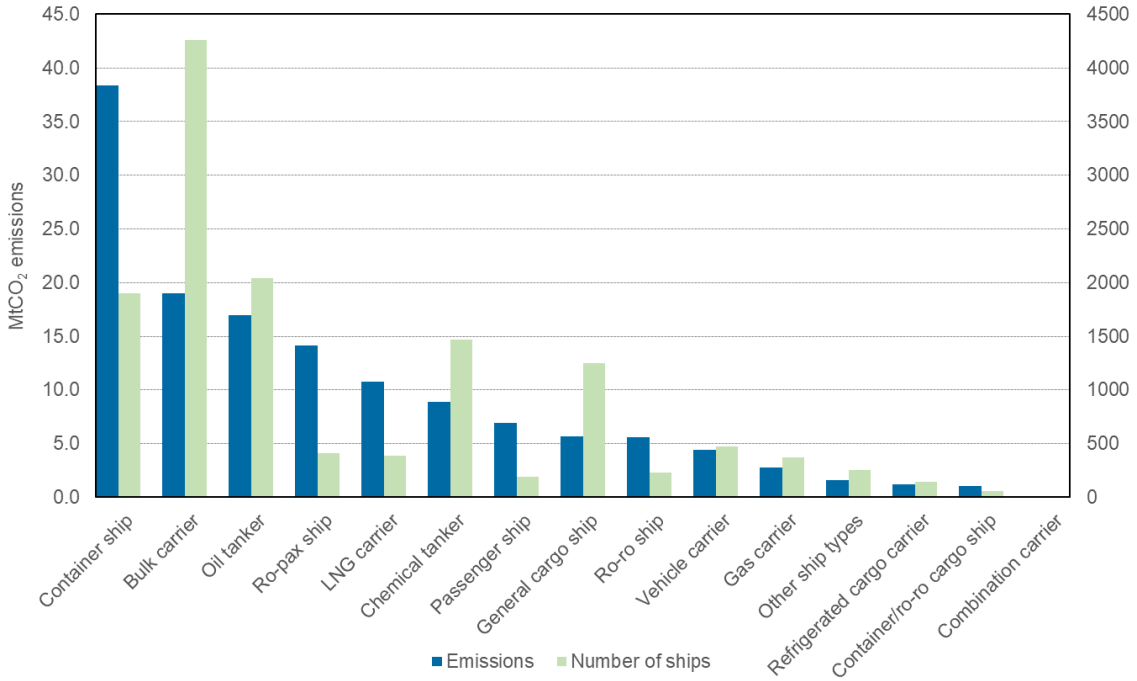
**Figure 3-2 Share of emissions from international and national maritime transport from the total EU MRV scope in 2022**




**Source:** EMSA (2024).

In 2022, the largest share of $CO_2$ emissions within the EU MRV stemmed from container ships (approx. 30%). Bulk carriers, oil tankers and ro-pax ships also have significant shares with 10-15%. The distribution of emissions between ship types in 2022 is shown in Figure 3-3 and is very similar to the distribution of previous years. However, LNG carriers and passenger ships increased their emissions significantly (by 172% and 59% respectively) compared to 2021 (EC 2024a). Although container ships have the largest share of the emissions, it should be noted that the emissions per individual ship vary significantly between ship types as, for example, there are much fewer passenger ships covered by the MRV than container ships but passenger ships still contribute significantly to EU-related emissions (Figure 3-3). The distribution of emissions between ship types will likely be similar for the smaller EU ETS scope from 2024 onwards.

**Figure 3-3 $CO_2$ emissions and number of ships per ship type covered by the EU MRV in 2022**




**Source:** EMSA (2024).

Consequently, the ten ships with the highest emissions in 2022 are all related to passenger transport, namely cruise ships (Table 3-2). Together, these ships make up only approx. 1% of total $CO_2$ emissions within the EU MRV scope (which covers more voyages than the EU ETS). This shows again the diversity of the sector: there are a few ships with very high individual emissions (passenger ships) but the majority of emissions with the EU MRV scope stems from a large number of cargo vessels.

**Table 3-2 Top ten emitters within the EU MRV scope in 2022**

| IMO number | Name | Ship type | Mt $CO_2$ emissions |
|---|---|---|---|
| 9803613 | MSC GRANDIOSA | Passenger ship, Cruise | 0.134 |
| 9826548 | IONA | Passenger ship, Cruise | 0.130 |
| 9333175 | VENTURA | Passenger ship, Cruise | 0.123 |
| 9351488 | CRUISE BARCELONA | Ro-pax ship | 0.121 |
| 9351476 | CRUISE ROMA | Ro-pax ship | 0.120 |
| 9410569 | NORWEGIAN EPIC | Passenger ship, Cruise | 0.118 |
| 9214276 | LA SUPERBA | Ro-pax ship | 0.107 |
| 9745378 | MSC SEAVIEW | Passenger ship, Cruise | 0.107 |
| 9745366 | MSC SEASIDE | Passenger ship, Cruise | 0.106 |
| 9227417 | SUPERFAST XI | Ro-pax ship | 0.104 |
| **Sum** | | | **1.170** |

**Source:** Data extracted from THETIS MRV Database on 29.07.2024, 2022 dataset version 218.

### *3.2.3 Cap and allocation*

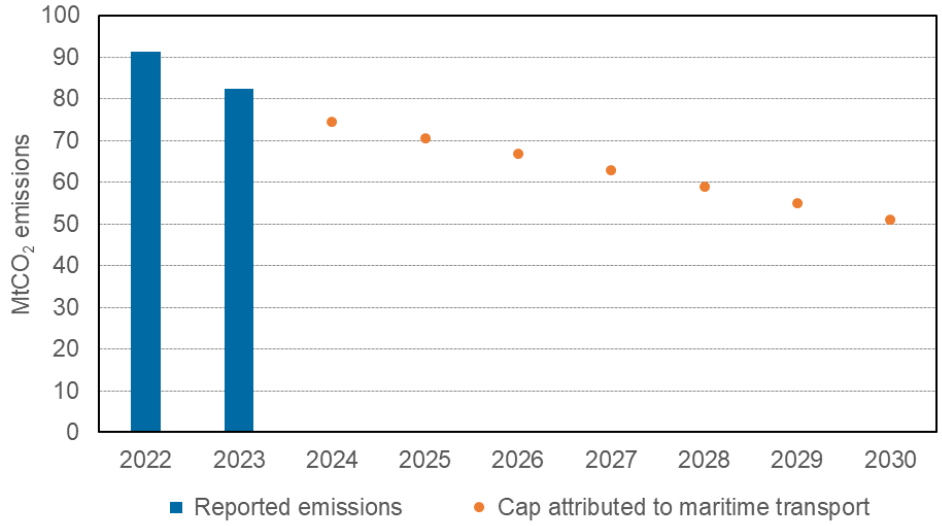
The maritime transport sector is being integrated into the existing EU ETS from 2024 onwards. Shipping companies will not receive free allocation, but allowances will be auctioned. There are no specific maritime transport emission allowances. The allowances will thus be freely tradable between all sectors included in the EU ETS.

In the first two years, emission allowances only have to be surrendered for a part of the verified emissions. The amount auctioned that can be attributed to maritime transport is reduced accordingly - the difference between emissions and surrendering requirements in the first two years translates into a reduction of the auctioning amounts in 2026 and 2027. The share of emissions in maritime transport that has to be covered by surrendered allowances increases gradually from 40% in 2024, 70% in 2025 to 100% in 2026. Ice-class ships may surrender 5% fewer allowances than their verified emissions until the end of 2030.

Maritime transport will be subject to the same linear reduction factor as the other sectors (4.3% currently, and 4.4% from 2028 onwards). Due to the application of the linear reduction factor to the maritime transport portion of the cap in 2024, the effective increase in the cap for maritime transport in this year is equal to 74.5 million EUA (Hermann and Cludius, Johanna, Graichen, Jakob 2023). The quantity of allowances will be increased in 2026 and 2027 to account for the inclusion of other GHGs and offshore ships respectively (see above).

It is expected that ETS prices will not be high enough in the short term to induce significant in-sector emission reductions, resulting in an expected net demand for allowances from the maritime sector in the EU ETS as maritime transport emissions are expected to increase (or at least remain stable) while the cap will decrease in the next years (Wissner and Graichen 2024). On the other hand, maritime emissions in the estimated ETS scope in 2022 and 2023 were not much higher than the 2024 cap (Figure 3-4). Therefore, it is unclear whether maritime transport will be a net buyer in the first years of its integration into the EU ETS:

**Figure 3-4 Emissions within ETS scope versus cap attributed to maritime transport until 2030**




**Source:** Data extracted from THETIS MRV Database on 29.07.2024, 2022 dataset version 218. ETS scope estimated based on 50% of emissions from ingoing voyages and 50% of outgoing voyages as reported in the THETIS MRV Database.

### *3.2.4 Revenues*

Of the auctioning amounts attributed to maritime transport 4.5% are attributed to the Modernisation Fund and 0.5 million allowances are auctioned every year on behalf of the Innovation Fund. The remaining auctioning quantities from the inclusion of maritime transport from 2024 onwards go to the Member States. 50% are distributed among the relevant Member States based on the share of shipping companies. 3.5% are allocated to countries with a large number of shipping companies compared to the number of inhabitants (as an indication of national dependency on maritime transport). The remainder of allowances to be auctioned will be distributed equally between the Member States. When additional GHG and offshore ships enter the EU ETS, the proceeds of the additional allowances to be auctioned will go to the Innovation Fund.

There is no specific new fund to promote decarbonisation in the maritime transport sector within the ETS. However, decarbonisation technologies and activities can be financed via the Innovation Fund, e.g. infrastructure for the production of low- and zero-carbon fuels. The European Commission will provide specific calls for proposals for dedicated maritime topics in the Innovation Fund using the auctioning proceeds of 20 million allowances up to 2030, including the electrification of maritime transport and the mitigation of impacts from black carbon emissions.

### *3.2.5 Interaction with IMO*

A review of the maritime chapter of the Directive is foreseen in case the International Maritime Organization (IMO) adopts a global market-based measure. Within 18 months of the adoption of such a measure, the EU Commission must submit a report to examine the measure with regard to its ambition in light of the objectives of the Paris Agreement, its environmental integrity, and the coherence between the EU ETS and that measure. If appropriate, the Commission may propose amendments to the ETS Directive in a manner that is consistent with the EU climate targets and that ensures environmental integrity and effectiveness of the EU ETS.

In fact, negotiations at the IMO are underway to adopt a basket of measures in 2025 consisting of a technical element - a goal-based marine fuel standard, similar to the FuelEU Maritime Regulation - and an economic element – e.g. a carbon pricing mechanism that acts like a levy. Discussions at the global level

have accelerated since the adoption of the IMO's revised GHG Strategy in July 2023 which sets a revised long-term climate target of reaching net-zero GHG emissions close to 2050.

If, on the other hand, IMO Member States do not adopt a global market-based measure by 2028 which is in line with the ambitions of the Paris Agreement, the EU Commission is to provide a report which examines the need to extend the geographical scope of the maritime EU ETS beyond 50% of ingoing and outgoing voyages. Where appropriate, the report shall be accompanied by a legislative proposal.

## 3.3 Outlook

In summary, reviews in relation to the maritime ETS are planned in the next years. The EU MRV Regulation will be reviewed by the end of 2024. A review of the ETS extension to maritime transport is scheduled for 2026 in view of a potential extension to cover smaller ships between 5,000 and 400 GT (instead of 5,000 GT and above). By the end of 2028, the above-mentioned rule will be reassessed whereby countries with a large number of shipping companies receive an extra share of allowances.

There are several planned and potential changes to the scope of the maritime ETS leading to an increase in emissions covered over the next 5-10 years. As in-sector reductions will likely occur rather in the mid to long term, induced through increasing ETS prices and/or FuelEU Maritime compliance, there is a net demand for allowances expected from the sector as well as increasing relative importance of the sector compared to the other ETS sectors.

The EU ETS for maritime transport is not independent from developments at international level at the IMO. While the effectiveness and environmental integrity shall be preserved, amendments to the ETS framework for maritime transport will likely be needed to account for a future IMO measure.

## List of abbreviations

| Abbreviation | Name |
|---|---|
| AFIR | Alternative Fuels Infrastructure Development |
| CRF | Common Reporting Framework |
| EEA | European Environment Agency |
| EEX | European Energy Exchange |
| EMSA | European Maritime Safety Agency |
| ENTSO-E | European Network of Transmission System Operators for Electricity |
| ETC CM | European Topic Centre on Climate Change Mitigation |
| EU ETS | EU Emissions Trading Scheme |
| EUA | EU Allowances |
| UAA | EU Aviation Allowances |
| EUTL | EU Transaction Log |
| GT | Gross Tonnage |
| IMO | International Maritime Organization |
| LNG | Liquefied Natural Gas |
| MRV | Monitoring, Reporting and Verification |
| MSR | Market Stability Reserve |
| NER | New Entrants Reserve |
| RED | Renewable Energy Directive |
| SAF | Sustainable Aviation Fuels |
| TNAC | Total Number of Allowances in Circulation |
| WAM | With Additional Measures |
| WEM | With Existing Measures |

# References


BAFU - Bundesamt für Umwelt, 2024, *Schweizer Emissionshandelsregister*, Bundesamt für Umwelt. Online available at https://www.emissionsregistry.admin.ch/crweb/public/reporting/ve/list.action, last accessed on 12 Sep 2024.

BDL (Berlin), 2024, *Vorausschau auf das Luftverkehrsangebot Juni 2024 – November 2024*, Berlin, 14 Jun 2024. Online available at https://www.bdls.aero/images/aktuell/2024/Vorausschau_auf_das_Luftverkehrsangebot_Jun-Nov24.pdf, last accessed on 6 Aug 2024.

EC (European Commission), 2021, *Updated information on Exchange and International Credit Use in the EU ETS, European Commission*. Online available at https://ec.europa.eu/clima/news/updated-information-exchange-and-international-credits-use-eu-ets_en, last accessed on 14 Jul 2021.

EC (European Commission), 2022a, *Recommended parameters for reporting on GHG projections in 2023*. Email with Mitglieder der WG II des Climate Change Committees, April 2022. PDF.

EC (European Commission), 2022b, *Report from the Commission to the European Parliament and the Council on the Functioning of the European carbon market in 2021 pursuant to Articles 10(5) and 21(2) of Directive 2003/87/EC (as amended by Directive 2009/29/EC and Directive (EU) 2018/410) (COM(2022) 516 final), 2022*. Online available at https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52022DC0516&from=EN, last accessed on 5 Apr 2023.

EC (European Commission), 2023a, *European Green Deal: new law agreed to cut aviation emissions by promoting sustainable aviation fuels*. European Commission (ed.). Brüssel, 26 Apr 2023.

EC (European Commission), 2023b, *Publication of the total number of allowances in circulation in 2022 for the purposes of the Market Stability Reserve under the EU Emissions Trading System established by Directive 2003/87/EC, Communication from the commission (2023/C 172/01), 15 May 2023*. Online available at https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52023XC0515(01), last accessed on 16 May 2023.

EC (European Commission), 2024a, *2023 Report from the European Commission on CO2 Emissions from Maritime Transport (SWD(2024) 87 final)*. Brussels, 2024. Online available at https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52024SC0087, last accessed on 25 Apr 2024.

EC (European Commission), 2024b, *ESR Emissions*. E-Mail with European Environment Agency, 24 Apr 2024.

EC (European Commission), 2024c, *Publication of the total number of allowances in circualtion in 2023 for the purposes of the Market Stability Reserve under the EU Emissions Trading System established by Directive 2003/87/EC (C(2024) 3369 final), 31 May 2024*. Online available at https://climate.ec.europa.eu/document/download/7a7780d7-8f18-42e0-aff9-5ade23e63d7e_en?filename=c_2024_3369_en.pdf, last accessed on 8 Jul 2024.

EC (European Commission), 2024d, *Reducing emissions from aviation, European Commission*. Online available at https://climate.ec.europa.eu/eu-action/transport/reducing-emissions-aviation_en, last accessed on 23 Aug 2024.

EEA (European Environment Agency), 2024, *EU Emissions Trading System (ETS) data viewer, 2024*. Online available at https://www.eea.europa.eu/data-and-maps/dashboards/emissions-trading-viewer-1.

EEX (European Energy Exchange), 2024, *EUA Primary Market Auction Report, European Energy Exchange*. Online available at https://www.eex.com/de/marktdaten/umweltprodukte/eex-eua-primary-auction-spot-download, last accessed on 27 Aug 2024.

EMSA (European Maritime Safety Agency), 2024, *THETIS-MRV, CO2-Emission Report*. Online available at https://mrv.emsa.europa.eu/#public/emission-report, last accessed on 14 Oct 2024.

Energy, COVID, and Climate Change, 1st IAEE Online Conference,June 7-9, 2021 (2021). Energy, COVID, and Climate Change, 1st IAEE Online Conference,June 7-9, 2021, [Tagungsort fehlt!]: International Association for Energy Economics.

ENTSO-E, 2024, *Actual Generation per Generation Unit*. Online available at https://transparency.entsoe.eu/generation/r2/actualGenerationPerGenerationUnit/show, last accessed on 12 Sep 2024.

EU (European Union), 2023a, Commission Decision (EU) 2023/2440 on the Union-wide total quantity of allowances to be allocated in respect of aircraft operators under the EU Emissions Trading System for 2024, 2023. Online available at https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:L_202302440, last accessed on 10 Nov 2023.

EU (European Union), 2023b, *Directive 2023/959 of the European Parliament and of the Council of 10 May 2023 amending Directive 2003/87/EC establishing a system for greenhouse gas emission allowance trading within the Union and Decision (EU) 2015/1814 concerning the establishment and operation of a market stability reserve for the Union greenhouse gas emission trading system*. In: Official Journal of the European Union (L 130/134). Online available at

https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32023L0959, last accessed on 27 Oct 2023.

EU (European Union), 2023c, *REGULATION (EU) 2023/957 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 10 May 2023 amending Regulation (EU) 2015/757 in order to provide for the inclusion of maritime transport activities in the EU Emissions Trading System and for the monitoring, reporting and verification of emissions of additional greenhouse gases and emissions from additional ship types*. Online available at https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32023R0957, last accessed on 11 Oct 2023.

EU (European Union), 2024, *European Union Transaction Log (EUTL)*. Online available at https://ec.europa.eu/clima/ets/, last updated on 7/2024, last accessed on 27 Aug 2024.

EU, 2015, *Regulation (EU) 2015/757 of the European Parliament and of the Council on the monitoring, reporting and verification of carbon dioxide emissions from maritime transpor and amending Directive 2009/16/EC*. Online available at http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32015R0757&from=EN, last accessed on 26 Sep 2015.

Eurocontrol, 2024, *European Aviation Overview 2023*, 18 Jan 2024. Online available at https://www.eurocontrol.int/sites/default/files/2024-01/eurocontrol-european-aviation-overview-20240118-2023-review.pdf, last accessed on 6 Aug 2024.

Euroelectric, 2024, *EU electricity generation greener than ever before,* 1 Jul 2024. Online available at https://www.eurelectric.org/news/eugreenest_power_mix, last accessed on 8 Jul 2024.

Eurostat, 2024, *Net electricity generation by type of fuel, monthly data; NRG_CB_PEM*. Online available at https://ec.europa.eu/eurostat/databrowser/product/view/NRG_CB_PEM, last accessed on 12 Sep 2024.

Graichen, V. and Wissner, N., 2023, *Aviation in the EU ETS and CORSIA in the 'Fit for 55' package, The EU agreement of June 2023*. Online available at https://www.umweltbundesamt.de/sites/default/files/medien/11850/publikationen/09_2023_factsheet_aviation_in_the_eu_ets_and_corsia.pdf, last accessed on 10 Nov 2023.

Hermann, H. and Cludius, J., Graichen, J., 2023, *Alignment of the EU ETS 1 with the new EU climate target for 2030 and reform of the Market Stability Reserve (MSR 1), Overview of the revised Emissions Trading Directive*. Online available at https://www.umweltbundesamt.de/publikationen/ausrichtung-des-eu-ets-1-auf-das-neue-eu, last accessed on 1 Aug 2024.

Hermann, H., Gores, S., and Nissen, C., 2021, *Matching of power plants by fuel, For the EEA EU ETS dataviewer* (ETC/CME Eionet Report, 10/2021). ETC/CME (ed.), 2021. Online available at https://www.eionet.europa.eu/etcs/etc-cme/products/etc-cme-reports/etc-cme-report-10-2021-matching-of-power-plants-by-fuel, last accessed on 20 Sep 2022.

ICE (Intercontinental Exchange), 2021, *Auctions - EUA UK, Market Data*. Online available at https://www.theice.com/marketdata/reports/148, last accessed on 14 Jul 2021.

Point Carbon, 2012, *Carbon Project Manager*. Point Carbon, 2012. Online available at http://www.pointcarbon.com/trading/.

Wissner, N. and Cames, M., 2023, Extension of the EU ETS to maritime transport, Key aspects of the revision of the ETS directive. Oeko-Institut. Umweltbundesamt (ed.), 2023. Online available at https://www.umweltbundesamt.de/publikationen/extension-of-the-eu-ets-to-maritime-transport, last accessed on 25 Apr 2024.

Wissner, N. and Graichen, V., 2024, Maritime transport in the EU climate policy, Key issues for the EU 2040 and 2050 target. Oeko-Institut (ed.), 2024.

# Annex 1 Verified emissions tables

**Table A1.1 Verified emissions (stationary installations) in million tonnes CO2-eq, 2005 – 2023**

| | | Combustion of fuels (ETS activity code 20) | All industrial installations (21-99) | Estimate to reflect current scope | UK incl. scope estimate |
|---|---|---|---|---|---|
| 1st Trading Period | 2005 | 1253,7 | 523,1 | 347,7 | 237,2 |
| | 2006 | 1258,2 | 532,1 | 332,7 | 245,4 |
| | 2007 | 1346,4 | 566,5 | 228,6 | 251,9 |
| 2nd Trading Period | 2008 | 1293,6 | 565,8 | 135,2 | 260,2 |
| | 2009 | 1191,0 | 460,4 | 118,7 | 228,2 |
| | 2010 | 1218,4 | 487,1 | 111,4 | 233,4 |
| | 2011 | 1203,4 | 483,8 | 105,2 | 217,1 |
| | 2012 | 1180,5 | 459,3 | 101,3 | 227,3 |
| 3rd Trading Period | 2013 | 1153,7 | 533,1 | | 221,1 |
| | 2014 | 1084,1 | 535,4 | | 194,1 |
| | 2015 | 1093,3 | 537,4 | | 172,2 |
| | 2016 | 1070,0 | 537,3 | | 143,3 |
| | 2017 | 1077,2 | 544,0 | | 133,6 |
| | 2018 | 1016,2 | 541,0 | | 126,0 |
| | 2019 | 883,7 | 530,8 | | 115,9 |
| | 2020 | 761,5 | 492,0 | | 102,6 |
| 4th Trading Period | 2021 | 820,4 | 516,3 | | |
| | 2022 | 828,4 | 484,8 | | |
| | 2023 | 651,2 | 444,7 | | |

**Source:** EEA (2024)

**Table A1.2 Verified Emissions from combustion by fuel**

| | 2020 | 2021 | 2022 | 2023 |
|---|---|---|---|---|
| Lignite | 215,2 | 243,7 | 255,6 | 189,2 |
| Hard Coal | 157,9 | 191,0 | 201,9 | 142,9 |
| Natural Gas | 152,4 | 144,2 | 144,2 | 120,9 |
| Blast Furnace | 45,4 | 51,7 | 47,8 | 42,1 |
| Oil products | 23,5 | 23,8 | 25,9 | 19,7 |
| Other | 2,8 | 2,2 | 2,3 | 1,5 |
| Unknown | 32,8 | 32,6 | 30,8 | 26,8 |
| Non-power combustion | 131,4 | 131,1 | 120,0 | 108,1 |

**Source:** EU (2024) based on methodology developed in Hermann et al. (2021)

**Table A1.3 Emissions by fuel in power generation**

| Country Code | Hard Coal | | Lignite | | Natural Gas | | Blast Furnace | |
|---|---|---|---|---|---|---|---|---|
| | 2022 | 2023 | 2022 | 2023 | 2022 | 2023 | 2022 | 2023 |
| Austria | 0,0 | 0,0 | 0,0 | 0,0 | 3,2 | 2,1 | 0,0 | 0,0 |
| Belgium | 0,7 | 0,7 | 0,0 | 0,0 | 3,4 | 2,4 | 5,1 | 4,1 |
| Bulgaria | 0,3 | 0,2 | 24,1 | 12,9 | 0,7 | 0,7 | 0,0 | 0,0 |
| Croatia | 1,3 | 1,1 | 0,0 | 0,0 | 1,2 | 1,2 | 0,0 | 0,0 |
| Cyprus | 0,0 | 0,0 | 0,0 | 0,0 | 0,0 | 0,0 | 0,0 | 0,0 |
| Czech Republic | 2,7 | 2,2 | 33,7 | 27,2 | 0,2 | 0,2 | 3,3 | 2,5 |
| Denmark | 3,9 | 2,4 | 0,0 | 0,0 | 1,2 | 1,2 | 0,0 | 0,0 |
| Estonia | 0,0 | 0,0 | 0,0 | 0,0 | 0,0 | 0,0 | 0,0 | 0,0 |
| Finland | 3,8 | 2,1 | 0,0 | 0,0 | 0,1 | 0,1 | 0,0 | 0,0 |
| France | 4,4 | 2,4 | 0,0 | 0,0 | 7,5 | 4,5 | 4,0 | 2,5 |
| Germany | 60,2 | 39,8 | 122,5 | 92,6 | 32,3 | 30,4 | 18,6 | 18,1 |
| Greece | 0,0 | 0,0 | 9,4 | 5,5 | 5,8 | 4,4 | 0,0 | 0,0 |
| Hungary | 0,0 | 0,0 | 3,5 | 3,0 | 1,8 | 1,4 | 0,7 | 0,4 |
| Iceland | 0,0 | 0,0 | 0,0 | 0,0 | 0,0 | 0,0 | 0,0 | 0,0 |
| Ireland | 2,7 | 1,4 | 0,0 | 0,0 | 5,6 | 5,2 | 0,0 | 0,0 |
| Italy | 21,8 | 12,5 | 0,0 | 0,0 | 39,6 | 31,9 | 4,8 | 4,7 |
| Latvia | 0,0 | 0,0 | 0,0 | 0,0 | 0,7 | 0,7 | 0,0 | 0,0 |
| Liechtenstein | 0,0 | 0,0 | 0,0 | 0,0 | 0,0 | 0,0 | 0,0 | 0,0 |
| Lithuania | 0,0 | 0,0 | 0,0 | 0,0 | 3,5 | 3,5 | 0,0 | 0,0 |
| Luxembourg | 0,0 | 0,0 | 0,0 | 0,0 | 0,1 | 0,1 | 0,0 | 0,0 |
| Malta | 0,0 | 0,0 | 0,0 | 0,0 | 0,8 | 0,8 | 0,0 | 0,0 |
| Netherlands | 12,3 | 7,7 | 0,0 | 0,0 | 10,9 | 10,1 | 5,5 | 4,0 |
| Norway | 0,0 | 0,0 | 0,0 | 0,0 | 0,0 | 0,0 | 0,0 | 0,0 |
| Poland | 75,2 | 62,7 | 49,9 | 36,8 | 1,1 | 1,6 | 3,3 | 3,2 |
| Portugal | 0,0 | 0,0 | 0,0 | 0,0 | 2,2 | 1,7 | 0,0 | 0,0 |
| Romania | 0,6 | 0,4 | 8,2 | 7,1 | 4,2 | 3,7 | 0,0 | 0,0 |
| Slovakia | 0,5 | 0,4 | 1,1 | 1,0 | 0,0 | 0,0 | 2,4 | 2,6 |
| Slovenia | 0,0 | 0,0 | 3,1 | 3,1 | 0,0 | 0,0 | 0,0 | 0,0 |
| Spain | 10,2 | 6,2 | 0,0 | 0,0 | 16,4 | 11,5 | 0,0 | 0,0 |
| Sweden | 0,0 | 0,0 | 0,0 | 0,0 | 0,0 | 0,0 | 0,0 | 0,0 |
| **Total** | **201,9** | **142,9** | **255,6** | **189,2** | **144,2** | **120,9** | **47,8** | **42,1** |

**Source:** EU (2024) based on methodology developed in Hermann et al. (2021)

# Annex 2 Activities and Sectors

**Table A2.3 Activities and sectors covered by the EU ETS**

| Activities | Sectors |
|---|---|
| 20 Combustion of fuels | Combustion |
| 21 Refining of mineral oil | Refineries |
| 22 Production of coke | Iron and steel, coke, metal ore |
| 23 Metal ore roasting or sintering | |
| 24 Production of pig iron or steel | |
| 25 Production or processing of ferrous metals | |
| 26 Production of primary aluminum | Other metals (incl. aluminum) |
| 27 Production of secondary aluminum | |
| 28 Production or processing of non-ferrous metals | |
| 29 Production of cement clinker | Cement and lime |
| 30 Production of lime, or calcination of dolomite/magnesite | |
| 31 Manufacture of glass | Other non-metallic minerals |
| 32 Manufacture of ceramics | |
| 33 Manufacture of mineral wool | |
| 34 Production or processing of gypsum or plasterboard | |
| 35 Production of pulp | Pulp and Paper |
| 36 Production of paper or cardboard | |
| 37 Production of carbon black | Chemicals |
| 38 Production of nitric acid | |
| 39 Production of adipic acid | |
| 40 Production of glyoxal and glyoxylic acid | |
| 41 Production of ammonia | |
| 42 Production of bulk chemicals | |
| 43 Production of hydrogen and synthesis gas | |
| 44 Production of soda ash and sodium bicarbonate | |
| 45 Capture of greenhouse gases under Directive 2009/31/EC | Other |
| 46 Transport of greenhouse gases under Directive 2009/31/EC | |
| 99 Other activity opted-in under Art. 24 | |
| 10 Aviation | Aviation |
| 50 Maritime Transport | Maritime |

European Topic Centre on
Climate change mitigation

https://www.eionet.europa.eu/etcs/etc-cm

The European Topic Centre on Climate change mitigation (ETC-CM) is a consortium of European institutes under contract of the European Environment Agency.

European Environment Agency
**European Topic Centre**
**Climate change mitigation**