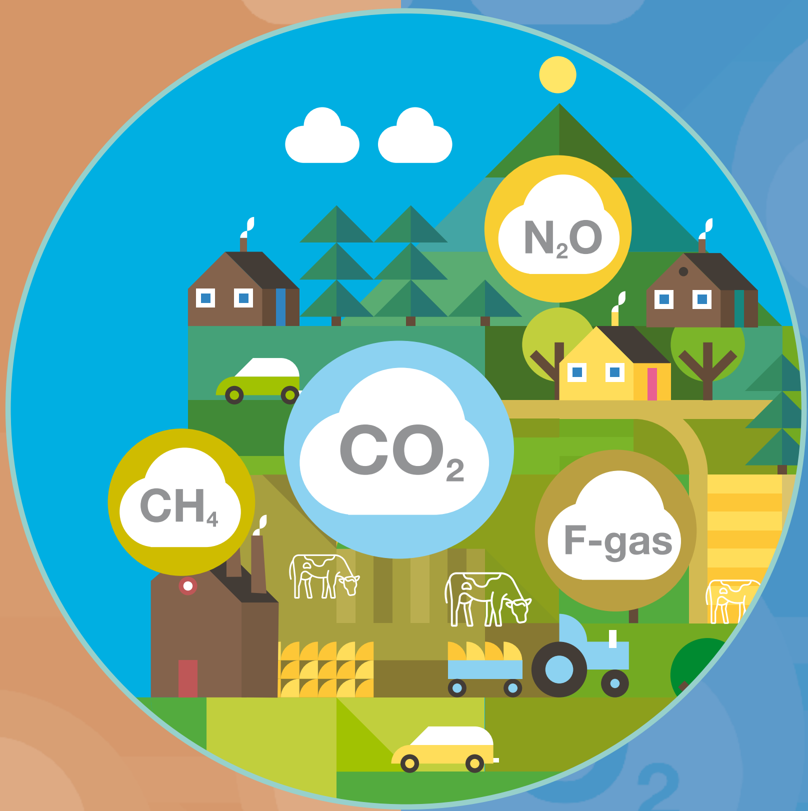
Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil

Quarterly Greenhouse Gas Emissions Indicator Report

2025 Quarter 4

June 2026



Environmental Protection Agency

The EPA is responsible for protecting and improving the environment as a valuable asset for the people of Ireland. We are committed to protecting people and the environment from the harmful effects of radiation and pollution.

The work of the EPA can be divided into three main areas:

- **Regulation:** Implementing regulation and environmental compliance systems to deliver good environmental outcomes and target those who don't comply.
- **Knowledge:** Providing high-quality, targeted and timely environmental data, information and assessment to inform decision making.
- **Advocacy:** Working with others to advocate for a clean, productive and well-protected environment and for sustainable environmental practices.

Our responsibilities include:

LICENSING

- Large-scale industrial waste and petrol storage activities;
- Urban wastewater discharges;
- The contained use and controlled release of genetically modified organisms;
- Sources of ionising radiation;
- Greenhouse gas emissions from industry and aviation through the EU Emissions Trading Scheme.

NATIONAL ENVIRONMENTAL ENFORCEMENT

- Audit and inspection of EPA-licensed facilities;
- Drive the implementation of best practice in regulated activities and facilities;
- Oversee local authority responsibilities for environmental protection;
- Regulate the quality of public drinking water and enforce urban wastewater discharge authorisations;
- Assess and report on public and private drinking water quality;
- Coordinate a network of public service organisations to support action against environmental crime;
- Prosecute those who flout environmental law and damage the environment.

WASTE MANAGEMENT AND CHEMICALS IN THE ENVIRONMENT

- Implement and enforce waste regulations including national enforcement issues;
- Prepare and publish national waste statistics and the National Hazardous Waste Management Plan;
- Develop and implement the National Waste Prevention Programme;
- Implement and report on legislation on the control of chemicals in the environment.

WATER MANAGEMENT

- Engage with national and regional governance and operational structures to implement the Water Framework Directive;
- Monitor, assess and report on the quality of rivers, lakes, transitional and coastal waters, bathing waters and groundwaters, and measurement of water levels and river flows.

CLIMATE SCIENCE AND CLIMATE CHANGE

- Publish Ireland's greenhouse gas emission inventories and projections;
- Provide the Secretariat to the Climate Change Advisory Council and support to the National Dialogue on Climate Action;
- Support National, EU and UN climate science and policy development activities.

ENVIRONMENTAL MONITORING & ASSESSMENT

- Design and implement national environmental monitoring systems: technology, data management, analysis and forecasting;
- Produce the State of Ireland's Environment and Indicator Reports;
- Monitor air quality and implement the EU Clean Air for Europe Directive, the Convention on Long Range Transboundary Air Pollution and the National Emissions Ceiling Directive;
- Oversee the implementation of the Environmental Noise Directive;
- Assess the impact of proposed plans and programmes on the Irish environment.

ENVIRONMENTAL RESEARCH AND DEVELOPMENT

- Coordinate and fund national environmental research activity to identify pressures, inform policy and provide solutions;
- Collaborate with national and EU environmental research activity.

RADIOLOGICAL PROTECTION

- Monitoring radiation levels and assess public exposure to ionising radiation and electromagnetic fields;
- Assist in developing national plans for emergencies arising from nuclear accidents;
- Monitor developments abroad relating to nuclear installations and radiological safety;
- Provide, or oversee the provision of, specialist radiation protection services.

GUIDANCE, AWARENESS RAISING, AND ACCESSIBLE INFORMATION

- Provide independent evidence-based reporting, advice and guidance to government, industry and the public on environmental and radiological protection topics;
- Promote the link between health and wellbeing, the economy and a clean environment;
- Promote environmental awareness including supporting behaviours for resource efficiency and climate transition;
- Promote radon testing in homes and workplaces and encourage remediation where necessary.

PARTNERSHIP AND NETWORKING

- Work with international and national agencies, regional and local authorities, non-governmental organisations, representative bodies and government departments to deliver environmental and radiological protection, research coordination and science-based decision making.

MANAGEMENT AND STRUCTURE OF THE EPA

The EPA is managed by a full-time Board, consisting of a Director General and five Directors. The work is carried out across five Offices:

- Office of Environmental Sustainability
- Office of Environmental Enforcement
- Office of Evidence and Assessment
- Office of Radiation Protection and Environmental Monitoring
- Office of Communications and Corporate Services

The EPA is assisted by advisory committees who meet regularly to discuss issues of concern and provide advice to the Board.

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ENVIRONMENTAL PROTECTION AGENCY

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Summary for Policy Makers

This section gives a concise overview of the latest short-term movement in national greenhouse gas emissions and the main sectoral drivers. Overall emissions continue to trend downward, although the pace and direction of change still differ across sectors.

January-December 2025 vs January-December 2024

Over the four quarters of 2025, greenhouse gas emissions decreased by **1.5%** compared to the same period in 2024. The largest downward contributions came from **Buildings (Residential)** and **Electricity**. Emissions also declined in **Agriculture** and **Transport**, while emissions increased in **Industry**, **Buildings (Commercial and Public)** and **Other**.

Main drivers	
Sector	**Summary**
Buildings (Residential)	7.2% reduction in emissions, driven by mild weather with less days requiring home heating.
Electricity	4.5% reduction in emissions, reflecting continued decarbonisation, increased renewable generation, and higher electricity imports.

Changes in other sectors	
Sector	**Summary**
Agriculture	0.5% reduction in emissions, reflecting lower emissions from Enteric fermentation and Manure management due to reduced cattle numbers, partially offset by increased emissions from Agricultural soils due to increased fertiliser sales.
Transport	0.7% reduction in emissions; reduced Road transportation emissions partly offset by higher emissions from domestic shipping between Irish ports.
Industry	0.2% increase in emissions, driven by higher emissions in the Mineral industry, partially offset by reductions in Manufacturing combustion.
Buildings (Commercial and Public)	1.0% increase in emissions; emissions remained broadly stable relative to the larger reductions in Buildings (Residential).
Other	7.6% increase in emissions, reflecting a rebound in Petroleum refining emissions following unusually low levels in the comparison year.

1. Key Findings

How to interpret changes in this section:

- Year-to-Date (YTD) compares cumulative emissions from January to December 2025 with emissions from January to December 2024.
- Year-on-Year (YoY) compares emissions in the current quarter with the same quarter of the previous year.
- Quarter-on-Quarter (QoQ) compares emissions in the current quarter with the previous quarter. These comparisons are based on seasonally adjusted data.

Figures in this section are presented using three standard comparison approaches: year-to-date (YTD), year-on-year (YoY), and quarter-on-quarter (QoQ), as defined above. Emissions are broken down by Climate Action Plan-aligned sectors, excluding LULUCF (Land Use, Land Use Change and Forestry).

Quarterly estimates can be volatile and are influenced by seasonal patterns, particularly when comparing consecutive quarters. To provide a clearer picture of underlying trends, all quarter-on-quarter comparisons are based on seasonally adjusted data. Changes observed at the quarterly level should not be interpreted as indicative of annual trends.

Looking at YTD 2025 compared to YTD 2024:

- Overall greenhouse gas emissions fell by 1.5% (-751.6 kt CO_2 eq) compared to YTD 2024.
- The largest decrease in emissions occurred in the Buildings (-392.3 kt CO_2 eq) sector, followed by the Electricity (-284.2 kt CO_2 eq) sector.
- The largest increase in emissions occurred in the Other (+98.2 kt CO_2 eq) sector.

There was a 4.1% decrease in the number of heating degree days (HDD, days with average temperature below 15.5 degrees Celsius where heating would be needed) in YTD 2025 compared to YTD 2024, resulting in lower demand for heating in the Buildings sector.

The share of the electricity supply in YTD 2025 compared to YTD 2024 included an increase in renewables (39.6% vs 39.0%), a decrease in non-renewables (42.9% vs 46.0%) and an increase in electricity imports (17.5% vs 15.0%). The amount of electricity supplied increased by 3.2%, driven by renewables up 1.6% and imports up 16.7%, with non-renewables down 6.8%.

Note: Indicators have a minimum of coverage of 90% of emissions per sector and exclude the LULUCF sector. The release of the Provisional National Greenhouse Gas Inventory 1990-2025 in July will provide the most accurate estimate of annual change from 2024 to 2025.

Table 1.1: Key findings: year-to-date trends (January-December compared to the same period last year)

Sector	Key Finding
GHG Emissions YTD 2025 vs. YTD 2024	Overall GHG emissions decreased by 1.5% (-751.6 kt CO_2 eq), driven primarily by reduced emissions from the Buildings and Electricity sectors, partially offset by increases in the Other and Industry sectors.
Agriculture	Agriculture emissions decreased by 0.5% (-99.6 kt CO_2 eq), mainly reflecting lower emissions from Enteric fermentation and Manure management, partially offset by increased emissions from Agricultural soils and Agriculture/Forestry fuel combustion.
Transport	Transport emissions fell slightly by 0.7% (-85.4 kt CO_2 eq), with reduced Road transportation emissions partly offset by higher emissions from Domestic navigation.
Electricity	Electricity emissions decreased by 4.5% (-284.2 kt CO_2 eq) despite higher electricity supply, reflecting increased renewable generation and electricity imports alongside ongoing decarbonisation of the sector.
Buildings (Commercial and Public)	Emissions increased marginally by 1.0% (+14.5 kt CO_2 eq), remaining broadly stable over the year compared with the larger reduction observed in Residential Buildings.
Buildings (Residential)	Residential emissions decreased by 7.2% (-406.8 kt CO_2 eq) as part of the wider 5.5% reduction in Buildings emissions, driven by fewer heating degree days and lower demand for space heating.
Industry	Industry emissions increased by 0.2% (+11.7 kt CO_2 eq), driven by higher emissions from the Mineral industry, partially offset by reductions in Manufacturing combustion.

Table 1.2: Key findings: year-on-year trends (current quarter compared to the same quarter last year)

Sector	Key Finding
GHG Emissions Q4 2024 to Q4 2025	Overall GHG emissions decreased by 1.3% (-161.9 kt CO_2 eq) compared to the same quarter last year, driven mainly by lower Electricity emissions, partially offset by increases in Buildings, Other and Industry emissions.
Agriculture	Agriculture emissions decreased by 0.3% (-14.3 kt CO_2 eq) compared to the same quarter last year, with reductions in Liming and Enteric fermentation partially offset by higher Agricultural soils emissions.
Transport	Transport emissions declined by 1.0% (-27.6 kt CO_2 eq), with lower Road transportation emissions partially offset by increased emissions from Domestic navigation.

Sector	Key Finding
Electricity	Electricity emissions fell sharply by 14.0% (-240.5 kt CO_2 eq) due to higher electricity imports and increased generation from renewable sources, despite rising electricity supply.
Buildings (Commercial and Public)	Emissions were broadly stable, with a small increase relative to the same quarter last year, reflecting relatively steady energy demand in this subsector.
Buildings (Residential)	Residential emissions increased 4.3% (+57.9 kt CO_2 eq) as part of the 3.6% increase in Buildings emissions, linked to higher heating demand during the quarter.
Industry	Industry emissions increased by 1.6% (+20.8 kt CO_2 eq) compared to the same quarter last year, driven by increased emissions in the Mineral industry, partially offset by a small decrease in Manufacturing combustion.

Table 1.3: Key findings: quarter-on-quarter trends (current quarter compared to previous quarter; seasonally adjusted)

Sector	Key Finding
GHG Emissions Q3 2025 to Q4 2025	On a seasonally adjusted basis, overall GHG emissions increased by 1.0% (+120.1 kt CO_2 eq) compared to the previous quarter, driven mainly by higher Buildings, Agriculture and Electricity emissions, partially offset by lower Transport emissions.
Agriculture	Agriculture emissions increased by 0.8% (+37.1 kt CO_2 eq) compared to the previous quarter, driven mainly by higher Agricultural soils emissions, partially offset by lower Liming emissions.
Transport	Transport emissions fell by 0.5% (-13.7 kt CO_2 eq), driven mainly by reduced emissions from Domestic navigation and Railways, partially offset by higher Road transportation emissions.
Electricity	Electricity emissions increased by 2.3% (+32.7 kt CO_2 eq) due to higher electricity supply, despite continued high levels of renewable generation.
Buildings (Commercial and Public)	Emissions increased slightly by 1.3% (+5.0 kt CO_2 eq) quarter-on-quarter, remaining broadly stable relative to the larger seasonal movement observed in Residential Buildings.
Buildings (Residential)	Residential emissions increased significantly (+59.7 kt CO_2 eq) as part of the 3.8% increase in Buildings emissions, reflecting greater seasonally adjusted heating demand.
Industry	Industry emissions decreased by 0.3% (-4.0 kt CO_2 eq) on a seasonally adjusted basis, driven mainly by a small reduction in Manufacturing combustion.

Table 1.4 brings together the headline percentage changes in greenhouse gas emissions by sector across the main reporting comparisons used in this report: year-to-date changes 2025 compared to 2024, Q4 2025 compared to Q4 2024, and Q4 2025 compared to Q3 2025. It is intended as a concise reference table to support comparison of sectoral trends across the three time perspectives of year-to-date, year-on-year and quarter-on-quarter.

Table 1.4: Summary of Q4 2025 greenhouse gas emissions by sector (kt CO_2 eq) with year-to-date, year-on-year and quarter-on-quarter percentage changes

		Percentage comparisons		
Sector	Emissions Q4 2025 (kt CO_2 eq)	YTD 2025 vs. 2024	vs. Q4 2024	vs. Q3 2025
Overall	**12,426.8**	**-1.5**	**-1.3**	**1.0**
Agriculture	4,695.9	-0.5	-0.3	0.8
Buildings	1,768.4	-5.5	3.6	3.8
Electricity	1,475.2	-4.5	-14.0	2.3
Industry	1,329.0	0.2	1.6	-0.3
Other	348.7	7.6	12.6	1.0
Transport	2,809.6	-0.7	-1.0	-0.5

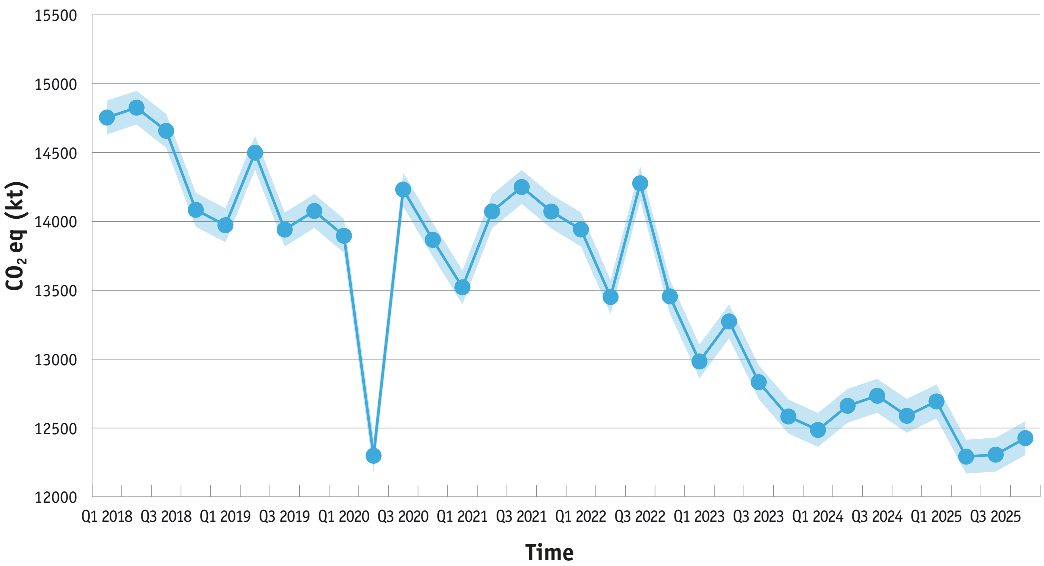
2. Quarter 4 2025 Summary

This section presents the key high-level emissions estimates for Quarter 4 2025, followed by further sectoral analysis in Section 3.

Figure 2.1 shows that, from a high in Q2 2018, overall emissions excluding LULUCF (Land Use, Land Use Change and Forestry) have followed a downward trend, with a marked drop during the COVID-19 pandemic lockdowns in Q2 2020.

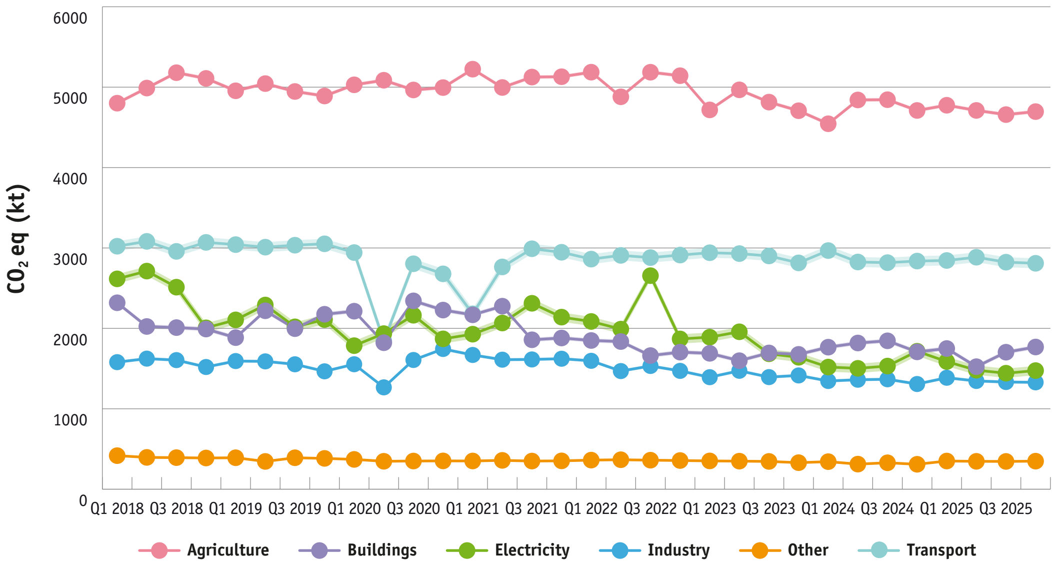
Since 2018, the broadly consistent trend in emissions reductions can be seen in the Buildings, Electricity and Industry sectors. The only major change was in Q2 2020 and Q2 2021 during the COVID-19 pandemic lockdowns, with marked reductions in Transport emissions. Agriculture remains the largest source of emissions throughout this period and the 'Other' sector (consisting of Waste, Petroleum refining and Fluorinated gases) the smallest source.

Figure 2.1: Overall quarterly movement in greenhouse gas emissions for all sectors from Q1 2018 to Q4 2025.



Shaded area represents 95% confidence interval.

Figure 2.2: Quarterly movement in greenhouse gas emissions by sector from Q1 2018 to Q4 2025.



Shaded area represents 95% confidence interval.

2.1 Year-to-Date Change

Looking at year-to-date 2025 compared to year-to-date 2024:

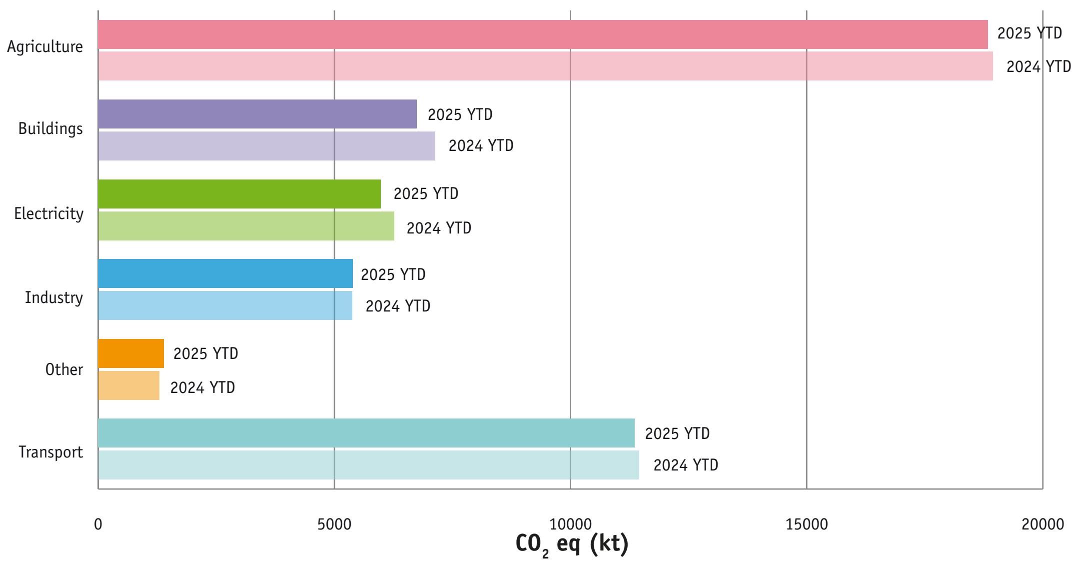
- Overall greenhouse gas emissions fell by 1.5% (-751.6 kt CO_2 eq) compared to year-to-date 2024.
- The largest decrease in emissions occurred in the Buildings (-392.3 kt CO_2 eq) sector, followed by the Electricity (-284.2 kt CO_2 eq) sector.
- The largest increase in emissions occurred in the Other (+98.2 kt CO_2 eq) sector.

Table 2.1: Summary YTD 2025 compared to YTD 2024 – Overall

				Comparison to YTD 2024	
Sector	Greenhouse Gas	Emissions YTD 2025 (kt CO_2 eq)	95% CI (kt CO_2 eq)	Change in emissions (kt CO_2 eq)	% change
Overall	**CH_4, CO_2, N_2O, HFC, PFC, SF_6, NF_3**	**49,718.7**	**49,595.6-49,841.8**	**-751.6**	**-1.5**
Agriculture	CH_4, CO_2, N_2O	18,840.4	18,816.9-18,863.9	-99.6	-0.5
Buildings	CH_4, CO_2	6,745.6	6,719.5-6,771.7	-392.3	-5.5
Electricity	CO_2	5,985.0	5,927.2-6,042.8	-284.2	-4.5
Industry	CO_2	5,394.1	5,374.9-5,413.3	11.7	0.2
Other	CO_2, CH_4, N_2O, HFC, PFC, SF_6, NF_3	1,391.1	1,382.2-1,400.0	98.2	7.6
Transport	CO_2	11,362.4	11,300.0-11,424.8	-85.4	-0.7

95% confidence intervals are derived from a joint block bootstrap applied to detrended quarterly series.

Figure 2.3: Comparing year-to-date 2025 to year-to-date 2024 by sector.



2.2 Year-on-Year Change

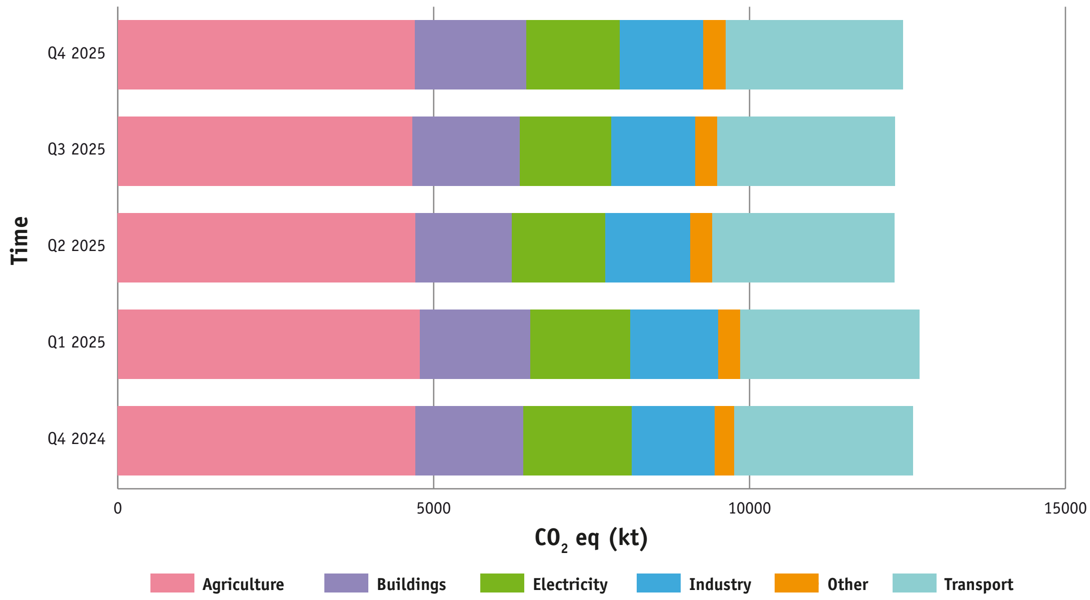
Looking at Quarter 4 2025 compared to Quarter 4 2024:

- Overall greenhouse gas emissions fell by 1.3% (-161.9 kt CO_2 eq) compared to Quarter 4 2024.
- The largest decrease in emissions occurred in the Electricity (-240.5 kt CO_2 eq) sector.
- The largest increase in emissions occurred in the Buildings (+60.8 kt CO_2 eq) sector, followed by the Other (+39.0 kt CO_2 eq) sector.

Table 2.2: Summary Q4 2025 compared to Q4 2024 – Overall

				Comparison to Q4 2024	
Sector	Greenhouse Gas	Emissions Q4 2025 (kt CO_2 eq)	95% CI (kt CO_2 eq)	Change in emissions (kt CO_2 eq)	% change
Overall	**CH_4, CO_2, N_2O, HFC, PFC, SF_6, NF_3**	**12,426.8**	**12,303.7-12,549.9**	**-161.9**	**-1.3**
Agriculture	CH_4, CO_2, N_2O	4,695.9	4,672.4-4,719.4	-14.3	-0.3
Buildings	CH_4, CO_2	1,768.4	1,742.3-1,794.5	60.8	3.6
Electricity	CO_2	1,475.2	1,417.4-1,533.0	-240.5	-14.0
Industry	CO_2	1,329.0	1,309.8-1,348.2	20.8	1.6
Other	CO_2, CH_4, N_2O, HFC, PFC, SF_6, NF_3	348.7	339.8-357.6	39.0	12.6
Transport	CO_2	2,809.6	2,747.2-2,872.0	-27.6	-1.0

Figure 2.4: Overall quarterly movement in greenhouse gas emissions for all sectors from Q4 2024 to Q4 2025.



2.3 Quarter-on-Quarter Change

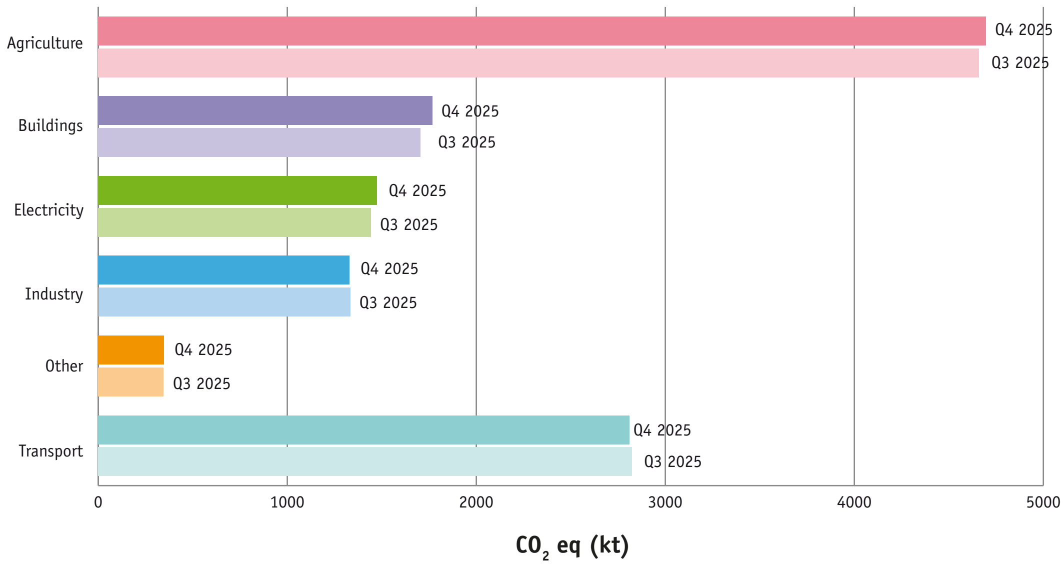
Looking at Quarter 4 2025 compared to Quarter 3 2025:

- Overall greenhouse gas emissions rose by 1.0% (+120.1 kt CO_2 eq) compared to Quarter 3 2025.
- The largest increase in emissions occurred in the Buildings (+64.8 kt CO_2 eq) sector, followed by the Agriculture (+37.1 kt CO_2 eq) sector.
- The largest decrease in emissions occurred in the Transport (-13.7 kt CO_2 eq) sector.

Table 2.3: Summary Q4 2025 compared to Q3 2025 – Overall

				Comparison to Q3 2025	
Sector	Greenhouse Gas	Emissions Q4 2025 (kt CO_2 eq)	95% CI (kt CO_2 eq)	Change in emissions (kt CO_2 eq)	% change
Overall	**CH_4, CO_2, N_2O, HFC, PFC, SF_6, NF_3**	**12,426.8**	**12,303.7-12,549.9**	**120.1**	**1.0**
Agriculture	CH_4, CO_2, N_2O	4,695.9	4,672.4-4,719.4	37.1	0.8
Buildings	CH_4, CO_2	1,768.4	1,742.3-1,794.5	64.8	3.8
Electricity	CO_2	1,475.2	1,417.4-1,533.0	32.7	2.3
Industry	CO_2	1,329.0	1,309.8-1,348.2	-4.0	-0.3
Other	CO_2, CH_4, N_2O, HFC, PFC, SF_6, NF_3	348.7	339.8-357.6	3.3	1.0
Transport	CO_2	2,809.6	2,747.2-2,872.0	-13.7	-0.5

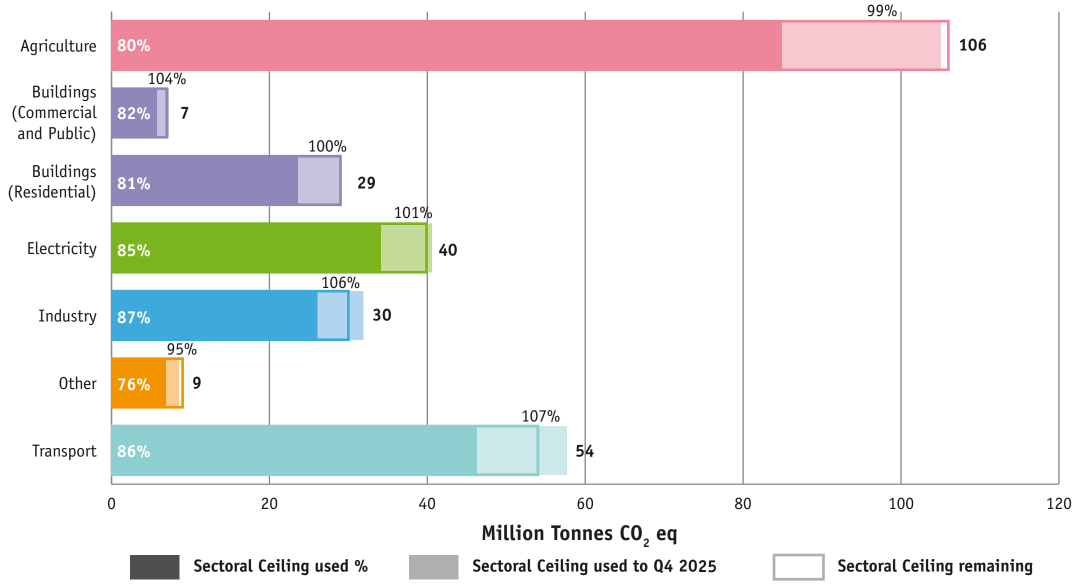
Figure 2.5: Comparing Q4 2025 to Q3 2025 by sector.



2.4 Sectoral Emissions Ceilings

With regards to Sectoral Emissions Ceilings, looking specifically at the first Carbon Budget period of 2021-2025, Figure 2.6 shows the emissions used and the remaining CAP emissions until the ceiling is reached. Based on the quarterly indicator estimates, the amount of sectoral budget used ranges from 95% in the Other sector to over 100% in the Industry, Transport, Buildings (Commercial and Public), and Electricity sectors. These estimates suggest that the indicative emissions allowances for those sectors may already have been fully used, subject to revision in the final annual inventory.

Figure 2.6: Summary of Sectoral Ceiling Emissions Used across 2021 to 2024 as reported in the Provisional Greenhouse Gas Emissions 1990-2024 (dark) and Emissions Used up to Q4 2025 (bright) based on Quarterly estimates.



3. Sectoral Summaries

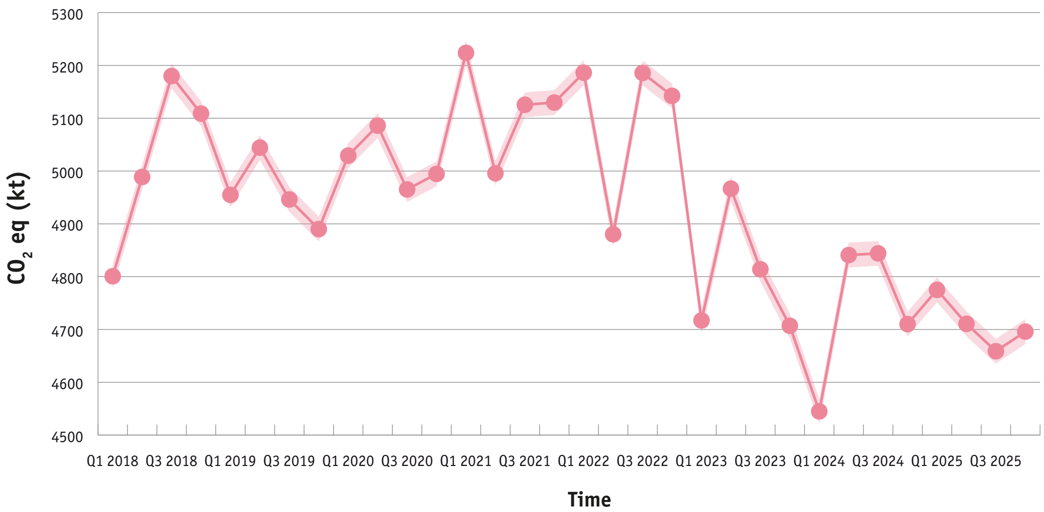
3.1 Agriculture

Subsectors: Agricultural soils; Agriculture/Forestry fuel combustion; Enteric fermentation; Fishing fuel combustion; Liming; Manure management; Urea application

Number of indicator categories: Eighteen

Estimated total coverage of quarterly indicator categories compared to original annual National Inventory Report: 93.2%

Figure 3.1: Changes in emissions in the Agriculture sector from Q1 2018 to Q4 2025, based on seasonally adjusted data.



Shaded area represents 95% confidence interval.

3.1.1 Agriculture Year-to-Date Change

Looking at year-to-date 2025 compared to year-to-date 2024:

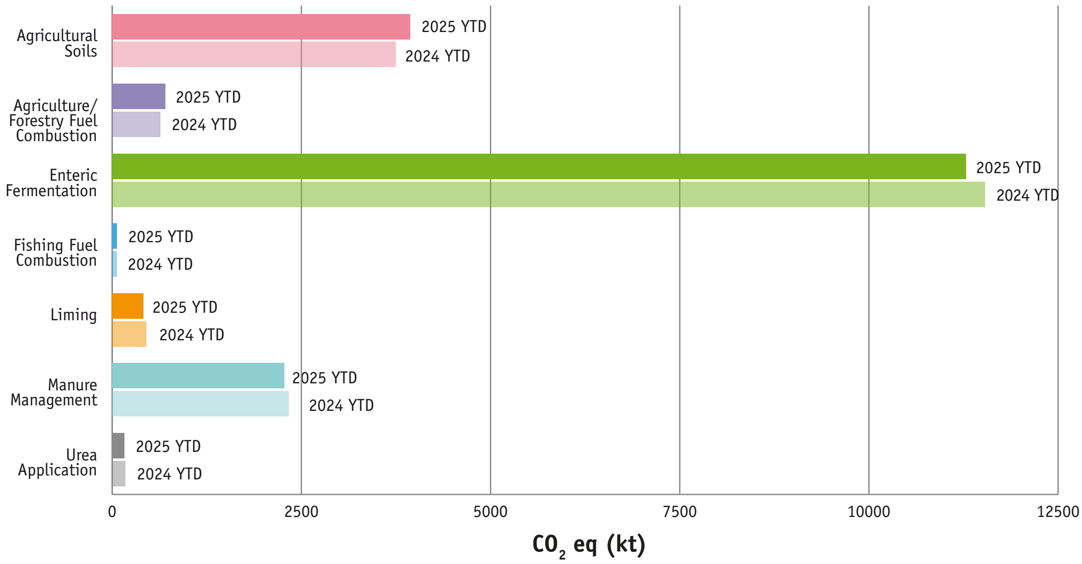
- Agriculture emissions were 0.5% (-99.6 kt CO_2 eq) lower year-to-date compared with the previous year. This was driven by a -3.1% reduction in total cattle numbers (-1.7% dairy cows, -3.6% other cattle) offset somewhat by increased fertiliser sales (+16.7%).
- The largest decreases in emissions occurred in the Enteric fermentation (-249.2 kt CO_2 eq) and Manure management (-60.4 kt CO_2 eq) subsectors.
- The largest increase in emissions occurred in the Agricultural soils (+191.8 kt CO_2 eq) subsector.

Table 3.1: Summary YTD 2025 compared to YTD 2024 – Agriculture

			Comparison to YTD 2024	
Sector	Greenhouse Gas	Emissions YTD 2025 (kt CO_2 eq)	Change in emissions (kt CO_2 eq)	% change
Agriculture	**CH_4, CO_2, N_2O**	**18,840.4**	**-99.6**	**-0.5**
Agricultural soils	N_2O	3,940.6	191.8	5.1
Agriculture/Forestry fuel combustion	CO_2	703.0	67.0	10.5
Enteric fermentation	CH_4	11,284.6	-249.2	-2.2
Fishing fuel combustion	CO_2	60.3	0.0	0.0
Liming	CO_2	412.3	-38.5	-8.5
Manure management	CH_4, N_2O	2,277.3	-60.4	-2.6
Urea application	CO_2	162.4	-10.3	-6.0

* Liming subsector: Direct CO_2 eq emissions only. Indirect benefits from liming, such as reduced fertiliser requirements due to increased soil fertility, are captured under other subsectors (e.g. Agricultural soils).

Figure 3.2: Comparing year-to-date 2025 to year-to-date 2024 by subsector.



3.1.2 Agriculture Year-on-Year Change

Looking at Quarter 4 2025 compared to Quarter 4 2024:

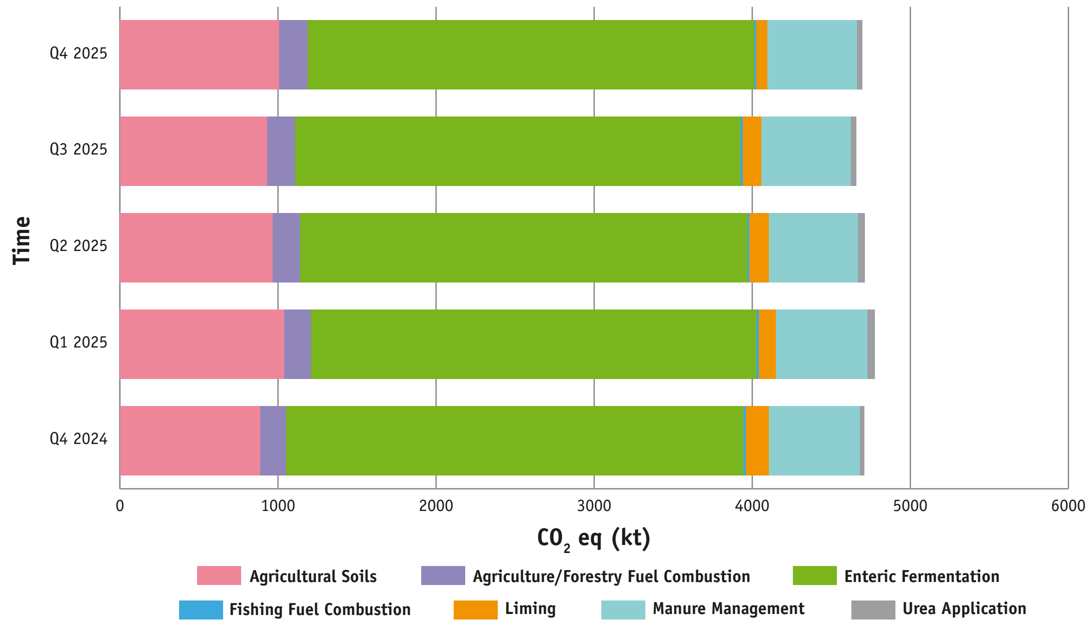
- Agriculture emissions were 0.3% (-14.3 kt CO_2 eq) lower compared to the same quarter last year. This was driven by a -1.1% reduction in total cattle numbers (+0.1% dairy cows, -1.5% other cattle) compared to the same quarter in 2024.
- The largest decreases in emissions occurred in the Liming (-78.0 kt CO_2 eq) and Enteric fermentation (-67.0 kt CO_2 eq) subsectors.
- The largest increase in emissions occurred in the Agricultural soils (+121.4 kt CO_2 eq) sector.

Table 3.2: Summary Q4 2025 compared to Q4 2024 – Agriculture

			Comparison to Q4 2024	
Sector	Greenhouse Gas	Emissions Q4 2025 (kt CO_2 eq)	Change in emissions (kt CO_2 eq)	% change
Agriculture	**CH_4, CO_2, N_2O**	**4,695.9**	**-14.3**	**-0.3**
Agricultural soils	N_2O	1,006.8	121.4	13.7
Agriculture/Forestry fuel combustion	CO_2	179.2	14.0	8.5
Enteric fermentation	CH_4	2,825.7	-67.0	-2.3
Fishing fuel combustion	CO_2	15.1	0.1	0.8
Liming	CO_2	68.4	-78.0	-53.3
Manure management	CH_4, N_2O	565.8	-8.2	-1.4
Urea application	CO_2	34.9	3.4	10.7

* Liming subsector: Direct CO_2 eq emissions only. Indirect benefits from liming, such as reduced fertiliser requirements due to increased soil fertility, are captured under other subsectors (e.g. Agricultural soils).

Figure 3.3: Comparison of subsectoral breakdown in emissions for this quarter vs last four quarters, based on seasonally adjusted data.



3.1.3 Agriculture Quarter-on-Quarter Change

Looking at Quarter 4 2025 compared to Quarter 3 2025:

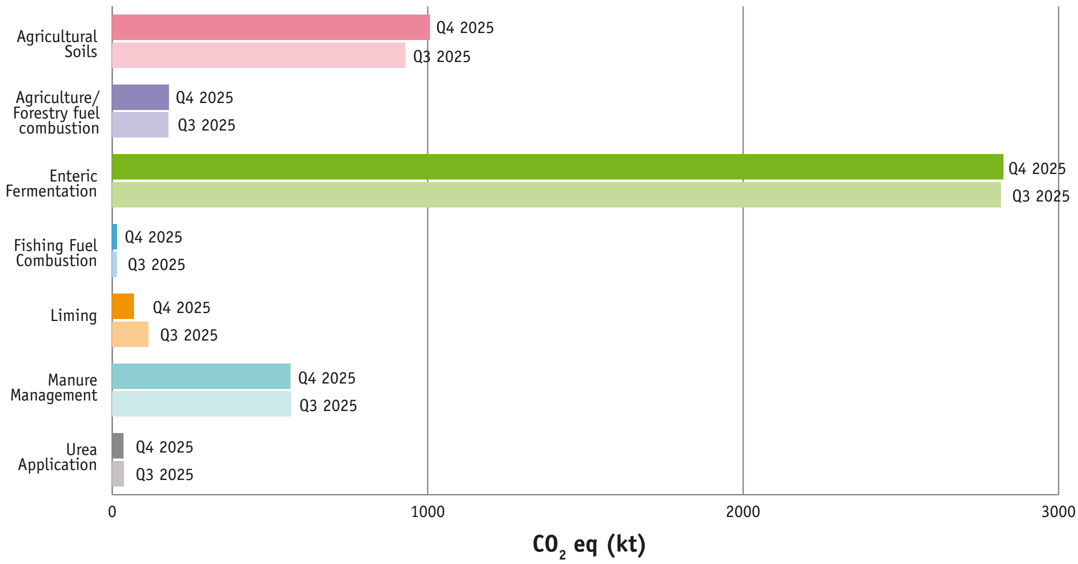
- Agriculture emissions rose by 0.8% (+37.1 kt CO_2 eq) compared to the previous quarter. This was driven mainly by higher Agricultural soils emissions (+77.0 kt CO_2 eq), partly offset by lower Liming emissions (-46.5 kt CO_2 eq).

Table 3.3: Summary Q4 2025 compared to Q3 2025 – Agriculture

			Comparison to Q3 2025	
Sector	Greenhouse Gas	Emissions Q4 2025 (kt CO_2 eq)	Change in emissions (kt CO_2 eq)	% change
Agriculture	**CH_4, CO_2, N_2O**	**4,695.9**	**37.1**	**0.8**
Agricultural soils	N_2O	1,006.8	77.0	8.3
Agriculture/Forestry fuel combustion	CO_2	179.2	1.4	0.8
Enteric fermentation	CH_4	2,825.7	8.4	0.3
Fishing fuel combustion	CO_2	15.1	0.0	0.1
Liming	CO_2	68.4	-46.5	-40.5
Manure management	CH_4, N_2O	565.8	-1.1	-0.2
Urea application	CO_2	34.9	-2.2	-6.0

* Liming subsector: Direct CO_2 eq emissions only. Indirect benefits from liming, such as reduced fertiliser requirements due to increased soil fertility, are captured under other subsectors (e.g. Agricultural soils).

Figure 3.4: Quarter-on-Quarter changes in emissions in the Agriculture subsectors, based on seasonally adjusted data.



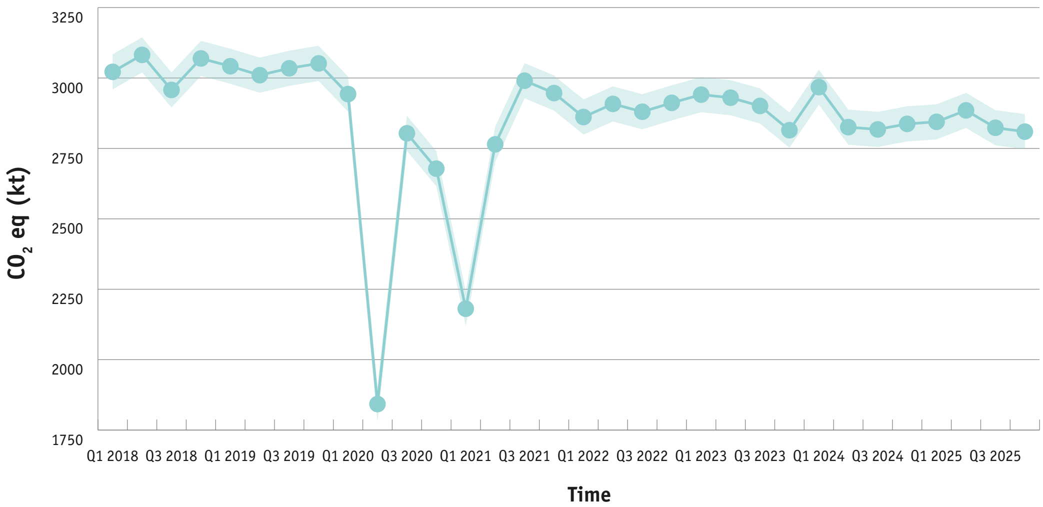
3.2 Transport

Subsectors: Domestic navigation; Other transportation; Railways; Road transportation

Number of indicator categories: Ten

Estimated total coverage of quarterly indicator categories compared to original annual National Inventory Report: 98.4%

Figure 3.5: Changes in emissions in the Transport sector from Q1 2018 to Q4 2025, based on seasonally adjusted data.



Shaded area represents 95% confidence interval.

3.2.1 Transport Year-to-Date Change

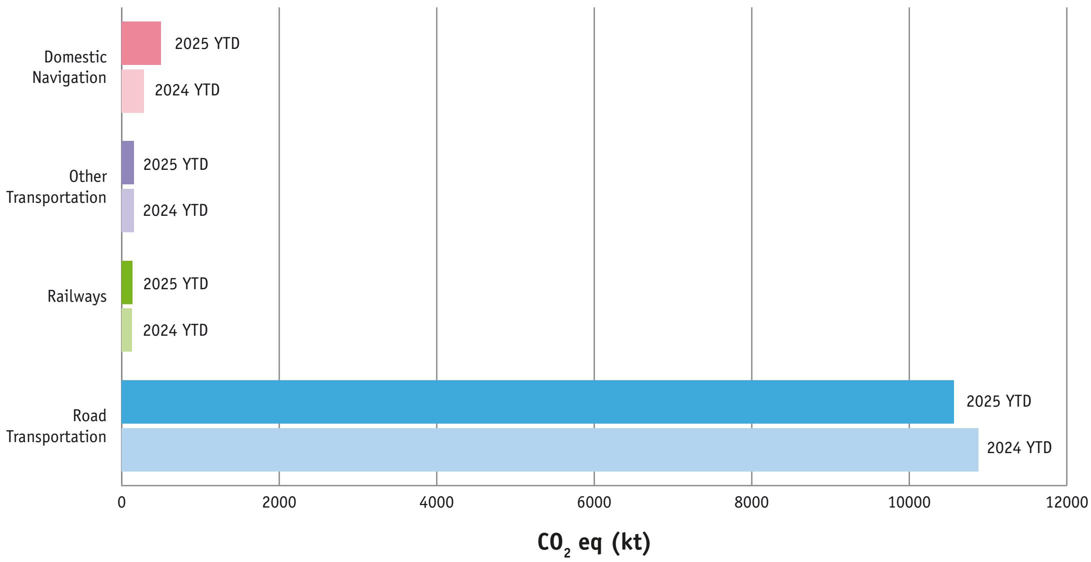
Looking at year-to-date 2025 compared to year-to-date 2024:

- The primary driver of the 0.7% (-85.4 kt CO_2 eq) reduction in emissions year-to-date was decreased emissions from Road transportation (-2.8%) due to decreased sales of diesel (-3.4%) partially offset by increased sales of petrol (+4.5%). Average petrol biofuel blending rates increased from 9.0% to 9.7% by volume, while diesel blending rates decreased from 6.5% to 6.2% by volume.
- The largest increase in emissions occurred in the Domestic navigation (+216.6 kt CO_2 eq) sector.

Table 3.4: Summary YTD 2025 compared to YTD 2024 – Transport

			Comparison to YTD 2024	
Sector	Greenhouse Gas	Emissions YTD 2025 (kt CO_2 eq)	Change in emissions (kt CO_2 eq)	% change
Transport	**CO_2**	**11,362.4**	**-85.4**	**-0.7**
Domestic navigation	CO_2	500.4	216.6	76.3
Other transportation	CO_2	154.1	-1.0	-0.6
Railways	CO_2	138.0	6.2	4.7
Road transportation	CO_2	10,570.0	-307.2	-2.8

Figure 3.6: Comparing year-to-date 2025 to year-to-date 2024 by subsector.



3.2.2 Transport Year-on-Year Change

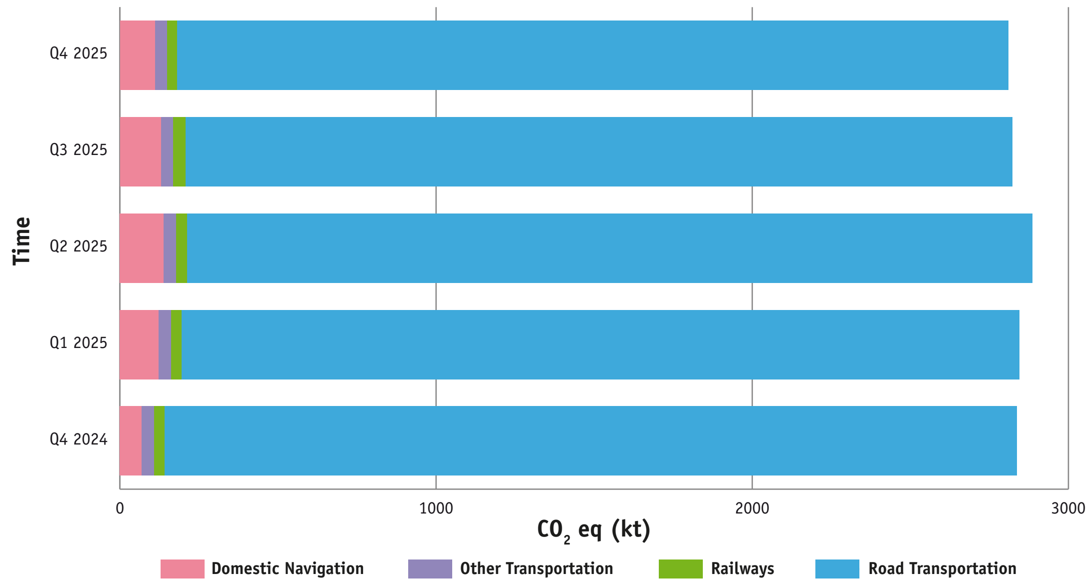
Looking at Quarter 4 2025 compared to Quarter 4 2024:

- Transport emissions were down 1.0% (-27.6 kt CO_2 eq) compared to the same quarter last year, with reduced emissions from Road transportation (-2.5%) due to decreased sales of diesel (-2.9%) partially offset by increased sales of petrol (+7.0%). Biofuel blending rates remained relatively constant compared to the year-ago quarter for petrol (9.7% versus 9.8% by volume) and diesel (6.3% versus 6.1% by volume).
- The largest increase in emissions occurred in the Domestic navigation (+42.6 kt CO_2 eq) sector.

Table 3.5: Summary Q4 2025 compared to Q4 2024 – Transport

			Comparison to Q4 2024	
Sector	Greenhouse Gas	Emissions Q4 2025 (kt CO_2 eq)	Change in emissions (kt CO_2 eq)	% change
Transport	**CO_2**	**2,809.6**	**-27.6**	**-1.0**
Domestic navigation	CO_2	110.7	42.6	62.5
Other transportation	CO_2	38.7	-1.0	-2.4
Railways	CO_2	30.8	-2.9	-8.5
Road transportation	CO_2	2,629.5	-66.3	-2.5

Figure 3.7: Comparison of subsectoral breakdown in emissions for this quarter vs last four quarters, based on seasonally adjusted data.



3.2.3 Transport Quarter-on-Quarter Change

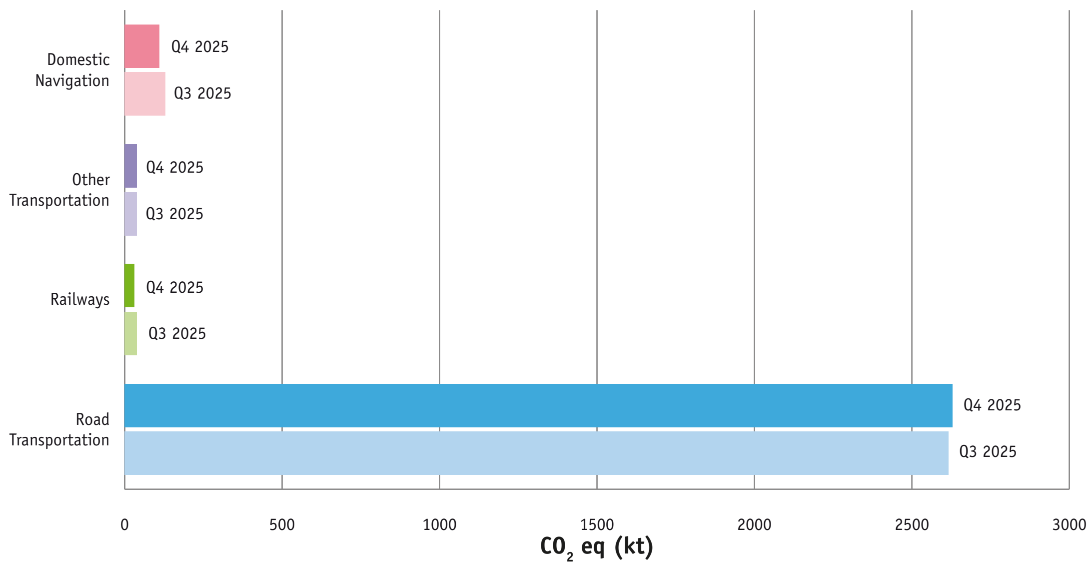
Looking at Quarter 4 2025 compared to Quarter 3 2025:

- The primary driver of the 0.5% (-13.7 kt CO_2 eq) reduction in emissions this quarter was decreased emissions from Domestic navigation (shipping between Irish ports).
- The largest increase in emissions occurred in the Road transportation (+12.7 kt CO_2 eq) sector.

Table 3.6: Summary Q4 2025 compared to Q3 2025 – Transport

			Comparison to Q3 2025	
Sector	Greenhouse Gas	Emissions Q4 2025 (kt CO_2 eq)	Change in emissions (kt CO_2 eq)	% change
Transport	**CO_2**	**2,809.6**	**-13.7**	**-0.5**
Domestic navigation	CO_2	110.7	-19.0	-14.6
Other transportation	CO_2	38.7	0.0	0.0
Railways	CO_2	30.8	-7.4	-19.4
Road transportation	CO_2	2,629.5	12.7	0.5

Figure 3.8: Quarter-on-Quarter changes in emissions in the Transport subsectors, based on seasonally adjusted data.



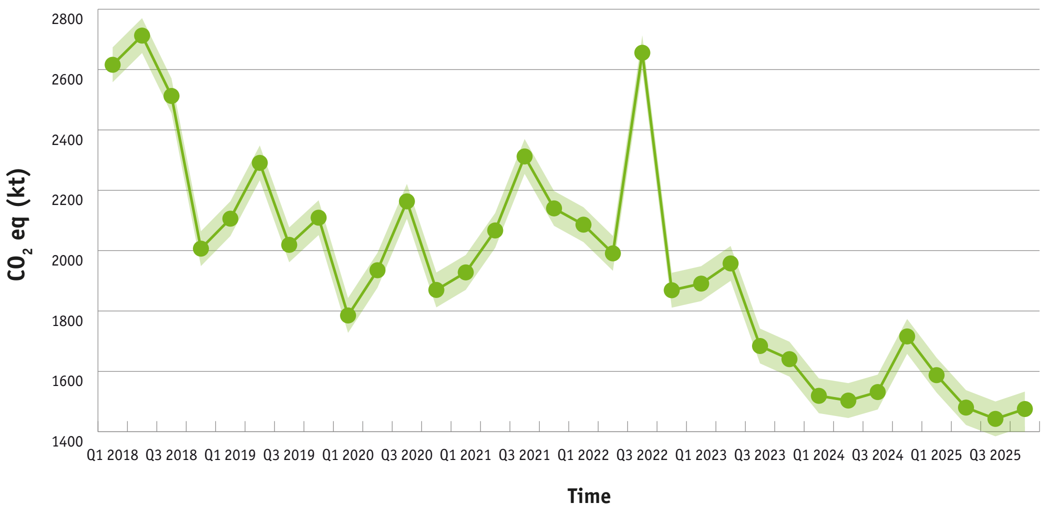
3.3 Electricity

Subsectors: Public electricity and heat production; Solid fuels and other energy industries

Number of indicator categories: Five

Estimated total coverage of quarterly indicator categories compared to original annual National Inventory Report: 91.7%

Figure 3.9: Changes in emissions in the Electricity sector from Q1 2018 to Q4 2025, based on seasonally adjusted data.



Shaded area represents 95% confidence interval.

3.3.1 Electricity Year-to-Date Change

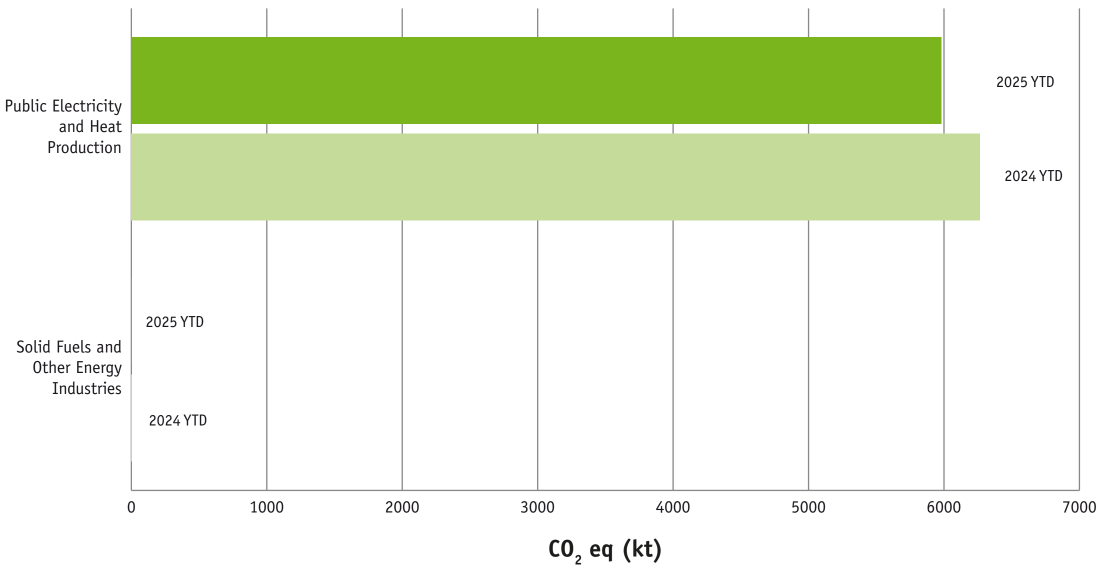
Looking at year-to-date 2025 compared to year-to-date 2024:

- Greenhouse gas emissions decreased by 4.5% (-284.2 kt CO_2 eq), despite a 3.2% increase in overall electricity supply, due to a 16.7% increase in imported electricity and a 1.6% increase in renewable sources of electricity generation. Such movements were reflected in changes in the share of the energy supply in 2025 compared to 2024 from renewables (39.6% vs 39.0%), non-renewables (42.9% vs 46.0%) and imports (17.5% vs 15.0%).

Table 3.7: Summary YTD 2025 compared to YTD 2024 – Electricity

			Comparison to YTD 2024	
Sector	Greenhouse Gas	Emissions YTD 2025 (kt CO_2 eq)	Change in emissions (kt CO_2 eq)	% change
Electricity	**CO_2**	**5,985.0**	**-284.2**	**-4.5**
Public electricity and heat production	CO_2	5,980.6	-284.2	-4.5
Solid fuels and other energy industries	CO_2	4.4	0.0	0.0

Figure 3.10: Comparing year-to-date 2025 to year-to-date 2024 by subsector.



3.3.2 Electricity Year-on-Year Change

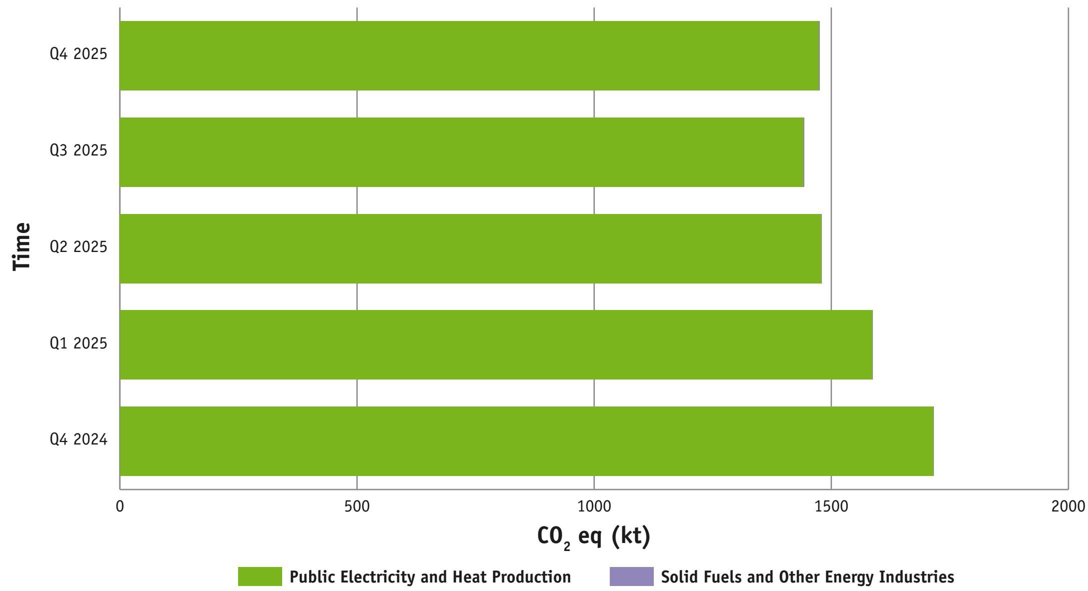
Looking at Quarter 4 2025 compared to Quarter 4 2024:

- Greenhouse gas emissions decreased by 14.0% (-240.5 kt CO_2 eq), despite a 4.2% increase in overall electricity supply, due to a 38.6% increase in imported electricity and a 5.6% increase in renewable sources of electricity generation. Such movements were reflected in changes in the share of the energy supply in Q4 2025 compared to Q4 2024 from renewables (42.7% vs 40.4%), non-renewables (40.6% vs 47.5%) and imports (16.7% vs 12.1%).

Table 3.8: Summary Q4 2025 compared to Q4 2024 – Electricity

			Comparison to Q4 2024	
Sector	Greenhouse Gas	Emissions Q4 2025 (kt CO_2 eq)	Change in emissions (kt CO_2 eq)	% change
Electricity	**CO_2**	**1,475.2**	**-240.5**	**-14.0**
Public electricity and heat production	CO_2	1,474.1	-240.4	-14.0
Solid fuels and other energy industries	CO_2	1.1	-0.1	-4.4

Figure 3.11: Comparison of subsectoral breakdown in emissions for this quarter vs last four quarters, based on seasonally adjusted data.



3.3.3 Electricity Quarter-on-Quarter Change

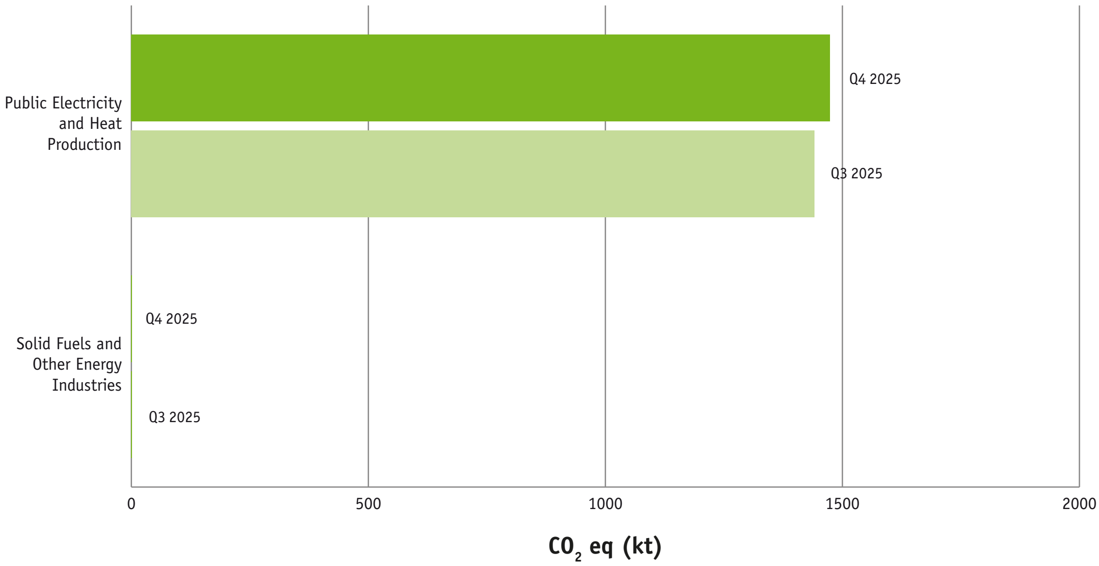
Looking at Quarter 4 2025 compared to Quarter 3 2025:

- Greenhouse gas emissions increased by 2.3% (+32.7 kt CO_2 eq) driven by a 14.8% increase in overall electricity supply, partially offset by a 17.2% increase in electricity generation from renewable sources.

Table 3.9: Summary Q4 2025 compared to Q3 2025 – Electricity

			Comparison to Q3 2025	
Sector	Greenhouse Gas	Emissions Q4 2025 (kt CO_2 eq)	Change in emissions (kt CO_2 eq)	% change
Electricity	**CO_2**	**1,475.2**	**32.7**	**2.3**
Public electricity and heat production	CO_2	1,474.1	32.7	2.3
Solid fuels and other energy industries	CO_2	1.1	0.0	-0.5

Figure 3.12: Quarter-on-Quarter changes in emissions in the Electricity subsectors, based on seasonally adjusted data.



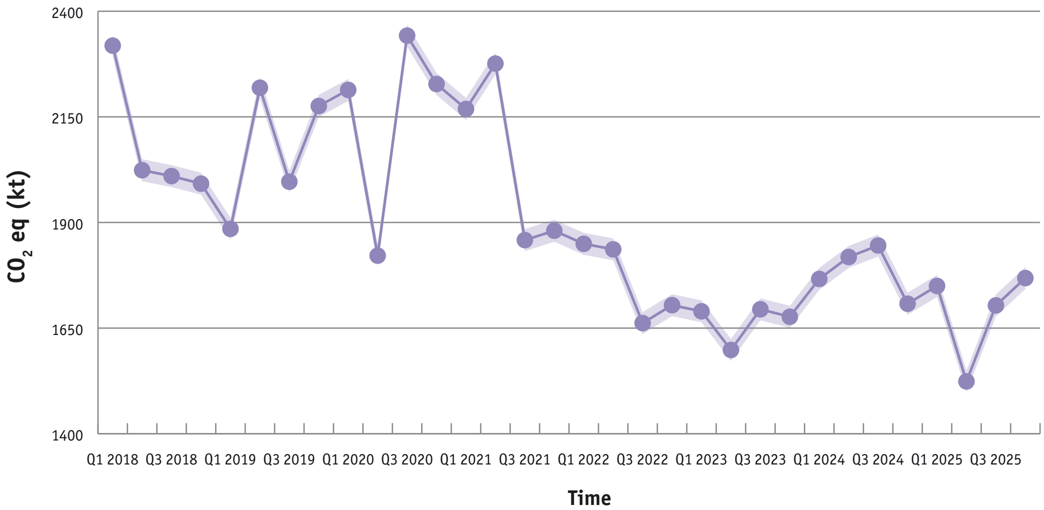
3.4 Buildings

Subsectors: Buildings (Residential); Buildings (Commercial and Public)

Number of indicator categories: Eight

Estimated total coverage of quarterly indicator categories compared to original annual National Inventory Report: 97.9%

Figure 3.13: Changes in emissions in the Buildings sector from Q1 2018 to Q4 2025, based on seasonally adjusted data.



3.4.1 Buildings Year-to-Date Change

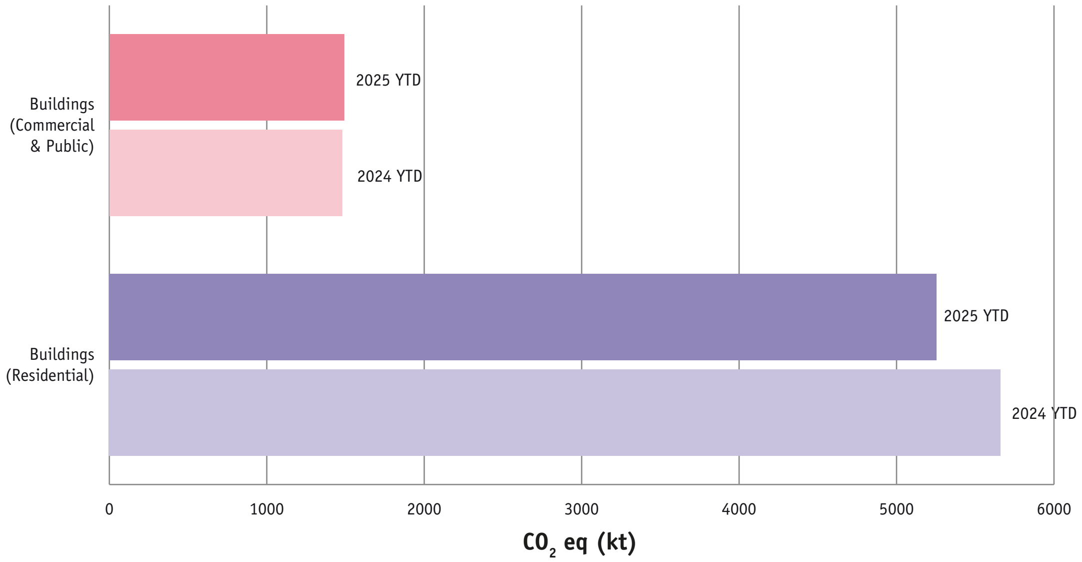
Looking at year-to-date 2025 compared to year-to-date 2024:

- Overall GHG emissions from Buildings were down 5.5% (-392.3 kt CO_2 eq), driven by decreased energy demand in the Residential sector (-7.2%, -406.8 kt CO_2 eq). This reflects milder conditions in 2025, with 4.1% fewer heating degree days compared to 2024, indicating reduced demand for space heating.

Table 3.10: Summary YTD 2025 compared to YTD 2024 – Buildings

			Comparison to YTD 2024	
Sector	Greenhouse Gas	Emissions YTD 2025 (kt CO_2 eq)	Change in emissions (kt CO_2 eq)	% change
Buildings	**CH_4, CO_2**	**6,745.6**	**-392.3**	**-5.5**
Buildings (Commercial and Public)	CO_2	1,491.9	14.5	1.0
Buildings (Residential)	CH_4, CO_2	5,253.6	-406.8	-7.2

Figure 3.14: Comparing year-to-date 2025 to year-to-date 2024 by subsector.



3.4.2 Buildings Year-on-Year Change

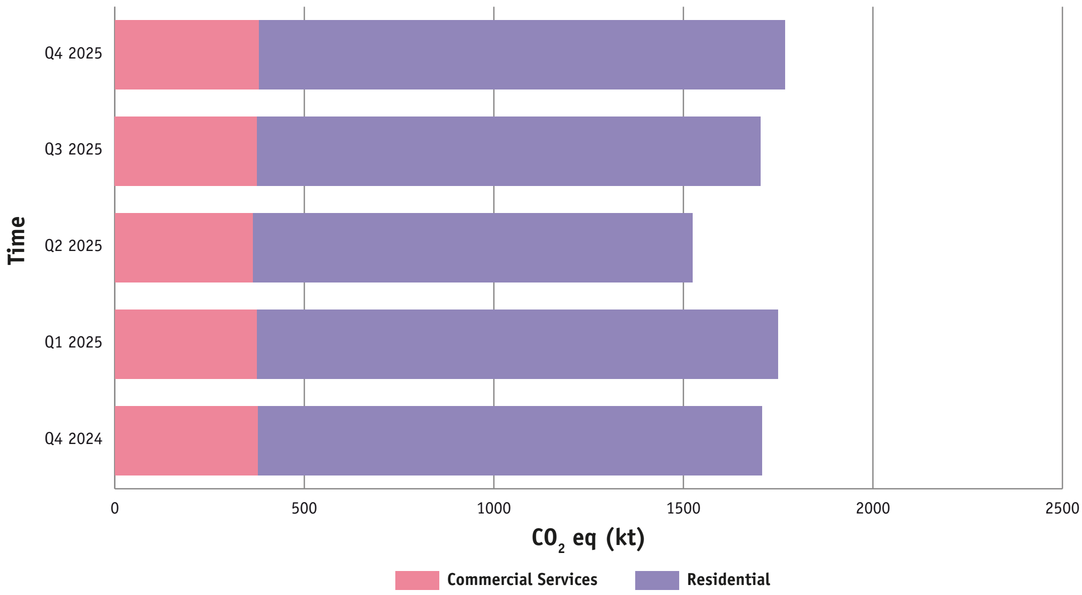
Looking at Quarter 4 2025 compared to Quarter 4 2024:

- GHG emissions from Buildings were up 3.6% (+60.8 kt CO_2 eq), driven by increased energy demand in the Residential sector (+4.3%, +57.9 kt CO_2 eq), with 4.4% more heating degree days (reflecting higher heating demand) compared to the same quarter last year.

Table 3.11: Summary Q4 2025 compared to Q4 2024 – Buildings

			Comparison to Q4 2024	
Sector	Greenhouse Gas	Emissions Q4 2025 (kt CO_2 eq)	Change in emissions (kt CO_2 eq)	% change
Buildings	**CH_4, CO_2**	**1,768.4**	**60.8**	**3.6**
Buildings (Commercial and Public)	CO_2	379.5	2.9	0.8
Buildings (Residential)	CH_4, CO_2	1,388.9	57.9	4.3

Figure 3.15: Comparison of subsectoral breakdown in emissions for this quarter vs last four quarters, based on seasonally adjusted data.



3.4.3 Buildings Quarter-on-Quarter Change

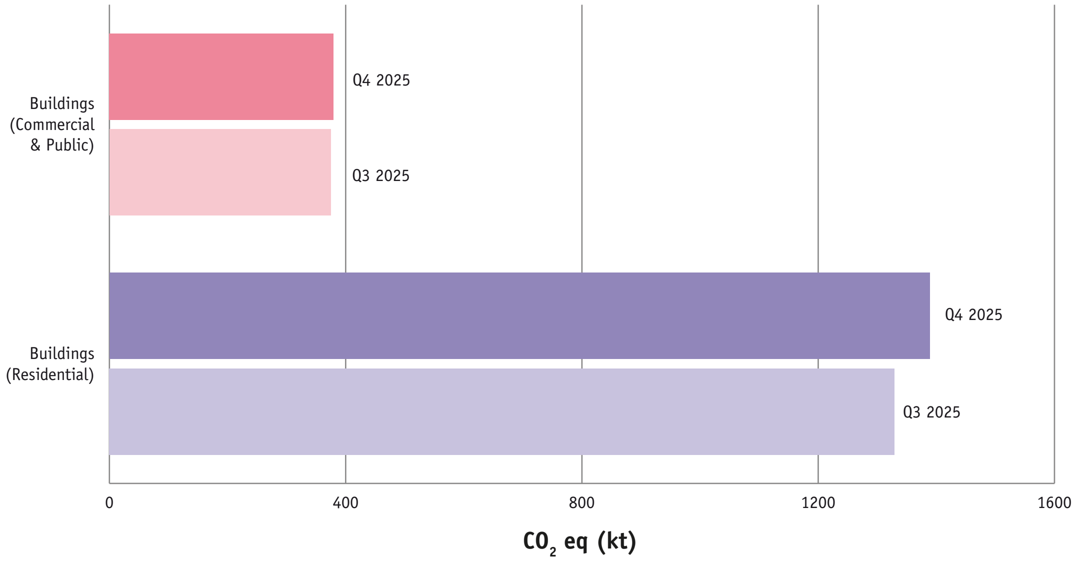
Looking at Quarter 4 2025 compared to Quarter 3 2025:

- GHG emissions from Buildings increased by 3.8% (+64.8 kt CO_2 eq) on a seasonally adjusted basis, with the largest subsectoral increase occurring in the Buildings (Residential) sector (+59.7 kt CO_2 eq).

Table 3.12: Summary Q4 2025 compared to Q3 2025 – Buildings

			Comparison to Q3 2025	
Sector	Greenhouse Gas	Emissions Q4 2025 (kt CO_2 eq)	Change in emissions (kt CO_2 eq)	% change
Buildings	**CH_4, CO_2**	**1,768.4**	**64.8**	**3.8**
Buildings (Commercial and Public)	CO_2	379.5	5.0	1.3
Buildings (Residential)	CH_4, CO_2	1,388.9	59.7	4.5

Figure 3.16: Quarter-on-Quarter changes in emissions in the Building subsectors, based on seasonally adjusted data.



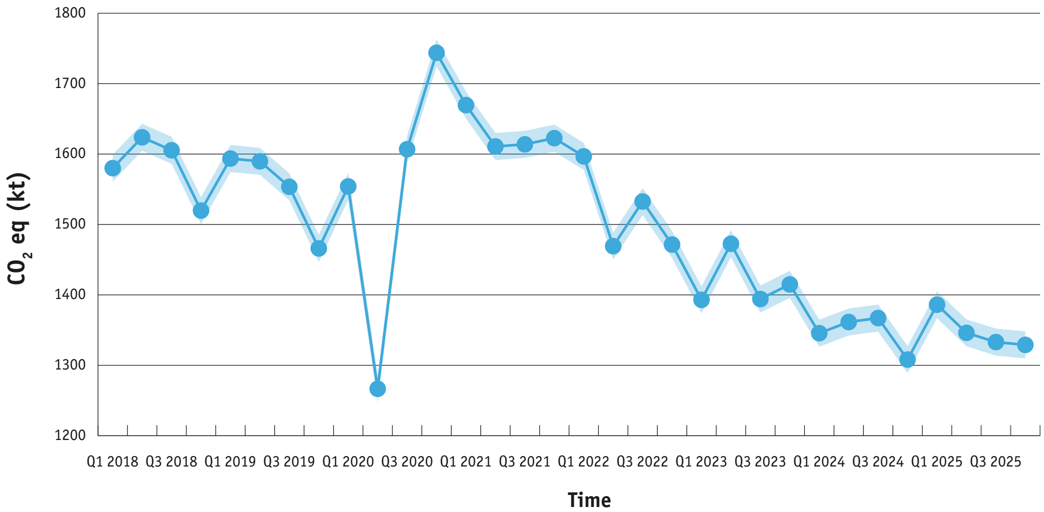
3.5 Industry

Subsectors: Manufacturing combustion; Mineral industry

Number of indicator categories: Ten

Estimated total coverage of quarterly indicator categories compared to original annual National Inventory Report: 90.9%

Figure 3.17: Changes in emissions in the Industry sector from Q1 2018 to Q4 2025, based on seasonally adjusted data.



Shaded area represents 95% confidence interval.

3.5.1 Industry Year-to-Date Change

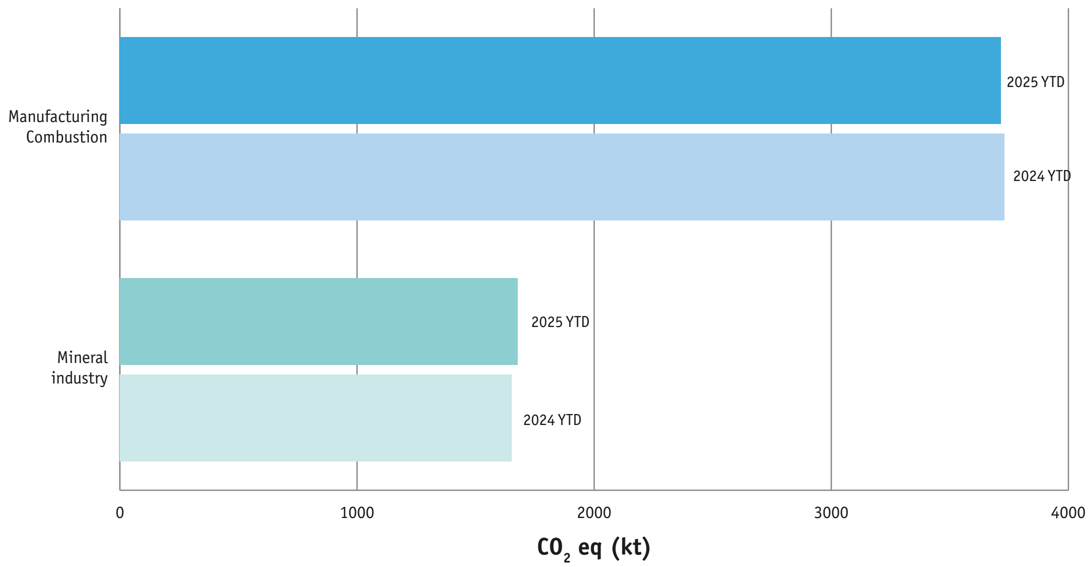
Looking at year-to-date 2025 compared to year-to-date 2024:

- Industry emissions increased by 0.2% (+11.7 kt CO_2 eq), reflecting higher emissions in the Mineral industry (+25.9 kt CO_2 eq), largely represented by cement production and including lime, brick and ceramic sectors.
- This was partially offset by a marginal reduction in emissions from Manufacturing combustion (-14.2 kt CO_2 eq).

Table 3.13: Summary YTD 2025 compared to YTD 2024 – Industry

			Comparison to YTD 2024	
Sector	Greenhouse Gas	Emissions YTD 2025 (kt CO_2 eq)	Change in emissions (kt CO_2 eq)	% change
Industry	**CO_2**	**5,394.1**	**11.7**	**0.2**
Manufacturing combustion	CO_2	3,715.9	-14.2	-0.4
Mineral industry	CO_2	1,678.2	25.9	1.6

Figure 3.18: Comparing year-to-date 2025 to year-to-date 2024 by subsector.



3.5.2 Industry Year-on-Year Change

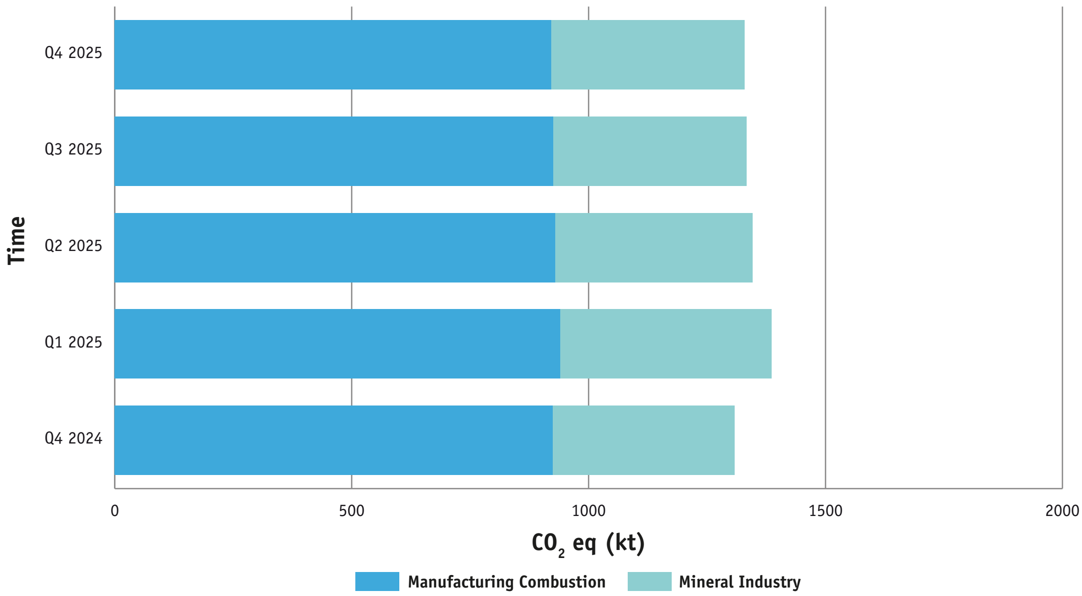
Looking at Quarter 4 2025 compared to Quarter 4 2024:

- Industry emissions increased by 1.6% (+20.8 kt CO_2 eq), driven by higher emissions in the Mineral industry (+23.8 kt CO_2 eq), largely represented by cement production and including lime, brick and ceramic sectors.
- Emissions from Manufacturing combustion were slightly down (-3.0 kt CO_2 eq).

Table 3.14: Summary Q4 2025 compared to Q4 2024 – Industry

			Comparison to Q4 2024	
Sector	Greenhouse Gas	Emissions Q4 2025 (kt CO_2 eq)	Change in emissions (kt CO_2 eq)	% change
Industry	**CO_2**	**1,329.0**	**20.8**	**1.6**
Manufacturing combustion	CO_2	921.4	-3.0	-0.3
Mineral industry	CO_2	407.5	23.8	6.2

Figure 3.19: Comparison of subsectoral breakdown in emissions for this quarter vs last four quarters, based on seasonally adjusted data.



3.5.3 Industry Quarter-on-Quarter Change

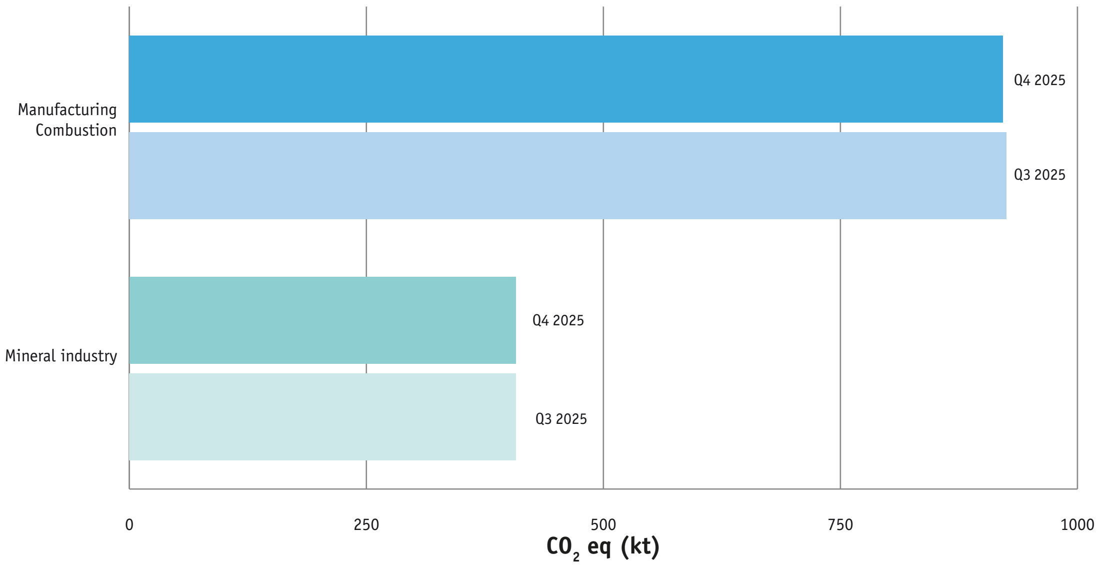
Looking at Quarter 4 2025 compared to Quarter 3 2025:

- Industry emissions were down 0.3% (-4.0 kt CO_2 eq), driven mainly by decreases in emissions from Manufacturing combustion (-3.6 kt CO_2 eq) on a seasonally adjusted basis.

Table 3.15: Summary Q4 2025 compared to Q3 2025 – Industry

			Comparison to Q3 2025	
Sector	Greenhouse Gas	Emissions Q4 2025 (kt CO_2 eq)	Change in emissions (kt CO_2 eq)	% change
Industry	**CO_2**	**1,329.0**	**-4.0**	**-0.3**
Manufacturing combustion	CO_2	921.4	-3.6	-0.4
Mineral industry	CO_2	407.5	-0.3	-0.1

Figure 3.20: Quarter-on-Quarter Changes in emissions in the Industry subsectors, based on seasonally adjusted data.



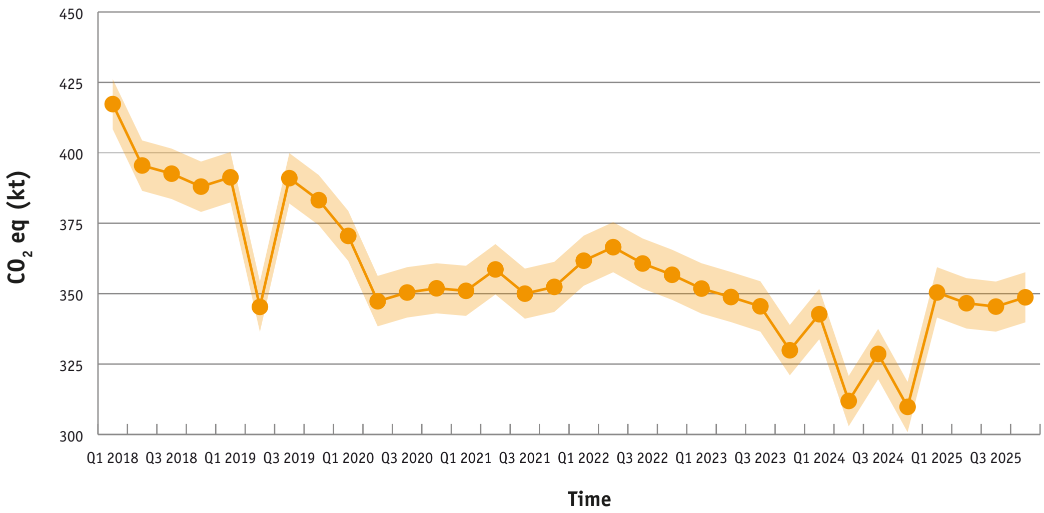
3.6 Other

Subsectors: F-Gases; Petroleum refining; Waste: Landfills; Waste: Wastewater treatment and discharge

Number of indicator categories: Six

Estimated total coverage of quarterly indicator categories compared to original annual National Inventory Report: 79.5%

Figure 3.21: Changes in emissions in the Other sector from Q1 2018 to Q4 2025, based on seasonally adjusted data.



3.6.1 Other Year-to-Date Change

Looking at year-to-date 2025 compared to year-to-date 2024:

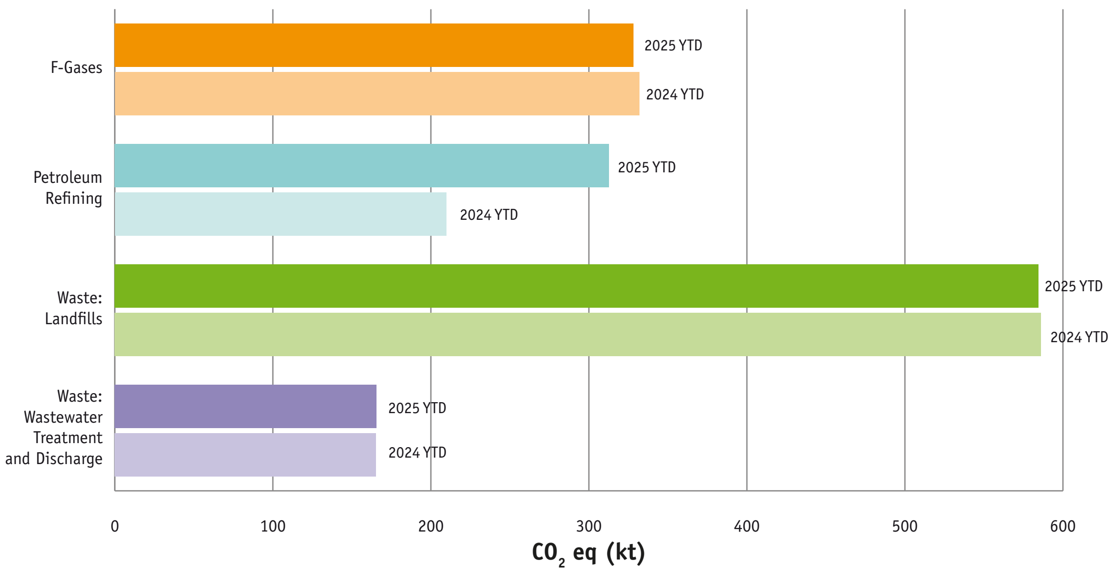
- The primary driver of the 7.6% (+98.2 kt CO_2 eq) change in year-to-date emissions was an increase in emissions from Petroleum refining (+49.1%) compared to the same period last year. A refinery was offline for essential maintenance for extended periods in 2024, resulting in unusually low emissions for that period and a corresponding rebound in 2025.

Table 3.16: Summary YTD 2025 compared to YTD 2024 – Other

			Comparison to YTD 2024	
Sector	Greenhouse Gas	Emissions YTD 2025 (kt CO_2 eq)	Change in emissions (kt CO_2 eq)	% change
Other	**CO_2, CH_4, N_2O, HFC, PFC, SF_6, NF_3**	**1,391.1**	**98.2**	**7.6**
F-Gases	HFC, PFC, SF_6, NF_3	328.3	-3.5	-1.1
Petroleum refining	CO_2	312.7	103.0	49.1
Waste: Landfills	CH_4	584.5	-1.6	-0.3
Waste: Wastewater treatment and discharge	CH_4, N_2O	165.6	0.3	0.2

* Waste: Landfills represents methane emissions from biodegradable municipal waste, the fraction of municipal waste that rots or degrades biologically, deposited in landfills.

Figure 3.22: Comparing year-to-date 2025 to year-to-date 2024 by subsector.



3.6.2 Other Year-on-Year Change

Looking at Quarter 4 2025 compared to Quarter 4 2024:

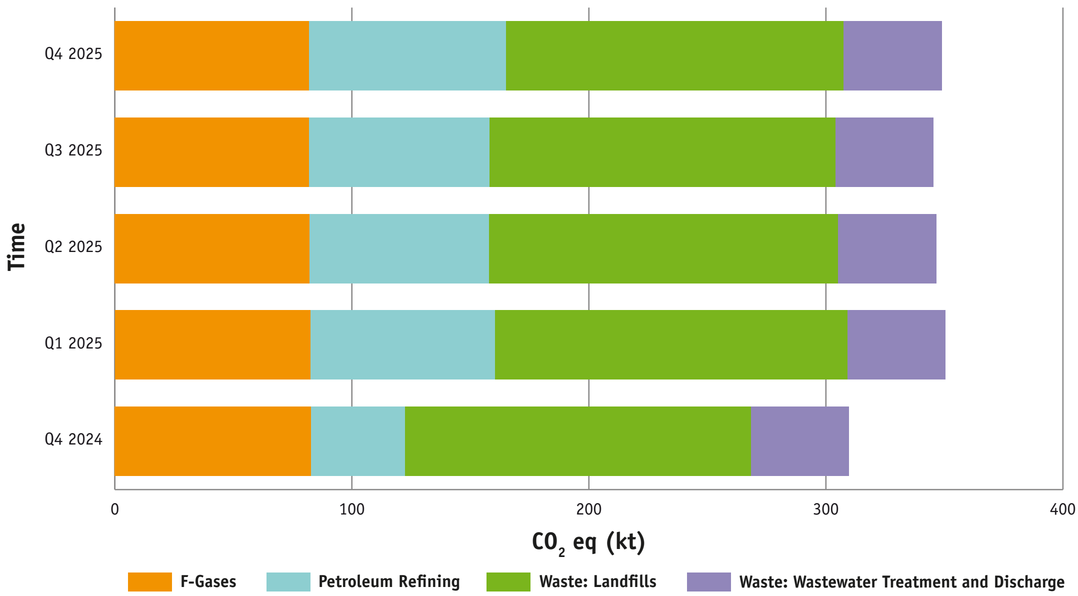
- The primary driver of the 12.6% (+39.0 kt CO_2 eq) change in emissions this quarter was an increase in emissions from Petroleum refining (+109.0%) compared to the same quarter last year. A refinery was offline for essential maintenance for extended periods last year which affected emissions in that period.

Table 3.17: Summary Q4 2025 compared to Q4 2024 – Other

			Comparison to Q4 2024	
Sector	Greenhouse Gas	Emissions Q4 2025 (kt CO_2 eq)	Change in emissions (kt CO_2 eq)	% change
Other	**CO_2, CH_4, N_2O, HFC, PFC, SF_6, NF_3**	**348.7**	**39.0**	**12.6**
F-Gases	HFC, PFC, SF_6, NF_3	81.9	-0.9	-1.1
Petroleum refining	CO_2	83.0	43.3	109.0
Waste: Landfills	CH_4	142.5	-3.4	-2.4
Waste: Wastewater treatment and discharge	CH_4, N_2O	41.4	0.0	0.0

* Waste: Landfills represents methane emissions from biodegradable municipal waste, the fraction of municipal waste that rots or degrades biologically, deposited in landfills.

Figure 3.23: Comparison of subsectoral breakdown in emissions for this quarter vs last four quarters, based on seasonally adjusted data.



3.6.3 Other Quarter-on-Quarter Change

Looking at Quarter 4 2025 compared to Quarter 3 2025:

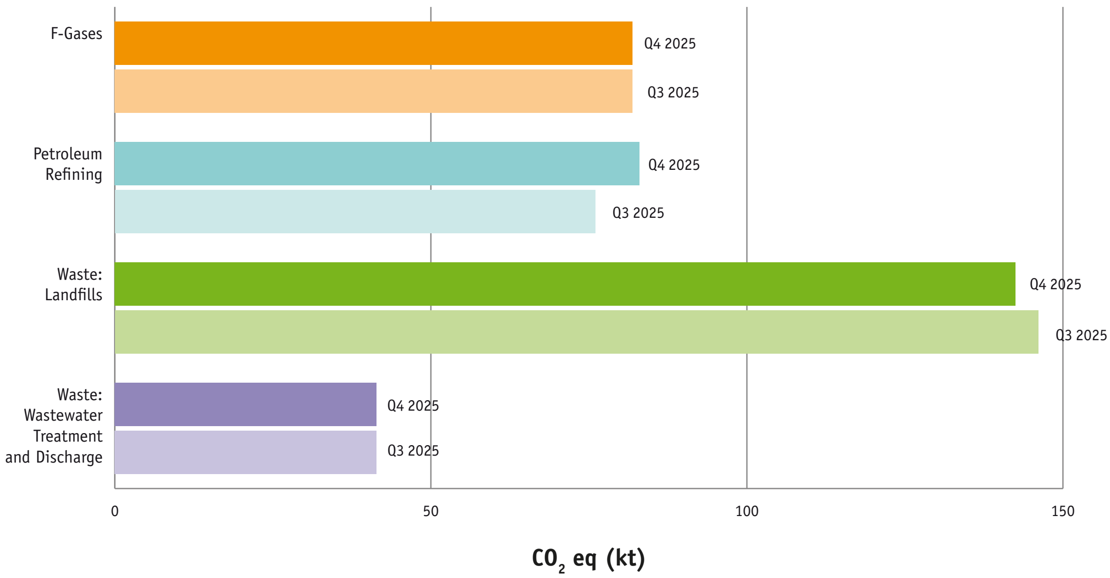
- Emissions from the Other sector increased by 1.0% driven by a quarter-on-quarter increase in emissions from Petroleum refining (+9.2%), partially offset by reduced emissions from biodegradable municipal solid waste deposited in landfills.

Table 3.18: Summary Q4 2025 compared to Q3 2025 – Other

			Comparison to Q3 2025	
Sector	Greenhouse Gas	Emissions Q4 2025 (kt CO_2 eq)	Change in emissions (kt CO_2 eq)	% change
Other	**CO_2, CH_4, N_2O, HFC, PFC, SF_6, NF_3**	**348.7**	**3.3**	**1.0**
F-Gases	HFC, PFC, SF_6, NF_3	81.9	-0.1	-0.1
Petroleum refining	CO_2	83.0	7.0	9.2
Waste: Landfills	CH_4	142.5	-3.6	-2.5
Waste: Wastewater treatment and discharge	CH_4, N_2O	41.4	0.0	0.0

* Waste: Landfills represents methane emissions from biodegradable municipal waste, the fraction of municipal waste that rots or degrades biologically, deposited in landfills.

Figure 3.24: Quarter-on-Quarter changes in emissions in the Other subsectors, based on seasonally adjusted data.



4. Data

All source data for this report is provided as a separate downloadable MS Excel file via the EPA website. For access to non-open licensed data, please contact the data provider directly.

5. Methodological Notes

This section provides an overview of the two key methodologies used to produce quarterly greenhouse gas emissions estimates:

- Temporal disaggregation and benchmarking of the existing EPA National Inventory Document emissions into quarterly values (Environmental Protection Agency (EPA) 2026). The method allows for the estimation of quarterly emissions while adhering to the constraint that the sum of all four quarters will equal the reported total annual emissions tonnage. In addition, quarters can be extrapolated by this method beyond current annual data (Chow and Lin 1971; Fernández 1981; Denton 1971; Dagum and Cholette 2006).
- Once quarterly data are available, either primary data or data estimated from temporal disaggregation and benchmarking, the degree of seasonality in the data is assessed and, when present, a robust method of seasonal adjustment is applied (Eurostat 2015; U.S. Census Bureau 2017).

5.1 Summary Methodology

5.1.1 Temporal Disaggregation with Benchmarking

Temporal disaggregation divides the annual inventory time series into four quarterly values. The benchmarking process ensures that the sum of the four quarters equals the annual reported value for the years. Importantly, the method also extrapolates estimates forward in time to predict quarterly values for which the annual totals are not yet available (Chow and Lin 1971; Fernández 1981; Denton 1971; Dagum and Cholette 2006).

Temporal disaggregation and extrapolation can be employed naively or with information from high frequency time series known as proxy indicators. As a first step, domain experts from each sector produce a list of potential proxy indicators. The indicators should approximate the quarterly behaviour or movement of the greenhouse gases emissions in each IPCC category. Examples of proxy indicator variables include monthly energy statistics, monthly trade data, daily gas meter usage data, quarterly census of animal population. The appropriate method of temporal disaggregation depends on the length of the high frequency proxy time series available. In the ideal case of ten plus years of high frequency data, the first step is to aggregate the high frequency data into annual data and test for correlation with the annual inventory time series using Kendall's tau. It is important to detrend both series by obtaining the first differences before testing for correlation.

There are two recommended statistical regression methods for the case of ten plus years of high frequency data. The Chow-Lin method is suited for stationary or cointegrated series, and for series with stable growth rates (Chow and Lin 1971). The alternative Fernandez method is recommended for unstable growth rates or for non-cointegrated data (Fernández 1981). The appropriate method is selected by comparing the model goodness of fit between Chow-Lin and Fernandez.

The next steps involve checking the quality of the disaggregated quarterly series. The ratio of the quarterly benchmark (the annual values divided by four) to the quarterly indicator over time should be stable. Both the disaggregated quarterly time series and quarterly indicator values are detrended by getting the first difference, and the correlation between the two is calculated using Kendall's tau on the detrended values.

To evaluate the forecast accuracy of the model, out of sample predictive performance for the disaggregated quarterly estimates are calculated. For each full year of available annual inventory data, a comparable annual value is predicted using only the preceding years disaggregated quarterly estimates data. The RMSE, MAE and BIAS between the two estimates as well as the average across years gives a measure of the performance of the disaggregated quarterly series in predicting the annual totals.

Finally, to gauge the volatility in disaggregated quarterly estimates over time, different ratios are calculated between the quarterly estimates and annual totals. The calculated ratios also summarise which quarters, on average, have the most emissions.

It is necessary to apply a slightly altered methodology for high frequency time series covering a period of five to ten years. As before, both Chow-Lin and Fernandez are applied, and the best fitting model chosen (Chow and Lin 1971; Fernández 1981). However here we also implement the Denton-Cholette method, which unlike the regression approaches, retains the movement of the high frequency series regardless of correlation with the annual series (Denton 1971; Dagum and Cholette 2006). The final model is selected based upon the quality of the disaggregated quarterly series produced from each approach. The Denton-Cholette method can only accommodate one proxy indicator, and if a more complex model involving multiple indicators is needed, a statistical regression method is used (Dagum and Cholette 2006).

If only two to four years of high frequency are available, the implementation of a statistical regression method is not recommended. Here the Denton-Cholette method is applied to produce disaggregated quarterly estimates (Denton 1971; Dagum and Cholette 2006). As before, the disaggregated quarterly time series is quality checked, and the predictive performance calculated.

5.1.2 Seasonal Adjustment

Seasonal adjustment cannot be undertaken for disaggregated quarterly time series with fewer than nine quarters of data. Preferably, the series should contain at least twenty quarters. For series containing between nine and nineteen quarters, a domain expert should be consulted to assess whether seasonal adjustment is warranted (Eurostat 2015).

An important first step is to check for the presence of seasonality in the data. Different plots (ACF, PACF, Quarterly sub-series, Lag correlation) are produced to visually inspect for seasonality. In combination with the visual inspection, three formal statistical tests are employed. The first known as the QS-test evaluates the null hypothesis that the first two seasonal lags for quarterly data (4 and 8) are zero. The second Kruskal-Wallis test is non-parametric and tests if the means of each quarter are drawn from different distributions. The final Friedman test is also non-parametric and tests if the medians differ across quarters. If at least two out of the three tests find seasonality, seasonal adjustment is implemented. If both the visual inspection, Kruskal-Wallis and Friedman tests fail to find any signal of seasonality (no seasonality or highly unstable seasonality), then the series is not adjusted (Eurostat 2015; Dagum and Bianconcini 2016).

All seasonal adjustment is implemented using the RJDemetra interface to JDemetra+ (Quartier-la-Tente *et al.* 2024; National Bank of Belgium and Deutsche Bundesbank and Eurostat 2026). The approach follows CSO seasonal adjustment practice, with X-13 RegARIMA methods used for pre-treatment, outlier detection and related diagnostic steps (Foley n.d.). These methods are consistent with wider ESS seasonal adjustment guidance and the X-13ARIMA-SEATS framework (Eurostat 2015; U.S. Census Bureau, Time Series Research Staff 2017).

It is important to check the quality of the model automatically selected by the RJDemetra interface. The normality, independence and linearity of the model residuals are assessed, and the distribution of model residuals visually inspected. If the model is not a good fit, the fully automated model selection specification is used to find a suitable model. If this also fails to produce a viable model and both Kruskal-Wallis and Friedman tests also fail, then seasonal adjustment is not applied (Eurostat 2015; Quartier-la-Tente *et al.* 2024).

Given the conservative threshold of detection in automatic identification of outliers, the irregular component of the initial model is examined and points in the time series where the value is greater than 1.5 times the inter-quartile range are identified. The irregular component is visually inspected, and additional outliers are manually included into the model specification. After applying the new model, if the t-value of the additional outliers is greater than 2.0, then the outliers are included in the final model (U.S. Census Bureau, Time Series Research Staff 2017; Eurostat 2015).

The quality of the seasonal adjustment is examined using different outputs from RJDemetra (Quartier-la-Tente *et al.* 2024; Quartier-la-Tente 2026). The idempotency test checks for residual seasonality in the adjusted series. The model decomposition is checked and visual inspections on the diagnostic plots completed. An important output from RJDemetra is the Statistics Canada's Seasonal Adjustment Dashboard (Verret 2021). The dashboard report includes graphs of the series, as well as summaries of individual seasonal effects and patterns. Additionally, key seasonal adjustment diagnostics are presented in a traffic light display, and the net effect of seasonal adjustment is decomposed into its various components. Red warnings on the Statistics Canada's Seasonal Adjustment Dashboard indicate poor seasonal adjustment (Verret 2021).

If the combination of the model and seasonal adjustment is of superior quality, then the model is implemented, and the resulting seasonally adjusted estimates used for reporting. However, if both the model and seasonal adjustment are of inadequate quality, seasonal adjustment is not implemented, and the unadjusted estimates are used for reporting. In cases where either the model or seasonal adjustment are poor, CSO methodologies are consulted to identify improvement actions (Eurostat 2015; U.S. Census Bureau 2017).

5.2 Revisions and Methodological Changes of Note

5.2.1 Uncertainty Estimation

As per best practice for time series, confidence intervals around the historical mean of the quarterly emissions series are estimated using a joint block bootstrap approach on the decomposed residuals. As the quarterly estimates are benchmarked to annual totals through temporal disaggregation, the annual level of emissions is treated as fixed, and uncertainty is assumed to arise from short-term variation in the quarterly series (Denton 1971; Dagum and Cholette 2006; Künsch 1989).

For each indicator, the time series is decomposed, a smooth trend component estimated using a non-parametric local regression (LOESS), and the residual variation around this trend is obtained (Cleveland 1979). A joint moving block bootstrap is then applied to these residuals preserving both the autocorrelation between consecutive quarters and the time series structure (Künsch 1989). In each bootstrap replicate, the resampled residuals are recombined with the fixed trend component to generate simulated series. Confidence intervals are constructed from the empirical distribution of the bootstrap estimate and combined across indicators by summation in quadrature.

Confidence intervals do not include forecast uncertainty for quarters beyond the latest available annual inventory year; they reflect short-term quarterly variation conditional on the available proxy data and temporal disaggregation model (Environmental Protection Agency (EPA) 2026; Dagum and Cholette 2006).

Table 5.1: Absolute 95% confidence interval widths by sector

Sector	95% CI (± kt CO_2 eq)
Overall	*123.1*
Agriculture	23.5
Transport	62.4
Electricity	57.8
Buildings	26.1
Industry	19.2
Other	8.9

5.2.2 Methodology for imputation of incomplete proxy data sets

Buildings sector: Daily gas demand activity data from the CSO were available up to October 2025. Gas demand for the months of November and December was forecasted to impute the fourth quarter and allow estimation of emissions in the Buildings sector. The daily data were aggregated to a monthly time series for analysis. Three time series models were developed: 1) simple linear regression, 2) exponential smoothing state space (ETS) models, 3) Autoregressive integrated moving average (ARIMA) models.

Model evaluation and selection was conducted using an expanding-window back-testing framework, with at least two years of historical data used as the initial training set. At each iteration, one additional month was added to the training set and a one-step-ahead forecast was produced. Forecast accuracy was assessed using Mean Absolute Error (MAE), Root Mean Squared Error (RMSE), and Symmetric Mean Absolute Percentage Error (sMAPE).

To forecast gas demand activity data in the Residential subsector, an ARIMA model was selected with heating degree days (HDD) as the explanatory variable. The observed HDD data for November and December were then used to generate a two-step-ahead forecast. For the Commercial subsector an ETS model was selected.

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An Ghníomhaireacht um Chaomhnú Comhshaoil

Tá an GCC freagrach as an gcomhshaol a chosaint agus a fheabhsú, mar shócmhainn luachmhar do mhuintir na hÉireann. Táimid tiomanta do dhaoine agus don chomhshaol a chosaint ar thionchar díobhálach na radaíochta agus an truaillithe.

Is féidir obair na Gníomhaireachta a roinnt ina trí phríomhréimse:

- Rialáil: Rialáil agus córais chomhlíonta comhshaoil éifeachtacha a chur i bhfeidhm, chun dea-thorthaí comhshaoil a bhaint amach agus díriú orthu siúd nach mbíonn ag cloí leo.
- Eolas: Sonraí, eolas agus measúnú ardchaighdeáin, spriocdhírithe agus tráthúil a chur ar fáil i leith an chomhshaoil chun bonn eolais a chur faoin gcinnteoireacht.
- Abhcóideacht: Ag obair le daoine eile ar son timpeallachta glaine, táirgiúla agus dea-chosanta agus ar son cleachtas inbhuanaithe i dtaobh an chomhshaoil.

I measc ár gcuid freagrachtaí tá:

CEADÚNÚ

- Gníomhaíochtaí tionscail, dramhaíola agus stórála peitril ar scála mór;
- Sceitheadh fuíolluisce uirbigh;
- Úsáid shrianta agus scaoileadh rialaithe Orgánach Géinmhodhnaithe;
- Foinsí radaíochta ianúcháin;
- Astaíochtaí gás ceaptha teasa ó thionscal agus ón eitlíocht trí Scéim an AE um Thrádáil Astaíochtaí.

FORFHEIDHMIÚ NÁISIÚNTA I LEITH CÚRSAÍ COMHSHAOIL

- Iniúchadh agus cigireacht ar shaoráidí a bhfuil ceadúnas acu ón GCC;
- Cur i bhfeidhm an dea-chleachtais a stiúradh i ngníomhaíochtaí agus i saoráidí rialáilte;
- Maoirseacht a dhéanamh ar fhreagrachtaí an údaráis áitiúil as cosaint an chomhshaoil;
- Caighdeán an uisce óil phoiblí a rialáil agus údaruithe um sceitheadh fuíolluisce uirbigh a fhorfheidhmiú
- Caighdeán an uisce óil phoiblí agus phríobháidigh a mheasúnú agus tuairisciú air;
- Comhordú a dhéanamh ar líonra d'eagraíochtaí seirbhíse poiblí chun tacú le gníomhú i gcoinne coireachta comhshaoil;
- An dlí a chur orthu siúd a bhriseann dlí an chomhshaoil agus a dhéanann dochar don chomhshaol.

BAINISTÍOCHT DRAMHAÍOLA AGUS CEIMICEÁIN SA CHOMHSHAOL

- Rialacháin dramhaíola a chur i bhfeidhm agus a fhorfheidhmiú lena n-áirítear saincheisteanna forfheidhmithe náisiúnta;
- Staitisticí dramhaíola náisiúnta a ullmhú agus a fhoilsiú chomh maith leis an bPlean Náisiúnta um Bainistíocht Dramhaíola Guaisí;
- An Clár Náisiúnta um Chosc Dramhaíola a fhorbairt agus a chur i bhfeidhm;
- Reachtaíocht ar rialú ceimiceán sa timpeallacht a chur i bhfeidhm agus tuairisciú ar an reachtaíocht sin.

BAINISTÍOCHT UISCE

- Plé le struchtúir náisiúnta agus réigiúnacha rialachais agus oibriúcháin chun an Chreat-treoir Uisce a chur i bhfeidhm;
- Monatóireacht, measúnú agus tuairisciú a dhéanamh ar chaighdeán aibhneacha, lochanna, uiscí idirchreasa agus cósta, uiscí snámha agus screamhuisce chomh maith le tomhas ar leibhéil uisce agus sreabhadh abhann.

EOLAÍOCHT AERÁIDE & ATHRÚ AERÁIDE

- Fardail agus réamh-mheastacháin a fhoilsiú um astaíochtaí gás ceaptha teasa na hÉireann;
- Rúnaíocht a chur ar fáil don Chomhairle Chomhairleach ar Athrú Aeráide agus tacaíocht a thabhairt don Idirphlé Náisiúnta ar Ghníomhú ar son na hAeráide;
- Tacú le gníomhaíochtaí forbartha Náisiúnta, AE agus NA um Eolaíocht agus Beartas Aeráide.

MONATÓIREACHT AGUS MEASÚNÚ AR AN GCOMHSHAOL

- Córais náisiúnta um monatóireacht an chomhshaoil a cheapadh agus a chur i bhfeidhm: teicneolaíocht, bainistíocht sonraí, anailís agus réamhaisnéisiú;
- Tuairiscí ar Staid Thimpeallacht na hÉireann agus ar Tháscairí a chur ar fáil;
- Monatóireacht a dhéanamh ar chaighdeán an aeir agus Treoir an AE i leith Aeir Ghlain don Eoraip a chur i bhfeidhm chomh maith leis an gCoinbhinsiún ar Aerthruailliú Fadraoin Trasteorann, agus an Treoir i leith na Teorann Náisiúnta Astaíochtaí;
- Maoirseacht a dhéanamh ar chur i bhfeidhm na Treorach i leith Torainn Timpeallachta;
- Measúnú a dhéanamh ar thionchar pleananna agus clár beartaithe ar chomhshaol na hÉireann.

TAIGHDE AGUS FORBAIRT COMHSHAOIL

- Comhordú a dhéanamh ar ghníomhaíochtaí taighde comhshaoil agus iad a mhaoiniú chun brú a aithint, bonn eolais a chur faoin mbeartas agus réitigh a chur ar fáil;
- Comhoibriú le gníomhaíocht náisiúnta agus AE um thaighde comhshaoil.

COSAINT RAIDEOLAÍOCH

- Monatóireacht a dhéanamh ar leibhéil radaíochta agus nochtadh an phobail do radaíocht ianúcháin agus do réimsí leictreamaighnéadacha a mheas;
- Cabhrú le pleananna náisiúnta a fhorbairt le haghaidh éigeandálaí ag eascairt as taismí núicléacha;
- Monatóireacht a dhéanamh ar fhorbairtí thar lear a bhaineann le saoráidí núicléacha agus leis an tsábháilteacht raideolaíochta;
- Sainseirbhísí um chosaint ar an radaíocht a sholáthar, nó maoirsiú a dhéanamh ar sholáthar na seirbhísí sin.

TREOIR, ARDÚ FEASACHTA AGUS FAISNÉIS INROCHTANA

- Tuairisciú, comhairle agus treoir neamhspleách, fianaise-bhunaithe a chur ar fáil don Rialtas, don tionscal agus don phobal ar ábhair maidir le cosaint comhshaoil agus raideolaíoch;
- An nasc idir sláinte agus folláine, an geilleagar agus timpeallacht ghlan a chur chun cinn;
- Feasacht comhshaoil a chur chun cinn lena n-áirítear tacú le hiompraíocht um éifeachtúlacht acmhainní agus aistriú aeráide;
- Tástáil radóin a chur chun cinn i dtithe agus in ionaid oibre agus feabhsúchán a mholadh áit is gá.

COMHPHÁIRTÍOCHT AGUS LÍONRÚ

Oibriú le gníomhaireachtaí idirnáisiúnta agus náisiúnta, údaráis réigiúnacha agus áitiúla, eagraíochtaí neamhrialtais, comhlachtaí ionadaíocha agus ranna rialtais chun cosaint chomhshaoil agus raideolaíoch a chur ar fáil, chomh maith le taighde, comhordú agus cinnteoireacht bunaithe ar an eolaíocht.

BAINISTÍOCHT AGUS STRUCHTÚR NA GNÍOMHAIREACHTA UM CHAOMHNÚ COMHSHAOIL

Tá an GCC á bainistiú ag Bord lánaimseartha, ar a bhfuil Ard-Stiúrthóir agus cúigear Stiúrthóir. Déantar an obair ar fud cúig cinn d'Oifigí:

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- An Oifig um Fhianaise agus Measúnú
- An Oifig um Chosaint ar Radaíocht agus Monatóireacht Comhshaoil
- An Oifig Cumarsáide agus Seirbhísí Corparáideacha

Tugann coistí comhairleacha cabhair don Ghníomhaireacht agus tagann siad le chéile go rialta le plé a dhéanamh ar ábhair imní agus le comhairle a chur ar an mBord.

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