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| Annex B1  to:  MEMORANDUM  Denmark’s biennial climate and energy reporting 2025  – to the European Commission |

**Descriptive summary information from the report “Climate Status and Out-look 2024” of 5 July 2024**

(This translation was also included in The Kingdom of Denmark’s First Biennial Transparency Report under the Paris Agreement, December 2024).

**1. Summary from “Climate Status and Outlook 2024”**

## Projections of greenhouse gas emissions and removals

In 2024, the 2024 baseline scenario with a projection of Denmark’s greenhouse gas emissions 2023-2035/2040 – i.e. a with existing measures (WEM) or frozen policy scenario – was published by the Ministry of Climate, Energy and Utilities in *Denmark's Climate Status and Outlook 2024* (CSO24)[[1]](#footnote-1). A supplemental documentation report in English was published in September 2024 by DCE, the Danish Centre for Environment and Energy at Aarhus University (*Nielsen et al. (2024b)*)[[2]](#footnote-2).

The results from the 2024 WEM projection are shown in Annex B2.

Projection of the key indicator relevant to Denmark’s contribution to the achievement of the EU joint NDC under the Paris Agreement – i.e. the projection of Denmark’s total greenhouse gas emissions with LULUCF and with indirect CO2 emissions is shown in Annex B3.

Information on key underlying assumptions and parameters used for projections are available in Annex B4.

Information about key facts and key models used in CSO24 are included in Annex B5.

### The big picture in the 2024 Climate Status and Outlook (CSO24)

#### Introduction

The purpose of *Denmark's Climate Status and Outlook 2024* (CSO24) is to explain the development of Denmark's greenhouse gas emissions from 1990 to 2022 and to estimate how emissions will develop until 2035. In addition, projection data are available until 2040. The annual climate status and projection thus forms the basis for assessing the extent to which the reduction targets laid down in the Danish Climate Act and the Danish EU climate commitments can be expected to be met through the climate and energy initiatives that have already been decided.

The CSO24 was prepared by the Danish Ministry of Climate, Energy and Utilities, including the Danish Energy Agency with the involvement of researchers from the Danish Centre for Environment and Energy (DCE) and the Danish Centre for Food and Agriculture (DCA) at Aarhus University as well as the Department of Food and Resource Economics (IFRO) and the Department of Geosciences and Natural Resource Management (IGN) at the University of Copenhagen. A number of ministries and agencies are also involved.

#### Estimates for meeting the climate targets in 2025 and 2030

The *Agreement on a Climate Act* of 6 December 2019 set a target of a 70 per cent reduction in emissions by 2030 compared to 1990. At the date of the agreement, a gap (meaning a need for further reduction) of approx. 18.4 million tonnes CO2e in 2030 was estimated to achieve the target.

The estimated outstanding reduction gap has been revised downwards in each projection since the agreement on the climate act was concluded. CSO24 estimates that total net emissions in 2030 will amount to 25.4 million tonnes CO2e which corresponds to a reduction of approx. 68 per cent compared to 1990. This leaves an estimated reduction gap of approx. 1.9 million tonnes CO2e. Taking into account the partially estimated reduction effects of the *Agreement on the partial implementation of the Green Fund (15 April 2024)* and the *Agreement on the implementation of the transition aid from the Green tax reform for industry etc. (19 March 2024)*, the reduction gap is estimated to be approx. 1.5 million tonnes CO2e (cf. Figure 2.6(1)).

The Climate Act also includes an indicative target to reduce emissions by 50-54 per cent in 2025 compared to 1990. CSO24 estimates that total emissions in Denmark will amount to 35.3 million tonnes CO2e in 2025 which corresponds to a reduction of approx. 55.0 per cent in 2025 compared to 1990. Taking into account the partially estimated effects of agreements concluded since 1 January 2024, total emissions are estimated to be reduced by approx. 55.5 per cent in 2025 compared to 1990. This means that the lower range of a 50 per cent reduction is estimated to be met with a margin of approx. 4.4 million tonnes CO2e and that the upper range of a 54 per cent reduction is estimated to be met with a margin of approx. 1.2 million tonnes CO2e – i.e. an over-achievement in both cases (cf. Figure 2.6(2)).

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| Figure 2.6(1)  Development in the reduction gap to the 70 per cent target in 2030 since *the Agreement on a Climate Act,* million tonnes CO2e    CSO24\*  CSO21  CSO22  CSO23 | Figure 2.6(2)  Over-achievement of the 50-54 per cent indicatice reduction target by 2025, million tonnes CO2e |
| Note: The gap in the agreement on the climate act is based on CSO19 adjusted for the agreement on the 2020 Finance Act. Each CSO contains the effects of policies up to 31 December of the previous year. \*CSO24 in the figure includes the partially estimated effect of diesel and road tax from the *Agreement on the partial implementation of the Green Fund* and the partially estimated effect of the transition aid from *the Agreement on the implementation of the transition aid from the Green tax reform for industry etc.*  Source: Danish Ministry of Climate, Energy and Utilities. | |

The *Agreement on the green transition of Danish agriculture* (2021)sets a reduction target for agriculture of 55-65 per cent in 2030 compared to emissions in 1990. The target includes emissions from agricultural processes, land and forests, but not energy-related emissions in agriculture. In 2030, sectoral greenhouse gas emissions covered by the reduction target are estimated to be reduced by approx. 48 per cent in CSO24, which corresponds to a reduction gap of approx. 1.5-3.5 million tonnes CO2e.

#### Estimates for the fulfilment of EU objectives

In addition to the national climate targets, a number of EU commitments relating to greenhouse gas emissions and energy consumption to which Denmark is subject have been established (cf. *chapter 2.6.5 Status of Denmark's EU commitments*).

Under the burden-sharing agreement, Denmark must reduce emissions for, *i.a.*, the transport sector, small-scale industry, households and agriculture by 50 per cent compared to 2005 levels for the period 2021-2030. The agreement covers sectors not covered by the EU Emissions Trading System (ETS1) or the LULUCF sectors. CSO24 estimates the total aggregated reduction gap at approx. 1.9 million tonnes CO2e under the burden-sharing agreement for the period 2021-2030. Taking into account the partially estimated reduction effect of the *Agreement on the partial implementation of the Green Fund* of 15 April 2024, the gap is estimated to be approx. 0.1 million tonnes CO2e, *see table 2.6(1).*

The LULUCF sectors include agricultural land use, land use change and forestry. Denmark is subject to several reduction targets, including reduction commitments for the 2021-2025 and 2026-2029 subperiods and a point target for 2030. For the LULUCF Regulation, overdelivery of the budget target for the period 2021-2025, an aggregated reduction gap of approx. 3.8 million tonnes CO2e for the period 2026-2029 and overdelivery of the reduction target in 2030 of approx. 0.2 million tonnes CO2e are estimated, *see table 2.6(1).*

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| Table 2.6(1)  Estimated gaps for Denmark's EU commitments, million tonnes CO2e   |  |  |  | | --- | --- | --- | | **Commitments** | **CSO23** | **CSO24** | | Burden-sharing agreement (2021-2030) | 16.1 | 0.1\* | | LULUCF budget target (2021-2025) | -12.7 | -30.6 | | LULUCF budget target (2026-2029) | 8.8 | 3.8 | | LULUCF reduction target 2030 | 2.0 | -0.2 | |
| Note: \*The CSO24 gap under the burden-sharing agreement includes the partially estimated effect of the diesel and road tax from the *Agreement on the partial implementation of the Green Fund*.  Source: Danish Ministry of Climate, Energy and Utilities. |

In addition, Denmark has a number of commitments to increase the use of renewable energy sources and reduce energy consumption in the Renewable Energy Directive (RE Directive) and the Energy Efficiency Directive (EED), respectively. Both directives were revised in 2023, and the actual implementation into Danish law is still pending for parts of the directives.

With an estimated RE share in energy consumption of 74 per cent in 2030, Denmark is expected to meet the primary commitment in the RE Directive. The directive stipulates that the EU's energy consumption must be at least 42.5 per cent by 2030, to which each member state must contribute with individual national targets. In addition, the RE Directive contains a number of sector-specific targets with an implementation deadline in May 2025. The assessment is that the requirements are deemed to be met, except commitments in relation to advanced biofuels and PtX fuels in the transport sector.

For the EED, Denmark is estimated to fulfil the national indicative contribution to the EU's common energy efficiency target as Denmark is estimated to have a final energy consumption of 550 PJ in 2030 while the EED requires Denmark's final consumption to be a maximum of 575 PJ in 2030.

The status and projection of Denmark's EU commitments are described in more detail in *Klimastatus og -fremskrivning 2024* (in Danish), *chapter* *30 Denmark's greenhouse gas commitments in the EU* and *chapter* *31 Denmark's EU commitments in relation to RE and EE*.

#### Development in emissions from 1990 to 2035

Total greenhouse gas emissions amounted to approx. 41.7 million tonnes CO2e in 2022. This means that greenhouse gas emissions were reduced by approx. 47 per cent compared to Denmark's total emissions in 1990.

CSO24 estimates total net emissions to be reduced to approx. 35.3 million tonnes CO2e in 2025 and approx. 25.4 million tonnes CO2e in 2030, *see figure 2.6(3).* Total emissions in 2035 are estimated to be further reduced to approx. 20.4 million tonnes CO2e.

The contribution of each sector to greenhouse gas emissions has changed significantly over the years. In the period 1990-2010, the energy sector accounted for the largest share of emissions, *see figure 2.6(3).* In 2030, it is estimated that agriculture, forests, horticulture and fisheries, including their energy consumption, will account for approx. 46 per cent of emissions, followed by approx. 33 per cent from the transport sector. Industry's share of emissions is estimated to remain stable while the share from the waste sector is estimated to increase from around 5 per cent to around 10 per cent of total emissions. From 2025, CCS is anticipated to contribute negative emissions through carbon capture.

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| Figure 2.6(3)  Development in CO2e emissions and removals across sectors 1990-2035, million tonnes CO2e |
| Note: The 'Industry' category covers the manufacturing industry and the building and construction sector as well as the production of oil, gas and renewable fuels. "Energy and utilities" covers the electricity and district heating sectors as well as households and service trades. CSO24 introduces CCS as a non-sectoral, negative emission in addition to the CCUS pool which is recognised in the electricity and district heating sectors. The figure does not include the partially estimated effect of diesel and road tax from the *Agreement on the partial implementation of the Green Fund* and the partially estimated effect of the transition aid from the *Agreement on the implementation of the transition aid from the Green tax reform for industry etc.*  Source: Danish Ministry of Climate, Energy and Utilities. |

#### Changes in CSO24 compared to CSO23

There have been several changes between CSO23 and CSO24 that affect the estimated emission levels in 2025 and 2030, *see figure 2.6(4) and figure 2.6(5).* Among other things, changes have been made due to new policies and improvements to the methodology and model basis for CSO24. These include carbon-rich soils, CO2e removal in forests, the transport sector and waste incineration. Chapter 2.6.4 explains the changes across sectors.

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| Figure 2.6(4)  Changes in total emissions in 2025 for CSO24 compared to CSO23, million tonnes CO2e    CSO24  CSO23 | Figure 2.6(5)  Changes in total emissions in 2030 for CSO24 compared to CSO23, million tonnes CO2e  CSO24  CSO23 |
| Note: Rounding may cause numbers to not add up to the total. The figure does not include the partially estimated effect of diesel and road tax from the *Agreement on the partial implementation of the Green Fund* and the partially estimated effect of the transition aid from the *Agreement on the implementation of the transition aid from the Green tax reform for industry etc.* Changes in households and service trades between CSO23 and CSO24 are less than 0.1 million tonnes CO2e and are therefore not included in the figure.  Source: Danish Ministry of Climate, Energy and Utilities. | |

#### How is CSO24 structured?

The CSO24 report presents the results of the projection and consists of two main parts.

Part 1 of CSO24 consists of chapters 1-16, which have been translated and included in this BTR1 as chapter 2.6.1.-2.6.16.

Chapter 2.6.2 describes the overall distribution of greenhouse gas emissions and removals across sectors in CSO24 as well as the main reasons for the anticipated reductions in the projection towards 2030.

Chapter 2.6.3 sheds light on the cross-cutting reasons for the projected development of emissions in CSO24. Chapter 2.6.4 explains the changes in the projection in CSO24 compared to CSO23. Chapter 2.6.5 describes the status and projection for fulfilling Denmark's EU commitments in relation to greenhouse gas reductions and energy consumption.

Chapters 2.6.6-2.6.14 introduce sources of greenhouse gas emissions and removals for each sector and the reasons for the projected development towards 2030. Chapter 2.6.15 focuses on the projection of emissions after 2030 and towards 2035. Finally, chapter 2.6.16 sheds light on the overall uncertainties and sensitivity calculations in the projection.

Part 2 of CSO24 consists of chapters 17-31 in *Klimastatus og -fremskrivning 2024* in which the status and projection of emissions, changes compared to CSO23 and uncertainties are reviewed for each sector in CSO24 (available in Danish only).

The specific assumptions, data and models used for the projection are available in 11 assumption notes in Danish. In addition, a number of data sheets are published in Danish with assumptions and results. In January 2024, a public consultation was conducted on the assumption notes for CSO24. 14 responses have been received.

#### Background for the 2024 Climate status and outlook

The Climate Act stipulates that the Minister of Climate, Energy and Utilities must prepare a climate status and projection once a year.

The reduction targets laid down in the Climate Act include Denmark's total greenhouse gas emissions, including carbon removals/emissions from land and forest (LULUCF), negative emissions from technological processes (e.g. underground carbon storage) and indirect carbon emissions (substances that are later converted to CO2 in the atmosphere). Greenhouse gas emissions are calculated in accordance with UN calculation methods. The projection in CSO24 has been made up to 2035, which is unchanged from CSO23. The projection period is revised on an ongoing basis and must continuously ensure a direction in relation to fulfilment of current climate objectives. The duration of the projection period will be continuously considered on that basis.

**What political initiatives are included in CSO24?**

CSO24 is based on the climate and energy initiatives decided by the Danish Parliament or the EU before 1 January 2024 or as a result of binding agreements. As a starting point, all political initiatives within climate and energy decided before the cut-off date are included in the annual CSO provided that these initiatives are supported by specific and funded instruments.

Between 2024 and the time of publication of CSO24, two political agreements have been concluded that are expected to reduce greenhouse gas emissions.

*Diesel and road tax*

The *Agreement on the partial implementation of the Green Fund* of 15 April 2024 increases, diesel taxes by DKK 0.50 per litre ex VAT from 2025. For cars and vans, the equalisation tax will be reduced proportionally from 2025 with further reductions in 2025 and 2026. For lorries, the kilometre-based road tax will be relaxed in the period 2025-2028. Finally, a framework of DKK 750 million has been set aside for the period 2024-2030 and DKK 50 million permanently for the green transition of heavy transport, including efficiency measures for road freight.

The agreement estimates that the changes to diesel and road taxes will reduce emissions from road transport by approx. 0.3 million tonnes CO2e in 2025 and 2030. The agreement was concluded after the cut-off date for CSO24 on 1 January 2024. The estimated reduction in diesel and road taxes has therefore only been partially incorporated in the gap assessment*.*

*Transition aid*

In March 2024, the *Agreement on the implementation of transition aid from the Green tax reform for industry etc.* (in the following “transition aid”) was concluded. The agreement establishes a framework for two aid schemes to support the green transition of those companies that have the most difficulties adapting and that are affected the most by the carbon tax from *the Agreement on the green tax reform for industry etc.*

The agreement estimates that the transition aid will contribute reductions of approx. 0.1 million tonnes CO2e in both 2025 and 2030. The agreement was adopted after the cut-off date for CSO24 and is therefore only partially incorporated in the gap assessment*.*

### Development in emissions across sectors

The projected development in total greenhouse gas emissions is a result of projections in the underlying sectors, *see* *table 2.6(2).* Industries across agriculture, forestry, horticulture and fisheries are collectively estimated to account for the largest share of emissions up until 2035. The electricity and district heating sector was the largest emitter in 1990 but is the first sector estimated to have CO2e net removals in 2030.

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| Table 2.6(2)  Development in emissions across sectors in selected years, million tonnes CO2e   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | |  | **1990** | **2022** | **2025** | **2030** | **2035** | | Agriculture, forestry, horticulture and fisheries (incl. energy) | 22.9 | 12.6 | 12.6 | 11.7 | 9.9 | | Transport | 11.7 | 12.4 | 10.6 | 8.4 | 6.0 | | Manufacturing industry and building and construction | 8.0 | 4.8 | 4.2 | 2.7 | 2.5 | | Electricity and district heating | 24.4 | 4.8 | 1.4 | -0.3 | -0.3 | | Production of oil, gas and renewable fuels | 2.2 | 2.4 | 2.5 | 2.2 | 2.1 | | Waste (incl. waste incineration) | 2.5 | 2.3 | 2.7 | 2.7 | 2.2 | | Households | 5.1 | 1.4 | 0.9 | 0.4 | 0.3 | | Service trades | 1.4 | 0.7 | 0.5 | 0.2 | 0.1 | | CCS (not broken down by sector) | 0.0 | 0.0 | 0.0 | -2.5 | -2.3 | | **In total** | **78.3** | **41.7** | **35.3** | **25.4** | **20.4** | |
| Note: The table includes statistical difference compared to DCE in historical years, specifically for 1990 and 2022. The table does not include the partially estimated effect of diesel and road tax from the *Agreement on the partial implementation of the Green Fund* and the partially estimated effect of the transition aid from the *Agreement on the implementation of the transition aid from the Green tax reform for industry etc.* CSO24 introduces CCS as a non-sectoral, negative emission in addition to the CCUS pool, which is recognised in the electricity and district heating sector.  Source: Danish Ministry of Climate, Energy and Utilities. |

CSO24 estimates a total reduction in emissions of approx. 16.1 million tonnes CO2e from 2022 to 2030 as a result of adopted policies, market developments, prices etc., *see figure 2.6(6).*

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| Figure 2.6(6)  Breakdown of estimated reductions from 2022 to 2030, million tonnes CO2e    (CSO24)  (CSO24) |
| Note: Rounding may cause numbers to not add up to the total. The figure excludes adjustment for statistical difference compared to DCE in 2022. The figure includes the partially estimated effect of diesel and road tax from the *Agreement on the partial implementation of the Green Fund* and the partially estimated effect of the transition aid from the *Agreement on the implementation of the transition aid from the Green tax reform for industry etc.*  Source: Danish Ministry of Climate, Energy and Utilities. |

The electricity and district heating sector is estimated to account for the largest reduction in emissions from 2022 to 2030 in both absolute and percentage terms, *see figure 2.6(7).* In addition, larger reductions are estimated in the transport sector, manufacturing industry and the building and construction sector as well as negative emissions from carbon capture.

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| Figure 2.6(7)  Emissions in 2022 and 2030 and expected reductions 2022-2030 per sector, million tonnes CO2e |
| Note: Rounding may cause changes to not add up to the total.  Source: Danish Ministry of Climate, Energy and Utilities. |

The estimated reduction in the electricity and district heating sector is primarily attributable to the transition to renewable energy sources and the phasing out of fossil fuels for electricity and district heating production. In 2028, the last coal-fired CHP station is expected to be shut down, and from 2029, piped gas consumption is estimated to be 100 per cent green. In addition, the implementation of the CCUS pool is expected to result in carbon capture at the Avedøre and Asnæs CHP stations being in service from December 2025.

The majority of the estimated reductions in the transport sector can be attributed to lower emissions from cars and vans as fossil fuel vehicles are replaced by electrified vehicles on an ongoing basis while newly sold petrol and diesel cars are more energy-efficient than the fossil fuel vehicles they replace. In addition, an increasing addition of renewable fuels and greater use of fuel filled up abroad and used in Denmark through cross-border trade is expected. Several policy measures encourage the transformation of the transport sector such as the introduction of a kilometre-based road tax for lorries and the EU climate plan, *Fit for 55*, which sets CO2e reduction requirements for new vehicles and introduces allowance payments on fossil fuel emissions in road transport from 2027.

In the manufacturing industry and in the building and construction sector, reductions are primarily due to the carbon tax from the *Agreement on the Green tax reform for industry etc.* and the revision of the EU's emissions trading system which imposes a tax and allowance price on energy- and process-related emissions from, *i.a.*, cement production and other mineralogical processes. In addition, significant reductions are expected as the share of biogas in the gas network is estimated to exceed 100 per cent from 2029.

CCS *(carbon capture and storage)* is an umbrella term for a range of technologies capable of capturing and storing CO2 underground. Carbon capture is expected to occur when CCS is established as a result of the allocated pools.

The estimated reductions in households and service trades are relatively smaller in the overall picture. However, compared to current emissions in the sectors, the reductions towards 2030 correspond to about three quarters of the emissions level in 2022. The agricultural sector is estimated to account for the largest emissions but is among the sectors with the relatively lowest reduction in the projection.

### The main cross-sectoral drivers for reductions in CSO24

The projected reductions in emissions towards 2030 are driven by several technological developments that have an impact across sectors in CSO24. These include phasing out coal power, electrification and other energy efficiency measures in sectors that currently use fossil fuels. In addition, reductions across several sectors are estimated as biogas production is expected to exceed Danish consumption of piped gas from 2029. Finally, the establishment of CCS stations is expected to lead to the capture and storage of CO2e across multiple sectors (cf. *chapter 29 CCS* in *Klimastatus og -fremskrivning 2024)*.

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| Figure 2.6(8)  Cross-cutting reasons for emissions reductions 2022-2030 |
| Source: Danish Ministry of Climate, Energy and Utilities. |

Primary energy consumption in Denmark is estimated to remain stable at just over 700 PJ towards 2030. This can primarily be attributed to a combination of growth and development of particularly energy-intensive businesses such as data centres and PtX, offset by significant energy efficiency measures. Energy efficiency measures are found across the entire energy system such as the transition from coal power to wind turbines, new fossil fuel vehicles, building insulation and electrification via heat pumps and electric vehicles.

#### Phasing out coal power

Emissions from Danish coal-fired power stations have decreased significantly since 1990, *see figure 2.6(9).* By 2025, emissions from coal-fired power stations are expected to be significantly reduced, primarily due to the expected closure of four out of the five coal-fired power stations in Denmark that were active in 2022. Subsequently, the coal-fired power station Nordjyllandsværket is expected to shut down in 2028, resulting in a total coal phase-out by 2030 in the electricity and district heating sector.

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| Figure 2.6(9)  Emissions from the production of coal power heat 1990-2035, million tonnes CO2e  P256C1T10#yIS1 |
| Source: Danish Ministry of Climate, Energy and Utilities |

Reinvestment in coal-fired power stations is considered unlikely due to improved economic conditions for renewable energy production. The timing for phasing out the remaining coal-fired power stations is determined by closure authorisations from the Danish Energy Agency. Ørsted has announced its intention to phase out coal at its CHP stations by 2023, but the phase-out has been postponed to 2024 due to the energy crisis and heat supply considerations.

In addition, Fynsværket's (CPH station) conversion to gas is expected to start in the summer of 2024 after coal firing is shut down in the spring of 2024. However, history has shown that the conversion of the stations can be delayed, such as Studstrupværket’s re-firing of coal after a fire and the temporary extension of coal-fired CHP stations until 2024 in light of the war in Ukraine.

#### Electrification etc.

The main driver behind the reduction in emissions in CSO24 from 2022 to 2030 is estimated to be the continued phase-out of fossil fuels as a result of, *i.a.*, electrification, e.g., electric vehicles and heat pumps.

Electricity consumption is expected to increase significantly towards 2035 in CSO24, *see figure 2.6(10).* At the same time, electricity production in Denmark is estimated to transition to net removals of CO2e via CCS projects.

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| Figure 2.6(10)  Total electricity consumption by sector 1990-2035, TWh |
| Source: Danish Ministry of Climate, Energy and Utilities. |

The increase in electricity consumption towards 2035 is expected to occur across several sectors in CSO24. In the service sector, the expansion of large data centres is expected to increase demand for electricity, and the expansion of PtX production will increase electricity consumption. In the transport sector, vehicles such as electric cars and electric lorries are expected to increase electricity consumption. In addition, electrification of low-temperature process heat and, to a lesser extent, internal transport with mobile, non-road machines (e.g. tractors and excavators) is expected. Finally, electrification is expected to contribute to the conversion of space heating with heat pumps, including both individual heat pumps to replace oil burners and gas furnaces and collective heat pumps in the district heating sector.

Electrification will therefore primarily take place in the transport sector, space heating and process energy where the electricity consumption is expected to increase significantly between 2023 and 2030, *see figure 2.6(11).*

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| Figure 2.6(11)  Estimated electricity consumption for space heating, process energy and transport, TWh |
| Note: Electricity consumption in transport covers electrification of road transport, shipping, rail transport etc.  Source: Danish Ministry of Climate, Energy and Utilities. |

**Electrification of road transport**

The anticipated electrification of road transport is primarily driven by the sale of electric cars, electric vans and electric lorries, which are estimated to reduce sectoral consumption of fossil fuels. For passenger cars, electric cars are estimated to account for almost two-thirds of new sales in 2030. From 2035, the EU regulation on CO2e reduction requirements for new passenger cars and vans sets a requirement of 100 per cent reduction of emissions from new, light vehicles.

For lorries, an increased incentive to invest in zero-emission lorries is expected. An increased expansion of charging infrastructure towards 2030 (cf. *chapter 21 Transport* in *Klimastatus og -fremskrivning 2024)*, is also expected. The development in road transport is driven, i.a., by the *Agreement on a kilometre-based road tax* and EU regulations such as the EU Emissions Trading System (ETS2) which, in isolation, is estimated to increase the incentive to invest in zero-emission lorries as a result of increased prices of the use of fossil fuels.

**Electrification through heat pumps in space heating**

Heat pumps are expected to make up an increasing share of heating sources for space heating in households and in the district heating sector.

There already is a significant shift towards heat pumps. This may be due to, *i.a.*, higher gas prices in 2021-2022 and an expectation of generally higher prices than before the energy crisis, as well as energy and carbon taxes on oil and gas consumption for space heating. In addition, ETS2 will impose an allowance price for emissions from fossil fuel heating in buildings.

**Electrification of the process industry**

In industry, the carbon tax from the *Agreement on the Green tax reform for industry etc.* and the revision of the EU Emissions Trading System for large energy and industrial installations (ETS1) are helping to promote the transition to electricity-based solutions primarily in low- and medium-temperature processes, for example through increased use of heat pumps.

There is general uncertainty about the technological possibilities for the electrification of internal transport in the manufacturing industry and in the building and construction sector as well as agriculture, forestry, fisheries and horticulture as the technological development in this area is more uncertain compared to, for example, the electrification of road transport.

#### Green gas

CSO24 estimates that the consumption of piped gas in Danish households and businesses will be 100 per cent green from 2029 as biogas production increases significantly while the consumption of piped gas is continuously reduced, *see figure 2.6(12).*

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| Figure 2.6(12)  Piped gas consumption and production of bio-natural gas 1990-2035, PJ |
| Source: Danish Ministry of Climate, Energy and Utilities. |

The expected development leads to reductions in all sectors with gas consumption. The main reduction in gas consumption is due to space heating and low-temperature processes switching to electricity-based solutions such as individual heat pumps in households etc. and collective heat pumps in the district heating expansion. The transition is taking place as a result of, *i.a.*, increasing taxes on piped gas as a result of the *Agreement on the Green tax reform for industry etc.* and higher gas distribution tariffs.

DKK 13 billion (2020 prices) has been set aside for biogas tenders up to 2050 through *the Climate Agreement for Energy and Industry etc.* of 22 June 2020 and *the Climate Agreement on Green Power and Heat 2022* of 25 June 2022. The first tender is pending state aid approval from the European Commission.

### Changes compared to the 2023 Climate Status and Outlook (CSO23)

At the time of the conclusion of the agreement on a climate act in 2019, there was a reduction need of 18.4 million tonnes CO2e to meet the 70 per cent target in 2030. Subsequent policy initiatives and other developments mean that more than 90 per cent of the reduction need is now expected to be met in 2030. For each CSO since 2019, a lower reduction gap than the last CSO has been estimated, *see figure 2.6(13)*.

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| Figure 2.6(13)  Development in the reduction gap in 2030 since the *Agreement on a Climate Act* in 2019, million tonnes CO2e    CSO24\* |
| Note: The year indicates the year of publication of the relevant climate projection. For example, "2022" shows the change in the reduction gap estimate between CSO21 and CSO22. The reduction gap estimate in the agreement on the climate act is based on the 2019 Basic projection (CSO19) adjusted for the agreement on the 2020 Finance Act. The gap change for each CSO contains the effects of policies up to 31 December of the previous year. \*Change from CSO23 to CSO24 includes the partially estimated effect of the diesel and road tax from the *Agreement on the partial implementation of the Green Fund* and the partially estimated effect of the transition aid from the *Agreement on the implementation of the transition aid from the Green tax reform for industry etc.*  Source: Danish Ministry of Climate, Energy and Utilities. |

There have been a number of changes in the expected emissions and removals of CO2e in CSO24 compared to CSO23, *see table 2.6(3).* These changes are based on new policies, changed assumptions and improvements in methodology and models. The quality of the projection increases as the basis is continuously updated with new research results, statistics, model developments and the like.

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| Table 2.6(3)  Changes in total emissions in 2025 and 2030 for CSO24 compared to CSO23, million tonnes CO2e   |  |  |  | | --- | --- | --- | |  | **2025** | **2030** | | **Total emissions (CSO23)** | **39.7** | **28.9** | | Carbon-rich soils | -1.9 | -2.0 | | Forest | -2.3 | -1.4 | | Other agriculture | -0.6 | -0.3 | | Transport | -1.6 | -2.1 | | Electricity and district heating | 0.2 | 0.0 | | Waste | 0.5 | 1.0 | | Production of oil, gas and renewable fuels | 0.4 | 0.3 | | Manufacturing industry and building and construction | 0.3 | 0.6 | | CCS (not broken down by sector) | 0.5 | 0.3 | | **Total emissions (CSO24)** | **35.3** | **25.4** | |
| Note: Rounding may cause numbers to not add up to the total. Changes in the household and service trade sectors are less than 0.1 million tonnes CO2e and are not included in the table.  Source: Danish Ministry of Climate, Energy and Utilities. |

**Carbon-rich agricultural land**

The estimate for emissions from carbon-rich agricultural land has been adjusted downwards by 1.9 million tonnes CO2e in 2025 and 2.0 million tonnes CO2e in 2030 compared to CSO23, *see figure 2.6(14).*

In 2020, the Ministry of Climate, Energy and Utilities initiated a research project from Aarhus University and GEUS on revising greenhouse gas inventories and emissions from areas with carbon-rich agricultural land. For example, previous inventories did not take into account the fact that soils degas over time and can no longer be classified as carbon-rich (mineralisation). The first partial result from Aarhus University has shown a reduction in the area of carbon-rich agricultural land which will be included in the emissions inventory after 2010.

The new map shows a write-down of approx. 30 per cent (approx. 50,000 hectares) of agricultural land with carbon-rich soil in 2022. In the second partial result, Aarhus University uncovers the relationship between carbon content, water level and emissions. Results are expected to be incorporated into next year's inventory and projection in CSO25 (cf. *chapter 18 Agricultural land* in *Klimastatus og -fremskrivning 2024).*

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| Figure 2.6(14)  Emissions from carbon-rich soils in CSO23 and CSO24, million tonnes CO2e  P371C1T16#yIS1  CSO24  CSO23 |
| Source: Ministry of Climate, Energy and Utilities (2024a) based on figures from DCE. |

**New forest projection model**

The estimate for the CO2e removal from carbon-rich agricultural land has been adjusted downwards by approx. 2.3 million tonnes CO2e in 2025 and approx. 1.4 million tonnes CO2e in 2030 compared to CSO23, *see figure 2.6(15).*

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| Figure 2.6(15)  Emissions and removal from forests and harvested wood products in CSO23 and CSO24, million tonnes CO2e    CSO24  CSO23 |
| Note: Negative values indicate removal, and positive values indicate carbon emissions.  Source: The Ministry of Climate, Energy and Utilities based on figures from the Department of Geosciences and Natural Resource Management (IGN) at the University of Copenhagen and the Danish Centre for Environment and Energy (DCE) at Aarhus University. |

The Department of Geosciences and Natural Resource Management (IGN) at the University of Copenhagen has created a new model for projecting carbon removal in Danish forests. In the past, it has been difficult to estimate the actual development in the short term. The forest projection in CSO23 underestimated the removal in 2021 by 0.8 million tonnes CO2e compared to the actual removal in the 2021 Forest Statistics and by 1.6 million tonnes CO2e in 2022 compared to the 2022 Forest Statistics.

Both CSO23 and CSO24 estimate a decreasing CO2e removal in forests in the next five years. In the subsequent years, CSO24 estimates that the CO2e removal will increase again towards 2035. According to IGN, the new forest projection model can better estimate felling because it now estimates the probability of a single tree being felled whereas it previously estimated whether an area was cleared of all trees, and as a result of more underlying data.

**Other agriculture**

The estimate for emissions from other agriculture has been adjusted downwards by approx. 0.6 million tonnes CO2e in 2025 and approx. 0.3 million tonnes CO2e in 2030 compared to CSO23.

Specifically, the estimate for emissions from Danish pig production has been adjusted downwards by approx. 0.2 million tonnes CO2e in 2025 and approx. 0.1 million tonnes CO2e in 2030 compared to CSO23. The downward adjustment is due to the fact that Chinese pig production is recovering from the outbreak of the African swine fever in China in 2019, which reduced sales opportunities for Danish pork. At the same time, feeding costs have been rising. It is therefore estimated that the number of year sows will be at a slightly lower level in the coming years than previously assumed. The development in the number of year sows is also reflected in the number of pigs produced, which is also estimated to be at a significantly lower level than in CSO23 throughout the projection period. The decrease in the number of pigs produced is mainly reflected in a decrease in the number of fattening pigs fattened in Denmark compared to CSO23.

In addition, the method for calculating live biomass has been changed in CSO24 from using data from Statistics Denmark to using data from the Danish Agricultural Agency's *Internet Markkort* (Internet field and crops plan). Methodology has been changed to better reflect actual conditions for live biomass and has an impact on emissions, both historically and in the projection. In isolation, a reduction of approx. 0.4 million tonnes CO2e in 2025 and approx. 0.3 million tonnes CO2e in 2030 compared to CSO23 is estimated.

**Transport**

The estimate for emissions from the transport sector has been adjusted downwards by approx. 1.6 million tonnes CO2e in 2025 and approx. 2.1 million tonnes in 2030 compared to CSO23.

When CSO24 was prepared, several adjustments were made to the transport sector projection. Firstly, a model used to estimate cross-border trade is introduced. Cross-border trade in the transport sector includes emissions from fuel sold in Denmark and subsequently used outside Denmark as well as fuel sold outside Denmark and subsequently consumed in Denmark. The model estimates cross-border trade based on, *i.a.*, tax and stock differences between Denmark and neighbouring countries. This includes price differences on diesel in neighbouring countries, including Sweden's lower diesel tax and CO2e displacement requirements from 2024, *see figure 2.6(16)* and *figure 2.6(17).*

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| Figure 2.6(16)  Price difference on diesel between Denmark and Sweden, DKK  P395C1T18#yIS1 | Figure 2.6(17)  Price difference on diesel between Denmark and Germany, DKK  P398C2T18#yIS1 |
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| Note: The price difference is shown in DKK relative to Danish diesel prices for the consumer. A positive price difference assumes a higher diesel price in Denmark relative to the neighbouring country. The development of cross-border trade is estimated based on the development of prices and regulation in Denmark, Sweden and Germany.  Source: The Danish Ministry of Taxation. | |

Secondly, the transport model has been calibrated against actual sales of electric vehicles in 2023, which exceeded the expected level in CSO23 by 58 per cent. Based on new projections with updated sales prices, electric vehicle sales are estimated to displace the share of fossil fuel vehicles sold at a higher rate than estimated in CSO23.

Finally, new framework conditions for shipping and aviation are included in CSO24. For aviation, this includes the *Agreement on Green Aviation in Denmark*, allocating funds for a green domestic route from 2025 and fully green domestic aviation from 2030. In addition, the EU regulation *ReFuelEU Aviation* introduces a gradually increasing blending requirement for sustainable aviation fuels from 2025 and subrequirements for synthetic fuels from 2030. For shipping, reductions are estimated as a result of the expansion of the EU Emissions Trading System (ETS1) from 2024 and the *FuelEU Maritime* Regulation establishing CO2e displacement requirements from 2025 for larger ships and ferries.

**Electricity and district heating**

The estimate for emissions from coal consumption for electricity and district heating production has been adjusted upwards by approx. 0.2 million tonnes CO2e in 2025 compared to CSO23. The reason is that increased electricity production (condensation production) is expected in the short term from, *i.a.*, Nordjyllandsværket as a result of changed fuel and allowance prices in CSO24 compared to CSO23.

**Waste**

The estimated CO2e emissions from waste management have been adjusted downwards by approx. 0.5 million tonnes CO2e in 2025 and approx. 1.0 million tonnes CO2e in 2030 compared to CSO23.

In collaboration with DTU, the University of Copenhagen and the DREAM group, the Danish Environmental Protection Agency has developed a new model for waste projections based on, *i.a.*, the environmental macro model GrønREFORM. This leads to changes in the projection of both waste volume, waste treatment and waste composition. The new waste projection estimates a lower recycling of waste. In addition, a higher total volume of waste and fossil waste incinerated is expected, *see figures 2.6(18) and 2.6(19).* Since CSO23, the calculation assumptions for garden waste and hazardous waste have also been adjusted.

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| Figure 2.6(18)  Development in the volume of Danish waste suitable for incineration, million tonnes of waste    CSO24  CSO24  CSO23 | Figure 2.6(19)  Development in fossil content in Danish waste suitable for incineration, per cent    CSO24  CSO24  CSO23 |
| Source: The Danish Environmental Protection Agency. | |

The change in Danish waste volumes and composition in CSO24generally makes the waste incineration sector more profitable compared to CSO23, and the higher fossil share increases the average calorific value, thus the energy production of the waste incineration sector. In addition, import of waste for incineration in CSO24 is estimated to stop completely from 2025 as the larger volumes of Danish waste suitable for incineration replace imported waste, which is assumed to have higher transport costs. From 2032 onwards, Danish waste incineration capacity is expected to decline as a number of waste incineration plants are anticipated to face major reinvestments and are no longer considered profitable.

**Production of oil, gas and renewable fuels**

Overall, the estimate for emissions from the production of oil, gas and renewable fuels has been adjusted upwards by approx. 0.4 million tonnes CO2e in 2025 and approx. 0.3 million tonnes CO2e in 2030 compared to CSO23. The upward adjustment is primarily due to an increase in the estimated own consumption of natural gas on the platforms in connection with the extraction of oil and gas in the North Sea in CSO24 compared to CSO23.

**Manufacturing industry and building and construction**

The estimate for emissions from activities in the manufacturing industry and in the building and construction sector has been adjusted upwards by approx. 0.3 million tonnes CO2e in 2025 and approx. 0.6 million tonnes CO2e in 2030 compared to CSO23.

In CSO23, it was estimated that the cement industry would switch from using coal and coke as fuel to gas around 2025. Due to falling fuel and allowance prices and rising gas distribution prices, this estimate has changed in CSO24. It is now estimated that the cement industry will continue to use petroleum coke throughout the projection period which, all things being equal, will lead to higher CO2e emissions.

However, the changeis partially offset by the fact that CSO24 estimates a higher biomass consumption and a reduced clinker proportion, especially in the grey cement type, which reduces process-related emissions. The reduction of white cement in 2022 is mainly due to reduced exports to North America, which is expected to cause a long-term change in the market. CSO24 therefore estimates a lower production level towards 2025 than was the case in CSO23.

In addition, CSO24 contains updated estimates for economic growth which leads to an increase in activity and thus energy consumption in the manufacturing industry, resulting in an increased fossil energy consumption. At the same time, a slightly lower degree of electrification in internal transport in the manufacturing industry and in the building and construction sector is estimated in CSO24 compared to CSO23, which also leads to slightly higher emissions in CSO24.

**CCS**

The estimated carbon removal from CCS is primarily due to the NECCS tender having been adjusted downwards by approx. 0.5 million tonnes CO2 in 2025 and approx. 0.3 million tonnes CO2 in 2030 compared to CSO23. In connection with CSO24, the effect of the CCS pool has been updated. The pool is still estimated to contribute approx. 2.3 million tonnes CO2 in 2030 and 2035, with minor deviations in the years from 2025-2029, where a lower carbon capture is estimated. A number of factors have been updated in the calculations, including the emission basis, the legal basis, energy prices and allowance prices. In addition, the assumptions have been updated based on the Danish Energy Agency's updated technology catalogues for biogas and CCS. CCS costs are generally estimated to be lower, but the pool has been updated to reflect the inclusion of VAT in the pool funds.

### Status of Denmark's EU commitments

The EU has a climate target of at least 55 per cent reduction of EU greenhouse gas emissions by 2030 compared to 1990 levels and a climate-neutrality objective by 2050. The EU's common climate and energy policy aims to fulfil the 2030 climate target and includes, *i.a.*, national reduction commitments for each member state for selected sectors:

* **LULUCF sectors:** By 2030, Denmark must reduce net emissions from land use, land use change and forestry by 0.44 million tonnes CO2e compared to net emissions in 2016-2018. Reduction commitments for the 2021-2025 and 2026-2029 subperiods and a point target for 2030 are also being set.
* **The burden-sharing agreement:** The commitments include greenhouse gas emissions in agriculture (excl. LULUCF), road transport, individual heating of buildings, small industrial companies, other waste and other minor emissions. By 2030, Denmark must reduce CO2e emissions by 50 per cent compared to 2005 levels.

In addition to LULUCF emissions and emissions covered by the burden-sharing agreement, the EU regulates the remaining greenhouse gas emissions under the EU Emissions Trading System (ETS1). The Emissions Trading System phases out emission permits over time, reducing sectoral emissions.

Denmark is also subject to a number of requirements for energy composition and energy efficiency measures through the *Renewable Energy Directive (RE Directive)* and *the Energy Efficiency Directive (EED)*.

#### The burden-sharing agreement

CSO24 estimates the total aggregated reduction gap under the burden-sharing agreement at approx. 1.9 million tonnes CO2e for the period 2021-2030, *see figure 2.6(20)*. Taking into account the partially estimated reduction effect of the diesel and road tax in the *Agreement on the partial implementation of the Green Fund*, the gap for the period 2021-2030 is estimated at approx. 0.1 million tonnes CO2e (cf. *chapter 2.6.1 The overall picture in the 2024 Climate status and projection*).

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| Figure 2.6(20)  Status of Denmark's fulfilment of the burden-sharing agreement, million tonnes CO2e |
| Note: The figure does not include the partially estimated effect of diesel and road tax from the *Agreement on the partial implementation of the Green Fund*.  Source: Danish Ministry of Climate, Energy and Utilities. |

The projection of emissions from the burden-sharing sectors includes, *i.a.*, reductions from the transport sector, small-scale industry, households and agriculture. The revision of the Emissions Trading Directive, including the introduction of ETS2, is estimated to lead to reductions in the burden-sharing sectors by 2030.

The reductions in the transport sector are due to increased electrification and the use of renewable fuels. In addition, a reduction in emissions associated with cross-border trade is expected (cf. *chapter 21 Transport* in *Klimastatus og -fremskrivning 2024)*.

#### The LULUCF Regulation

CSO24 estimates that Denmark will overachieve the budget target for the period 2021-2025 by approx. 30.6 million tonnes CO2e. For the period 2026-2029, CSO24 estimates that a reduction gap of approx. 3.8 million tonnes CO2e will remain. Finally, it is estimated that the point target will be exceeded in 2030 by approx. 0.2 million tonnes CO2e, *see figure 2.6(21).*

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| Figure 2.6(21)  Status of Denmark's fulfilment of the LULUCF Regulation, million tonnes CO2e |
| Source: Danish Ministry of Climate, Energy and Utilities. |

Emissions from carbon-rich agricultural land are estimated to be reduced from approx. 3 million tonnes CO2e in 2022 to approx. 1.9 million tonnes CO2e in 2030. The reduction is expected due to annual mineralisation of the carbon pool on the land as well as policy measures on set-aside and rewetting of the land (cf. *chapter 18 Agricultural land and other land* in *Klimastatus og -fremskrivning 2024)*.

The fluctuations in net removals of forests are relatively large from year to year and are described in more detail in *Klimastatus og -fremskrivning 2024,* chapter 19 *Forests and harvested wood products*.

The fulfilment of Denmark's EU commitments is subject to several uncertainties, including the phase-in of electric vehicles, cross-border trade projections, mineralisation of the carbon pool and forest projections.

### Agriculture, forestry, fisheries and horticulture

Total emissions from agriculture, forestry, fisheries and horticulture have gradually decreased since 1990, mainly due to agricultural land use. The projection estimates a continued decline towards 2035, *see figure 2.6(22).* Greenhouse gas emissions can be calculated in different ways depending on which categories are included.

Combining the categories used in CSO24 with all emissions and removals in agriculture, forestry, fisheries and horticulture results in an estimated share of *approx. 46 per cent of Denmark's total net emissions in 2030.* This includes greenhouse gas emissions and removals from agricultural processes, land use in agriculture, urban areas and wetland areas, forests and energy consumption in agriculture, forestry, fisheries and horticulture.

Energy consumption in agriculture, forestry, fisheries and horticulture is not included in the calculation of the sector target for agriculture of a 55-65 per cent reduction in 2030 compared to 1990 from the *Agricultural Agreement* from 2021. This calculation estimated sectoral emissions to account for *approx. 42 per cent of Denmark's total net emissions in 2030.*

Conversely, if agricultural emissions and removals are calculated without emissions and removals in forests, urban areas and wetland areas, agricultural emissions are estimated to account for *approx. 50 per cent of Denmark's total net emissions in 2030*.

Finally, agricultural emissions can be calculated without emissions and removals in forests, urban areas and wetland areas and without energy consumption in agriculture, forestry, fisheries and horticulture. This calculation means that agricultural emissions account for *approx. 46 per cent of Denmark's total net emissions in 2030.*

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| Figure 2. 6(22)  Agricultural land use  Agricultural processes  Energy consumption  Emissions and removals 1990-2035 across agriculture, forestry, fisheries and horticulture, million tonnes CO2e  P479C1T25#yIS1 |
| Source: Danish Ministry of Climate, Energy and Utilities |

Forest

Urban and wetlands

Total emissions from the industries include the following areas:

* **Agricultural processes:** Emissions from livestock digestion, fertiliser management and nitrous oxide emissions from cultivating fields. The level of emissions depends, *i.a.*, on the livestock population, especially the development of the cattle and pig population as well as fertilisation and set-aside of agricultural land for extensification.
* **Agricultural, urban and wetland areas:** CO2e removals and emissions from cropland and grassland in agriculture, including carbon-rich soil, mineral soil and live and dead biomass in fruit trees, windbreaks and the like. There are also emissions from re-established wetland areas and from the conversion of agricultural land to urban areas and infrastructure.
* **Forests and harvested wood products:** CO2e removals in live biomass in forests and emissions occur from the harvesting/felling of trees and when trees in forests decay. Removals and emissions depend on, *i.a.*, factors such as the size of the total forest area, afforestation and harvesting.
* **Energy consumption in agriculture, forestry, horticulture and fisheries:** Emissions from internal transport, especially including agricultural machinery and fishing vessels as well as process heat, e.g. for heating greenhouses and livestock buildings.

The *Agreement on the green transition of Danish agriculture* (the Agricultural Agreement) from 2021 sets a reduction target for agriculture of 55-65 per cent in 2030 compared to emissions in 1990. The reduction target includes emissions from agricultural processes, land and forests, but not energy-related emissions in agriculture. Greenhouse gas emissions from the sector are estimated to be reduced by 48 per cent in 2030 compared to 1990, corresponding to a gap of 1.5-3.5 million tonnes CO2e compared to the reduction target.

#### Main reasons for emissions reductions towards 2030

In 2022, emissions from the sector were 12.6 million tonnes CO2e. By 2030, emissions from agriculture and forestry are estimated to be reduced by approx. 0.9 million tonnes CO2e. This can be attributed to reductions in emissions from agricultural land, agricultural processes and energy consumption in industries, and an opposite reduction in CO2e removals from forests and harvested wood products, *see figure 2.6(23).*

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| Figure 2.6(23)  Distribution of emissions in 2022 and 2030 across subsectors, million tonnes CO2e |
| Source: Danish Ministry of Climate, Energy and Utilities |

The decrease in estimated emissions from agricultural processes is partly due to the expectation of fewer cattle and pigs in production, reducing emissions from animal digestion and fertiliser management. Despite a slight increase in milk production due to an increasing milk yield per cow, fewer cattle are expected in the future. Fewer pigs are expected in the future due to reduced sales opportunities for Danish pork caused by the re-establishment of Chinese pig production following the outbreak of the African swine fever since 2019. Add to that rising feed prices and increasing exports of piglets for fattening and slaughtering abroad.

Furthermore, the implementation of new political initiatives is expected to reduce emissions from fertiliser management. This includes, for example, frequent slurry discharge from pig barns and increased biogasification of slurry. Measures to increase extensification of agricultural land are expected to further reduce fertiliser consumption, thus nitrous oxide emissions from fields.

A reduction in emissions from agricultural land use is also estimated. The development is mainly due to a decrease in the number of carbon-rich agricultural land due to annual mineralisation of the soils and expected set-aside and rewetting of the land which reduces greenhouse gas emissions from these areas.

Finally, energy consumption in agriculture, forestry, horticulture and fisheries is estimated to be reduced as a result of ongoing energy efficiency measures for agricultural machinery and the fishing fleet as well as an expected spread of heat pumps that will reduce emissions associated with low-temperature processes.

Carbon removal in Danish forests is an important part of the Danish climate account. Forests contribute to reducing Denmark's greenhouse gas emissions by removing CO2 from the atmosphere. Forests and harvested wood products have removed an average of approx. 3 million tonnes CO2e annually over the past 10 years. This net removal of CO2e in forests and wood products is estimated to decrease until 2028, after which it will return to current levels by 2035. This development is due to decreasing annual carbon sequestration in Danish forests and in the pool of wood products, partly due to regeneration of old forests.

Emissions from agriculture, forestry, horticulture and fisheries are subject to significant uncertainty as emissions are tied to biological processes that are difficult to determine. For CSO25, for example, emissions from carbon-rich soils can be adjusted as a research project is underway to update emission factors from these areas (*cf. chapter 18 Agricultural land and other land in Klimastatus og -fremskrivning 2024*).

The most significant changes compared to CSO23 concern a new calculation of land with carbon-rich soil in Denmark from the Danish Centre for Food and Agriculture (DCA) at Aarhus University and new forest projections from the Department of Geosciences and Natural Resource Management (IGN) at the University of Copenhagen (*cf. chapter 2.6.4 Changes compared to CSO23*).

Organic production is included in the projection as the calculation of emissions is based on average data from both conventional and organic production. For CSO24, a project has been initiated with the Innovation Centre for Organic Farming to investigate available data that could be included in a separate calculation of organic production. Collecting data has proven to be difficult, which means that a separate projection of ecology still needs to be made. Opposing effects are expected when splitting organic and conventional production, where some parameters are expected to contribute to reduced emissions and other parameters are expected to contribute to increased emissions in organic production.

### Transport

Transport sector emissions in 2022 were at about the same level as in 1990, but emissions are expected to decrease significantly towards 2035, *see figure 2.6(24).* The transport sector is estimated to emit approx. 8.4 million tonnes CO2e in 2030, corresponding to approx. 33 per cent of Denmark's total emissions. Thus, the transport sector will be the second most emitting sector in 2030.

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| Figure 2.6(24)  Transport sector emissions and removals 1990-2035 by subsector, million tonnes CO2e | |
| Note: The figure does not include partially estimated effects of the diesel and road tax from the *Agreement on the partial implementation of the Green Fund*.  Source: Danish Ministry of Climate, Energy and Utilities. |

CO2e emissions from the transport sector are primarily due to the combustion of fossil fuels and are divided into the following subsectors:

* **Road transport:** CO2e emissions from fuel combustion in cars, vans, lorries, buses and motorcycles. The estimated emissions include all fuel filled up in Denmark, regardless of whether it is subsequently consumed in Denmark or abroad. Conversely, fuel filled up abroad that is estimated to be consumed in Denmark is not included.
* **Rail transport:** CO2e emissions associated with long-distance and regional trains, S-trains, Metro, light rail, freight trains and other trains such as local trains.
* **Domestic shipping:** CO2e emissions from shipping between Danish ports and fuel filled up in Denmark and used in shipping from Denmark to Greenland and the Faroe Islands, respectively.
* **Domestic aviation:** CO2e emissions from aviation between Danish airports and fuel filled up in Denmark and used in aviation from Denmark to Greenland and the Faroe Islands, respectively.
* **Other transport:** CO2e emissions from the Danish Defence vehicles and recreational craft.

#### Main reasons for emissions reductions towards 2030

By 2030, emissions from the transport sector are estimated to be reduced by approx. 4.3 million tonnes CO2e mainly due to reductions in road transport emissions, *see figure 2.6(25).*

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| Figure 2.6(25)  Emissions in 2022 and 2030 across subsectors in transport, million tonnes CO2e |
| Source: Danish Ministry of Climate, Energy and Utilities. |

Sales of electric vehicles have increased significantly in recent years. In 2023, more than 60,000 new electric vehicles were sold, representing over 40 per cent of total new sales. Electric vehicle sales in 2023 is a doubling of sales compared to 2022.

In CSO24, the development of electric vehicle sales is expected to continue. By 2030, electric vehicles are expected to account for more than half of all new sales at approx. 61 per cent, corresponding to approx. 150,000 electric vehicles. This development is supported by, *i.a.*, an expected increase in the supply of electric vehicles and the fact that electric vehicles can fulfil more needs. In addition, a lower vehicle registration fee on the purchase of zero-emission vehicles from the *Agreement on Green Road Transport*.

Electric vehicle sales in 2023 were spread across 74 available models, which is also a significant increase from 2022. In addition, development is supported by factors such as longer range, improved charging infrastructure and the price development of electric vehicles. CSO24 estimates that there will be 750,000 new electric vehicles between 2024 and 2030, *see figure 2.6(26).*

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| Figure 2.6(26)  Sales of new cars, thousands |
| Source: Danish Ministry of Climate, Energy and Utilities. |

The sales share of plug-in hybrid vehicles is estimated to decrease as a result of electric vehicles becoming increasingly competitive and the registration fee being phased in faster for electric vehicles than for plug-in hybrid vehicles, *see the Agreement on Green Road Transport*.

Overall, CSO24 estimates that by 2030, there will be approx. 1.2 million zero- and low-emission vehicles consisting of approx. 925,000 electric cars, approx. 200,000 plug-in hybrid cars and approx. 80,000 plug-in hybrid and electric vans.

The reduction in passenger car emissions primarily occurs when a petrol and diesel car is replaced with an electric car, but replacing the fossil fuel fleet can also contribute to reductions as newly sold petrol and diesel cars are, on average, more energy-efficient than the fossil fuel cars they replace. In addition, increased blending of renewable fuels is also estimated to reduce emissions.

The electrification of lorries towards 2030 is expected to be faster in CSO24 than in CSO23. Electric lorries are expected to account for approx. 65 per cent of total sales and approx. 20 per cent of the fleet. The electrification of lorries will be supported by, *i.a.*, 25 new charging stations across the country by 2030 with a maximum of 60 kilometres between charging points on the main road network.

On average, lorries have a shorter life than, for example, passenger cars, so increasing sales shares will have a relatively faster impact on the lorry fleet. To a certain extent, the reduction in carbon emissions for vans and lorries can also be attributed to increased energy efficiency and increased use of renewable fuels.

In 2022, fuel was cheaper to fill up in Denmark compared to Sweden and Germany. This has changed from 2024 as Sweden has lowered both fuel taxes and carbon displacement requirements. The projection therefore assumes that fuel will remain cheaper in Sweden until 2030. Due to tax differences between Denmark and Germany and Sweden, cross-border trade is estimated to be significantly reduced in 2030 compared to 2022.

For both domestic shipping and domestic aviation, emissions in CSO24 are estimated to be reduced towards 2030, including as a result of completely green domestic aviation from 2030.

There is particular uncertainty related to the electrification of road transport, the projection of cross-border trade (*cf. chapter 21 Transport* in Klimastatus og -fremskrivning 2024), and the incorporation of the EU regulations *FuelEU Maritime* and *ReFuelEU Aviation*, which both contain flexibility mechanisms to meet the requirements.

### The manufacturing industry and the building and construction sector

Emissions from the manufacturing industry and the building and construction sector fell significantly during the financial crisis around 2008-2009 and have remained relatively unchanged since, *see figure 2.6(27).* Emissions are expected to be significantly reduced in the projection towards 2030. The manufacturing industry and the building and construction sector are estimated to emit approx. 2.7 million tonnes CO2e in 2030, corresponding to approx. 11 per cent of Denmark's total net emissions in 2030. The cement industry is the single largest source of emissions in the sector and is estimated to account for almost half of total emissions from the manufacturing industry and the building and construction sector in both 2022 and 2030.

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| Figure 2.6(27)  Emissions from the manufacturing industry and the building and construction sector 1990-2035 by type, million tonnes CO2e  P569C1T32#yIS1 | |
| Source: Danish Ministry of Climate, Energy and Utilities. |

The production of goods and semifinished products as well as the construction of buildings and roads are activities that typically require a significant amount of energy. In addition, the processing of certain raw materials and the use of refrigerants may, per se, lead to greenhouse gas emissions, known as process emissions and F-gases.

Energy-related – Methane, nitrous oxide and indirect CO2

Process emissions – Other industries

Energy-related CO2 – Building and construction sector

Process emissions – Cement production

Energy-related CO2 – Manufacturing industries

Greenhouse gas emissions in the manufacturing industry and in the building and construction sector are calculated according to the following types:

* **Energy-related emissions**: Emissions from the use of fossil fuels for, *i.a.*, space and process heating and internal transport (e.g., excavators and construction machinery).
* **Process emissions from cement production**: Carbon emissions associated with the processing of raw materials such as clay and chalk for cement production, e.g., the calcination process in cement production.
* **Process emissions from other industries**: CO2e emissions associated with the processing of raw materials for other mineralogical manufacturing processes such as burning clay for brick production.
* **F-gases**: F-gases are greenhouse gases that are leaked into the atmosphere, for example when using air conditioning for cooling.

#### Main reasons for emissions reductions towards 2030

By 2030, emissions from the manufacturing industry and the building and construction sector are estimated to be reduced by approx. 2.1 million tonnes CO2e, *see figure 2.6(28).*

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| Figure 2.6(28)  Emissions in 2023 and 2030 across emission types in the manufacturing industry and in the building and construction sector, million tonnes CO2e |
| Note: Energy statistics do not break down emissions at detailed industry level, and estimated values for 2023 are therefore used as a reference to calculate energy-related emissions from the cement industry separately from manufacturing industries  Source: Danish Ministry of Climate, Energy and Utilities. |

A significant decrease in white and grey cement production is recorded in 2022 and 2023, and this is reflected in the cement production projection in CSO24. This decrease has resulted in a reduction of approx. 0.5 million tonnes CO2e from 2021 to 2023. The reduction in emissions from the cement industry towards 2030 can be attributed to increased use of biomass and waste and an estimated decrease in the total cement production as a result of the introduction of the carbon tax from the *Agreement on the Green tax reform for industry etc.* In addition, reductions are expected from technological developments in cement types, which are estimated to contribute to further reductions in both energy-related and process-related emissions from cement production.

Other manufacturing industries are estimated to reduce emissions as gas consumption is converted, with biogas production estimated to exceed piped gas consumption from 2029. Furthermore, reductions in emissions are estimated because of utilisation of residual and ambient heat, electrification and energy savings. Of the total reduction for other manufacturing industries of 1.6 million tonnes CO2e by 2030, conversion of piped gas is estimated to represent a reduction of approx. 0.9 million tonnes CO2e.

CSO24 estimates that there will be no significant carbon reduction in the building and construction industries. The majority of industrial emissions are related to internal transport, including excavators and construction machinery. It is estimated that electrification of these machines will only be profitable to a limited extent under current regulations.

The most significant changes compared to CSO23 relate to an upwardly adjusted expectation for activities, thus energy consumption and emissions in the sector. In addition, changes in fuel and allowance prices mean that, unlike in CSO23, the cement industry is not estimated to switch to gas consumption in CSO24. On the other hand, there was a reduction in white cement production in 2022, mainly due to reduced exports to North America, which is expected to cause a long-term change in the market. CSO24 therefore estimates a lower production level towards 2025 than was the case in CSO23. Overall, these changes are estimated to result in lower emissions from cement production in 2025 in CSO24 than in CSO23, but higher emissions from cement production in 2030 in CSO24 than in CSO23, *see figure 2.6(29).*

There is uncertainty about developments in cement production, including conversion to gas (cf. *chapter 22 Manufacturing industry and building and construction* in *Klimastatus og -fremskrivning 2024)*.

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| Figure 2.6(29)  Emissions from cement production in CSO24 compared to CSO23, million tonnes CO2e    CSO24  CSO23  CSO23  CSO24 |
| Source: Danish Ministry of Climate, Energy and Utilities. |

### Electricity and district heating

The electricity and district heating sector is estimated to have net emissions of approx. -0.3 million tonnes CO2e in 2030, *see figure 2.6(30).* In 1990, the electricity and district heating sector was the sector with most emissions in Denmark but is estimated to be the first sector to have net removals of greenhouse gases overall. In addition, the electricity and district heating sector is estimated to contribute more to the reduction of greenhouse gas emissions from other sectors, for example through electrification of transport, heating and industrial processes.

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| Figure 2.6(30)  Electricity and district heating sector emissions and removals 1990-2035 by subsector, million tonnes CO2e  P608C1T36#yIS1  Carbon capture  Not distributed by fuel  Oil  Natural gas  Coal | |
| Source: Danish Ministry of Climate, Energy and Utilities. |

Greenhouse gas emissions in the sector are primarily associated with the production of electricity and district heating plants using fossil fuels. The projection also includes the decision of the CCUS pool with carbon capture at the Avedøre and Asnæs stations.

Emissions and removals of greenhouse gases in the electricity and district heating sector are divided into the following types of stations:

* **Large and small CHP stations**: Emissions from large and small CHP stations that produce both electricity and district heating. These include coal, gas and biomass CHP stations.
* **Wind power and photovoltaic systems**: Electricity from wind and photovoltaic systems is produced using renewable energy and is therefore CO2e neutral.
* **Boilers, heat pumps, photovoltaic and residual heat plants**: Emissions from plants that produce district heating. The processes involve the use of electricity generated through the use of fossil fuels or directly through renewable energy such as solar power.
* **Carbon capture**: CO2e removal in the electricity and district heating sector includes carbon capture at the biomass-fired CHP stations Avedøre and Asnæs.

#### Main reasons for emissions reductions towards 2030

By 2030, emissions from the electricity and district heating sector are estimated to be reduced by approx. 5.1 million tonnes CO2e, *see figure 2.6(31).*

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| Figure 2.6(31)  Emissions in 2022 and 2030 across the electricity and district heating sectors, million tonnes CO2e |
| Source: Danish Ministry of Climate, Energy and Utilities. |

In CSO24, a significant decrease in emissions from the use of fossil fuels in the electricity and district heating sector is expected. The reduction is partly due to the phase-out of coal-fired CHP stations with the closure of the last coal-fired power station, Nordjyllandsværket, in 2028 and the transition of grid consumption to be 100 per cent green from 2029 in terms of inventory. Finally, the sector as a whole is estimated to have negative net emissions from 2029 due to the establishment of carbon capture at the Avedøre and Asnæs stations.

Total net electricity consumption (including grid losses) is estimated to almost double from 35 TWh in 2022 to 63 TWh in 2030 with increased consumption across all sectors. This development is particularly driven by data centres and new technologies such as heat pumps in households and district heating, PtX and the electrification of the transport sector, particularly with more electric vehicles (cf. *chapter 2.6.3 The main cross-sectoral drivers for reductions in CSO24*).

The increase in electricity consumption is estimated to be offset by an even greater increase in electricity production by which Denmark is expected to become a net exporter of electricity from 2024. The combination of increasing demand for electricity, higher costs for thermal plants due to decreasing subsidies, rising carbon allowance prices and decreasing costs for onshore wind and solar power is estimated to lead to an increase in capacity from RE technologies and associated electricity production.

In the *2022 Climate Agreement on Green Electricity and Heat*, a majority of the Danish Parliament agreed to ensure framework conditions to enable a quadrupling of electricity production from solar energy and onshore wind by 2030, corresponding to an annual electricity production from solar and onshore wind of approx. 50 TWh. The estimated onshore RE production in CSO24 is approx. 40 TWh in 2030, which roughly corresponds to a tripling. Of this, approx. 25 TWh is estimated to come from solar energy and approx. 14 TWh from onshore wind. Compared to CSO23, RE production is thus estimated to increase by 8 TWh, which is mainly attributed to expectations of more PV projects in CSO24. Onshore energy parks have not yet been designated, and electricity production from future energy parks is therefore not quantified in CSO24, *see sector assumption note electricity and district heating*.

In addition, 4 GW is estimated from future offshore wind tenders as a result of profitability assessments of offshore wind projects, *see sector assumption note electricity and district heating*. Profitability assessments are subject to considerable uncertainty, and their results are highly sensitive to the considered assumptions. In April 2024, the Danish Energy Agency launched an offshore wind tender for 6 GW offshore wind towards 2030 with the possibility of establishing 10 GW offshore wind or more. As no bids were received for the three areas in the North Sea (3 GW) by the deadline 5 December 2024, a dialogue with the market actors has immediately been initiated. The tenders of the last three areas (3 GW) are expected to be decided in 2025, and their results can then be incorporated into CSO26.

Based on the phase-out of fossil fuels, uncertainties regarding the reduction of emissions in the electricity and district heating sector are estimated to be low in 2030. This was due to the fact that reinvestment in new coal-fired power stations in particular is not considered profitable due to falling costs for onshore wind and solar power. The development of electricity production, consumption, prices and net exports is subject to uncertainty due to changes in offshore wind development, data centres, fuel prices and weather variations.

### Production of oil, gas and renewable fuels

Emissions from the production of oil, gas and renewable fuels peaked between 1999 and 2004. Since then, emissions have been slightly decreasing, which is expected to continue towards 2035, *see figure 2.6(32).* The production of oil, gas and renewable fuels are estimated to emit approx. 2.2 million tonnes CO2e in 2030, corresponding to approx. 9 per cent of Denmark's total net emissions in 2030.

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| Figure 2.6(32)  Emissions from the production of oil, gas and renewable fuels 1990-2035 by type, million tonnes CO2e  P640C1T39#yIS1  Own consumption of fossil fuels for oil and gas extraction  Fugitive emissions from oil and gas  Methane leakage for biogas  Own consumption of fossil fuels at refineries | |
| Source: Danish Ministry of Climate, Energy and Utilities. |

Greenhouse gas emissions from the production of oil, gas and renewable fuels include the following areas:

* **Own consumption:** CO2e emissions from the consumption of gas for electricity production during oil and gas extraction in the North Sea.
* **Refineries:** Emissions from the two Danish refineries include energy consumption for heating the refining process as well as electricity and heat production at the refinery plants, most of which is used in production at the refineries.
* **Flaring**: Emissions from controlled burning of surplus methane from oil and gas production and refining to reduce the greenhouse gas impact of direct methane gas emissions.
* **Fugitive emissions:** Emissions from, *i.a.*, evaporation and leaks that occur as part of the extraction, production and transport of oil and gas products.
* **Renewable fuels:** The emissions and energy consumption of Power to X (PtX) and biofuels including biogas production and the related methane leakage.

#### Main reasons for emissions reductions towards 2030

By 2030, emissions from the production of oil, gas and renewable fuels are estimated to be reduced by approx. 0.2 million tonnes CO2e, *see figure 2.6(33).*

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| Figure 2.6(33)  Emissions in 2022 and 2030 across types in the production of oil, gas and renewable fuels, million tonnes CO2e |
| Source: Danish Ministry of Climate, Energy and Utilities. |

Greenhouse gas emissions from oil and gas extraction are estimated to increase towards 2030. This is partly due to the redevelopment of the Tyra field extraction platform in 2019-2023, which will be operational again from 2024. Emissions associated with own consumption and fugitive emissions from oil and gas extraction are estimated to increase by a total of approx. 0.4 million tonnes CO2e by 2030.

Emissions from the own consumption of fossil fuels at the refineries are estimated to be reduced by around 0.4 million tonnes CO2e in 2030 compared to 2022. The reduction is due to a decline in activities and increased consumption of renewable energy as a result of the phase-in of the carbon tax from the Agreement on the Green tax reform for industry etc. from 2025. The estimated effect of the carbon tax is recognised as a percentage decrease in activities but can occur in several ways across the different refineries in Denmark. It can also occur by converting Danish refineries towards the production of green fuels such as bio-oil or methanol produced from green hydrogen, which is used to, i.a., fulfil blending requirements and reduction targets in international aviation and shipping.

From 2029, Danish biogas production is estimated to exceed the consumption of piped gas. This will make gas 100 per cent green in terms of inventory. The regulation of methane losses from biogas production is also expected to contribute to a reduction in emissions from methane leakage by approx. 0.2 million tonnes CO2e in 2030 compared to 2022 despite the fact that biogas production is estimated to almost double over the same period.

The most significant changes compared to CSO23 concern an upwardly adjusted own consumption for oil and gas extraction and a delayed decision for the first biogas tender. In addition, the total aid amount from the biogas pools is reduced after the inclusion of VAT costs that were previously not included in the calculation of the aid amount. This means that a slightly smaller biogas expansion towards 2030 is estimated in CSO24 compared to CSO23.

### Waste

Emissions from the waste sector have remained relatively constant from 1990 towards 2022. For CSO24, future emissions are adjusted upwards due to a new waste projection, *see figure 2.6(34).* The waste sector is estimated to emit approx. 2.7 million tonnes CO2e in 2030, corresponding to approx. 10 per cent of Denmark's total emissions in 2030.

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| Figure 2.6(34)  Waste sector emissions 1990-2035 by subsector, million tonnes CO2e  P676C1T42#yIS1  Other waste management  Wastewater  Composting  Waste disposal  Waste incineration | |
| Note: The new waste projection had a data breach between 2022 and 2023. The development towards 2030 is therefore compared to 2023.  Source: Danish Ministry of Climate, Energy and Utilities. |

Greenhouse gas emissions from the waste sector include the following subsectors:

* **Waste incineration**: CO2e emissions from the incineration of waste material.
* **Waste disposal**: CO2e emissions from the release of methane for the disposal of organic waste.
* **Wastewater**: CO2eemissions from sewer systems, wastewater treatment plants and septic tanks.
* **Composting**: CO2e emissions from the release of methane and nitrous oxide from composting garden and park waste, organic waste and sludge.
* **Other**: In addition to the above, a minimal amount of greenhouse gases are released from other processes within the waste sector.

Due to a new waste projection from the Danish Environmental Protection Agency, emissions from waste incineration are adjusted upwards compared to CSO23. The new waste projection model is based on the environmental macro model GrønREFORM. The increase is due to the model projecting an upward adjustment of both the waste volume suitable for incineration and its fossil share and a downward adjustment of expectations for waste recycling in Denmark. The introduction of the model has led to a significant upward adjustment of the waste volume suitable for incineration and the fossil share, thus emissions, compared to CSO23. There is also a data breach in the transition from historical data in 2022 to projection data in 2023 due to a difference in methodology for calculating the fossil share.

#### Main reasons for emissions reductions towards 2030

By 2030, emissions from the waste sector are estimated to be reduced by approx. 0.3 million tonnes CO2e, *see figure 2.6(35).*

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| Figure 2.6(35)  Emissions in 2023 and 2030 across types in the waste sector, million tonnes CO2e |
| Note: The new waste projection had a data breach between 2022 and 2023. The development towards 2030 is therefore compared to 2023.  Source: Danish Ministry of Climate, Energy and Utilities. |

Emissions from waste incineration have increased historically due to increasing waste volumes suitable for incineration and accounted for approx. 76 per cent of emissions from the waste sector in 2023. CSO24 estimates reduced emissions from waste incineration based on the expectation that the total waste volume suitable for incineration will be reduced by 2030 due to a reduction in the volume of imported waste.

In 2023, the used incineration capacity at Danish waste incineration plants is estimated to be approx. 3.5 million tonnes of waste of which approx. 0.3 million tonnes consist of imported waste suitable for incineration. From 2025, it is estimated that there will be no more imports of waste for incineration. The reason is that it is assumed that imported waste has higher transport costs than Danish waste. This means that from 2025, the Danish waste incineration capacity is expected to be adapted to the Danish waste volumes suitable for incineration, including garden waste and hazardous waste. A number of waste incineration plants are estimated to face major reinvestments after 2032 which will no longer be profitable. On this basis, exports of Danish waste are estimated.

Estimates of waste volumes are subject to uncertainty based on a wide range of assumptions about market trends and technical development (cf. *chapter 2.6.15* on *Uncertainties and sensitivities* and *chapter 25 on Waste incineration* in *Klimastatus og -fremskrivning 2024*).

### Households

In 2021, the final energy consumption of households accounted for approx. one third of the total final energy consumption. CSO24 accounts for a large part of household emissions in other sectors related to producing services for households, e.g. the electricity and district heating sector, the waste sector and the transport sector. Household emissions in CSO24 are therefore primarily from individual heating.

Household emissions have decreased significantly since the 1990s until 2022, and a further significant reduction in sectoral emissions is projected until 2030, *see figure 2.6(36).* Households are estimated to emit approx. 0.4 million tonnes CO2e, corresponding to approx. 1.4 per cent of Denmark's total emissions in 2030.

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| Figure 2.6(36)  Household emissions 1990-2035 by emission source, million tonnes CO2e | |
| Source: Danish Ministry of Climate, Energy and Utilities. |

Greenhouse gas emissions from households include the following subsectors in CSO24:

* **Individual heating**: Emissions from household heating, primarily from the use of oil burners and gas furnaces.
* **F-gases**: Emissions from refrigerants used in e.g. household heat pumps and from propellants used in medical asthma inhalers.
* **Other**: Emissions from gas patio heaters, petrol lawn mowers etc.

#### Main reasons for emissions reductions towards 2030

By 2030, emissions from households are estimated to be reduced by approx. 1.1 million tonnes CO2e, *see figure 2.6(37).*

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| Figure 2.6(37)  Emissions in 2023 and 2030 across emission sources in households, million tonnes CO2e |
| Note: The figure shows the estimated change from 2023 to 2030. Energy consumption in 2022 is estimated to be extraordinarily low due to high energy prices, and 2023 is therefore used as the reference year for households rather than 2022 (cf. *chapter 27 Households* in *Klimastatus og -fremskrivning 2024*).  Source: Danish Ministry of Climate, Energy and Utilities. |

CSO24 estimates a decrease in emissions from gas furnaces of approx. 0.7 million tonnes CO2e between 2023 and 2030. The reduction is mainly due to an increasing RE share of piped gas where biogas production is estimated to exceed Danish consumption of piped gas from 2029 (*cf. chapter 24 Production of oil, gas and renewable fuels in Klimastatus og -fremskrivning 2024*). The remaining gas furnaces use piped gas.

Emissions from oil burners are estimated to fall from approx. 0.4 million tonnes CO2e in 2023 to approx. 0.1 million tonnes CO2e in 2030. The reduction in the number of households heated with oil burners is partly due to the fact that alternatives such as heat pumps will often be cheaper as well as the possibility to apply for aid for heat pumps through the Heat Pump Pool and the Scrapping Scheme. In addition, expanding the district heating network will enable more households to switch to district heating from fossil heating sources. However, the majority of households with oil burners are located outside areas where district heating is expected to be introduced.

By 2023, an estimated 60,000 households will use oil burners while an estimated 380,000 households will use gas furnaces as their primary heating. It is estimated that in 2030, around 30,000 households will use oil burners while around 130,000 households are estimated to use gas furnaces as their primary heating, *see figure 2.6(38).*

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| Figure 2.6(38)  Households with oil burners and gas furnaces as primary heating, thousands |
| Note: In this context, households are defined as occupied dwellings.  Source: Danish Ministry of Climate, Energy and Utilities. |

There is some uncertainty about the phase-out of oil burners and gas furnaces and the costs associated with the transition to alternative forms of heating such as heat pumps which may vary between buildings.

### The service sector

Emissions from the service sector fell during the financial crisis in 2008-09 and have since been continuously reduced, *see figure 2.6(39).* A continuous ongoing reduction of emissions is projected until 2030. The service sector is a small part of total emissions with estimated greenhouse gas emissions of approx. 0.2 million tonnes CO2e in 2030. This corresponds to less than 1 per cent of Denmark's total net emissions in 2030.

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| Figure 2.6(39)  Service trade emissions 1990-2035 by subsector, million tonnes CO2e | |
| Source: Danish Ministry of Climate, Energy and Utilities. |

Greenhouse gas emissions from the service sector include the following subsectors:

* **Retail and wholesale trade** which includes supermarkets, pharmacies and animal feed distributors.
* **Public services** which include daycare centres, schools and hospitals.
* **Private services** which include restaurants, financial institutions and data centres.
* Methane, nitrous oxide and indirect carbon emissions from leakage from e.g. gas furnaces.
* **F-gases** used for cooling and heat pumps.

CO2e emissions from retail and wholesale trade, public services and private services are due to internal transport and space heating. Emissions from space heating in the service trades occur when fossil heat sources such as gas furnaces and oil burners are used. If electricity or district heating is used, these emissions are reported in the electricity or district heating sectors (cf. chapter *23 Electricity and district heating in Klimastatus og -fremskrivning 2024*). Internal transport covers fossil fuels, e.g. for forklifts.

#### Main reasons for emissions reductions towards 2030

By 2030, emissions from service trades are estimated to be reduced by approx. 0.6 million tonnes CO2e, *see figure 2.6(40).* The majority of this reduction comes from lower space heating emissions and the use of F-gases with a lower climate impact.

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| Figure 2.6(40)  Emissions in 2022 and 2030 across subsectors in service trades, million tonnes CO2e |
| Source: Danish Ministry of Climate, Energy and Utilities. |

CSO24 estimates a total decrease in emissions from retail and wholesale trade, public services and private services of approx. 0.5 million tonnes CO2e between 2022 and 2030. This is because fossil piped gas and oil are expected to be replaced by heat pumps and biogas.

From 2022 to 2030, emissions from methane, nitrous oxide and indirect CO2 are estimated to be reduced by approx. 0.1 million tonnes CO2e as a result of phasing out fossil fuels as these emissions occur as leakage during combustion and storage.

In addition, emissions from F-gases are estimated to be reduced by less than 0.1 million tonnes CO2e which is mainly due to the *Climate Agreement for Energy and Industry etc.* from June 2020*,* which further tightens regulations and increases taxes on the use of F-gases.

Compared to CSO23, CSO24 anticipates a slight increase in estimated emissions towards 2025 due to a slower phase-out of oil. In addition, an updated projection of fuel prices has been made for CSO24. Furthermore, the revision of the EU Emissions Trading System has been implemented. From 2027, the system will have a minor effect on the total emissions from heating buildings in the new system (ETS2).

### Carbon Capture and Storage (CCS)

CCS, *"carbon capture and storage*", is a collective term for a number of technologies that can capture CO2, e.g. from cement production and waste incineration, and store it underground. No commercial-scale CCS plants have yet been built in Denmark, but since 2020, a number of political agreements have been made to promote the deployment of CCS in Denmark.

Two tenders have been organised so far:

* **The first phase of the CCUS pool** agreed in the *Climate Agreement for Energy and Industry etc.* of 22 June 2020. The funds from the first phase of the CCUS pool were awarded in May 2023 to the successful tenderer with expected operations from December 2025.
* **The NECCS pool** which was decided in the *Partial Agreement on Investments in a Continuously Greener Denmark* of 4 December 2021 as part of the 2022 Finance Act. In April 2024, a contract was signed for the NECCS pool funds which were awarded to three successful tenderers. The projects are expected to contribute carbon capture and storage from 2026.

In addition, the Green Tax Reform (GSR) pool was established in connection with the *Agreement on the Green tax reform for industry etc.* inJune 2022. With the agreement on *strengthened framework conditions for CCS in Denmark* from September 2023, the second phase of the CCUS pool and the GSR pool were combined into one CCS pool totalling DKK 26.9 billion. The new total CCS pool will be realised through two tender rounds expected to open in 2024 and 2025, respectively. The tenders will be approx. DKK 10.5 billion and DKK 16.3 billion, respectively, over a 15-year period.

CSO24 estimates that CCS will reduce Danish greenhouse gas emissions in 2030 by approx. 2.9 million tonnes CO2e. Of this, approx. 2.5 million tonnes CO2e is estimated to come from the CCS pool and the NECCS pool while the CCUS pool is expected to contribute 0.4 million tonnes CO2e*, see figure 2.6(41).* This corresponds to a reduction in Denmark's total CO2e emissions in 2030 of around 10 per cent*.* By 2035, greenhouse gas capture is estimated to decrease by approx. 2.7 million tonnes CO2e, *see figure 2.6(41).* The decrease is due to the NECCS pool funding commitment expiring in 2032.

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| Figure 2.6(41)  CCS sector contribution to carbon reductions in 2025-2035, million tonnes CO2 |
| Note: Estimated reductions of the CCUS pool are recognised in the electricity and district heating sector.  Source: Danish Ministry of Climate, Energy and Utilities. |

The first phase of the CCUS pool is expected to contribute to negative emissions of 0.4 million tonnes CO2 annually from December 2025 to 2045 in the electricity and district heating sector. Carbon capture from the CCUS pool is therefore recognised in this sector in CSO24 (cf. *chapter 23* *Electricity and district heating* and *chapter 29* *CCS* – both in *Klimastatus og -fremskrivning 2024*).

The NECCS pool is estimated to contribute 0.2 million tonnes CO2 per year from 2026-2032. From 2029, the CCS pool is expected to contribute approx. 2.3 million tonnes CO2.

As part of the Ministry of Climate, Energy and Utilities' general model and methodology development, the effect of the CCS pool has been updated based on the *Agreement on strengthened framework conditions for CCS in Denmark* from September 2023. CSO24 still estimates the pool to contribute approx. 2.3 million tonnes CO2 in 2030 and 2035, with minor deviations in the years from 2025-2029, where a lower carbon capture is estimated compared to CSO24. This is mainly due to the fact that the outcome of the NECCS tender has resulted in fewer reductions than assumed in CSO23. After 2032, more reductions are estimated in CSO24 compared to CSO23.

The NECCS pool is expected to contribute negative emissions associated with the production of oil, gas and renewable fuels. The impact of the NECCS pool and the CCS pool is not yet broken down by sector. This means that the estimated carbon capture from the pools is not included in specific sectors in CSO24 but is calculated as an impact under the CCS category. This will be revisited towards the upcoming projections as tenders are decided.

### Development in emissions up to 2035

CSO24 estimates that net greenhouse gas emissions in Denmark will be approx. 20.4 million CO2e in 2035. This corresponds to a reduction of approx. 74 per cent compared to 1990.

In 2035, the agriculture, forestry, horticulture and fisheries industries and the transport sector are estimated to continue to account for the largest shares of net emissions in Denmark, *see figure 2.6(42).* The two sectors are estimated to account for 49 and 29 per cent, respectively, of total net emissions in 2035.

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| Figure 2.6(42)  Estimated emissions in 2035 by subsector, million tonnes CO2e |
| Note: The figure does not include the partially estimated effect of diesel and road tax from the *Agreement on the partial implementation of the Green Fund* and the partially estimated effect of the transition aid from the *Agreement on the implementation of the transition aid from the Green tax reform for industry etc.*  Source: Danish Ministry of Climate, Energy and Utilities. |

The majority of the estimated reductions from 2030-2035 occur in these two sectors*, see figure 2.6(43).* This should be seen in the context of the other sectors having significantly reduced emissions towards 2030.

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| Figure 2.6(43)  Estimated emission reductions from 2030 to 2035, million tonnes CO2e |
| Note: Negative numbers indicate increased emissions. The figure does not include the partially estimated effect of diesel and road tax from the *Agreement on the partial implementation of the Green Fund* and the partially estimated effect of the transition aid from the *Agreement on the implementation of the transition aid from the Green tax reform for industry etc.*  Source: Danish Ministry of Climate, Energy and Utilities. |

The expected reductions for agriculture, forestry, horticulture and fisheriesare primarily due to increased CO2e removal in forests and harvested wood products and smaller reductions in agricultural processes and agricultural land use. CSO24 estimates the total removal in live biomass to increase from approx. 1.7 million tonnes CO2e in 2030 to approx. 2.9 million tonnes CO2e in 2035.

In the transport sector, emissions from passenger cars are expected to be significantly reduced by 2035, mainly due to continued electrification. Electric cars are estimated to make up around half of the passenger car fleet by 2035 while emissions from vans are estimated to halve compared to 2022 levels. From 2035, the *EU regulation on CO2 reduction requirements for new passenger cars and vans* sets a requirement of 100 per cent CO2 reduction for new passenger cars and vans. This requirement is, de facto, estimated to stop new sales of fossil-fuelled cars and vans from 2035.

Electrification of lorries is estimated to accelerate after 2030. A significant increase in sales of electric lorries is expected from 2029 onwards as electric lorries are expected to become more profitable.

The reduction in emissions from the waste sector is primarily due to reduced emissions from waste incineration which is estimated to fall from approx. 1.9 million tonnes CO2e in 2030 to approx. 1.5 million tonnes CO2e in 2035. From 2032, a number of waste incineration plants are expected to face reinvestments that are not deemed profitable for them to undertake. For this reason, exports of Danish waste for incineration abroad are expected from 2032. However, the profitability of opening new waste incineration capacity in Denmark from 2032 has not been estimated.

The change for CCS is due to the NECCS pool being decided and the first phase of the GSR and CCUS pools being merged into a new pool, updating the estimate for their impact. Overall, this is estimated to lead to lower removals from CCS between 2025 and 2032, primarily due to a lower estimated impact from the NECCS pool.

Across the sectors, a continued transition of the primary energy consumption is estimated to continue, particularly from oil to renewable energy sources such as wind and solar power. Specifically, energy consumption from oil is estimated to decrease from 186 PJ in 2030 to 145 PJ in 2035 while energy consumption from wind and solar energy is estimated to increase from 234 PJ to 306 PJ over the same period. This transition must be seen in the context of the continued electrification of several sectors (cf. *chapter 2.6.3 The main cross-sectoral drivers for reductions in CSO24*).

### Uncertainties and sensitivity calculations

The projection is subject to uncertainty. The further into the future the projection estimates greenhouse gas emissions and removals, the greater the uncertainty associated with the estimated impact. The uncertainty is mainly related to assumptions and estimates of external variables that are sensitive to unforeseen developments in prices, behaviour and technology as well as weather fluctuations etc.

To illustrate key uncertainties and the importance of assumptions in the projections, a number of sensitivity calculations have been performed. They are used to show how sensitive the projection (e.g. road transport emissions) is to changes in key assumptions (e.g. purchase price of electric lorries).

Across sectors, there are several general developments that contribute to emission reductions (cf. *chapter 2.6.3 The main cross-sectoral drivers for reductions in CSO24*). The uncertainties in these cross-cutting drivers of reductions thus mainly revolve around the speed and timing of the transition. This is influenced by several variables, including price differences and competition with alternative modes of transport and heating.

Each sector chapter discusses uncertainties and sensitivity calculations for the relevant sector. The main uncertainties are related to projections in the agricultural and forestry sectors, waste projections, cross-border trade in fuels as well as CCS and general uncertainties due to cyclical fluctuations.

**Agricultural processes and land use**

In general, the calculation of emissions and removals in agricultural processes and the LULUCF sector is estimated to be more uncertain than for most other sectors in CSO24. This is partly because these are complex biological processes that are difficult to quantify.

DCE estimates that there is an overall uncertainty of approx. ±44 per cent for the historical calculation of emissions from agricultural processes while the uncertainty in the projection must be considered significantly higher as a number of variables are difficult to predict. For land, the uncertainties are also very high for both mineral soils and carbon-rich soils as carbon pool changes depend on many uncertain variables.

There is generally low uncertainty for activity data in the emission inventory due to high data collection, primarily by the Danish Agricultural Agency. Uncertainty in the projection is particularly related to emission factors and the models behind the emission calculations. Continuously updating and improving methods can therefore contribute to the figures changing.

*Carbon-rich soil*

In 2020, a research project on an improved emissions inventory for carbon-rich land was initiated. As part of the project, DCA has prepared the new mapping of carbon-rich land, which is incorporated in CSO24. In addition, GEUS has mapped the water level on cultivated, carbon-rich agricultural land. The final new model is still awaited. It includes updated emission factors and the inclusion of the influence of the water level. The new model for emissions from Danish carbon-rich land is expected to be incorporated into CSO25.

The calculations of emissions from carbon-rich soil in CSO24 involve uncertainty about the level of emissions from carbon-rich soils with different organic carbon content. GEUS' water level mapping shows that some of the areas are less drained than previously assumed. DCE states that it is not yet possible to say whether emissions from carbon-rich soil will be higher or lower with the upcoming calculation model as opposing impacts are expected from various subprojects.

There is also general uncertainty as to when the effect of carbon-rich agricultural land set aside will materialise. Among other things, it is uncertain how long it will take from the time of the allocation until land is actually set aside and wetted. For CSO24, an assumption is made that it takes an average of five years from the allocation of funds until the effect is realised. This is based on experience from the Danish Agricultural Agency, the Danish Environmental Protection Agency and the Danish Nature Agency. This assumption has been adjusted since CSO23 in which the assumption was three years from the allocation to effect. The land set aside, including the distribution over the years, is therefore subject to great uncertainty.

**Forest projection**

Basically, the calculation and projection of emissions and removals from forests and harvested wood products as a whole is considered to be associated with greater uncertainty than for most other sectors. The reason is that annual net emissions and removals are a result of small changes in large carbon pools.

Specifically, IGN estimates an annual uncertainty of approx. 1.5 million tonnes CO2e in historical forest emissions and removals in live biomass. In addition, there are major uncertainties concerning emissions from forest soils. The uncertainties associated with the projection of emissions up to 2035 from forest biomass and soils are expected to be significantly higher.

IGN expects that the new forest projection model will, all things being equal, reduce the uncertainty associated with predicting the amount of tree growth and felling that will take place each year. The actual management of the forest area in the coming years depends on many factors besides the age of the trees, e.g. economy, prices and demand.

The development of the forest carbon pool is therefore subject to considerable uncertainty, and shifts in harvesting could affect the actual process in the years to come. Forest statistics used as a basis for the projection are based on data collected in the period 2018-2022. It is therefore possible that trees that are expected to be felled in the projection have already been felled. Thus, it is possible that some of the reduction in the CO2e removal in the next five-year period of the projection has already been realised.

**Waste**

The projection of emissions in the waste sector is based on a number of estimates and assumptions, including the Ministry of the Environment's projections of waste suitable for incineration, energy prices, foreign willingness to pay etc. The sector is also expected to undergo a number of radical changes, including exposure to competition and new tax rates from the *Agreement on the Green tax reform for industry etc.*

Sensitivities have been prepared for Danish waste volumes for incineration and for import/export prices of waste suitable for incineration which, however, only show limited sensitivity (cf. *chapter 25 Waste incineration* in *Klimastatus og -fremskrivning 2024*).

The estimates for Danish waste volumes for incineration affect the projected emissions. The estimate affects both the profitability of the incineration plants and direct emissions through the fossil content. The projections are based on a number of assumptions for e.g. waste generation, sorting, recycling options etc. The Danish Environmental Protection Agency's projection model is still undergoing technical development which may lead to changes in the projection results in the future.

All things being equal, higher volumes of Danish waste than anticipated in CSO24 will lead to higher emissions. The reason is that Danish waste is assumed to be more profitable than importing waste due to lower transport costs. Therefore, an increase in Danish waste volumes will result in more Danish waste incineration plants becoming profitable, thereby maintaining more capacity. Conversely, a lower volume of Danish waste than anticipated in CSO24 will, all things being equal, lead to fewer emissions. This is also because the smaller volume of Danish waste will generally make the sector less profitable, resulting in capacity closing as early as 2025. However, from 2030 onwards, capacity is estimated to gradually decrease, even if waste volumes are higher than anticipated in CSO24, as a number of plants are facing reinvestments and are therefore expected to close (cf. *chapter 25 Waste incineration* in *Klimastatus og -fremskrivning 2024*).

**Cross-border trade in the transport sector**

The estimated emissions associated with cross-border fuel trade are subject to uncertainty. The projection is based on estimated differences in fuel prices in Denmark and neighbouring countries. This has an impact on the estimate of where it is considered most profitable to fill up diesel and, to some extent, petrol. Cross-border fuel trade is particularly sensitive to the price of diesel as lorry transport largely occurs across national borders. Based on current price differences and future price differences with current regulation, large fluctuations in cross-border trade are estimated.

There is particular uncertainty surrounding Sweden's abolition of their national CO2e displacement requirement from 2027 as it remains to be seen whether Sweden will introduce an alternative regulation for road transport and, if so, what that regulation would be. In general, there is uncertainty when making assumptions about regulation abroad.

**CCS**

Estimates for the effect of the CCS pool are subject to uncertainty. Uncertainties include costs and potential as well as the specific construction dates and the timing of the CCS value chain establishment and capacity adaptation. In addition, there is uncertainty concerning how the pool will be implemented and concerning the design of the specific terms of tender.

The NECCS pool was settled in April 2024 with a total capture from 2026 and runs over an 8-year funding period. The anticipated capture from the first tender has been adjusted downwards compared to previous estimates which is mainly due to the commissioning requirement from 2026. It is not expected that the carbon capture in future tenders is overestimated due to tender framework terms. The NECCS tender has an 8-year funding period and a short deadline from enrolment to carbon capture. The expectation for the upcoming tender of the CCS pool is maintained, partly because tender terms offer a longer 15-year contract period and later commissioning requirements from 2029.

**Uncertainties** **about cyclical fluctuations and prices**

*Manufacturing industry and building and construction*

Future growth in the manufacturing industry and the building and construction sector is subject to uncertainty, especially in individual years, partly because activity is sensitive to cyclical fluctuations. After the financial crisis, significant decreases in energy consumption, emissions and growth were observed in this sector. Any future cyclical fluctuations are expected to have a significant impact on sectoral emissions in individual years.

*Production of oil, gas and renewable fuels*

The long-term investment and maintenance of oil and gas extraction is largely driven by the price of crude oil which has historically fluctuated significantly due to changes in the international market.

For refineries, the introduction of the carbon tax, see the *Agreement on the Green tax reform for industry etc.*, is estimated to result in a structural production decline of approx. 4 per cent in 2023, increasing to approx. 29 per cent in 2029 (cf. *chapter 24 Production of oil, gas and renewable fuels* in *Klimastatus og -fremskrivning 2024*). The structural effects for refineries may also reflect the likelihood of production closing at one or both refineries. The effect is recognised as a decrease in refinery activity, but the structural effects for refineries may reflect a probability of production closure. Emissions may therefore be higher or lower in case of continued production or closure, respectively, at one or both refineries.

1. *CSO24: Klimastatus og –fremskrivning 2024*, Ministry of Climate, Energy and Utilities, April 2024 (draft) / July 2024 (final) (<https://www.kefm.dk/klima/klimastatus-og-fremskrivning> ) [↑](#footnote-ref-1)
2. *Nielsen et al. (2024b):* Projection of greenhouse gases 2023-2040. Nielsen, O.-K., Plejdrup, M.S., Winther, M., Hjelgaard, K., Nielsen, M., Mikkelsen, M.H., Albrektsen, R., Andersen, T.A, Callisen, L.W. , Gyldenkærne, S., & Levin, G. 2024. Projection of greenhouse gases 2023-2040. Aarhus University, DCE – Danish Centre for Environment and Energy, 150 pp. Scientific Report No. 610. (<https://dce.au.dk/fileadmin/dce.au.dk/Udgivelser/Videnskabelige_rapporter_600-699/SR610.pdf> ) [↑](#footnote-ref-2)