Department for Energy Security & Net Zero

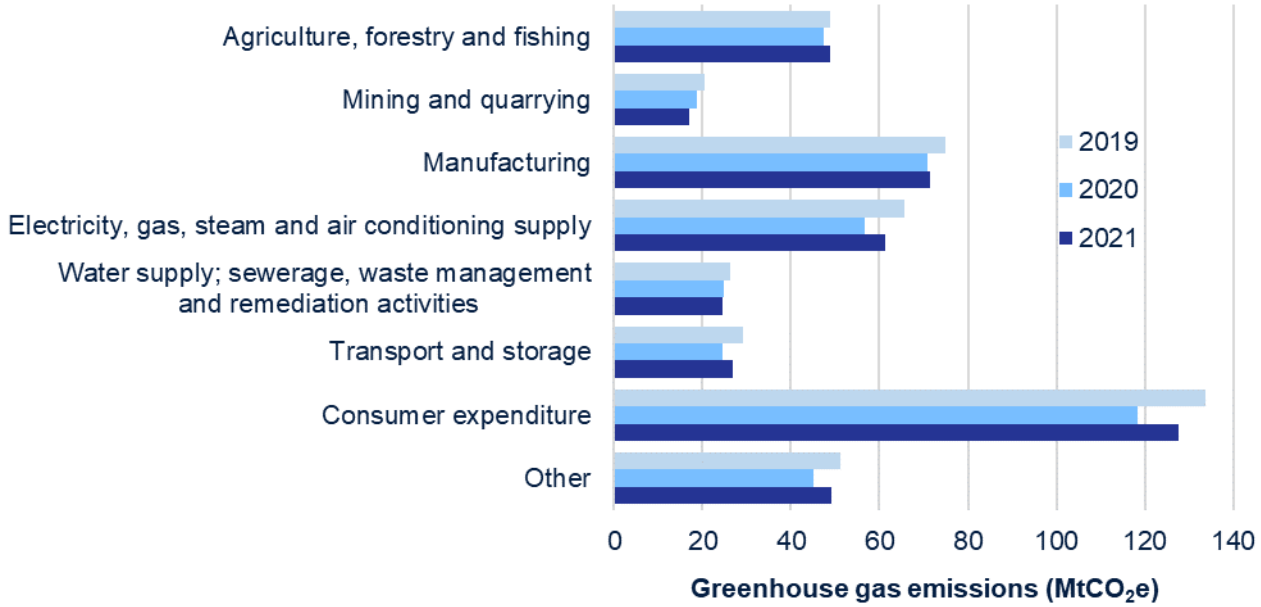
Annex 2: 2021 UK Greenhouse Gas Emissions, by Standard Industrial Classification

29 June 2023 **National Statistics**

This publication is an extension of the final UK territorial greenhouse gas emission estimates by source for 1990-2021 published in February 2023. It provides the latest estimates of 1990-2021 greenhouse gas emissions in the UK by Standard Industrial Classification (SIC).

- Manufacturing was the largest emitting SIC section at an estimated 71.4 million tonnes of carbon dioxide equivalent ($MtCO_2e$) in 2021, followed by 'electricity, gas, steam and air conditioning supply' with 61.4 $MtCO_2e$, equating to 16.7% and 14.4% respectively of all emissions in the UK in 2021.
- Between 2020 and 2021, most SIC sections saw an increase in emissions, largely due to COVID-19 restrictions easing and colder temperatures increasing the use of heating in buildings. The SIC section with the largest absolute increase in total emissions was 'Electricity, gas, steam and air conditioning supply', which increased by 4.6 $MtCO_2e$ (8.2%), largely due to increased demand for electricity and an increase in the use of fossil fuels for electricity generation, although it was still 6.5% lower than in 2019.
- Two SIC sections saw a decrease in emissions in 2021, with 'mining and quarrying' having the larger decrease of 10.6% (2.0 $MtCO_2e$) while 'water supply; sewerage, waste management and remediation activities' decreased by 0.6% (0.2 $MtCO_2e$).
- 29.9% of 2021 emissions (127.6 $MtCO_2e$) are captured by 'consumer expenditure', a non-SIC section which captures emissions associated with households and personal travel, as opposed to business activity. This total increased by 7.8% (9.2 $MtCO_2e$) in 2021, although it was still 4.6% (6.1 $MtCO_2e$) lower than in 2019.

Figure 1: Territorial greenhouse gas emissions by Standard Industrial Classification section, UK 2019 to 2021



Source: Table 8.1, Final UK greenhouse gas emissions national statistics 1990-2021 Excel data tables

Responsible statistician: Christopher Waite **Email: GreenhouseGas.Statistics@beis.gov.uk**
Media enquiries: 020 7215 1000 **Public enquiries: 07824 416228** **Next publication: June 2024**

Introduction

This publication is an extension of the final UK territorial greenhouse gas emission estimates by source for 1990-2021 published in February 2023. It provides the latest estimates of 1990-2021 greenhouse gas emissions in the UK by Standard Industrial Classification (SIC), which are presented in carbon dioxide equivalent units throughout this statistical release. Million tonnes of carbon dioxide equivalent ($MtCO_2e$) is used within this report to provide consistency and comparability with the report from the main part of this publication, whilst figures are presented in thousand tonnes of carbon dioxide equivalent ($ktCO_2e$) in the accompanying data tables so that smaller figures can more easily be distinguished from zeros. The COVID-19 pandemic and the subsequent restrictions that were in place in 2020 and 2021 across the UK had a significant impact on greenhouse gas emissions in the UK, affecting different industries in different ways.

The Standard Industrial Classification is used to classify business and activities to the relevant industries and includes a hierarchy of SIC codes to represent subsections of various industries. Using this system allows this publication to report greenhouse gas emissions against their relevant industry rather than their whole-economy sector, as is seen in the estimates by National Communication sector that were published in February 2023. Emissions from a particular industry can vary over time due to a number of factors, including expansions and contractions in that industry as well as changes in practices. The total emissions presented here are consistent with the data published in February by source sector.

In the data tables accompanying this report, tables 8.1 to 8.8 present emissions by SIC section and group overall and for each gas, while table 8.9 shows how the emissions in each SIC group break down into National Communication sectors. All the figures in this report and in tables 8.1-8.9 present estimates of the different greenhouse gases using the global warming potentials from Working Group 1 of the IPCC Fifth Assessment Report: Climate Change 2014.

Note that as part of this release the 1990-2020 emissions figures have been revised since the previous publication of territorial emissions by SIC in June 2022, to incorporate methodological improvements and new data. So the estimates presented here supersede previous ones.

2021 greenhouse gas emissions by SIC section

In 2021, 16.7% of the UK's territorial greenhouse gas emissions were from the manufacturing industry, with emissions of 71.4 $MtCO_2e$. This was the largest of any of the industry sections presented in these statistics and has been since 2018. The electricity, gas, steam and air conditioning supply section had emissions of 61.4 $MtCO_2e$ (14.4% of the UK total) and the ‘agriculture, forestry and fishing’ section 48.8 $MtCO_2e$ (11.5%).

Greenhouse gas emissions increased 5.0% from 2020 to 2021, largely due to COVID-19 restrictions easing and colder temperatures increasing the use of heating in buildings, though were still 5.3% lower than in 2019, the most recent pre-pandemic year. Consequently, all but

two SIC sections saw emissions increase between 2020 and 2021, but all but two SIC sections still had lower emissions in 2021 than they did in 2019. The largest absolute rise in emissions in 2021 from 2020, excluding 'consumer expenditure', was from electricity, gas, steam and air conditioning supply, increasing by 4.6 $MtCO_2e$ (8.2%). Emissions from 'transport and storage' increased by 2.3 $MtCO_2e$ (9.5%), following a large fall of 4.7 $MtCO_2e$ (16.2%) between 2019 and 2020 when COVID-19 restrictions were introduced.

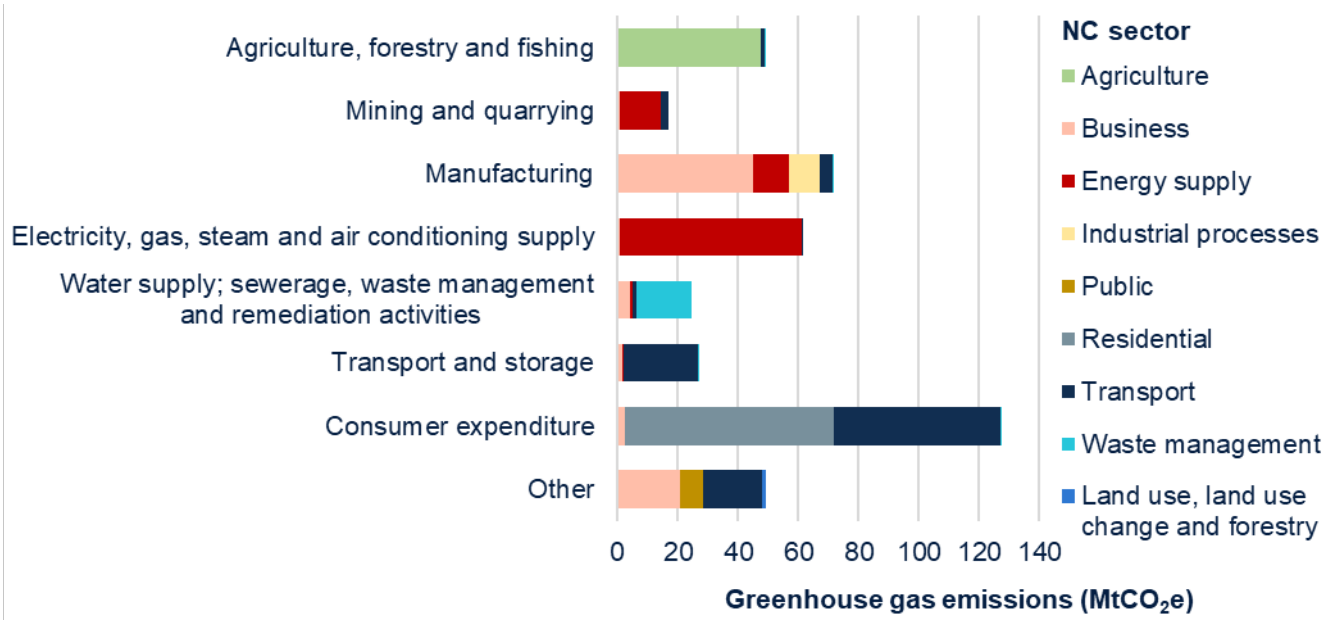
The two SIC sections that saw a decrease in emissions between 2020 and 2021 were 'mining and quarrying', which saw a fall of 2.0 $MtCO_2e$ (10.6%), and 'water supply; sewerage, waste management and remediation activities', which decreased by 0.2 $MtCO_2e$ (0.6%). The two SIC sections for which emissions were higher in 2021 than in 2019 were 'human health and social work activities', which was 0.5 $MtCO_2e$ (10.1%) higher, and construction, which was 0.03 $MtCO_2e$ (0.3%) higher.

In 2021, consumer expenditure emissions increased 9.2 $MtCO_2e$ (7.8%) to 127.6 $MtCO_2e$ compared to 2020, representing 29.9% of all greenhouse gas emissions in the UK. Private travel, largely road transport, accounted for 56.3 $MtCO_2e$ (44.1%) of the 2021 consumer expenditure emissions total, with the rest almost entirely resulting from the combustion of fuels in homes, in particular from gas boilers used for heating. The level of greenhouse gas emissions from private travel increased by 9.5% from 2020 to 2021 as COVID-19 restrictions were eased and people were able to travel more freely, although this was still 15.0% lower than in 2019, while emissions from non-travel increased by 6.4% from 2020 to 2021, with the colder temperatures in 2021 likely to be the main factor, resulting in more energy being used to heat homes.

Figure 2 shows which National Communication (NC) sectors the emissions in each SIC section fall into. The emissions from some NC sectors, such as agriculture, industrial processes and waste management, fall entirely or almost entirely within one SIC section, while emissions from others, such as business and transport, are spread across a large range of SIC sections.

When emissions are considered on an NC sector basis, the largest sector in recent years is transport, which was responsible for 25.7% of UK emissions in 2021 (109.5 $MtCO_2e$). Around half (50.8%) of these transport emissions in 2021 were from households, predominantly from the private use of cars. The largest SIC industry section was transport and storage (section H), which was responsible for 22.7% of UK transport emissions in 2021, with the remaining 26.4% of transport emissions split across other industry sections.

Figure 2: Territorial greenhouse gas emissions by Standard Industrial Classification section and NC sector, UK 2021



Source: Table 8.9, Final UK greenhouse gas emissions national statistics 1990-2021 Excel data tables

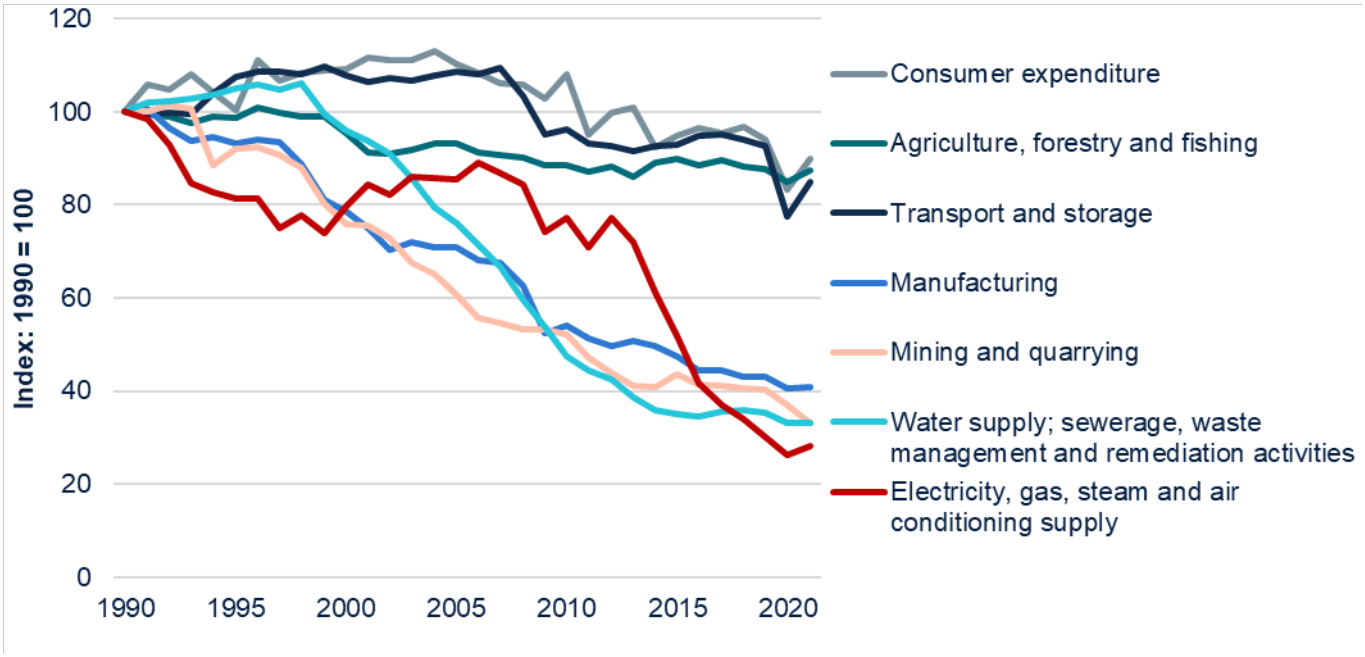
1990-2021 greenhouse gas emissions by SIC section

The overall reduction in territorial greenhouse gas emissions in the UK from 1990 to 2021 was 47.6% (386.9 $MtCO_2e$), with the largest contributor being a 71.7% (155.8 $MtCO_2e$) fall in emissions from the 'electricity, gas, steam and air conditioning supply' section, due largely to a switch from the use of coal in electricity production to other more efficient fuels such as natural gas and more recently renewable sources.

Emissions from the manufacturing section fell by 102.8 $MtCO_2e$ (59.0%) between 1990 and 2021. The most significant reduction in manufacturing was a 37.6 $MtCO_2e$ (88.9%) fall in the manufacture of petrochemicals, followed by a fall of 13.8 $MtCO_2e$ (55.8%) in emissions from the manufacture of basic iron & steel.

There was a 66.9% (49.7 $MtCO_2e$) fall in emissions from the 'water supply; sewerage, waste management and remediation activities' industry section between 1990 and 2021. This was due to a combination of factors, including improvements in the standards of landfilling, changes to the types of waste going to landfill (such as reducing the amount of biodegradable waste), and an increase in the amount of landfill gas being used for energy. In 2021 it was responsible for about 5.8% of UK emissions (24.5 $MtCO_2e$).

Figure 3: Trend in territorial greenhouse gas emissions for selected Standard Industrial Classification sections, UK 1990 to 2021



Source: Table 8.1, Final UK greenhouse gas emissions national statistics 1990-2021 Excel data tables

Five of the twenty industry sections have seen increases in greenhouse gas emissions since 1990. This includes emissions from the construction industry, which increased by 59.3% (3.4 $MtCO_2e$) to 9.2 $MtCO_2e$ in 2021. Emissions from the 'wholesale and retail trade (including the repair of motor vehicles and motorcycles)' increased by 20.3% (2.4 $MtCO_2e$) between 1990 and 2021 to 14.5 $MtCO_2e$. This was due to an increase in emissions from the retail sector, driven by increased emissions from the use of refrigeration and air conditioning systems which use HFCs.

Consumer expenditure greenhouse gas emissions fell by 10.1% (14.4 $MtCO_2e$) between 1990 and 2021. Within that, private travel emissions had increased by 10.0% (6.0 $MtCO_2e$) from 1990 to 2019, however, following a large reduction due to the COVID-19 pandemic and resulting restrictions they were down 6.5% in 2021 compared to 1990. Non-travel emissions tend to fluctuate from year to year depending on the temperature, as households consume more or less energy depending on the weather, but they have seen a gradual fall over time and were 12.8% (10.5 $MtCO_2e$) lower in 2021 than in 1990.

Accompanying tables

The following tables are available in Excel and ODS format on the department's statistics website.

Table 8.1	Estimated territorial greenhouse gas emissions by industry section and group, UK 1990-2021
Table 8.2	Estimated territorial emissions of carbon dioxide (CO_2) by industry section and group, UK 1990-2021
Table 8.3	Estimated territorial emissions of methane (CH_4) by industry section and group, UK 1990-2021
Table 8.4	Estimated territorial emissions of nitrous oxide (N_2O) by industry section and group, UK 1990-2021
Table 8.5	Estimated territorial emissions of hydrofluorocarbons (HFCs) by industry section and group, UK 1990-2021
Table 8.6	Estimated territorial emissions of perfluorocarbons (PFCs) by industry section and group, UK 1990-2021
Table 8.7	Estimated territorial emissions of sulphur hexafluoride (SF_6) by industry section and group, UK 1990-2021
Table 8.8	Estimated territorial emissions of nitrogen trifluoride (NF_3) by industry section and group, UK 1990-2021
Table 8.9	Estimated territorial greenhouse gas emissions by industry section, group and National Communication sector, UK 1990-2021

Technical information

These estimates have been produced by Ricardo Energy and Environment based on the territorial greenhouse gas emission estimates in the National Atmospheric Emissions Inventory (NAEI), which is maintained by Ricardo Energy and Environment on behalf of the Department for Energy Security and Net Zero. They are consistent with the estimates of emissions by Standard Industrial Classification (SIC) groups published by the Office for National Statistics (ONS) in the UK's Environmental Accounts, other than that the ONS estimates are presented on a "residency" basis whereas these statistics are on a "territorial" basis.

The greenhouse gas emission estimates in the NAEI are primarily calculated from a combination of activity data and emission factors. The methodology is outlined and explained in the final 2021 UK greenhouse gas emissions estimates statistical release that this annex accompanies.

These emissions have then been allocated to industry sectors based on the Standard Industrial Classification (SIC) 2007. A mapping procedure is required to make a link between the source categories in the NAEI and the SIC 2007 groups. The definitions are such that many of the NAEI sources can be mapped directly to a SIC 2007 group through many-to-one relationships, where one or more NAEI sources are judged as being equivalent to or contained within a single SIC 2007 group. In some other cases NAEI sources can be linked to several SIC 2007 codes through one-to-many relationships, and here the “activity” and consequent emissions from that source have to be split to each of the relevant SIC 2007 codes either directly according to their proportionate level of activity, or indirectly.

Further details can be found in the ONS Environmental Accounts quality and methodology information here:
https://www.ons.gov.uk/economy/environmentalaccounts/methodologies/environmentalaccountsonairemissionsqmi

These estimates are on a "territorial" basis, meaning they show emissions within the UK's borders. Similar estimates are also published on a "residency" basis by the Office for National Statistics, as part of the UK Environmental Accounts. These are known as the air emissions accounts. Emissions on a residency basis include emissions that UK residents and UK-registered businesses are directly responsible for, whether in the UK or overseas, but exclude emissions from foreign visitors and businesses in the UK. The methodology used to allocate the territorial emissions to SIC (in this publication) and residency emissions are the same, although the scope will be different.

An explanation of the different measures of greenhouse gas emissions in the UK can be found on the 'Measuring UK greenhouse gas emissions' page on the government's Climate Change Portal.

Bridging tables are available from ONS that clearly explain the differences between the reporting used for the ONS Environmental Accounts, used to fulfil the UK's UN System of Environmental-Economic Accounting (SEEA) reporting requirements for Eurostat, and the territorial estimates published by BEIS and used to fulfil the UK's international UNFCCC reporting requirements:
https://www.ons.gov.uk/economy/environmentalaccounts/datasets/ukenvironmentalaccountsatmosphericemissionsbridgingtables

Estimates of emissions have an inherent uncertainty due to uncertainty in the underlying data used for the inventory and due to uncertainty in the applicability, completeness and application of that data. Estimates of the uncertainty in the emissions estimates by gas and by sector are shown in tables 4.1 and 4.2 in the main set of Excel tables in the final 2021 UK greenhouse gas emissions statistics. In addition, there are further uncertainties in these estimates by SIC group due to the allocation of the emissions estimates to industry groups, which in some cases has needed to be modelled using other datasets. Further details are published by ONS in its methodology information:
https://www.ons.gov.uk/economy/environmentalaccounts/methodologies/environmentalaccountsonairemissionsqmi#methods-used-to-produce-the-air-emissions-data

Further information

Future updates to these statistics

In February 2024 final 1990-2022 UK greenhouse gas emissions estimates will be published by source sector.

In March 2024 the 1990-2022 UK emissions estimates will be updated to include estimates by end user and uncertainty estimates, and provisional 2023 emissions estimates will be published.

In June 2024 the 1990-2022 UK emissions estimates will be updated to include estimates by Standard Industrial Classification (SIC). We will also publish estimates of greenhouse gas emissions by local authority for 2022.

Contact

- Responsible statistician: Christopher Waite
- Email: GreenhouseGas.Statistics@beis.gov.uk
- Media enquiries: 020 7215 1000
- Public enquiries: 07824 416228

This publication is available from: https://www.gov.uk/government/collections/uk-territorial-greenhouse-gas-emissions-national-statistics

If you need a version of this document in a more accessible format, please email GreenhouseGas.Statistics@beis.gov.uk. Please tell us what format you need. It will help us if you say what assistive technology you use.