National Atmospheric Emissions Inventory



# AIR POLLUTANT INVENTORIES FOR ENGLAND, SCOTLAND, WALES AND NORTHERN IRELAND: 2005-2024

Report for: the Department of Environment, Food and Rural Affairs, The Scottish Government, The Welsh Government and The Northern Ireland Department for Agriculture, Environment and Rural Affairs

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Department for Environment, Food & Rural Affairs

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wsp

UK Centre for Ecology & Hydrology

Forest Research

Aether

Gluckman Consulting
specialists in refrigeration and climate change

ADAS

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## Contact:
**Science policy enquiries** should be directed to:
Jen Cottingham,
Emissions Science,
Air Quality and Industrial Emissions, Environmental Quality,
Department for Environment, Food and Rural Affairs,
Seacole Building, 2 Marsham Street, London, SW1P 4DF,
UK.
aqie.correspondence@defra.gov.uk

**Technical enquiries** should be directed to:
Roxy Cottey
Aether Ltd
Blue Boar Court, 9 Alfred Street, Oxford,
OX1 4EH
roxy.cottey@aether-uk.com

## Author:
Mitchell J, Cottey R, Batchelor A, Bennett L, Bert N, Blannin L, Miles J, Putman S, Shams F, Sidhu N (Aether), Richmond B, Willis D (WSP)

## With Contributions from:

Elliott M, Ingledew D, Barber R, Del Vento S, Gorji S, Hows S, Kelsall A, MacCarthy J, Marshall, O, Pang Y, Passant N, Rose R, Stewart R, Thistlethwaite G, Tsagatakis I, Wakeling D, Wiltshire J, Wong J (WSP), Anthony S (ADAS) Carswell, A, Cardenas, L, Gilhespy, S (Rothamsted Research), Sanders D (Cranfield University), Dragosits U, Tomlinson S (UKCEH)

## Approved by:
Hampshire, K.

## Date:
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# ABBREVIATIONS

| Abbreviation | Definition |
|---|---|
| AIS | Automatic Identification System |
| AQEG | Air Quality Expert Group |
| AQS | Air Quality Strategy |
| $NH_3$ | Ammonia |
| B[a]P | Benzo[a]pyrene |
| BAT | Best Available Techniques |
| BATC | Best Available Techniques Conclusion |
| BOFA | Boosted Over Fire Air |
| CAA | Civil Aviation Authority |
| CO | Carbon Monoxide |
| CCGT | Combined Cycle Gas Turbine |
| CLRTAP | Convention on Long-Range Transboundary Air Pollution |
| COMEAP | Committee on the Medical Effects of Air Pollutants |
| DAERA | Department of Agriculture, Environment and Rural Affairs of Northern Ireland |
| DEC | Display Energy Certificates |
| Defra | Department for Environment, Food and Rural Affairs |
| DERV | Diesel engine road vehicle |
| DESNZ | Department for Energy Security and Net Zero |
| DfT | Department for Transport |
| DFPNI | Department of Finance and Personnel, Northern Ireland |
| DG | Devolved Governments |
| DRD | Northern Ireland Department for Regional Development |
| DUKES | Digest of UK Energy Statistics |
| DVLA | Driver and Vehicle Licensing Agency |
| EEA | European Environment Agency |
| EEMS | Environmental and Emissions Monitoring System |
| EFDSF | Emission Factors for Domestic Solid Fuels |
| EMEP | European Monitoring and Evaluation Programme |
| EPC | Energy Performance Certificates |
| EPR | Environmental Permitting Regulations |
| E-PRTR | European Pollutant Release and Transfer Register |
| ERC | Emission Reduction Commitments |
| ETS (UK) | Emissions Trading Scheme (United Kingdom) |
| ETS (EU) | Emissions Trading System (European Union) |
| EU | European Union |
| FGD | Flue-gas desulphurization |
| GHG | Greenhouse Gas |
| GDP | Gross Domestic Product |
| GVA | Gross Value Added |
| HCB | Hexachlorobenzene |
| Hg | Mercury |
| I-TEQ | International Toxic Equivalents |
| IDBR | Inter-Departmental Business Register |
| IED | Industrial Emissions Directive |
| IE | Included Elsewhere |
| IIR | Informative Inventory Report |
| IMO | International Maritime Organisation |
| IPCC | Intergovernmental Panel on Climate Change |
| IPPC | Integrated Pollution Prevention and Control |
| ISSB | Iron and Steel Statistics Bureau |
| LDV/LGV | Light duty vehicles/ light goods vehicles |
| LOSP | Light Organic Solvent Preserved Timber |
| LA | Local Authority |
| MMO | Marine Management Organisation |
| MSW | Municipal solid waste |
| MPA | Mineral Products Association |

| | |
|---|---|
| NAEI | National Atmospheric Emissions Inventory |
| NECR | National Emissions Ceiling Regulations |
| NFR | Nomenclature for Reporting |
| NHS | National Health Service |
| NIEA | Northern Ireland Environment Agency |
| NIP | National Improvement Plan |
| NIPI | Northern Ireland Pollution Inventory |
| NMVOC | Non-methane volatile organic compounds |
| $NO_X$ | Nitrogen oxides |
| NRMM | Non-road Mobile Machinery |
| NRW | Natural Resources Wales |
| ONS | Office for National Statistics |
| OCGT | Open Cycle Gas Turbines |
| OPRED | Offshore Petroleum Regulator for Environment and Decommissioning |
| PAHs | Polycyclic Aromatic Hydrocarbons |
| Pb | Lead |
| PCDD/Fs | Dioxins and furans [polychlorobenzodioxins (PCDDs) and polychlorodibenzofurans (PCDFs)] |
| PCP | Pentachlorophenol |
| PI | Pollution Inventory |
| $PM_{2.5}$ | Particulate matter less than 2.5 micrometres |
| $PM_{10}$ | Particulate matter less than 10 micrometres |
| PPC | Pollution, Prevention and Control Regulations |
| POPs | Persistent Organic Pollutants |
| PRODCOM | UK Manufacturers' Sales by Product |
| PRTR | Pollutant Release and Transfer Register |
| REM | Rail Emissions Model |
| RIDB | Regulator Inventory Database |
| SEPA | Scottish Environment Protection Agency |
| $SO_2$ | Sulphur dioxide |
| SPRI | Scottish Pollutant Release Inventory |
| SSF | Smokeless Solid Fuels |
| UK | United Kingdom |
| UKCEH | United Kingdom Centre for Ecology and Hydrology |
| UNECE | United Nations Economic Commission for Europe |
| Vkm | Vehicle kilometres |
| WEI | Welsh Emissions Inventory |
| WHO | World Health Organization |
| WID | Waste Incineration Directive |

# 1. INTRODUCTION

This report presents air pollutant emissions inventories for England, Scotland, Wales, and Northern Ireland (collectively England and the Devolved Governments), for the period 2005 to 2024 for the following priority pollutants:

- Ammonia ($NH_3$)
- Carbon monoxide (CO)
- Nitrogen oxides ($NO_X$ as $NO_2$)
- Non-methane volatile organic compounds (NMVOCs)
- Particulate matter less than 10 micrometres ($PM_{10}$)
- Particulate matter less than 2.5 micrometres ($PM_{2.5}$)
- Sulphur dioxide ($SO_2$)
- Lead (Pb)

The inventories data are presented as Pivot Tables, and can be found on the NAEI website here: https://naei.energysecurity.gov.uk/reports/air-pollutant-inventories-england-scotland-wales-and-northern-ireland-2005-2024

These inventories are compiled on behalf of the UK Department for Environment, Food & Rural Affairs (Defra), the Scottish Government, the Welsh Government and the Department of Agriculture, Environment and Rural Affairs (DAERA) for Northern Ireland, by the Inventory Agency, a WSP-led consortium including Aether and the UK Centre for Ecology & Hydrology (UKCEH). The agriculture inventory is prepared by ADAS, and includes Rothamsted Research and Cranfield University.

In addition to the above suite of air pollutants, for which source data and inventory methods are well-established, experimental inventory statistics are presented in **Appendix C** for emissions of (i) benzo[a]pyrene (B[a]P), (ii) dioxins and furans (PCDD/Fs), and (iii) mercury (Hg). These are priority toxic pollutants, for which emission estimates are within the scope of UK inventory submissions under the Convention on Long-Range Transboundary Air Pollution (CLRTAP). The data quality at the sub-national level is such that the B[a]P, PCDD/F and Hg inventory data should be regarded as experimental statistics only. Further work is needed to improve the quality of England and the Devolved Governments' estimates across the time series; see **Appendix C** for further details.

## 1.1 BACKGROUND TO INVENTORY DEVELOPMENT

The development of air pollutant inventories (API) for England and each of the Devolved Government (DGs), hereafter referred to as the 'DG inventories', has been commissioned by Defra to better inform policymakers within the DGs.

Provision of DG-level datasets and subsequent identification of key sources at more regional and local levels is crucial for the prioritisation of local action and to highlight the potential impacts of specific policies and measures. The time series of air pollutant emissions provides an insight into the effects of environmental policies and may help identify where policies could be pursued to achieve both Air Quality and Greenhouse Gas policy goals.

Further information on the background of the inventory development can be found **Appendix A.**

## 1.2 ABOUT THE AIR POLLUTANTS

Each of the priority air pollutants for which DG inventories are calculated is briefly described below. Further information can be found on the NAEI website: https://naei.energysecurity.gov.uk/air-pollutants, which includes an overview of the health impacts of these pollutants.

- **Ammonia ($NH_3$)** emissions play a key role in several different environmental issues, including acidification, eutrophication, and changes in biodiversity. The atmospheric chemistry of $NH_3$ and ammonium ($NH_4^+$) is such that the transport of the pollutants can vary greatly. As a result, $NH_3$ emissions can both exert impacts on a highly localised level and contribute to the effects

of long-range pollutant transport. Agriculture is the most important source of $NH_3$ within the UK, contributing to the majority of emissions across the time series. Emission estimates for non-agricultural sources are often uncertain since $NH_3$ tends to originate from diffuse sources (i.e. wide geographical spread and large variety of emission sources), leading to a lack of activity and emission factor data.

- **Carbon monoxide (CO)** arises primarily from incomplete fuel combustion and industrial processes. CO is of concern mainly due to its toxicity and its role in tropospheric ozone formation. In terms of human health, CO combines with haemoglobin in the blood, decreasing the uptake of oxygen by the lungs, with symptoms varying from nausea to asphyxiation depending upon the level of exposure.
- **Nitrogen oxides ($NO_X$)** emissions arise primarily from combustion sources. Estimating these emissions is complex since the nitrogen can be derived either from the nitrogen contained within fuels or through the oxidation of atmospheric nitrogen at the high temperatures associated with combustion engines. The emissions rate depends on combustion conditions, particularly temperature and the relative proportions of air-fuel in a combustion chamber, which can vary considerably. Thus, combustion conditions, engine load, and state of engine maintenance are important. Studies into the effects of exposure on human health suggest $NO_X$ exacerbates respiratory illnesses and cardiovascular disease; however, due to $NO_X$ often being co-emitted with several other pollutants, the quantification of health impacts from $NO_X$ alone is complex (COMEAP, 2018).
- **Non-methane volatile organic compounds (NMVOCs)** are emitted to air from various sources across many industrial sectors, transport, agriculture, and the residential sector. They are emitted primarily as combustion by-products, as vapour arising from the transfer, storage and handling or use of petroleum distillates, solvent or chemical use. The solvent use sector comprises industrial and domestic solvent applications (such as cleaning, degreasing) and the manufacturing and processing of chemical products. NMVOCs are involved in the photochemical production of ozone and the formation of secondary aerosols in the atmosphere over a large spatial scale. However, the exact reactivity is dependent on the particular compound in question. Some NMVOCs also directly impact human health: benzenes and 1,3-butadiene are both carcinogens, for example.
- **Particulate matter (PM)** is a general term describing the size distribution of the solid and liquid particles emitted to air. PM is categorised into different size fractions: $PM_{10}$ refers to particles with an aerodynamic diameter of fewer than 10 micrometres, whilst $PM_{2.5}$ refers to particles with an aerodynamic diameter of fewer than 2.5 micrometres. In general, PM in the atmosphere arises from primary and secondary sources. Primary sources are direct emissions of PM into the atmosphere. They arise from a wide range of sources such as fuel combustion and mechanical break-up in, for example, quarrying and construction sites. PM may be formed in the atmosphere through reactions of other pollutants such as $SO_2$, $NO_X$ and $NH_3$ to form solid sulphates and nitrates, as well as organic aerosols formed from the oxidation of NMVOCs. These are known as secondary sources. These inventories only consider primary sources. For further information on secondary particulates, see the Air Quality Expert Group (AQEG) Report on particulate matter in the United Kingdom (AQEG, 2005) and fine particulate matter ($PM_{2.5}$) in the United Kingdom (AQEG, 2012).
- **Sulphur dioxide ($SO_2$)** emissions commonly arise from combustion. They can be calculated from the sulphur content of the fuel and information on the amount of sulphur retained in the ash. Inventory estimates are produced using UK energy statistics, information on the sulphur content of liquid fuels, and data on the sulphur content of coal from coal suppliers. $SO_2$ has long been recognised as a pollutant because of its role, along with PM, in winter-time smog formation and the creation of acid rain. Studies indicate that $SO_2$ causes nerve stimulation in the lining of the nose and throat. This can cause irritation, coughing and a feeling of chest tightness, which may cause the airways to narrow. People who have asthma are considered to be particularly sensitive to $SO_2$ concentrations.

- **Lead (Pb)** is a very toxic element and can cause various symptoms at low concentrations. Lead dust or fumes can irritate the eyes on contact and irritate the nose and throat on inhalation. Acute exposure can lead to loss of appetite, weight loss, stomach upsets, nausea and muscle cramps. High levels of acute exposure may also cause brain and kidney damage. Chronic exposure can affect the blood, kidneys, central nervous system and vitamin D metabolism. Emissions prior to 1999 arose primarily from the combustion of leaded petrol. The lead content of petrol was reduced from around 0.34 g/l to 0.143 g/l in 1986. From 1987, sales of unleaded petrol increased, particularly due to the increased use of cars fitted with three-way catalytic converters that are incompatible with leaded petrol due to catalyst poisoning. Leaded petrol was then phased out from general sale at the end of 1999. These changes have caused a significant decline in total lead emissions across the UK between 1990 and 2000. UK-wide Pb emissions now primarily originate from combustion sources (mainly of solid fuels, biomass, and lubricants in industrial and residential sectors, and metal production processes at foundries and iron and steelworks).

## 1.3 DATA SOURCES AND INVENTORY METHODOLOGY

The DG inventories are compiled by disaggregating the UK emission totals. The UK totals are presented within the Annex I template[1] that has been compiled using the methodologies set out in the IIR (Elliott, et al., 2025). The emission estimates for each pollutant are presented in this report in Nomenclature for Reporting (NFR) format to be consistent with the UK inventory submissions to the United Nations Economic Commission for Europe (UNECE), which follow international inventory reporting guidelines. Emission estimates at the national level are made using direct emission measurements (e.g. for industrial point sources) or by combining activity data with a mixture of country-specific and default emission factors (EMEP/EEA Guidebook, 2023). These are known as ‘bottom-up’ and ‘top-down’ approaches, respectively.

The method for disaggregating UK emission totals across England and the DGs draws on a combination of point source data (e.g. Regulatory Inventory Database[2] (RIDB) data for industrial emissions) and sub-national datasets such as:

- DESNZ sub-national statistics on energy use;
- Other regional energy use data for specific industries or regional data on raw material consumption or sector-specific production;
- Data on vehicle kilometres travelled;
- Domestic and international flight data from each major UK airport;
- Regional housing, employment, population, and economic data;
- Agricultural surveys (livestock numbers, crop production, fertiliser application);
- Land use survey data.

Disaggregated emission estimates are only published when they can be directly attributed to the constituent countries. Therefore, emissions from offshore oil and gas installations and the vessels servicing them are excluded from the reported totals and accompanying dataset. In 2024, this ‘unallocated’ proportion of the UK inventory total was 7% of the UK total for $NO_X$, 4% for NMVOCs, 3% for $SO_2$, 2% for CO, $PM_{2.5}$, and Hg, and 1% for $PM_{10}$. The ‘unallocated’ proportion of the UK inventory was zero or negligible for the remaining pollutants. These ‘unallocated’ emissions, as well as emissions associated with Gibraltar, means that the sum of the DG total emissions for these

1 Note that Annex I includes both UK and Gibraltar emissions. The DG inventories are based on the UK emissions only. Annex I can be found here: https://naei.energysecurity.gov.uk/data

2 The term “Regulatory Inventory Database” is used here to represent the industrial emissions databases of the UK environmental regulators: The Environment Agency, the Scottish Environment Protection Agency, Natural Resources Wales and the Northern Ireland Environment Agency, which comprise annual emission estimates from all environmental permitting and regulation-regulated processes under their authority. The environmental permitting and regulation system for England and Wales is set out in the Environmental Permitting (England and Wales) Regulations 2016; the Pollution Prevention and Control (Industrial Emissions) Regulations (Northern Ireland) 2013 for Northern Ireland; and the Environmental Authorisations (Scotland) Regulation 2018 for Scotland

pollutants do not match the published UK national totals. Further information on the data sources and inventory methodology can be found in **Appendix B**.

This report does not provide descriptions of trends or recalculations on memo items (e.g. natural sources and international aviation/shipping). These items are identified in the inventories data set by NFR codes starting with "z_". For further information on memo items, please refer to the UK IIR (Elliott, et al., 2025).

## 1.4 UNCERTAINTIES

Uncertainties in the UK inventory are associated with the availability and quality of activity data, emission factors, and the methodologies used in emissions calculations throughout the time series. These uncertainties are quantified using a Tier 1 uncertainty aggregation (or error propagation) method. The Tier 1 methodology estimates the emissions uncertainty by source category, and combines these to estimate the overall uncertainty in both the Emission Ceilings Regulations (NECR) and CLRTAP base year (2005) and the most recently reported year. Emissions uncertainties are calculated using the uncertainty in activity statistics and emission factors for each source, often provided by inventory compilation guidebooks or expert judgement. The uncertainty in the trend is also estimated by considering sensitivities due to correlation in emission factors or activity statistics between the base year and most recently reported year. The Tier 1 methodology for the UK air pollutant inventory are presented in Chapter 1.7 of the IIR (Elliott, et al., 2025).

England and the DGs APIs are derived by disaggregating UK emissions across the four countries and the unallocated region, and so the UK-wide uncertainty is compounded by further uncertainty introduced by the methods developed to split emissions on a source-activity scale. The uncertainties associated with the APIs are quantified using a Tier 1 uncertainty aggregation approach, described in **Appendix E** and summarised in **Table 1**. Further commentary on the levels of uncertainty in data used to estimate the emission inventories of B[a]P, PCDD/Fs, and Hg is included in **Appendix C**.

Using the top row of **Table 1** as an example, $PM_{10}$ emissions in England were 131.7 kilotonnes (kt) in 2005 with a 28% uncertainty (±37 kt), resulting in a range of 95 kt to 169 kt. In 2024, emissions were 80.1 kt with a 40% uncertainty (±32 kt), resulting in a range of 48 kt to 112 kt. From 2005 to 2024, there was a 39% reduction in emissions with a 12% uncertainty, corresponding to a decrease between 45 kt and 58 kt.

Table 1: Total Tier 1 uncertainty values by pollutant split by region[3]

| DG/Pollutant | Emissions[a] | | | Estimated uncertainty[b] | | |
|---|---|---|---|---|---|---|
| | 2005 (kt) | 2024 (kt) | Trend (%) | 2005 (%) | 2024 (%) | Trend (%)[c] |
| **England** | | | | | | |
| $PM_{10}$ | 132 | 80 | -39% | 28% | 40% | 12% |
| $PM_{2.5}$ | 75 | 40 | -47% | 19% | 30% | 13% |
| $SO_2$ | 547 | 61 | -89% | 6% | 15% | 1% |
| $NO_X$ | 1248 | 386 | -69% | 7% | 9% | 2% |
| NMVOCs | 908 | 494 | -46% | 13% | 22% | 8% |
| $NH_3$ | 192 | 168 | -12% | 23% | 18% | 13% |
| Pb (t) | 165 | 96 | -42% | 56% | 76% | 19% |
| **Scotland** | | | | | | |
| $PM_{10}$ | 16 | 11 | -32% | 31% | 46% | 28% |

3 Note that CO emission uncertainties are not quantified in the UK air pollutant inventory, and as such, no Tier 1 approach is presented in the DG air pollutant inventories.

| DG/Pollutant | Emissions[a] | | | Estimated uncertainty[b] | | |
|---|---|---|---|---|---|---|
| | 2005 (kt) | 2024 (kt) | Trend (%) | 2005 (%) | 2024 (%) | Trend (%)[c] |
| $PM_{2.5}$ | 10 | 6 | -34% | 21% | 73% | 51% |
| $SO_2$ | 81 | 10 | -87% | 7% | 18% | 2% |
| $NO_X$ | 160 | 61 | -62% | 9% | 13% | 6% |
| NMVOCs | 181 | 152 | -16% | 19% | 16% | 15% |
| $NH_3$ | 36 | 31 | -14% | 30% | 24% | 24% |
| Pb (t) | 14 | 9 | -39% | 74% | 92% | 38% |
| **Wales** | | | | | | |
| $PM_{10}$ | 12 | 7 | -41% | 26% | 42% | 21% |
| $PM_{2.5}$ | 7 | 4 | -49% | 26% | 43% | 24% |
| $SO_2$ | 56 | 7 | -88% | 7% | 13% | 2% |
| $NO_X$ | 98 | 33 | -66% | 10% | 14% | 5% |
| NMVOCs | 66 | 38 | -42% | 23% | 41% | 20% |
| $NH_3$ | 22 | 23 | 4% | 37% | 34% | 42% |
| Pb (t) | 26 | 14 | -44% | 70% | 89% | 18% |
| **Northern Ireland** | | | | | | |
| $PM_{10}$ | 7 | 5 | -33% | 43% | 70% | 34% |
| $PM_{2.5}$ | 4 | 2 | -45% | 35% | 61% | 37% |
| $SO_2$ | 23 | 3 | -87% | 10% | 30% | 4% |
| $NO_X$ | 51 | 18 | -65% | 14% | 22% | 7% |
| NMVOCs | 43 | 35 | -19% | 42% | 59% | 30% |
| $NH_3$ | 30 | 33 | 9% | 34% | 29% | 36% |
| Pb (t) | 4 | 3 | -35% | 100% | 134% | 52% |

[a] Emissions data are presented in kilotonnes (kt) for all pollutants, except tonnes (t) for lead (Pb), and are rounded to the nearest integer. Emissions are expressed on a fuel used basis in line with the UK inventory uncertainties.

[b] the range of ± the percentages given represents a 95% confidence interval. Because the Tier 1 approach used does not account for asymmetric distributions these values can be greater than 100%. This does not indicate that emissions could be negative, but that the values are very uncertain, and a skewed distribution is expected. Data are presented to 2 significant figures.

[c] This is the 95% confidence interval from the central estimate of the trend, e.g. if the trend in emissions is a decrease of 50% and the trend uncertainty is 5%, then the 95% confidence interval would be a decrease of between 45 and 55%.

# 2. DG AIR POLLUTANT ESTIMATES (2005 – 2024)

The following sections outline the emissions inventories for England and the DGs, providing information on the trends and emission estimates for each of the eight air pollutants.

These sections include the following:

- **Trends as a percentage of the 2005 total** for all pollutants. The change in pollutant emissions over time is shown graphically to enable pollutant comparison. This graph shows the relative rate at which all pollutants have declined across the time series, with 2005 emissions as the baseline value (i.e. 100%).
- **Figures presenting the inventory data**, showing the annual trend from 2005 to 2024 for each pollutant. These graphs are also disaggregated by sector, and further information on the categorisation used in these summaries relative to NFR code can be found in **Appendix G**.
- **Summary information on trends** is provided for each pollutant, highlighting the key reasons for the observed trend since 2005 and other notable aspects. This information is not guided by detailed statistical analyses but through the association of underlying trends in activity data with the visible trends in emissions.
- **Sectoral contribution matrix** provides an overview of the importance of each sector for each pollutant. For example, transport sources accounts for a considerable proportion of CO, $NO_X$ and $PM_{10}$ emissions in some regions. This is another way in which the pollutants can be compared.
- **Mapped emissions** for all pollutants are also provided to show the geographical disaggregation of each pollutant. This helps the reader to identify substantive areas for emissions and the spatial patterns associated with that pollutant. For example, $NO_X$ emissions are concentrated around the road networks of the countries.

## 2.1 ENGLAND

The following section summarises emissions in England for the eight priority air pollutants: $NH_3$, CO, $NO_X$, NMVOCs, $PM_{10}$, $PM_{2.5}$, $SO_2$, and Pb. Information is also presented for emissions of PCDD/Fs, B[a]P, and Hg, with more detailed information for these three pollutants presented in **Appendix C**. Emissions of PCDD/Fs, B[a]P, and Hg should be considered as experimental emission estimates only.[4] **Appendix F** presents the inventory data summary tables for England and the DGs, whilst **Appendix G** presents source category mapping used in the report**.**

**Figure 1** shows emissions of all eleven air pollutants as a percentage of the 2005 total. For England, the pollutants that have seen the greatest rate of change within the time series are summarised below, with detailed descriptions for all pollutants provided in the following sections.

B[a]P is the only pollutant where emissions are higher in 2024 than in 2005. There has been a 10% increase in emissions since 2005, due to an increase in wood burning in residential combustion in England, according to the latest Defra survey on Domestic Burning Practices in the UK (Defra, 2025b). Please see **Appendix C** for more details.

The greatest rate of decline is observed in the trend for sulphur dioxide emissions, with a 65% decrease between 2012 and 2016, principally due to the reduction of sulphur-containing solid fuels, such as coal, being burnt in the UK. In 2024, sulphur dioxide emissions had reduced by 89% since 2005.

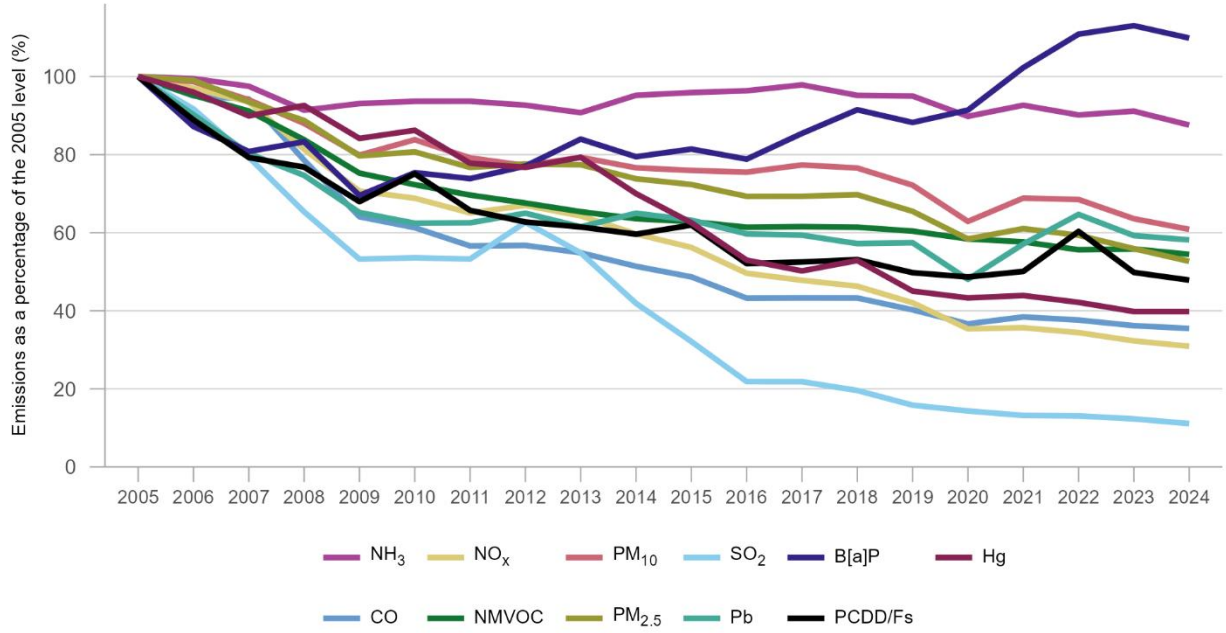


Figure 1: England trends for all pollutants as a percentage of the 2005 level

4 The emission estimates are considered experimental. While the inventories and trends have been interrogated and to ensure the suitability of methods for the most important sources, it is recognised that data quality on a subnational level is generally poor. As a result, these emission estimates are currently considered experimental only, and require further work to evaluate the methods used, to identify alternative methods that are more suitable, and to reduce the uncertainty in the early part of the time series. More information on the inventory methods used for B[a]P, PCDD/Fs, and Hg is available in Appendix C.

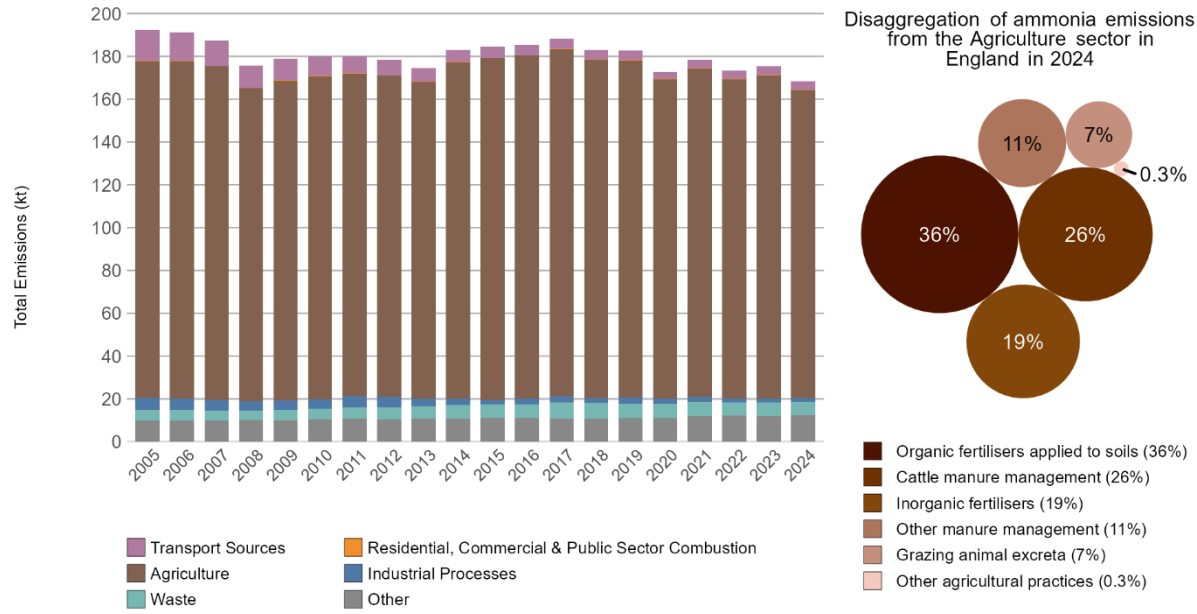


Figure 2: Ammonia ($NH_3$) emissions in England

Note: The disaggregated emissions chart and summary statistics below may not add up to 100% due to rounding.

### 2.1.1 Ammonia

The total ammonia emissions for England are shown in **Figure 2**. A disaggregation of the largest sector is shown in the bubble chart. The sectors definitions are provided in **Appendix G**.

England's ammonia emissions were estimated to be 168.4 kt in 2024 and have decreased by 12% since 2005. England accounts for 66% of the total UK ammonia emissions in 2024. The agriculture sector makes up the largest contribution to ammonia emissions throughout the time series. In 2024, the largest subsector was organic fertilisers applied to soils (3Da2), which represents 36% of agriculture emissions.

Emissions from the agriculture sector have decreased by 9% between 2005 and 2024. The initial decrease in ammonia emissions from 2005 is primarily driven by reduced nitrogen fertiliser application rates and reductions in numbers of some types of agricultural animals such as beef cattle, pigs, and turkeys until 2008. After this point, emissions have fluctuated slightly each year, due to slight changes in numbers of dairy cattle, but also due to increased use of urea-based fertilisers. The price of fertilisers varies and thus there is annual variation in the quantities applied and the balance between types of fertiliser. This is also driving the decrease in the latest year, where emissions from inorganic fertilisers (3Da1) have decreased by 18% since 2023, driven almost entirely by a decrease in the quantity of nitrogen fertiliser applied on arable and grassland. This is partially offset by an increase in pet numbers (6A), and as such, England's overall ammonia emissions decreased by 4% from 2023 to 2024.

It's also worth noting that there has been a decrease in the numbers of some types of livestock such as beef cattle, pigs, and turkeys, leading to 44% lower emissions from other manure management (3B2, 3B3, 3B4) of wastes (excreta) of these types of animals. This is also contributing to the decrease in ammonia emissions across the time series.

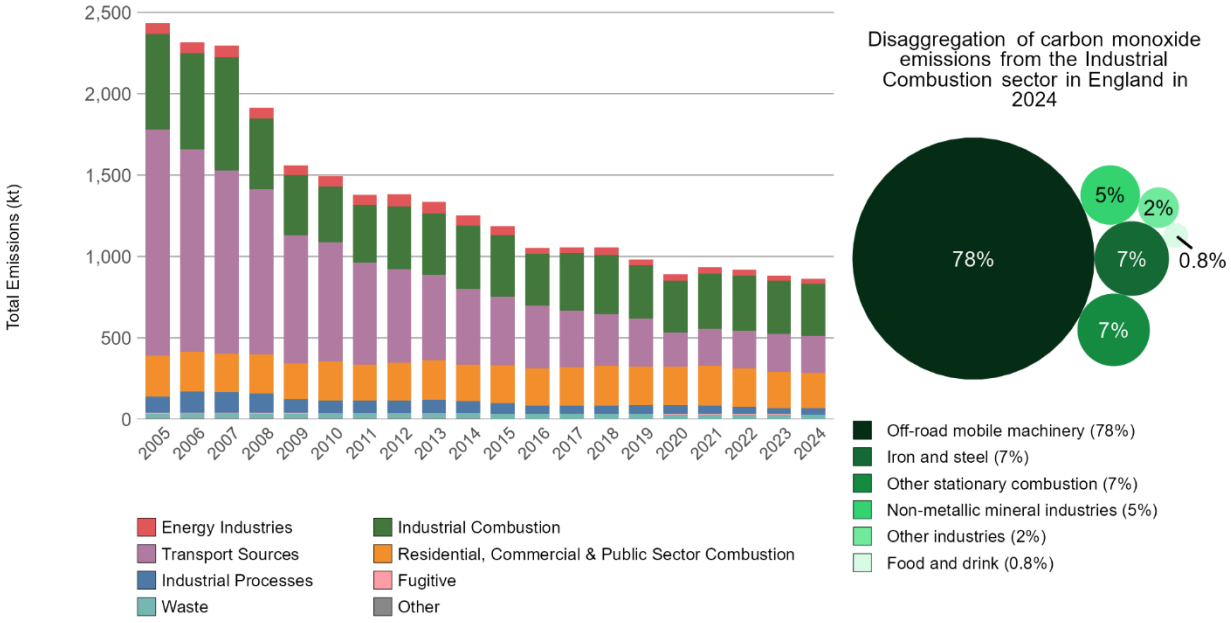


Figure 3: Carbon monoxide (CO) emissions in England[5]

Note: The disaggregated emissions chart and summary statistics below may not add up to 100% due to rounding.

### 2.1.2 Carbon monoxide

Emissions of carbon monoxide in England were estimated to be 863.9 kt in 2024, as shown in **Figure 3**, and have decreased by 65% since 2005. Emissions in England account for 77% of the UK total for carbon monoxide in 2024.

The industrial combustion sector makes up the largest contribution to carbon monoxide emissions since 2017. In 2024, off-road mobile machinery (1A2gvii) accounts for 78% of the industrial combustion sector emissions. However, emissions from other stationary combustion (1A2gviii) decreased by 19% between 2023 and 2024, and this is ultimately driving the 2% decrease in England's carbon monoxide emissions between 2023 and 2024.

The long-term decline in carbon monoxide emissions is driven by the transport sources sector, which has seen a decline in emissions of 84% since 2005. In particular, emissions from passenger cars (1A3bi) have decreased by 87% since 2005 in England. Similarly, other road transport[6] (1A3b except 1A3bi) has also had a significant decrease in emissions of 92% since 2005. This is primarily driven by an increase in the number of vehicles compliant with the more recent Euro standards (Euro V and above) on UK roads, which required the fitting of emission controls (e.g. three-way catalytic converters) in new petrol vehicles. Improved catalyst repair rates resulting from regulations controlling the sale and installation of replacement catalytic converters and particle filters for light-duty vehicles in 2008 also contribute to the decrease in emissions. More recently, the switch from petrol cars and diesel cars to electric vehicles, which produce no carbon monoxide emissions when driven, has also contributed to the observed decrease in emissions.

5 Other industries presented in the bubble graph inset in Figure 3 relate to combustion emissions in the chemical, non-ferrous metals, pulp paper and print and other industries.

[6] Other road transport includes light duty vehicles, heavy duty vehicles and buses, mopeds and motorcycles, gasoline evaporation and automobile road abrasion.

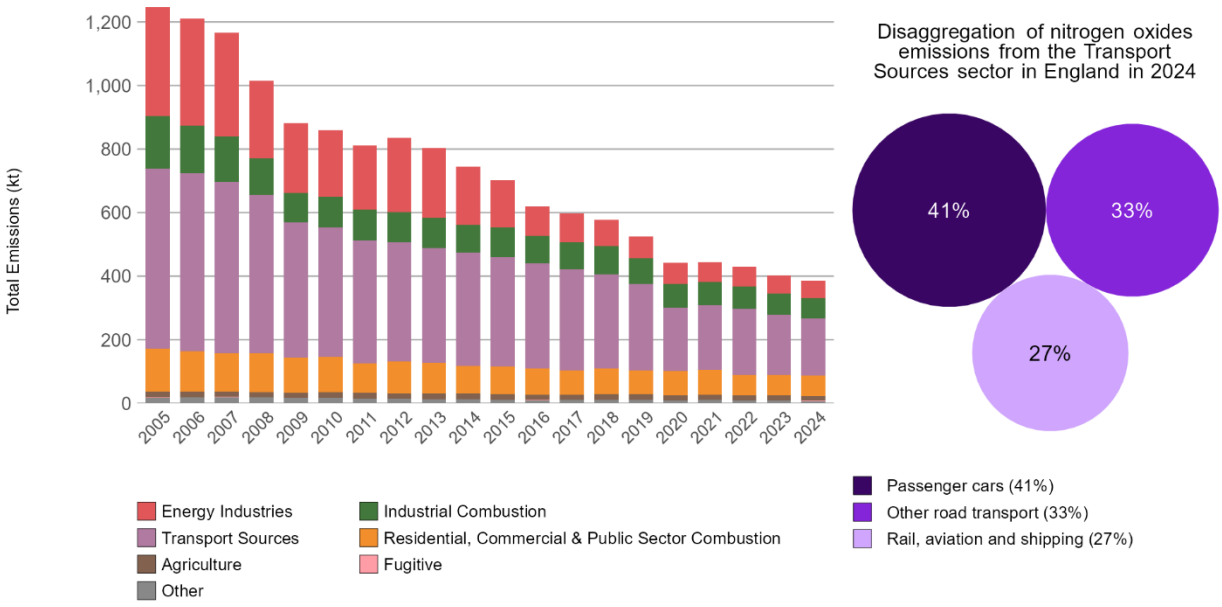


Figure 4: Nitrogen oxides ($NO_x$) emissions in England

Note: The disaggregated emissions chart and summary statistics below may not add up to 100% due to rounding.

### 2.1.3 Nitrogen oxides

Emissions of nitrogen oxides in England were estimated to be 385.7 kt in 2024, as shown in **Figure 4**, and have decreased by 69% since 2005. Emissions in England account for 72% of the UK total for nitrogen oxides in 2024.

The transport sources sector makes up the largest contribution to nitrogen oxides emissions throughout the time series. In 2024, passenger cars (1A3bi) represent 41% of the emissions from transport sources. Despite this, emissions from other road transport[7] (1A3b except 1A3bi) have decreased by 78% since 2005, and emissions from passenger cars (1A3bi) specifically have decreased by 69%. This is primarily driven by the successive introduction of tighter emission standards for petrol cars and all types of new diesel vehicles over the past decade. Improved catalyst repair rates resulting from regulations controlling the sale and installation of replacement catalytic converters and particle filters for light-duty vehicles in 2008 also contribute to the decrease in emissions. Note that the decrease in emissions in 2020 is likely due to travel restrictions during the COVID-19 pandemic resulting in reduced traffic volumes.

In recent years, the uptake of less emissive vehicles (e.g. electric vehicles) in the road transport fleet (1A3b) has also helped reduce emissions. This is driving the latest year trend, where nitrogen oxides emissions overall decreased by 4% between 2023 and 2024.

Additionally, emissions from the energy industries sector have also declined due to the decline in coal use in power stations and industrial sites, with the last of the coal-fired power stations closing on 30th September 2024. Between 2023 and 2024, there has also been reduced gas oil and natural gas use, lower $NO_x$ intensity in upstream oil production, decreased coke oven gas use (1A1c), and a continued decline in natural gas and coal use for electricity generation at power stations (1A1a).

[7] Other road transport includes light duty vehicles, heavy duty vehicles and buses, mopeds and motorcycles, gasoline evaporation and automobile road abrasion.

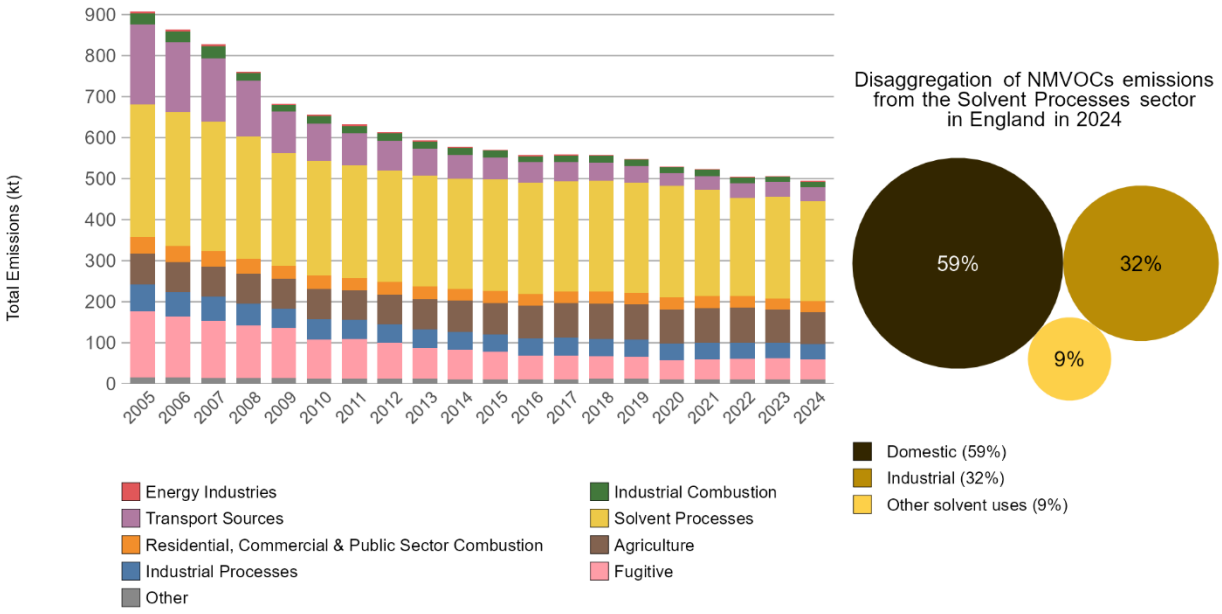


Figure 5: Non-methane volatile organic compounds (NMVOC) emissions in England

Note: The disaggregated emissions chart and summary statistics below may not add up to 100% due to rounding.

### 2.1.4 NMVOCs

Emissions of NMVOCs in England were estimated to be 494.4 kt in 2024, as shown in **Figure 5**, and have decreased by 46% since 2005. Emissions in England account for 66% of the UK total for NMVOCs in 2024.

The solvent processes sector makes up the largest contribution to NMVOCs emissions throughout the time series. Within solvent processes, domestic solvent (2D3a) emissions represent 59% of the emissions in 2024. While other solvent use (2D3i) only accounted for 9% of solvent process emissions in 2024, emissions from this source continued to fall in line with BASA data, reflecting the ongoing shift away from high-solvent adhesives. This is largely what's driving the overall 2% decrease in NMVOC emissions between 2023 and 2024, although there have also been reductions in activity in the offshore oil and gas sector (1B2ai and 1B2c) impacting the fugitive emissions from these sectors.

The transport sources sector also plays a large role in the reduction of NMVOC emissions. Emissions from transport sources have decreased by 82% since 2005, and emissions from passenger cars (1A3bi) specifically have decreased by 92%. Emissions have decreased due to the introduction of three-way catalytic converters and controls on evaporative emissions from vehicles, and, to a lesser degree, a switch away from petrol to diesel cars, and improved fuel economy.

Emissions remained relatively consistent between 2014 and 2018, before reducing in the following years as a result of reduced venting in the upstream oil and gas sector, followed by reductions in activity in many sectors which coincided with the COVID-19 pandemic. 2021 to 2022 saw further reductions, predominantly due to reduced usage of hand sanitiser when compared to the peak in 2020.

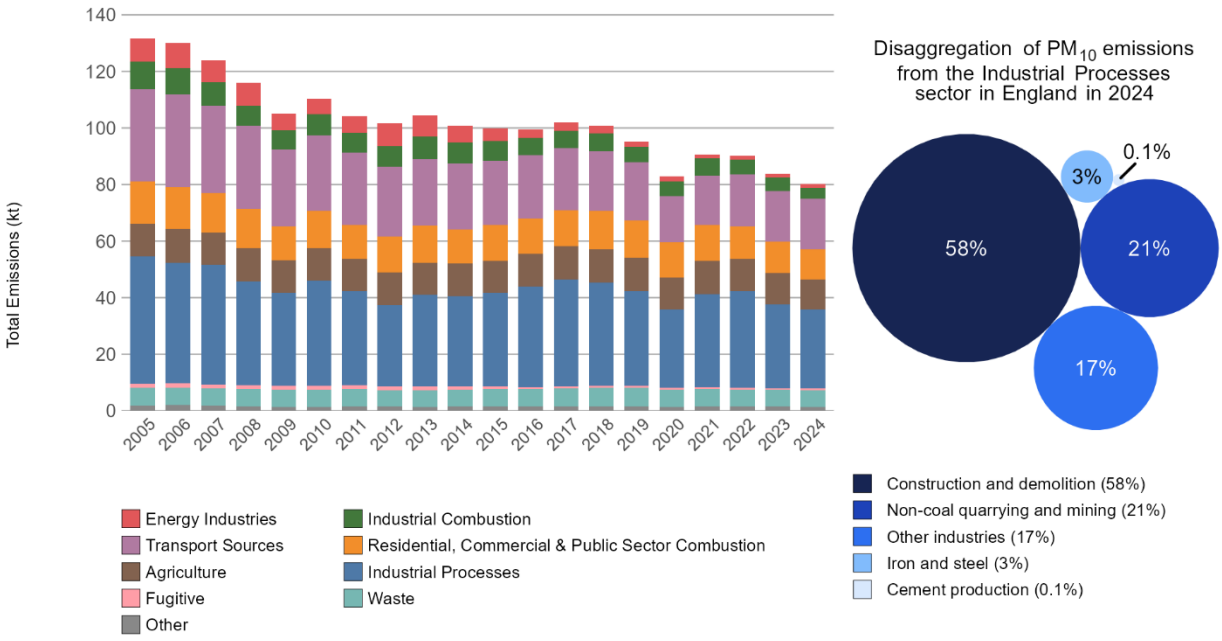


Figure 6: Particulate matter < 10 µm ($PM_{10}$) emissions in England[8]

Note: The disaggregated emissions chart and summary statistics below may not add up to 100% due to rounding.

### 2.1.5 $PM_{10}$

Emissions of $PM_{10}$ in England were estimated to be 80.1 kt in 2024, as shown in **Figure 6**, and have decreased by 39% since 2005. Emissions in England account for 77% of the UK total for $PM_{10}$ in 2024.

The industrial processes sector makes up the largest contribution to $PM_{10}$ emissions throughout the time series. Although $PM_{10}$ emissions from the construction of roads and non-residential buildings has decreased since 2005, construction and demolition (2A5b) still accounts for 58% of emissions from the industrial processes sector in 2024. There have been other decreases in emissions from the industrial processes sector across the time series. Since 2005, emissions from other industries[8] and non-coal quarrying and mining (2A5a) have decreased by 54% and 43% respectively. There has also been a decline in emissions from the iron and steel industry since 2005. Between 2023 and 2024, $PM_{10}$ emissions decreased by 4%, primarily due to reductions in iron and steel (2C1) activity in the industrial processes sector.

Emissions from the transport and industrial combustion sectors have also decreased since 2005. Controls on vehicle exhaust emissions, along with the transition away from coal in industrial combustion, have also contributed to the decreasing trend in $PM_{10}$ emissions. Note that the decrease in emissions in 2020 is likely due to travel restrictions during the COVID-19 pandemic resulting in reduced traffic volumes.

8 Other industries presented in the bubble graph inset in Figure 6 relate to emissions from glass production, storage handling and transport of chemical products, nitric acid production, titanium dioxide production, soda ash production, aluminium production, lead production, zinc production, copper production, other mineral products, other chemical industry, other metal production, pulp and paper industry, wood processing, other product use, other industrial processes.

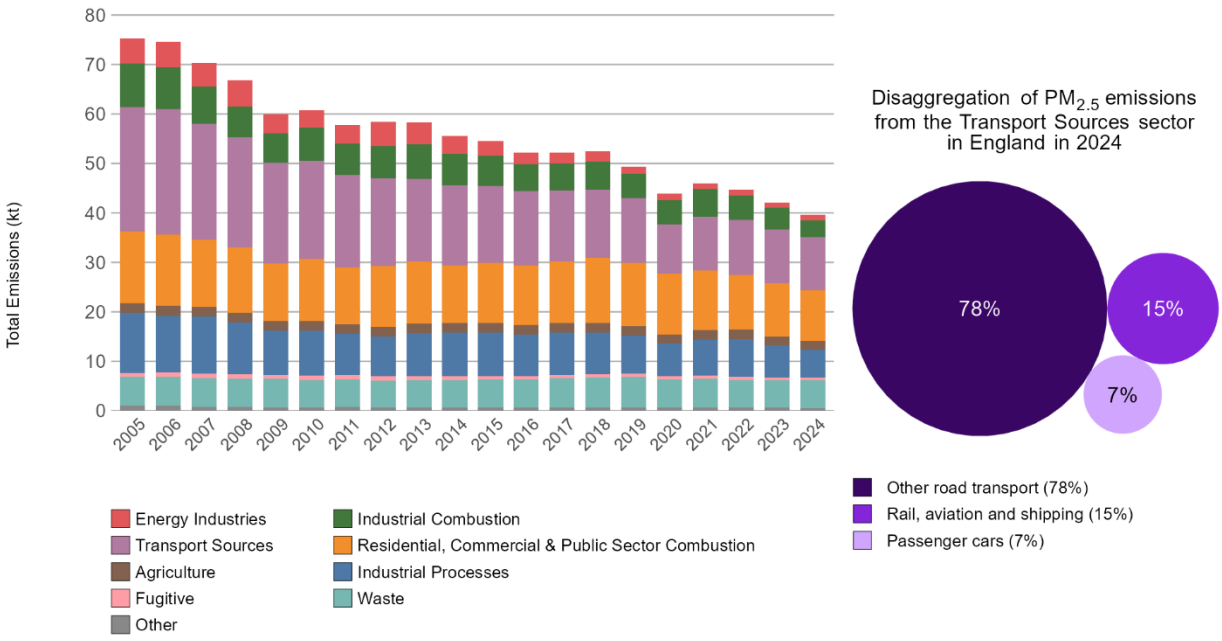


Figure 7: Particulate matter < 2.5 µm ($PM_{2.5}$) emissions in England

Note: The disaggregated emissions chart and summary statistics below may not add up to 100% due to rounding.

### 2.1.6 $PM_{2.5}$

Emissions of $PM_{2.5}$ in England were estimated to be 39.7 kt in 2024, as shown in **Figure 7**, and have decreased by 47% since 2005. Emissions in England account for 75% of the UK total for $PM_{2.5}$ in 2024.

Since 2022, the transport sources sector makes up the largest contributions to $PM_{2.5}$ emissions, with other road transport[9] (1A3b except 1A3bi passenger cars) accounting for 78% of the transport sources emissions in 2024.

Despite this, emissions from transport sources have decreased by 57% since 2005, driven by reductions from other road transport (49%), passenger cars (84%) and rail, aviation and shipping (1A3) (58%). These reductions reflect the introduction of progressively more stringent emissions standards through time, as well as increased uptake of electric vehicles in recent years.

The long-term decline in $PM_{2.5}$ emissions has also been driven by the continued switch in the fuel mix used in electricity generation away from coal and towards natural gas. Between 2023 and 2024, $PM_{2.5}$ emissions decreased by 6%, primarily due to reductions in the industrial combustion and industrial processes sectors. For example, emissions from other stationary combustion (1A2gviii) have decreased by 29%, while emissions from the iron and steel sector (2C1) decreased by 62%.

[9] Other road transport includes light duty vehicles, heavy duty vehicles and buses, mopeds and motorcycles, gasoline evaporation and automobile road abrasion.

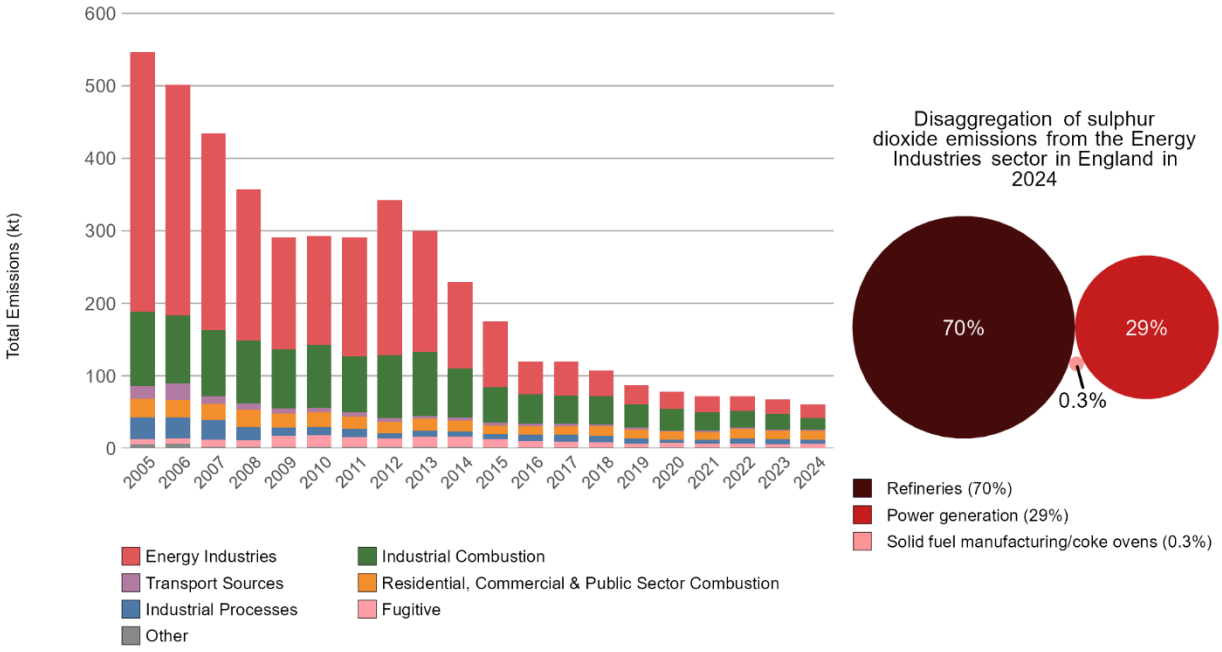


Figure 8: Sulphur dioxide ($SO_2$) emissions in England

Note: The disaggregated emissions chart and summary statistics below may not add up to 100% due to rounding.

### 2.1.7 Sulphur dioxide

Emissions of sulphur dioxide in England were estimated to be 60.7 kt in 2024, as shown in **Figure 8**, and have decreased by 89% since 2005. Emissions in England account for 73% of the UK total for sulphur dioxide in 2024.

The energy industries sector makes up the largest contribution to sulphur dioxide emissions in 2024, although emissions from this source have decreased by 95% since 2005. This is driven by the 98% decrease in emissions from power generation (1A1a) and 98% decrease from solid fuel manufacturing and coke ovens (1A1c), as a result of shifting away from using high sulphur content fuels in the energy production and industrial sectors and switching to low sulphur content fuels such as biomass-based fuels. Furthermore, flue gas desulphurisation was fitted in any remaining coal powered plants. Sulphur dioxide emissions from domestic combustion has also significantly reduced due to the reduction of petroleum coke and smokeless solid fuels in fireplaces and stoves.

By comparison, emissions from refineries (1A1b) have only decreased by 77% since 2005, and refineries is now the largest sub-sector in energy industries, accounting for 70% of the emissions in 2024.

In more recent years, industrial combustion is playing a larger role in the emissions trend. Sulphur dioxide emissions decreased by 10% from 2023 to 2024, primarily a result of a decrease in coal use in other industrial combustion (1A2gviii) as well as decreases in activity in the iron and steel sector (1A2a). This is partially offset by an increase in emissions from small stationary combustion sources (1A4ai) due to increase in fuel oil activity in Public Sector and Miscellaneous Industrial & Commercial combustion categories in DUKES. There was also an increase in fugitive sources (1B2c) related to upstream oil processes.

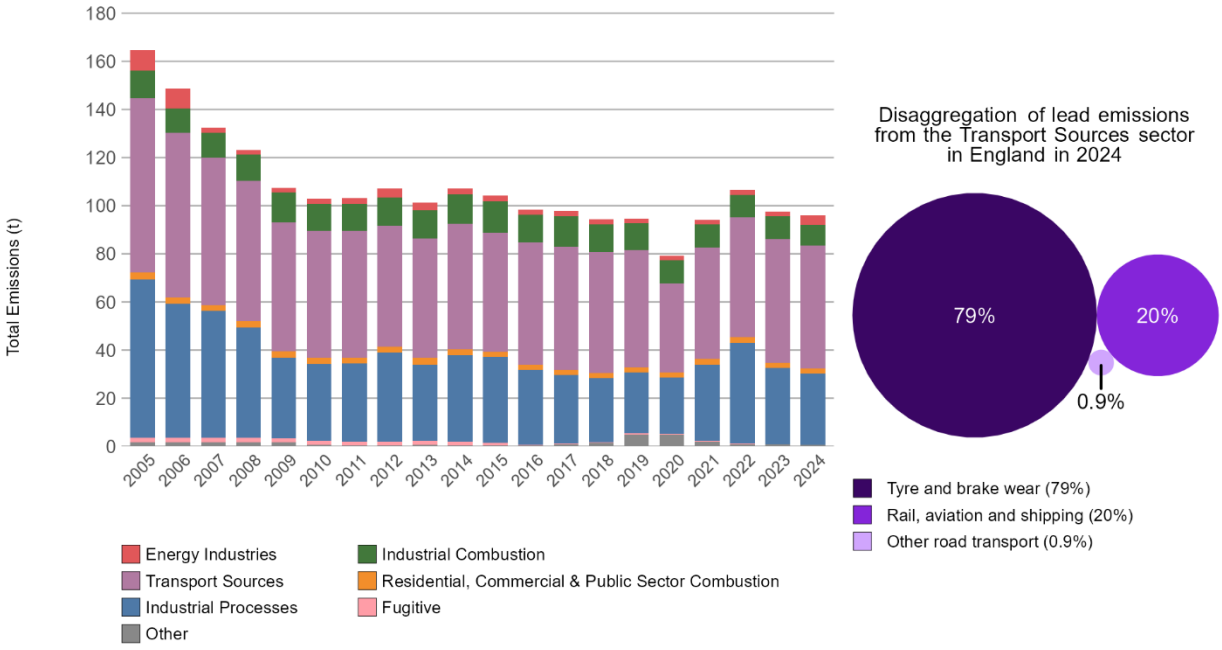


Figure 9: Lead (Pb) emissions in England

Note: The disaggregated emissions chart and summary statistics below may not add up to 100% due to rounding.

### 2.1.8 Lead

Emissions of lead in England were estimated to be 95.8 t in 2024, as shown in **Figure 9**, and have decreased by 42% since 2005. Emissions in England account for 79% of the UK total for lead in 2024.

The transport sources sector makes up the largest contribution to lead emissions throughout the time series. Emissions from tyre and brake wear (1A3bvi) have been increasing since 2022, and in 2024 it represents 79% of emissions in the transport sources sector. There has also been an increase in emissions from domestic aviation (1A3aii(i)). However, this is partially offset by decreases in emissions due to the phase out of leaded petrol use in vehicles and the increase in cars fitted with three-way catalysts.

The overall decrease in lead emissions is primarily driven by changes within the industrial processes sector, where emissions have decreased by 55% since 2005. Although there was an increase in lead emissions from 2021 to 2022 due to increased steel production (1A2a), recent closures in iron and steel production sites (2C1) is contributing to the 2% decrease in lead emissions between 2023 and 2024. There has also been a 71% decrease in emissions from other industries[10] which is also contributing to the lead emissions decrease between 2023 and 2024.

In the energy industries sector, where the use of coal has been significantly reduced, lead emissions from burning municipal solid waste in waste-to-energy plants have also reduced due to stricter regulation and improved technology.

[10] Other industries relates to emissions glass production, storage handling and transport of chemical products, nitric acid production, titanium dioxide production, soda ash production, aluminium production, lead production, zinc production, copper production, other mineral products, other chemical industry, other metal production, pulp and paper industry, wood processing, other product use, other industrial processes.

**Table 2** below provides a summary of the percentage contribution of each sector for each pollutant in 2024. The table is shaded according to the overall contribution of that sector to the pollutant total, (with darker shades representing greater contribution). Important sectors indicated by the table are energy industries (the highest contributor of $SO_2$ and Hg emissions), transport sources (the highest contributor of $NO_x$, $PM_{2.5}$ and Pb emissions) and residential, commercial & public sector combustion (the highest contributor of B[a]P emissions).

Industrial combustion is a major source of emissions, whilst industrial processes are also important, especially for emissions of $PM_{10}$. This table also highlights that although emissions from the agriculture sector are not significant when considering all pollutants, it is of very high significance when considering emissions of $NH_3$; the same is true for NMVOC emissions from solvent processes.

Table 2: Source emission contributions ranked by sector, England, 2024

| Sector | $NH_3$ | CO | $NO_x$ | NMVOC | $PM_{10}$ | $PM_{2.5}$ | $SO_2$ | Pb | B[a]P | PCDD/Fs | Hg |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Agriculture | 85.4% | NA | 3.7% | 15.9% | 13.5% | 4.5% | NA | NA | NA | NA | NA |
| Energy Industries | IE | 3.9% | 14.2% | 0.3% | 1.7% | 2.9% | 31.3% | 4.1% | 5.3% | 5.0% | 29.1% |
| Fugitive | IE | 0.2% | 0.1% | 9.8% | 0.7% | 1.4% | 10.0% | 0.1% | 0.0% | IE | IE |
| Industrial Combustion | IE | 36.7% | 16.4% | 2.5% | 4.6% | 8.6% | 26.3% | 8.9% | 0.7% | 16.5% | 22.1% |
| Industrial Processes | 1.1% | 4.5% | IE | 7.6% | 34.6% | 14.2% | 8.1% | 30.7% | 1.0% | 6.4% | 9.7% |
| Residential, Commercial & Public Sector Combustion | 0.2% | 25.0% | 16.9% | 5.2% | 13.1% | 25.6% | 20.4% | 2.2% | 83.4% | 25.6% | 8.5% |
| Solvent Processes | IE | NA | NA | 49.6% | IE | IE | NA | NA | IE | IE | NA |
| Transport Sources | 2.3% | 26.3% | 46.7% | 6.9% | 22.5% | 27.3% | 2.7% | 53.3% | 3.0% | 5.1% | 7.6% |
| Waste | 3.6% | 3.2% | IE | IE | 7.4% | 14.1% | IE | IE | 6.4% | 41.2% | 22.8% |
| Other | 7.4% | 0.2% | 2.0% | 2.2% | 1.8% | 1.5% | 1.1% | 0.7% | 0.2% | 0.2% | 0.2% |

*The sector: “other” will include all “other” categories in the inventory and also a number of categories that are insignificant for a specific pollutant. These have been marked in the table as “IE” (used in inventory reporting for “Included Elsewhere”). A breakdown of what is included within this category in respect to each pollutant can be found in Table 32.

The maps below show the emission totals for England, excluding large industrial point sources and shipping. Units are in tonnes, except Pb in kg, per square kilometre in 2024. Details on the methodology for these can be found in Appendix B and in the Spatial Emissions Methodology for NAEI report (Tsagatakis, et al., 2025), found here: https://naei.energysecurity.gov.uk/reports/uk-spatial-emissions-methodology-report-national-atmospheric-emissions-inventory-2023

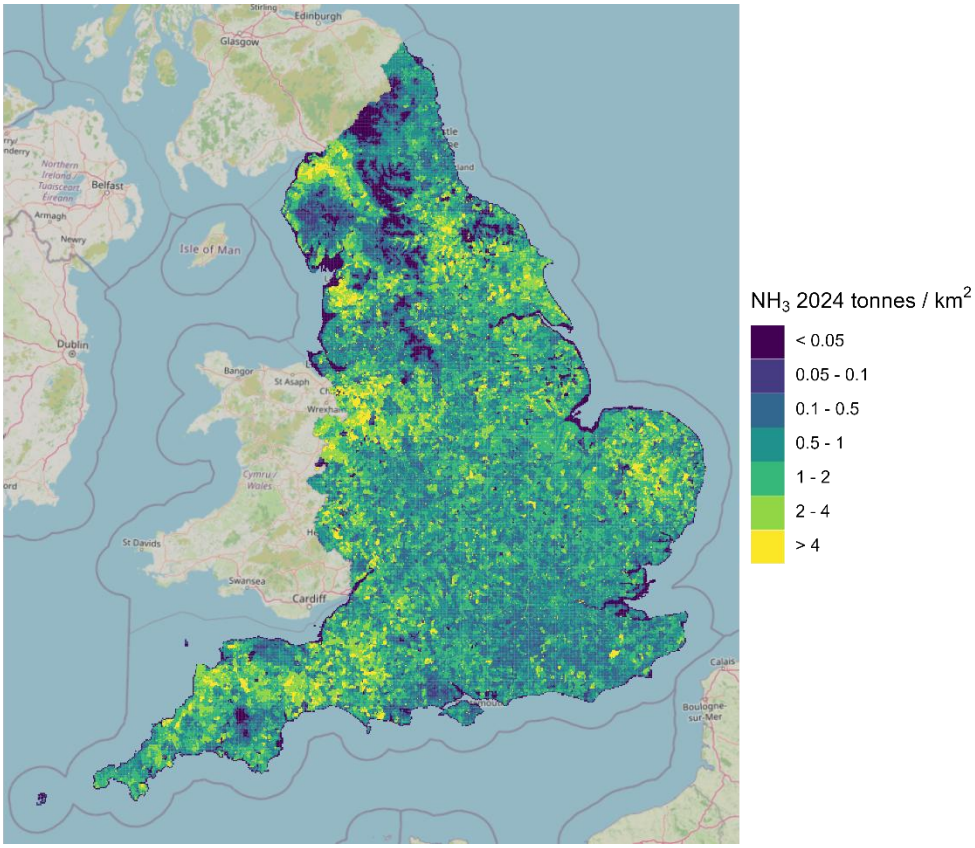


Figure 10: Ammonia ($NH_3$) emissions in England, 2024

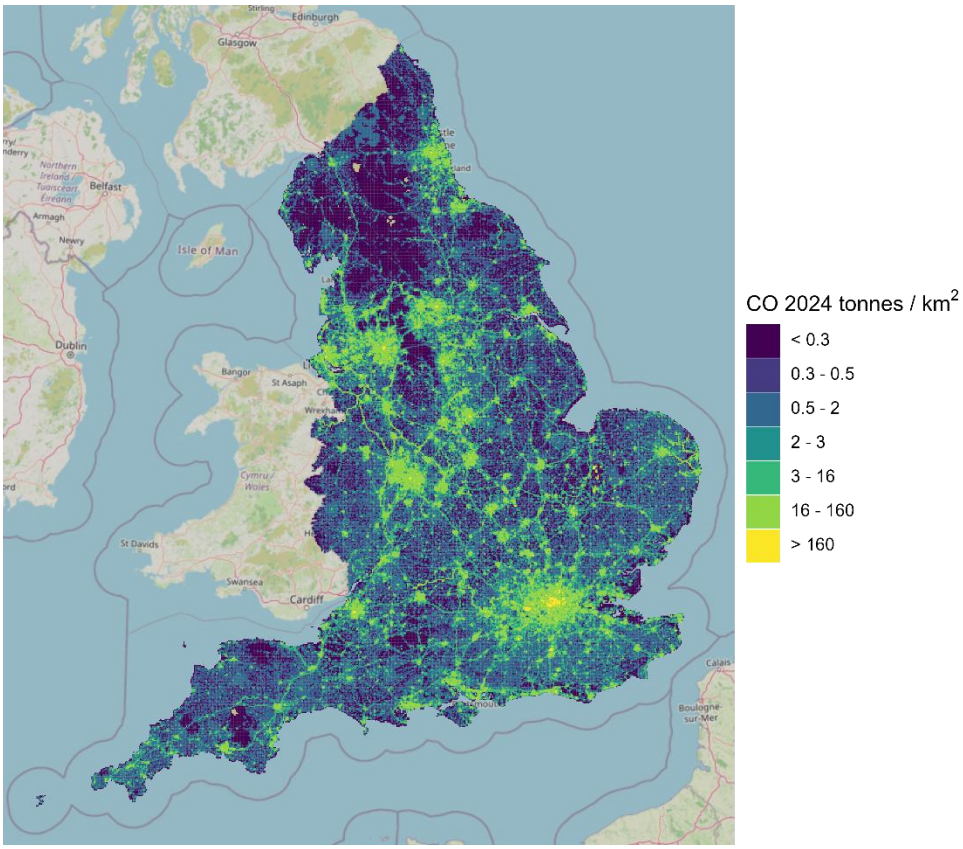


Figure 11: Carbon monoxide (CO) emissions in England, 2024

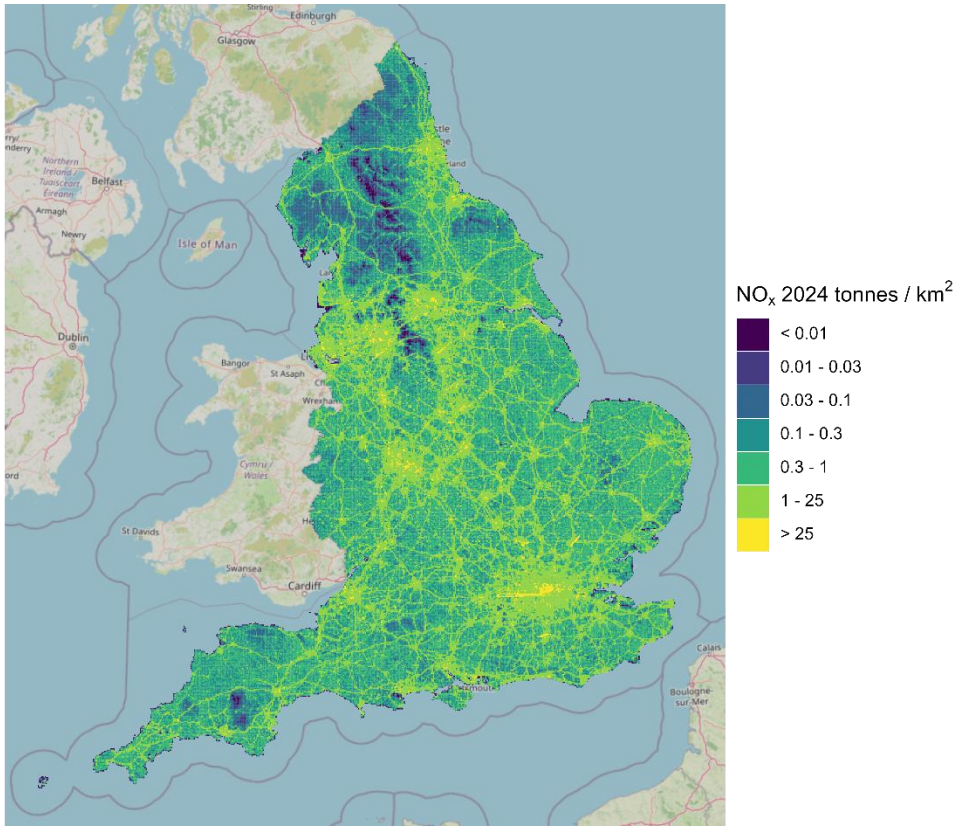


Figure 12: Nitrogen oxides ($NO_x$) emissions in England, 2024

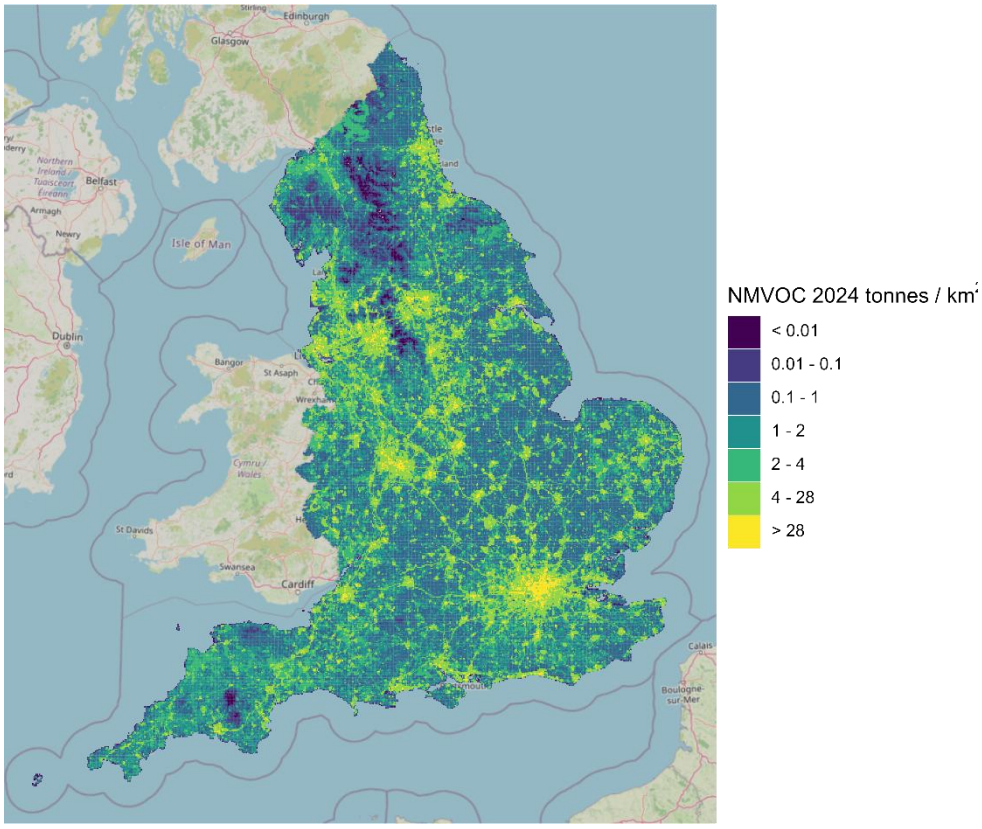


Figure 13: Non-methane volatile organic compounds (NMVOC) emissions in England, 2024

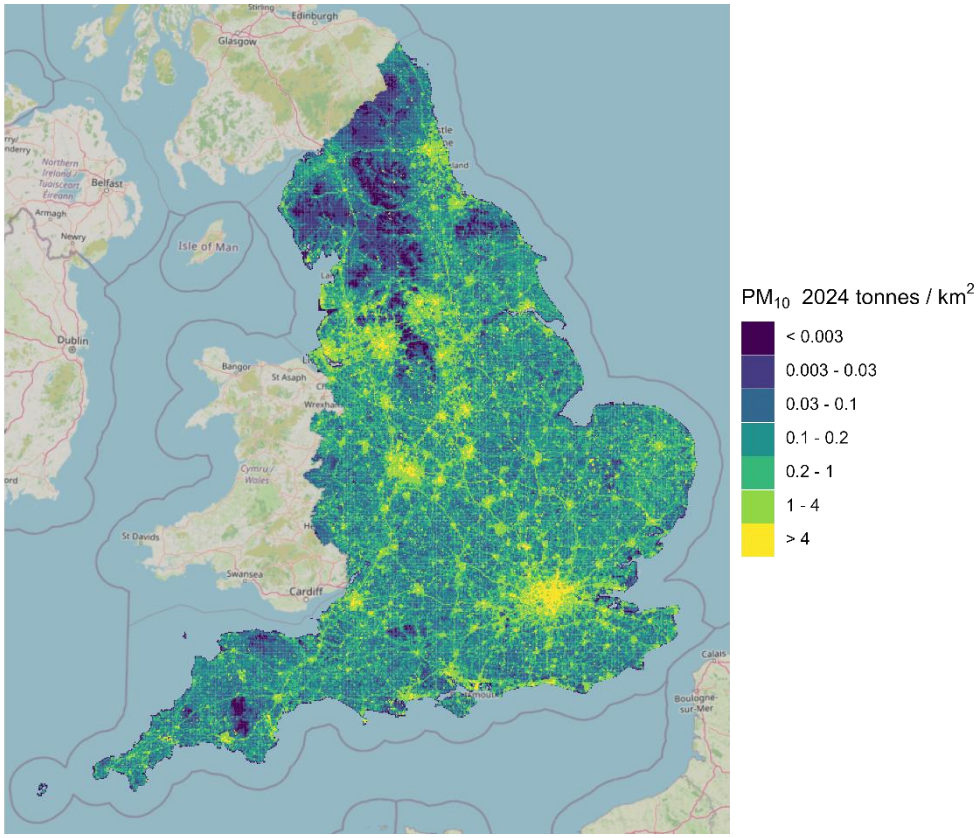


Figure 14: Particulate matter < 10 µm ($PM_{10}$) emissions in England, 2024

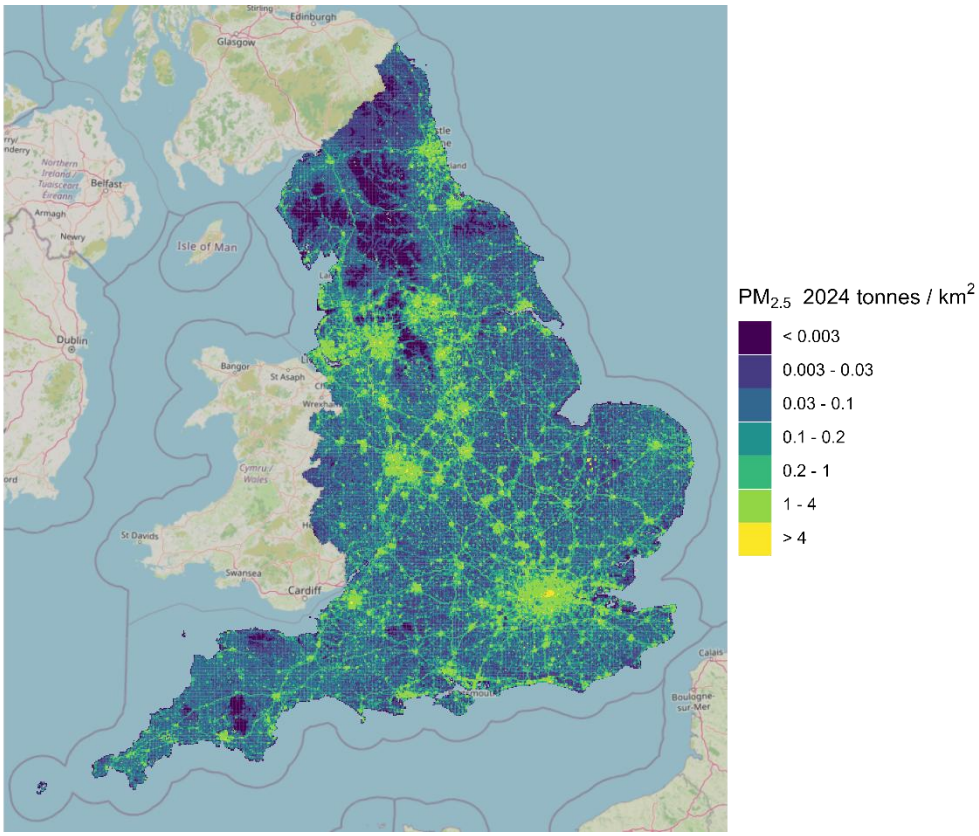


Figure 15: Particulate matter < 2.5 µm ($PM_{2.5}$) emissions in England, 2024

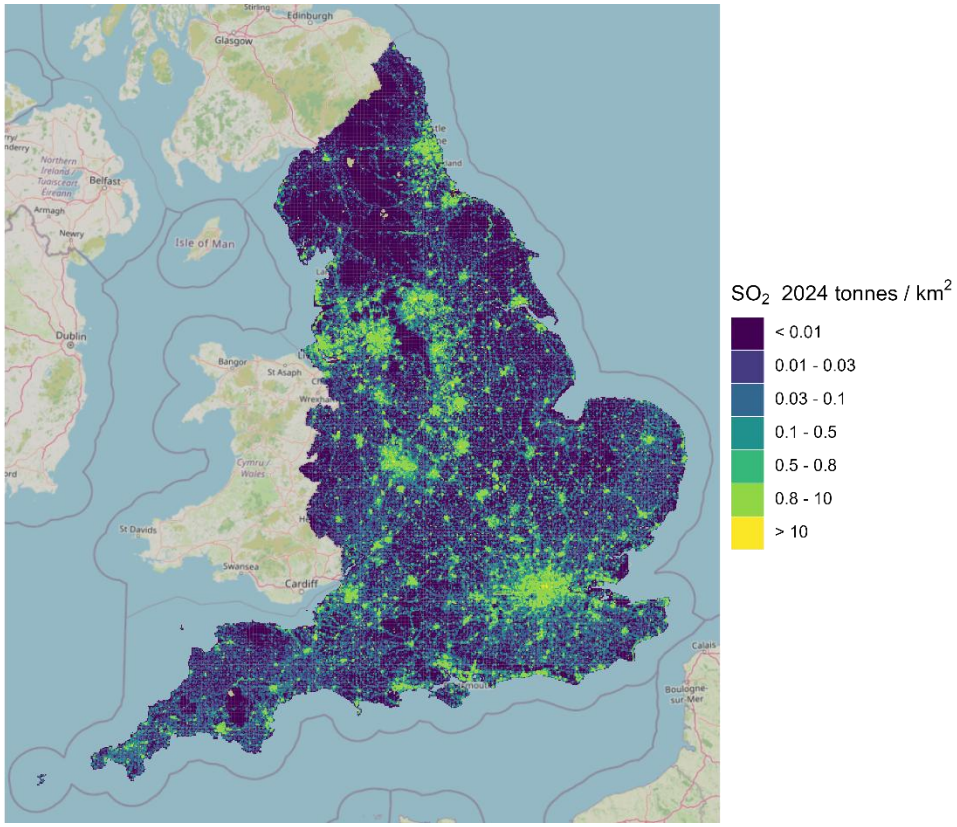


Figure 16: Sulphur dioxide ($SO_2$) emissions in England, 2024

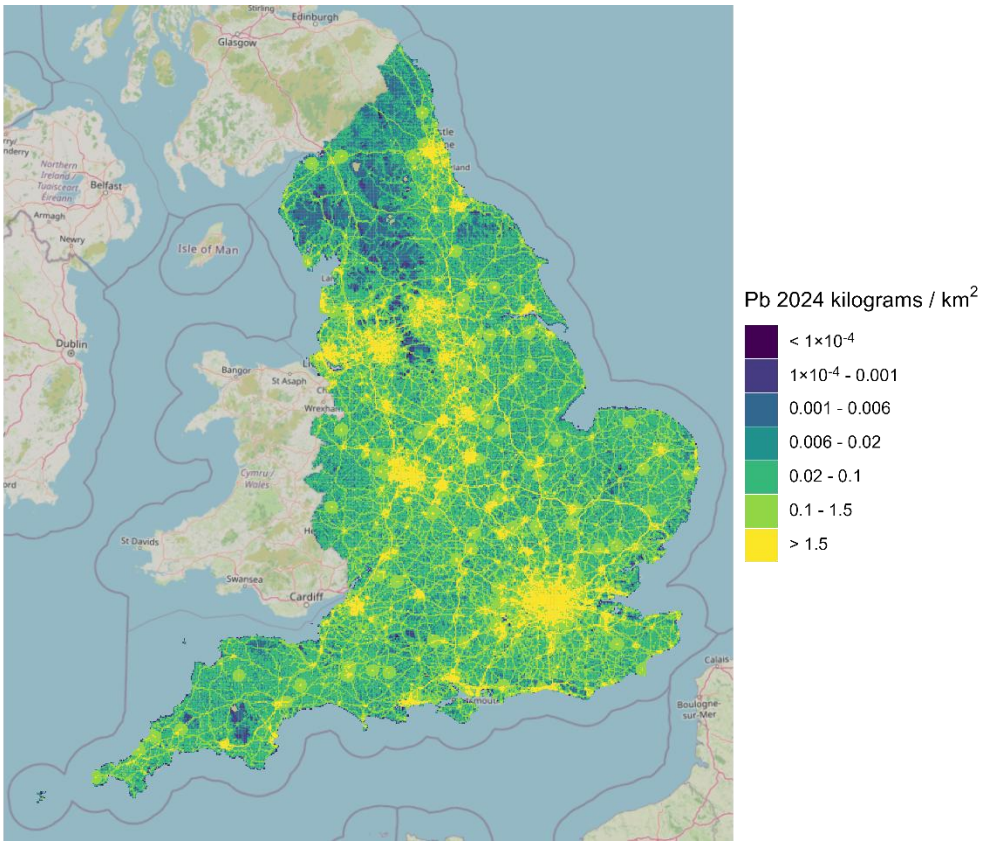


Figure 17: Lead (Pb) emissions in England, 2024

## 2.2 SCOTLAND

The following section summarises emissions in Scotland for the eight priority air pollutants: $NH_3$, CO, $NO_X$, NMVOCs, $PM_{10}$, $PM_{2.5}$, $SO_2$, and Pb. Information is also presented for emissions of PCDD/Fs, B[a]P, and Hg, with more detailed information for these three pollutants presented in **Appendix C**. Emissions of PCDD/Fs, B[a]P, and Hg should be considered as experimental statistics only.[11] **Appendix F** presents the inventory data summary tables for England and the DGs, whilst **Appendix G** presents source category mapping used in the report**.**

**Figure 18** shows emissions of all eleven air pollutants as a percentage of the 2005 total. For Scotland, the pollutants that have seen the greatest rate of change within the time series are summarised below, with detailed descriptions for all pollutants provided in the following sections.

B[a]P is the only pollutant where emissions are higher in 2024 than in 2005. B[a]P emissions increased sharply between 2020 and 2023, due to an increase in wood burning in residential combustion in Scotland, according to the latest Defra survey on Domestic Burning Practices in the UK (Defra, 2025b). Please see **Appendix C** for more details.

The greatest rate of decline is observed in the trend for sulphur dioxide emissions, principally due to the decline in sulphur-containing solid fuels, such as coal, being burnt in the UK. However, there was a 16% increase between 2023 and 2024, due to petroleum refining activities (1A1b).

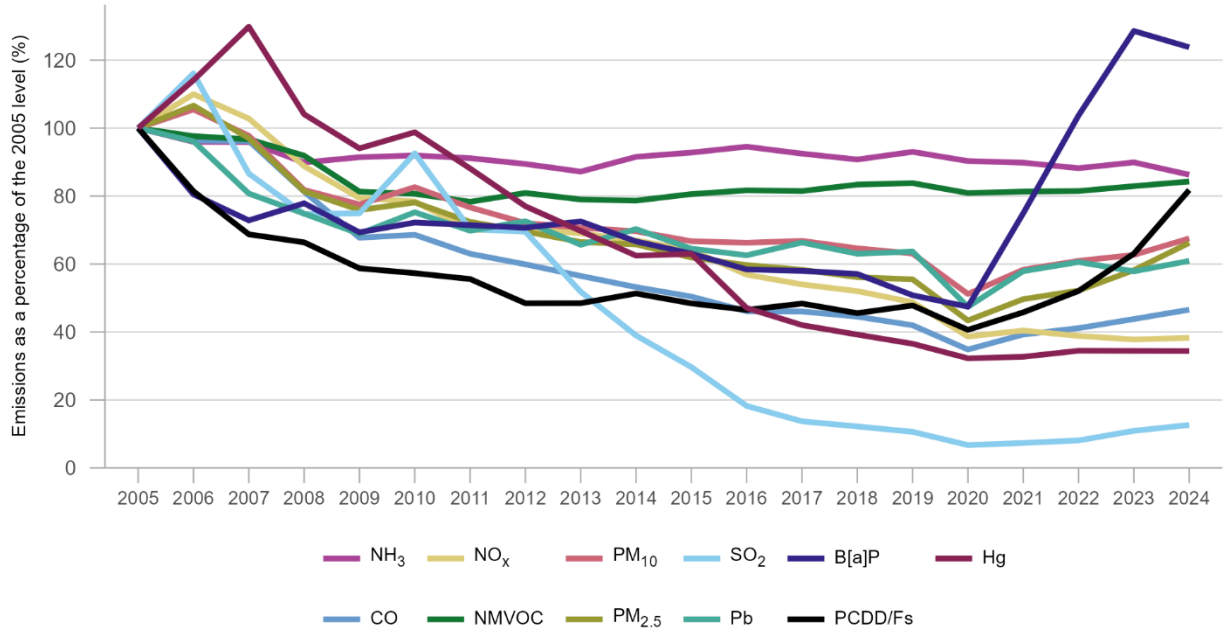


Figure 18: Scotland trends for all pollutants as a percentage of the 2005 level

11 The emission estimates are considered experimental. While the inventories and trends have been interrogated and to ensure the suitability of methods for the most important sources, it is recognised that data quality on a subnational level is generally poor. As a result, these emission estimates are currently considered experimental only, and require further work to evaluate the methods used, to identify alternative methods that are more suitable, and to reduce the uncertainty in the early part of the time series. More information on the inventory methods used for B[a]P, PCDD/Fs, and Hg is available Appendix C.

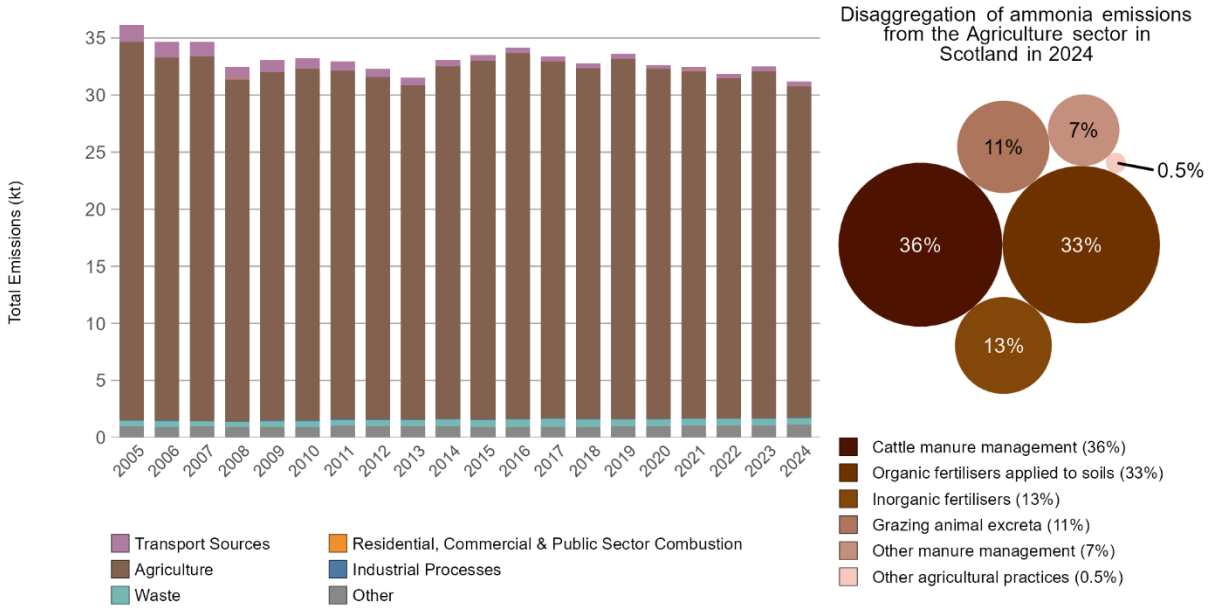


Figure 19: Ammonia ($NH_3$) emissions in Scotland

Note: The disaggregated emissions chart and summary statistics below may not add up to 100% due to rounding.

### 2.2.1 Ammonia

The total ammonia emissions for Scotland are shown in **Figure 19**. A disaggregation of the largest sector is shown in the bubble chart. The sectors definitions are provided in **Appendix G**.

Emissions of ammonia in Scotland were estimated to be 31.2 kt in 2024, and have decreased by 14% since 2005. Emissions in Scotland account for 12% of the UK total for ammonia in 2024.

The agriculture sector makes up the largest contribution to ammonia emissions throughout the time series, representing for 93% of ammonia emissions in 2024. Despite this, emissions from the agriculture sector have decreased by 12% since 2005. The initial decrease is primarily driven by reduced nitrogen fertiliser application rates and reductions in numbers of some types of agricultural animals such as beef cattle, pigs, and turkeys until 2008. After this point, emissions have fluctuated slightly each year, due to changes in numbers of dairy cattle, but also due to increased use of urea-based fertilisers. The price of fertilisers varies and thus there is annual variation in the quantities applied and the balance between types of fertiliser.

Fertiliser application is also driving the decrease in emissions in the latest year. Emissions from inorganic fertilisers (3Da1) decreased by 15% between 2023 and 2024, as a result of a decreased quantity of nitrogen fertiliser applied on arable and grassland. This is partially offset by an increase in pet numbers (6A), and as such, Scotland's overall ammonia emissions decreased by 4% between 2023 and 2024.

It's also worth noting that emissions from cattle manure management (3B1) and other manure management (3B2, 3B3, 3B4) have decreased substantially since 2005, by 16% and 36% respectively. This is due to a decrease in numbers of some types of livestock such as beef cattle, pigs, and turkeys, leading to lower emissions from the manure management of wastes (excreta) of these types of animals. This is also contributing to the decrease in ammonia emissions across the time series.

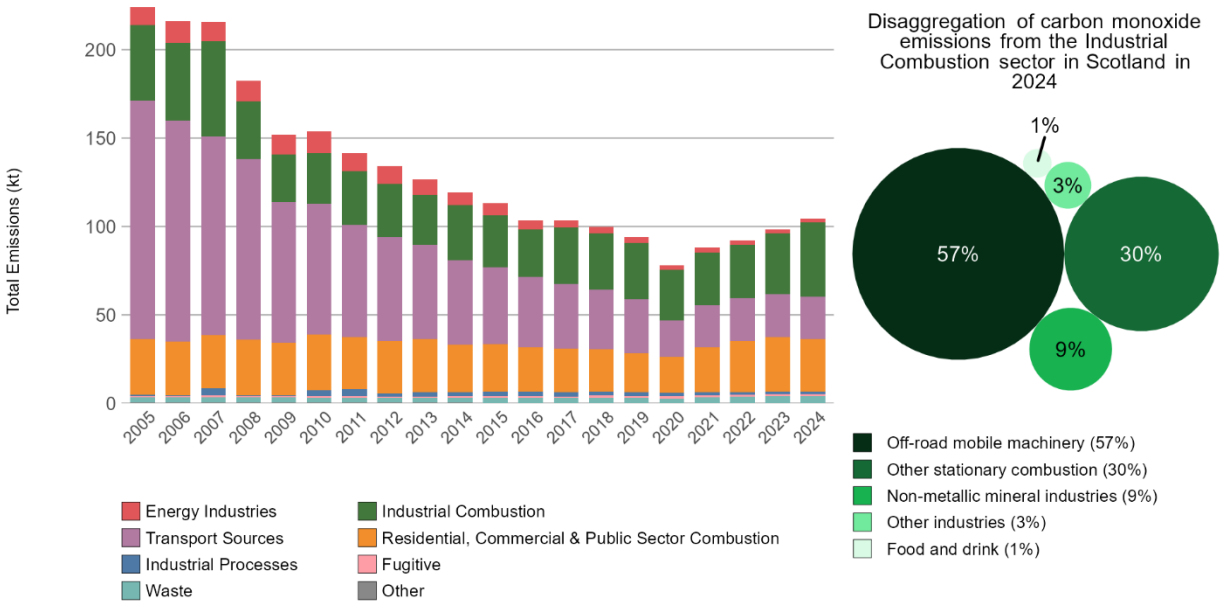


Figure 20: Carbon monoxide (CO) emissions in Scotland[12]

Note: The disaggregated emissions chart and summary statistics below may not add up to 100% due to rounding.

### 2.2.2 Carbon monoxide

Emissions of carbon monoxide in Scotland were estimated to be 104.4 kt in 2024, as shown in **Figure 20**, and have decreased by 53% since 2005. Emissions in Scotland account for 9% of the UK total for carbon monoxide in 2024.

The industrial combustion sector makes up the largest contribution to carbon monoxide emissions since 2019. In 2024, off-road mobile machinery (1A2gvii) accounts for 57% of the industrial combustion emissions in Scotland. However, emissions from other stationary combustion (1A2gviii) increased by 156% between 2023 and 2024, and this is ultimately driving the 6% increase in Scotland's carbon monoxide emissions between 2023 and 2024. This is a result of industries burning more plant biomass[13] in combustion processes.

The long-term decline in carbon monoxide emissions is driven by the transport sources sector, which has seen a decline of 82% in emissions since 2005. In particular, emissions from passenger cars (1A3bi) have decreased by 86% since 2005, and emissions from other road transport[14] (1A3b except 1A3bi) have decreased by 90%. This is due to the increased proportion in the fleet of vehicles compliant with the more recent Euro standards (Euro V and above) on UK roads, which required the fitting of emission controls (e.g. three-way catalytic converters) in new petrol vehicles. Improved catalyst repair rates resulting from regulations controlling the sale and installation of replacement catalytic converters and particle filters for light-duty vehicles in 2008 also contribute to the decrease in emissions. More recently, the switch from petrol cars to diesel cars, which have lower associated carbon monoxide emissions rates, has also contributed to the observed decrease in emissions.

12 Other industries presented in the bubble graph inset in Figure 20 relate to combustion emissions in the chemical, non-ferrous metals, pulp paper and print and other industries

13 Plant biomass includes a wide variety of fuels ranging from wood pellets, energy crops, to lesser used fuels such as paper and sewage sludge. It also includes solid biomass of unknown origin and properties.

14 Other road transport includes light duty vehicles, heavy duty vehicles and buses, mopeds and motorcycles, gasoline evaporation and automobile road abrasion.

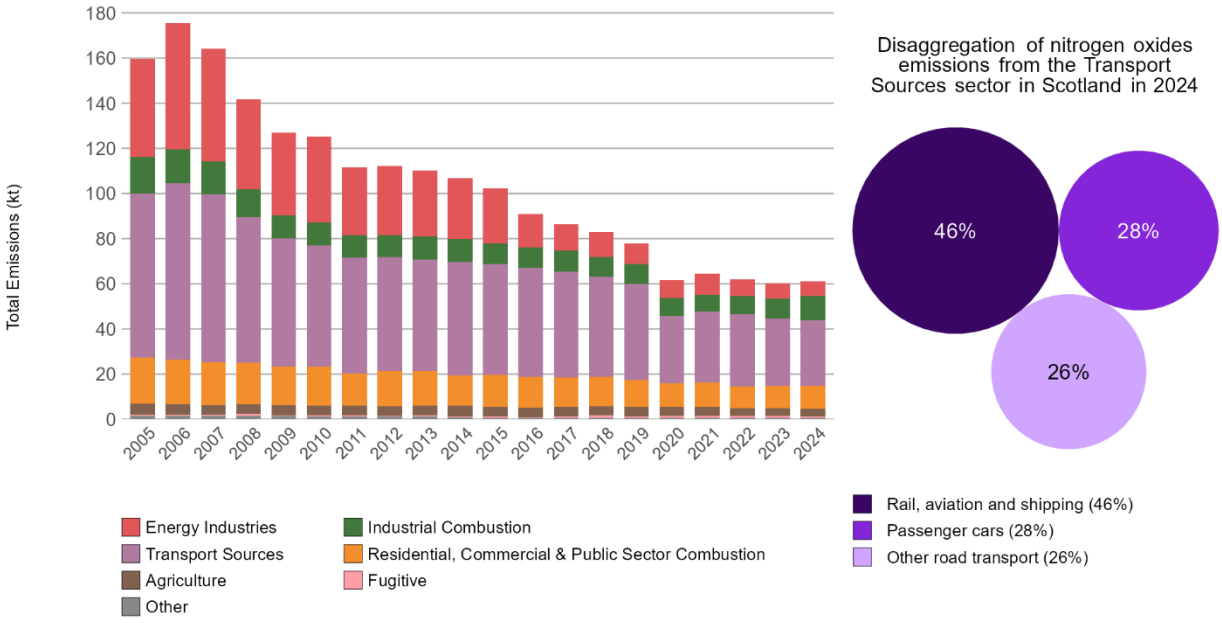


Figure 21: Nitrogen oxides ($NO_x$) emissions in Scotland

Note: The disaggregated emissions chart and summary statistics below may not add up to 100% due to rounding.

### 2.2.3 Nitrogen oxides

Emissions of nitrogen oxides in Scotland were estimated to be 61.1 kt in 2024, as shown in **Figure 21**, and have decreased by 62% since 2005. Emissions in Scotland account for 11% of the UK total for nitrogen oxides in 2024.

The transport sources sector makes up the largest contribution to nitrogen oxides emissions throughout the time series. In 2024, the largest transport sectors were rail, aviation and shipping (1A3a, 1A3c, 1A3dii, 1A3eii), which collectively comprised 46% of the emissions. Since 2005, emissions from transport have decreased by 60% due to the successive introduction of tighter Euro emission standards, and the increase in the number of vehicles compliant with the more recent Euro standards (Euro V and above) on UK roads. In addition, improvements in catalyst repair rates resulting from regulations controlling the sale and installation of replacement catalytic converters and particle filters for light-duty vehicles contributes to the decline since 2008. However, a period of preferred uptake of diesel cars over petrol cars partly offsets these emissions reductions, because diesel cars emit higher $NO_X$ relative to their petrol counterparts. In recent years, the increased uptake of electric vehicles has helped to reduce emissions. Note that the decrease in emissions in 2020 is likely due to travel restrictions during the COVID-19 pandemic resulting in reduced traffic volumes.

The peak in nitrogen oxide emissions in 2006 is due to the increased use of coal at power stations that year. There was also a small increase in coal-fired generation in 2012 due to a UK-wide shift in the fuel mix used for power generation from gas to coal in that year (DESNZ, 2025a). Energy industry emissions have declined across the time series, linked to Boosted Over-Fire Air (BOFA) abatement systems which were fitted to all four of Longannet's units, to reduce $NO_X$ emissions from coal-fired generation by up to 25% (Scottish Power, 2012). BOFA systems were also fitted on all four units at Cockenzie power station which then closed in 2013 (Scottish Power, 2011). Longannet power station closed in March 2016 marking the end of coal combustion for power generation in Scotland and causing a step-change in emissions between 2015 and 2016.

Nitrogen oxides emissions increased by 1% from 2023 to 2024. The main sub-sector driving this change is other stationary combustion (1A2gviii), in the industrial combustion sector, which increased by 44%.

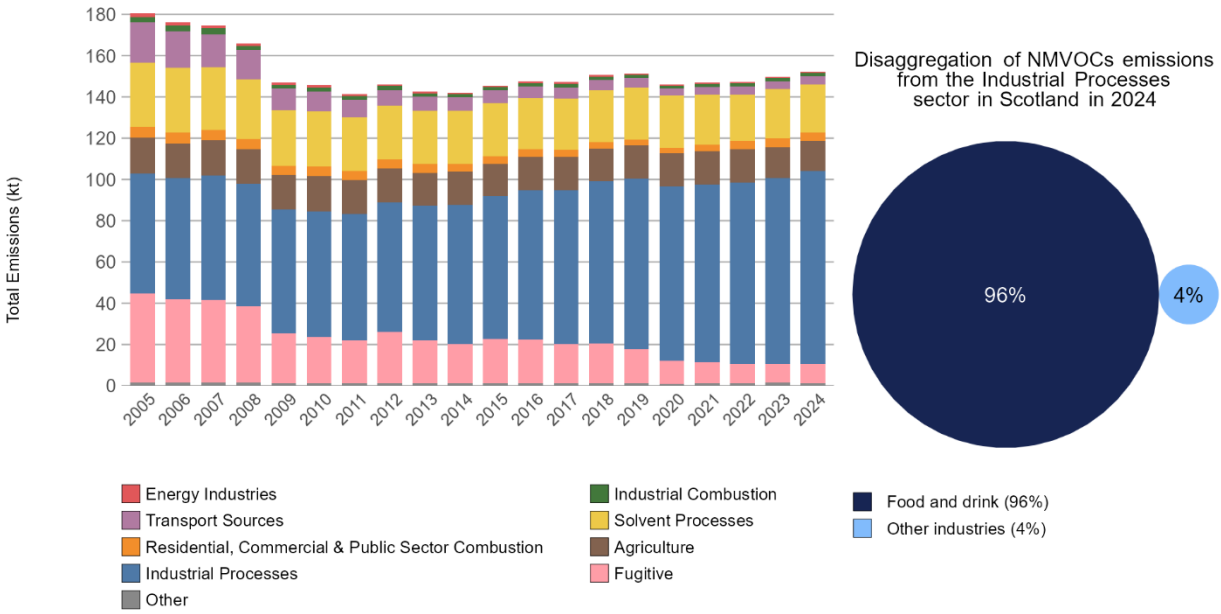


Figure 22: Non-methane volatile organic compounds (NMVOC) emissions in Scotland[15]

Note: The disaggregated emissions chart and summary statistics below may not add up to 100% due to rounding.

### 2.2.4 NMVOCs

Emissions of NMVOCs in Scotland were estimated to be 152.2 kt in 2024, as shown in **Figure 22**, and have decreased by 16% since 2005. Emissions in Scotland account for 20% of the UK total for NMVOCs in 2024.

The industrial processes sector makes up the largest contribution to NMVOCs emissions throughout the time series. Food and drink (2H2) accounts for 96% of the emissions in the industrial processes sector in 2024, although emissions have increased since 2009 due to the increased production and storage of whisky. This trend continues in recent years, as emissions from food and drink increased by 4% between 2023 and 2024, due to increased whisky maturation activity. This is ultimately driving Scotland's overall NMVOC emissions increase of 2% between 2023 and 2024.

The long-term trend in NMVOC emissions is driven by fugitive sources (1B1a, 1B1b, 1B2ai, 1B2aiv, 1B2av, 1B2b, 1B2c), which have seen a 79% decrease in emissions since 2005. The sharper decrease between 2008 and 2009 was due to reductions in fugitive NMVOC emissions from oil loading at the Sullom Voe terminal in Shetland.

Emissions from transport sources have also decreased since 2005, due to the introduction of three-way catalytic converters and controls on evaporative emissions from vehicles, and, to a lesser degree, a switch away from petrol to diesel cars, and improved fuel economy. This also contributes to the long-term decrease in NMVOC emissions over time.

15 Other industries presented in the bubble graph inset in Figure 22 relate to emissions from glass production, storage handling and transport of chemical products, nitric acid production, titanium dioxide production, soda ash production, aluminium production, lead production, zinc production, copper production, other mineral products, other chemical industry, other metal production, pulp and paper industry, wood processing, other product use, other industrial processes.

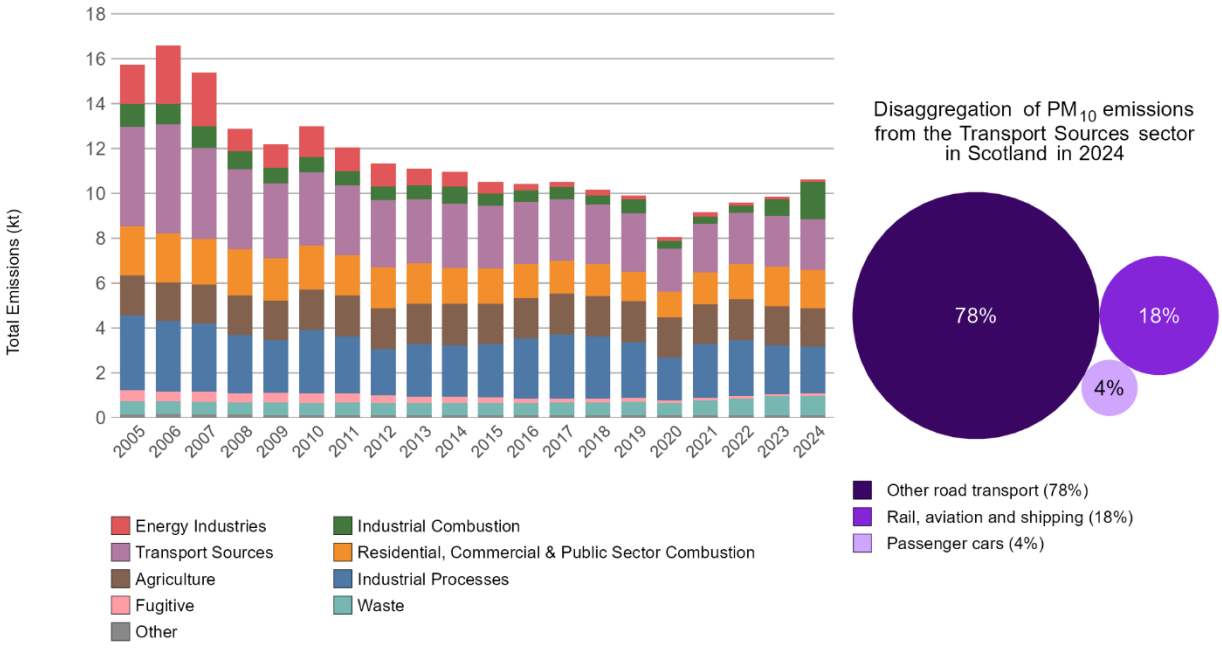


Figure 23: Particulate matter < 10 µm ($PM_{10}$) emissions in Scotland

Note: The disaggregated emissions chart and summary statistics below may not add up to 100% due to rounding.

### 2.2.5 $PM_{10}$

Emissions of $PM_{10}$ in Scotland were estimated to be 10.6 kt in 2024, as shown in **Figure 23**, and have decreased by 32% since 2005. Emissions in Scotland account for 10% of the UK total for $PM_{10}$ in 2024.

The transport sources sector makes up the largest contribution to $PM_{10}$ emissions for 2024. Other road transport[16] (1A3b except 1A3bi) accounts for 78% of the $PM_{10}$ emissions from transport sources in 2024. Despite this, transport sources have seen a 49% decrease in emissions since 2005, mainly due to a 73% decrease in emissions from rail, aviation, and shipping (1A3a, 1A3c, 1A3dii, 1A3eii). Controls on vehicle exhaust emissions have also contributed to the decrease in $PM_{10}$ emissions. Note that the decrease in emissions in 2020 is likely due to travel restrictions during the COVID-19 pandemic resulting in reduced traffic volumes.

$PM_{10}$ emissions increased by 8% from 2023 to 2024. The main sub-sector driving this change is other stationary combustion (1A2gviii), due to industries burning more plant biomass[17] in combustion processes.

[16] Other road transport includes light duty vehicles, heavy duty vehicles and buses, mopeds and motorcycles, gasoline evaporation and automobile road abrasion.

[17] Plant biomass includes a wide variety of fuels ranging from wood pellets, energy crops, to lesser used fuels such as paper and sewage sludge. It also includes solid biomass of unknown origin and properties.

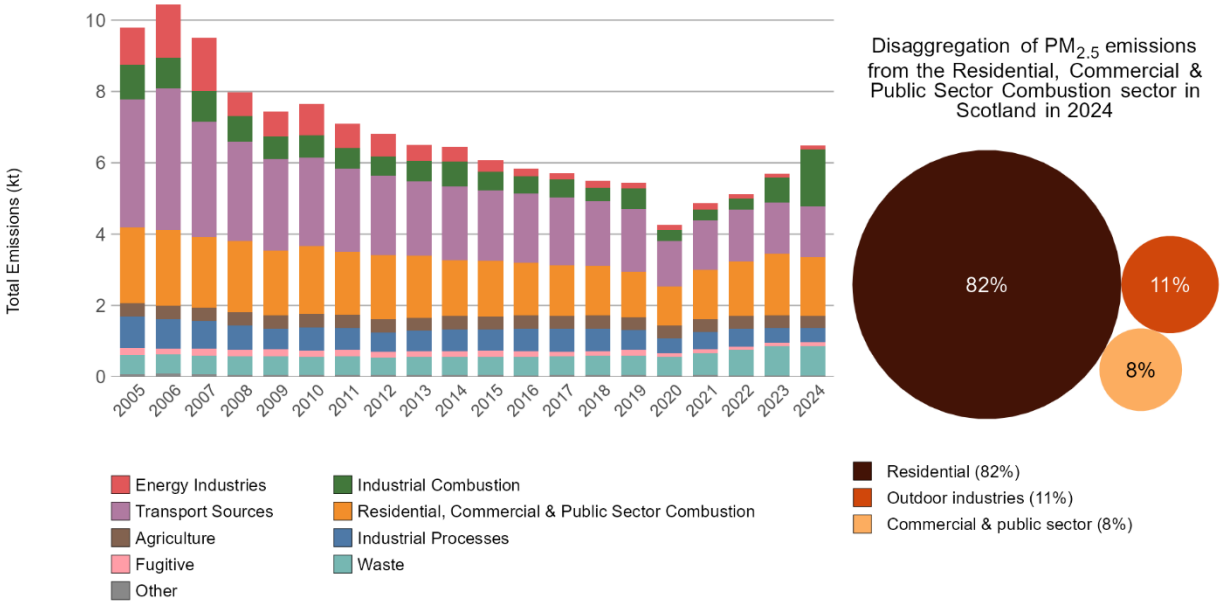


Figure 24: Particulate matter < 2.5 µm ($PM_{2.5}$) emissions in Scotland[18]

Note: The disaggregated emissions chart and summary statistics below may not add up to 100% due to rounding.

### 2.2.6 $PM_{2.5}$

Emissions of $PM_{2.5}$ in Scotland were estimated to be 6.5 kt in 2024, as shown in **Figure 24**, and have decreased by 34% since 2005. Emissions in Scotland account for 12% of the UK total for $PM_{2.5}$ in 2024.

The residential, commercial & public sector combustion sector makes up the largest contribution to $PM_{2.5}$ emissions for 2024. The residential sector (1A4bi) accounts for 82% of the residential, commercial & public sector combustion sector emissions in 2024. Despite this, emissions from these sources have been decreasing since 2005, primarily due to the continued switch in the fuel mix used in electricity generation away from coal and towards natural gas.

However, it is the transport sources sector that has seen the largest decrease in emissions (61%) since 2005. This is driven by a 73% decrease in emissions from rail, aviation, and shipping (1A3a, 1A3c, 1A3dii, 1A3eii). There has also been a 44% decrease in emissions from other road transport[19] (1A3b except 1A3bi) since 2005, due to the introduction of progressively more stringent emissions standards through time, as well as increased uptake of electric vehicles in recent years. Note that the decrease in emissions in 2020 is likely due to travel restrictions during the COVID-19 pandemic resulting in reduced traffic volumes.

$PM_{2.5}$ emissions increased by 14% from 2023 to 2024. The main sub-sector driving this change is other stationary combustion (1A2gviii), where emissions increased by 171%, due to industries burning more plant biomass[20] in combustion processes

18 Outdoor industries presented in the bubble graph inset in Figure 24 relate to combustion emissions from machinery in the agriculture, forestry and fishing industries.

19 Other road transport includes light duty vehicles, heavy duty vehicles and buses, mopeds and motorcycles, gasoline evaporation and automobile road abrasion.

20 Plant biomass includes a wide variety of fuels ranging from wood pellets, energy crops, to lesser used fuels such as paper and sewage sludge. It also includes solid biomass of unknown origin and properties.

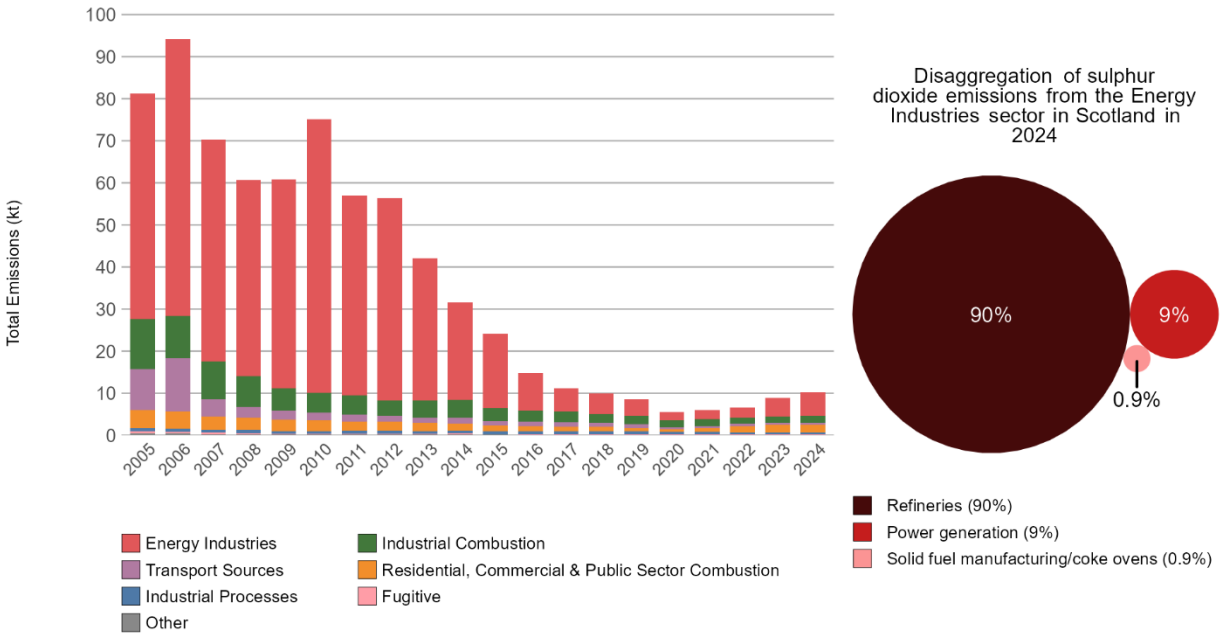


Figure 25: Sulphur dioxide ($SO_2$) emissions in Scotland

Note: The disaggregated emissions chart and summary statistics below may not add up to 100% due to rounding.

### 2.2.7 Sulphur dioxide

Emissions of sulphur dioxide in Scotland were estimated to be 10.3 kt in 2024, as shown in **Figure 25**, and have decreased by 87% since 2005. Emissions in Scotland account for 12% of the UK total for sulphur dioxide in 2024.

The energy industries sector makes up the largest contribution to sulphur dioxide emissions throughout the time series. Historically, power generation (1A1a) was the largest subsector, however, emissions from power generation have decreased by 99% since 2005, driven by the following changes: reduction in coal fired power relative to other sources; improved emission controls on some large coal fired plants such as the installation of an FGD (flue-gas desulphurization) plant at Longannet power station; the use of coal of lower sulphur content in later years at Cockenzie (Scottish Power, 2012) before its closure in March 2013, and finally the complete cessation of coal combustion for power generation in Scotland in 2016 after the closure of Longannet. Sulphur dioxide emissions from domestic combustion have also significantly reduced due to the reduction of petroleum coke and smokeless solid fuels in fireplaces and stoves.

Therefore, in 2024, it is refineries (1A1b) that accounts for the majority (90%) of the emissions from energy industries. Due to an increase in petroleum refining activities, emission from refineries have increased by 34% between 2023 and 2024. This is ultimately what is driving Scotland's 16% increase in sulphur dioxide emissions from 2023 to 2024.

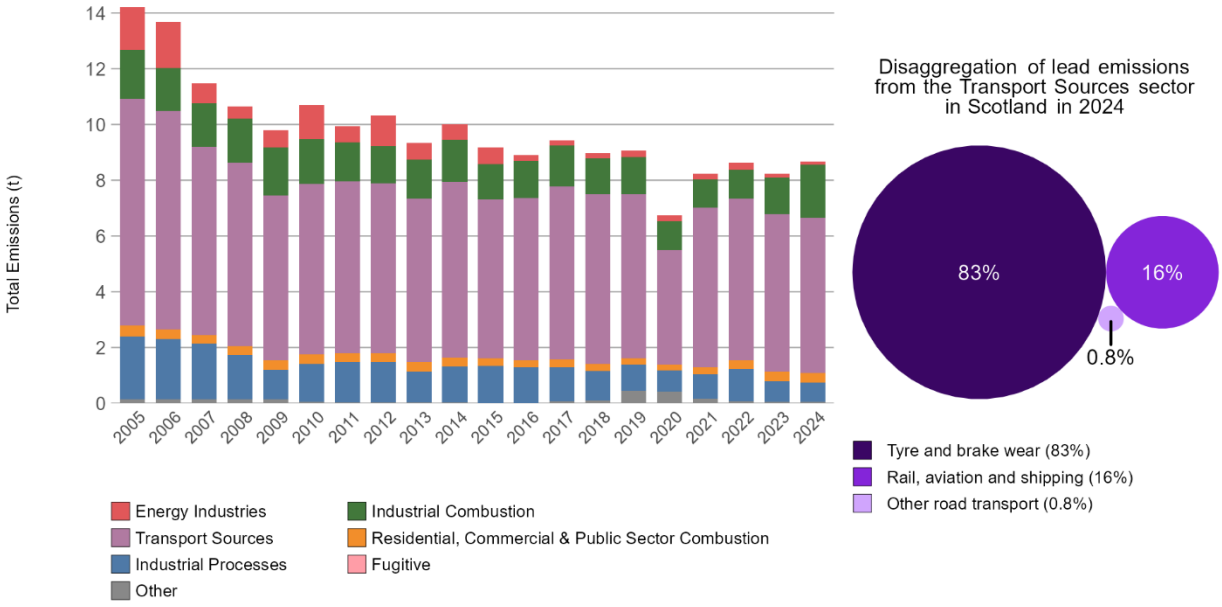


Figure 26: Lead (Pb) emissions in Scotland

Note: The disaggregated emissions chart and summary statistics below may not add up to 100% due to rounding.

### 2.2.8 Lead

Emissions of lead in Scotland were estimated to be 8.7 t in 2024, as shown in **Figure 26**, and have decreased by 39% since 2005. Emissions in Scotland account for 7% of the UK total for lead in 2024.

The transport sources sector makes up the largest contribution to lead emissions throughout the time series. Since 2005, the transport sources sector has decreased by 31%. This is driven by a 77% decrease in emissions from rail, aviation and shipping (1A3a, 1A3c, 1A3dii, 1A3eii). In 2024, tyre and brake wear (1A3bvi) accounts for 83% of the emissions from the transport sources sector. Tyre and brake wear (1A3bvi) emissions, that is emissions from the mechanical wear as a result of the interaction between the vehicles tyres and road surface and when brakes are applied, have increased by 11% since 2005 which partially offsets the overall decrease for transport sources. Unlike exhaust emissions, which have been subject to the continued implementation of more stringent European regulation, non-exhaust emissions are not regulated and are strongly linked to the vehicle-kilometres driven. Note that the decrease in emissions in 2020 is likely due to travel restrictions during the COVID-19 pandemic resulting in reduced traffic volumes.

Beyond transport, the decline in lead emissions from 2005 is largely driven by changes in energy industries and industrial processes. Emissions from power stations have decreased due to the phase out of coal from the energy generation mix, with the closure of Longannet in 2016 marking the end of the use of coal in energy generation in Scotland.

Lead emissions increased by 5% from 2023 to 2024. The main sub-sectors driving this change are in other stationary combustion (1A2gviii), which increased emissions by 52% due to industries burning more plant biomass[21] in combustion processes.

[21] Plant biomass includes a wide variety of fuels ranging from wood pellets, energy crops, to lesser used fuels such as paper and sewage sludge. It also includes solid biomass of unknown origin and properties.

**Table 3** below provides a summary of the percentage contribution of each sector for each pollutant in 2024. The table is shaded according to the overall contribution of that sector to the pollutant total, (with darker shades representing greater contribution). Important sectors indicated by the table are residential, commercial & public sector combustion (the highest contributor of B[a]P emissions), transport sources (the highest contributor of Pb and $NO_x$ emissions), industrial processes (the highest contributor of NMVOC emissions), and industrial combustion (the highest contributor of CO and PCDD/Fs emissions).

The waste sector is also important, especially for emissions of Hg, and energy industries contribute the most towards $SO_2$ emissions. This table also highlights that although emissions from the agriculture sector are not significant when considering all pollutants, it is of very high significance when considering emissions of $NH_3$.

Table 3: Source emission contributions ranked by sector, Scotland, 2024

| Sector | $NH_3$ | CO | $NO_x$ | NMVOC | $PM_{10}$ | $PM_{2.5}$ | $SO_2$ | Pb | B[a]P | PCDD/Fs | Hg |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Agriculture | 93.0% | NA | 5.4% | 9.6% | 16.2% | 5.3% | NA | NA | NA | NA | NA |
| Energy Industries | IE | 1.9% | 10.7% | 0.3% | 1.1% | 1.6% | 55.2% | 1.3% | 0.0% | 2.2% | 13.5% |
| Fugitive | IE | 1.2% | 1.1% | 6.0% | 1.0% | 1.7% | 0.8% | 0.0% | 0.0% | IE | IE |
| Industrial Combustion | IE | 40.3% | 17.7% | 1.2% | 15.7% | 24.9% | 16.1% | 22.0% | 0.5% | 40.1% | 26.5% |
| Industrial Processes | 0.1% | 1.4% | IE | 61.5% | 19.7% | 6.1% | 4.3% | 7.9% | 0.9% | 0.7% | 4.6% |
| Residential, Commercial & Public Sector Combustion | 0.1% | 28.3% | 17.0% | 2.6% | 16.0% | 25.4% | 18.1% | 3.9% | 90.1% | 25.7% | 14.6% |
| Solvent Processes | IE | NA | NA | 15.3% | IE | IE | NA | NA | IE | IE | NA |
| Transport Sources | 1.3% | 23.0% | 47.1% | 2.6% | 21.1% | 21.9% | 4.8% | 64.3% | 2.2% | 3.9% | 13.4% |
| Waste | 1.8% | 3.7% | IE | IE | 8.1% | 12.6% | IE | IE | 6.2% | 27.3% | 27.3% |
| Other | 3.6% | 0.1% | 1.0% | 0.9% | 0.9% | 0.6% | 0.7% | 0.6% | 0.1% | 0.1% | 0.1% |

* The sector: “other” includes all “other” categories in the inventory and also a number of categories that are insignificant for a specific pollutant. These have been marked in the table as “IE” (used in inventory reporting for “Included Elsewhere”). A breakdown of what is included within this category in respect to each pollutant can be found in Table 32.

The maps below show the emission totals for Scotland, excluding large industrial point sources and shipping. Units are in tonnes, except Pb in kg, per square kilometre in 2024. Details on the methodology for these can be found in Appendix B and in the Spatial Emissions Methodology for NAEI report (Tsagatakis, et al., 2025), found here: https://naei.energysecurity.gov.uk/reports/uk-spatial-emissions-methodology-report-national-atmospheric-emissions-inventory-2023

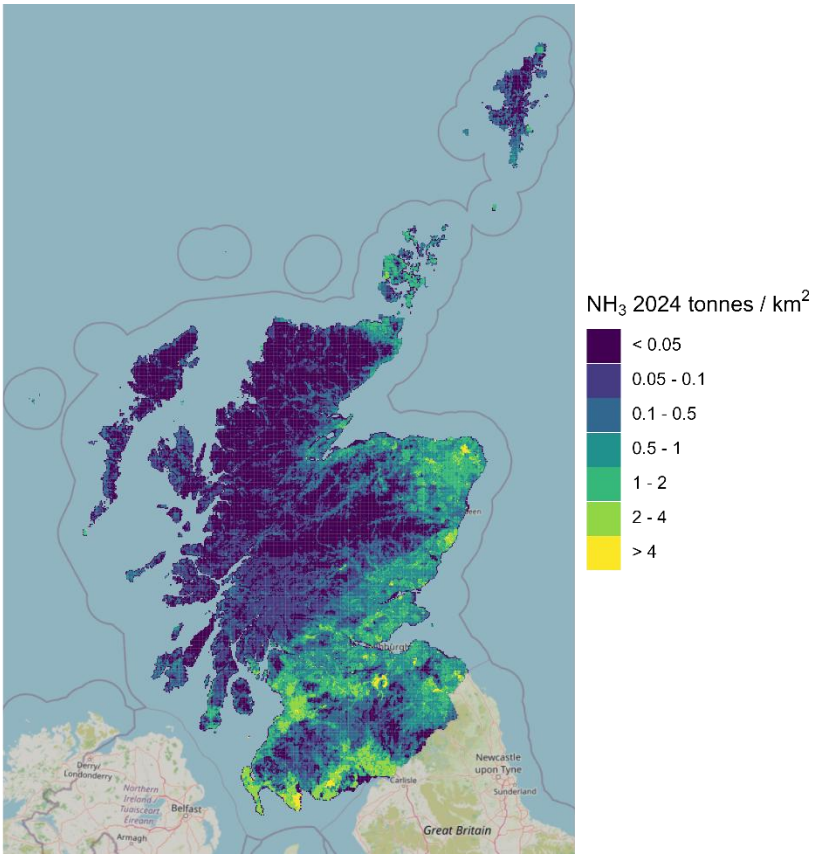


Figure 27: Ammonia ($NH_3$) emissions in Scotland, 2024

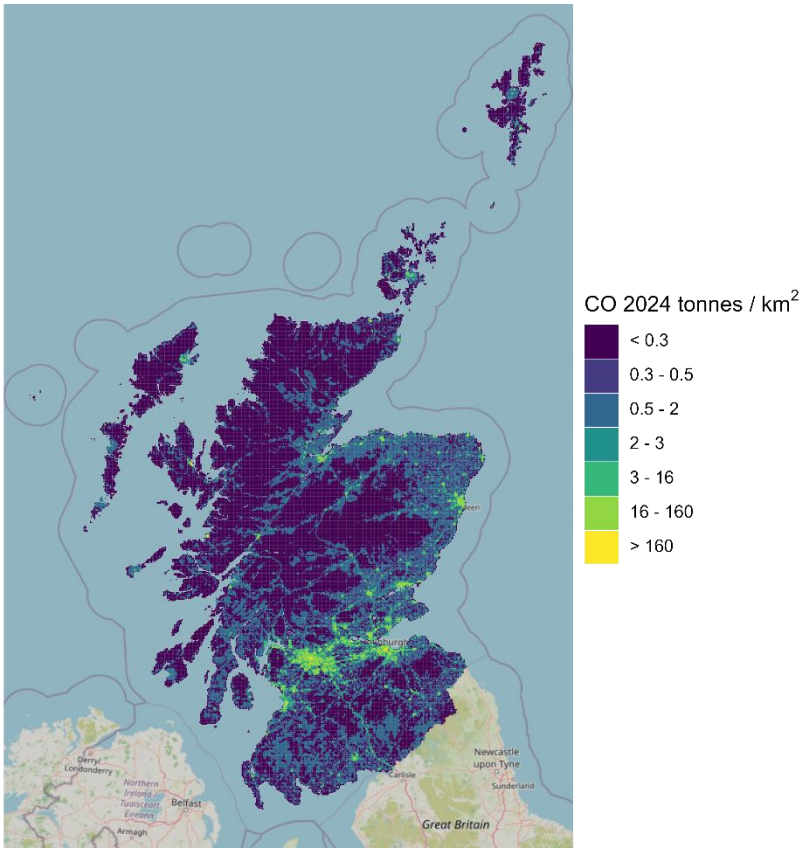


Figure 28: Carbon monoxide (CO) emissions in Scotland, 2024

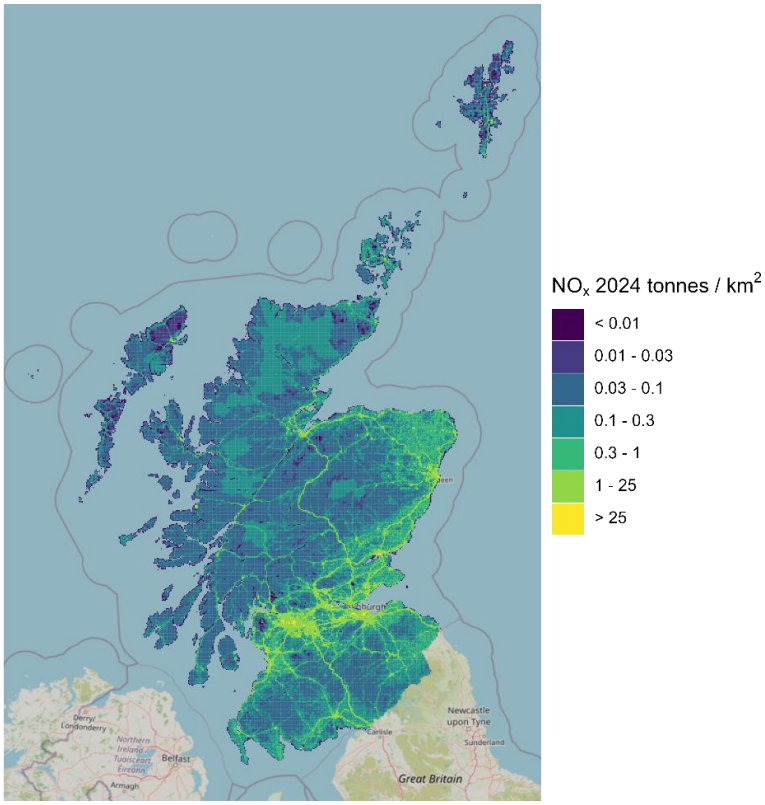


Figure 29: Nitrogen oxides ($NO_x$) emissions in Scotland, 2024

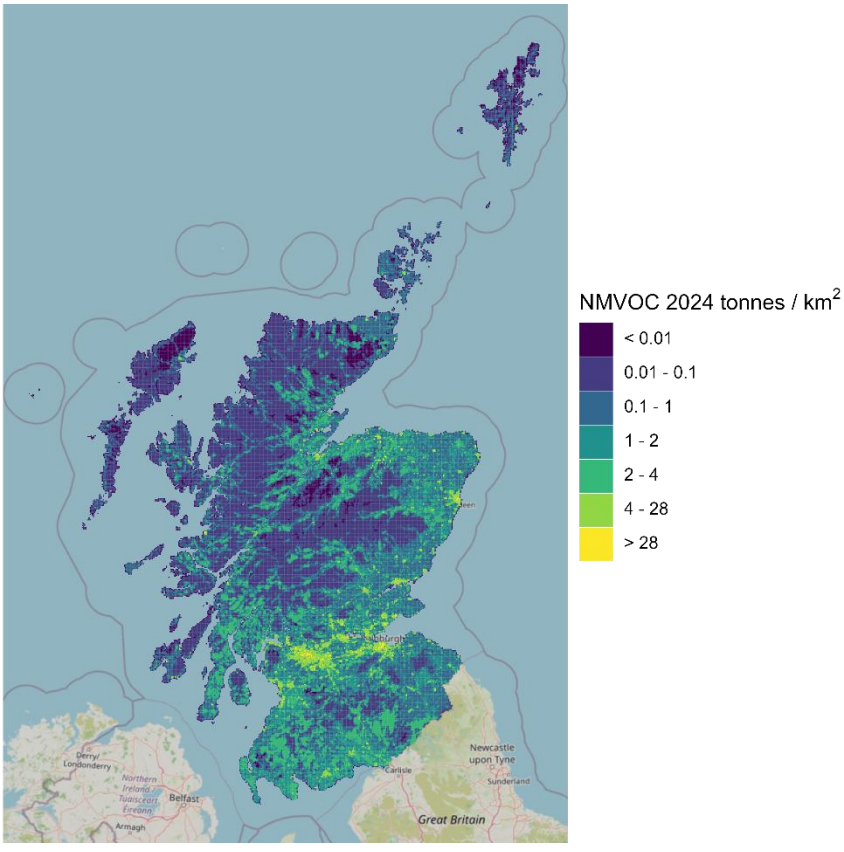


Figure 30: Non-methane volatile organic compounds (NMVOC) emissions in Scotland, 2024

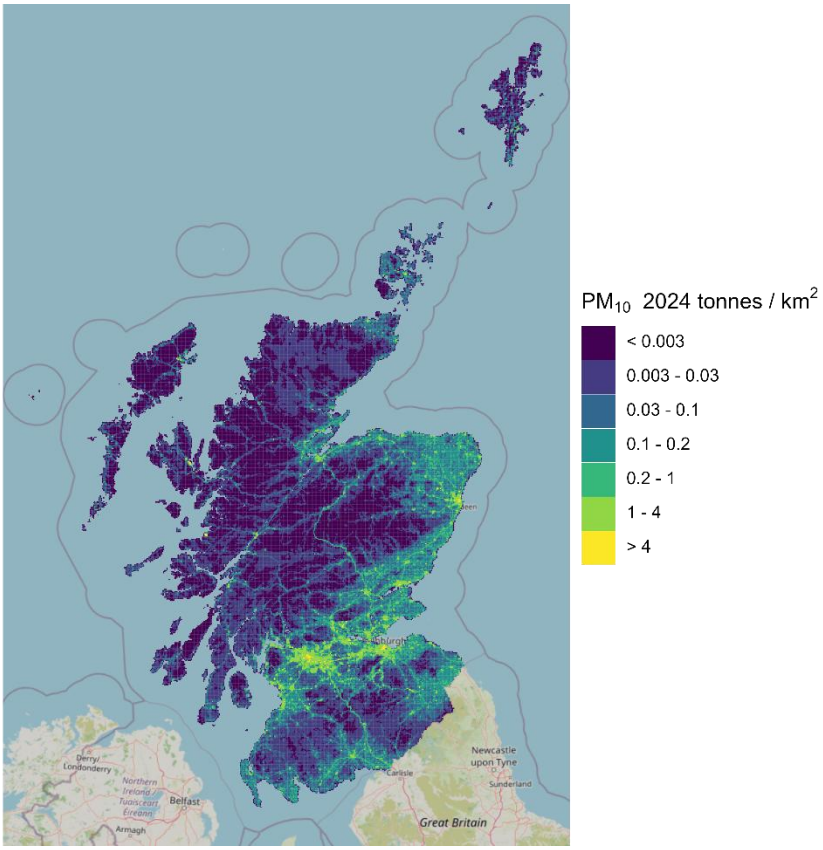


Figure 31: Particulate matter < 10 µm ($PM_{10}$) emissions in Scotland, 2024

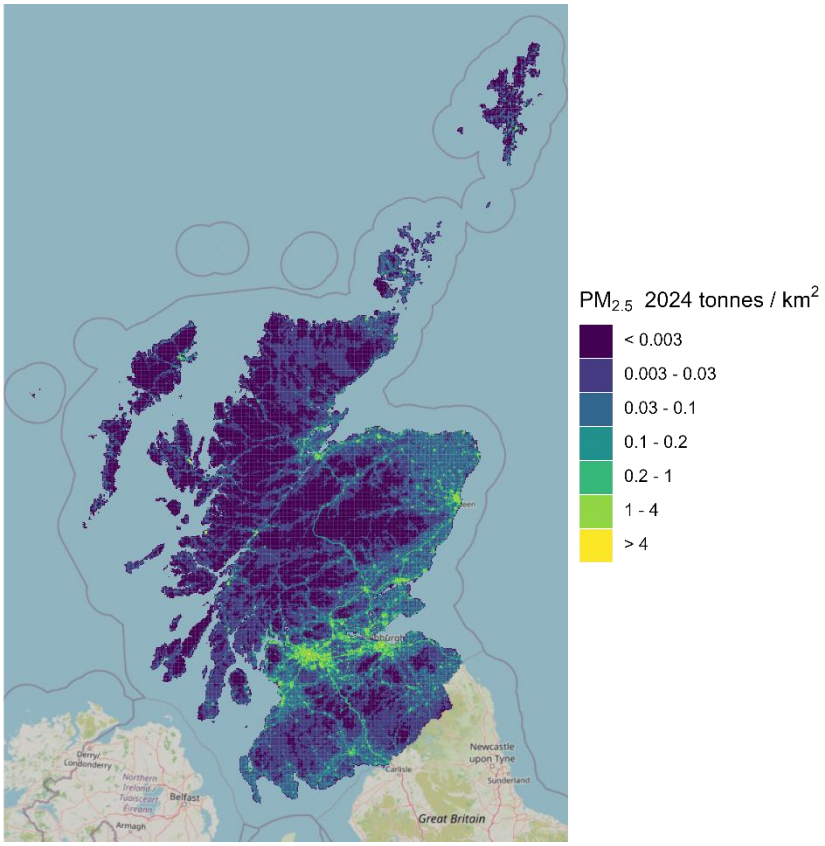


Figure 32: Particulate matter < 2.5 µm ($PM_{2.5}$) emissions in Scotland, 2024

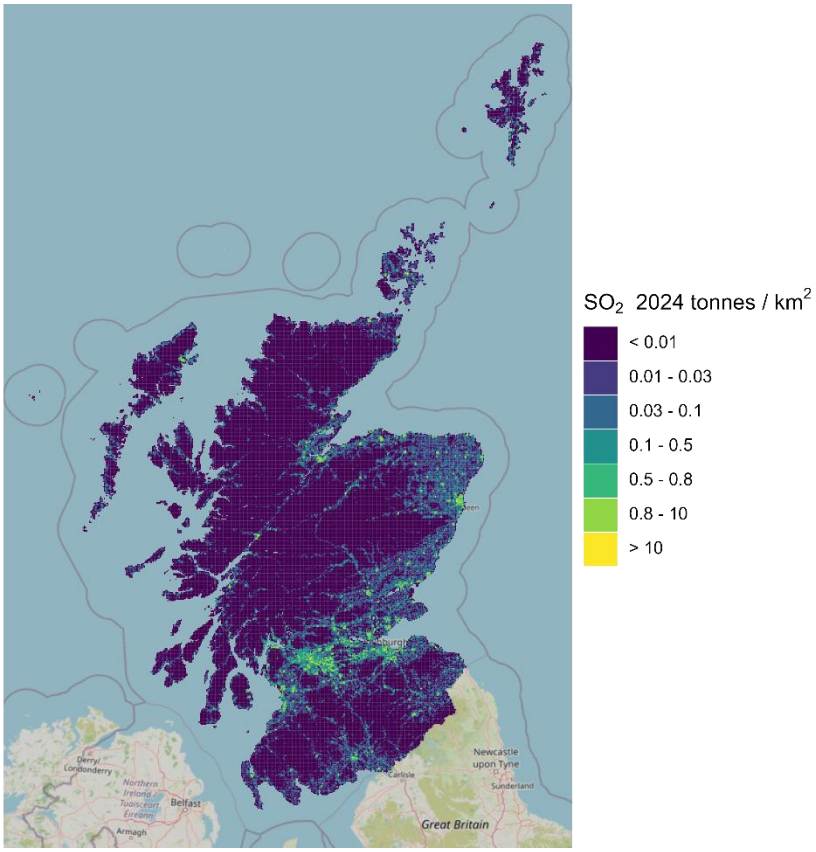


Figure 33: Sulphur dioxide ($SO_2$) emissions in Scotland, 2024

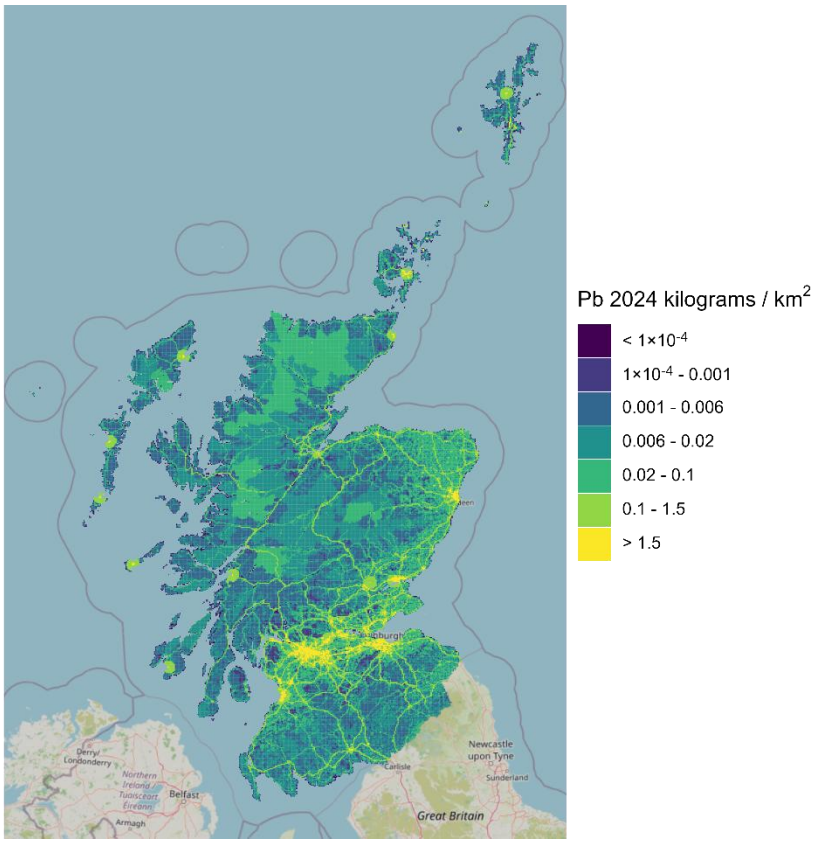


Figure 34: Lead (Pb) emissions in Scotland, 2023

## 2.3 WALES

The following section summarises emissions in Wales for the eight priority air pollutants: $NH_3$, CO, $NO_X$, NMVOCs, $PM_{10}$, $PM_{2.5}$, $SO_2$, and Pb. Information is also presented for emissions of PCDD/Fs, B[a]P, and Hg, with more detailed information for these three pollutants presented in **Appendix C**. Emissions of PCDD/Fs, B[a]P, and Hg should be considered as experimental statistics only[22]. **Appendix F** presents the inventory data summary tables for England and the DGs, whilst **Appendix G** presents source category mapping used in the report**.**

**Figure 35** shows emissions of all eleven air pollutants as a percentage of the 2005 total. For Wales, the pollutants that have seen the greatest rate of change within the time series are summarised below, with detailed descriptions for all pollutants provided in the following sections.

Ammonia is the only pollutant with higher emissions in 2024 than in 2005, which is attributable to agriculture, particularly emissions from livestock manure management and organic fertilisers applied to soils, although ammonia emissions decreased slightly between 2023 and 2024.

The greatest rate of decline is observed for sulphur dioxide, with an 88% decrease between 2005 and 2024 principally due to the decline in sulphur-containing solid fuels, such as coal, being burnt in the UK. The latest year decrease, between 2023 and 2024, was driven by reduced emissions from the iron and steel sector.

The graph also shows more year-to-year variability for some of the experimental pollutants and metals, particularly PCDD/Fs, mercury and lead. These pollutants remain below their 2005 levels in 2024 but show short-term peaks during the time series. For lead, emissions decreased by 44% between 2005 and 2024, including a 32% decrease between 2023 and 2024. These changes are consistent with variations in industrial process activity in Wales, particularly iron and steel sources.

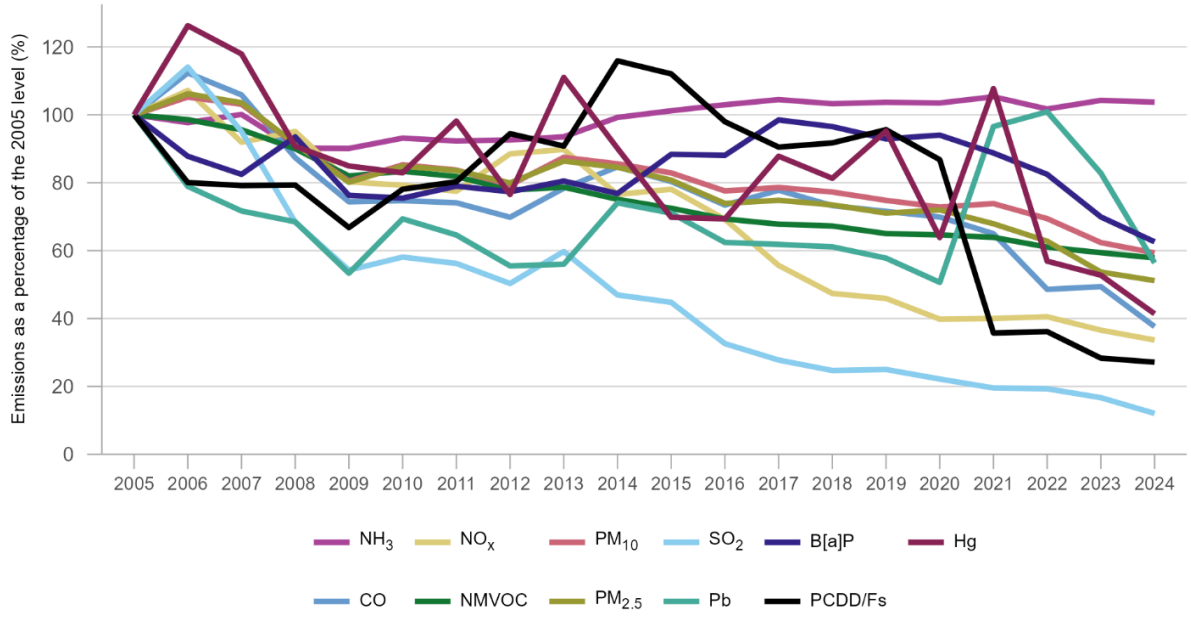


Figure 35: Wales trends for all pollutants as a percentage of the 2005 level

[22] The emission estimates are considered experimental. While the inventories and trends have been interrogated and to ensure the suitability of methods for the most important sources, it is recognised that data quality on a subnational level is generally poor. As a result, these emission estimates are currently considered experimental only, and require further work to evaluate the methods used, to identify alternative methods that are more suitable, and to reduce the uncertainty in the early part of the time series. More information on the inventory methods used for B[a]P, PCDD/Fs, and Hg is available in Appendix C.

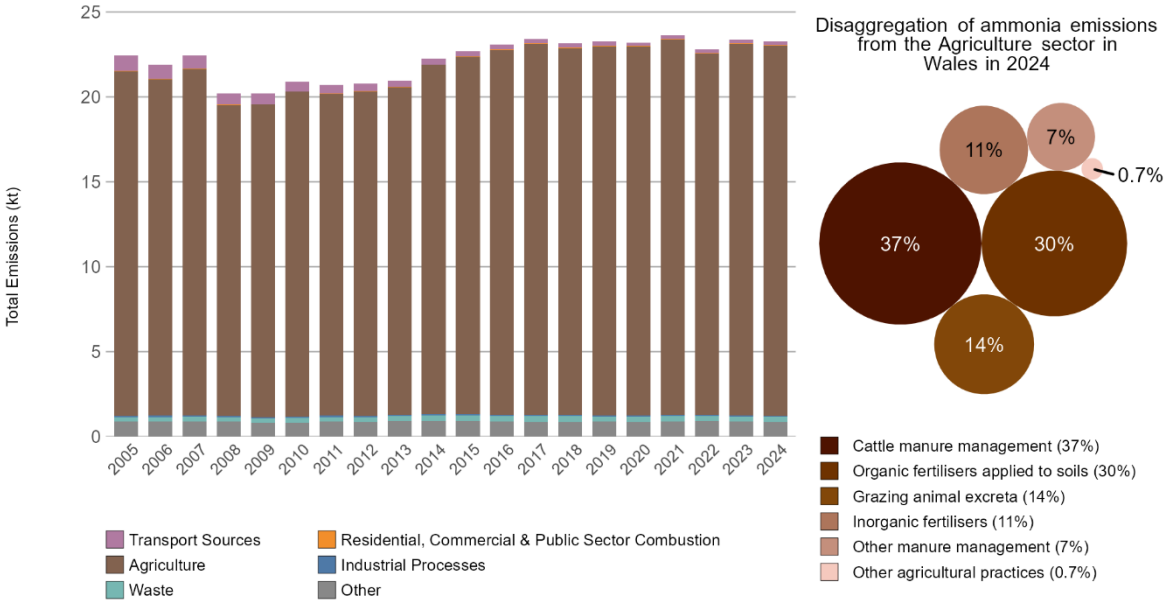


Figure 36: Ammonia ($NH_3$) emissions in Wales

Note: The disaggregated emissions chart and summary statistics below may not add up to 100% due to rounding.

### 2.3.1 Ammonia

The total ammonia emissions for Wales are shown in **Figure 36**. A disaggregation of the largest sector is shown in the bubble chart. The sectors definitions are provided in **Appendix G**.

Emissions of ammonia in Wales were estimated to be 23.3 kt in 2024, and have increased by 4% since 2005. Emissions in Wales accounted for 9% of the UK total for ammonia in 2024.

The agriculture sector makes up the largest contribution to ammonia emissions throughout the time series, and agriculture emissions have increased by 8% since 2005. The largest increases were from organic fertilisers applied to soils (3Da2), which increased by 21%. Emission increases since 2008 have been driven largely by emissions from manure management practices, particularly for dairy cattle, and from the application of urea-based fertilisers and digestate to soils.

In 2024, the largest agricultural source was cattle manure management (3B1), which accounted for 37% of agricultural ammonia emissions. Emissions from this source decreased by 2% between 2023 and 2024.

Separately to agriculture, it's worth noting that ammonia emissions from transport sources decreased by 75% between 2005 and 2024, reflecting changes in the road transport fleet and increased uptake of electric vehicles.

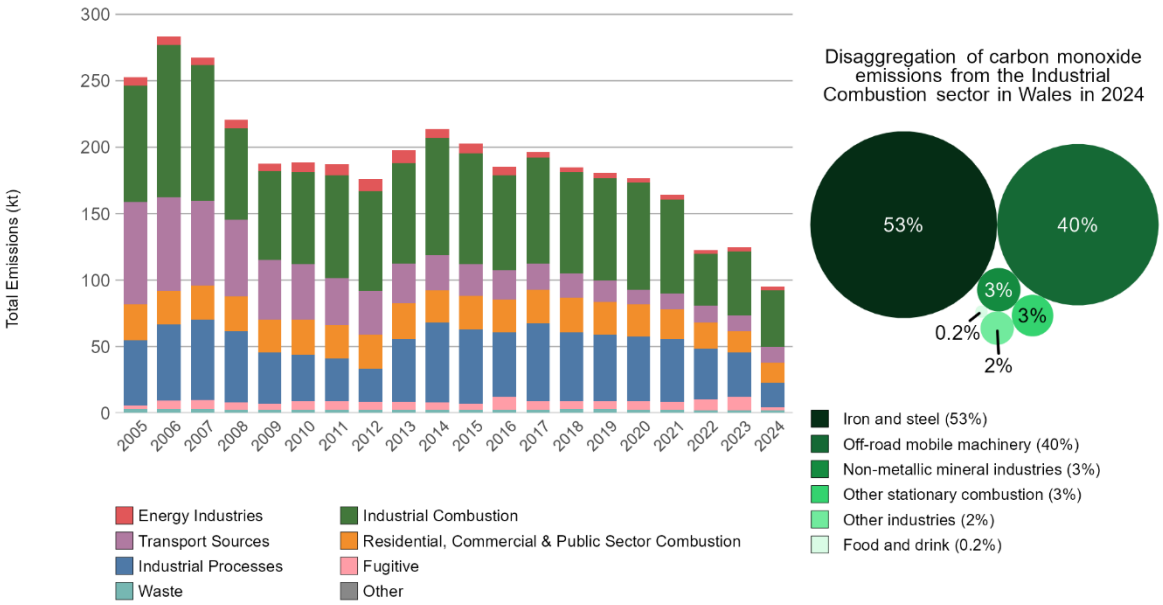


Figure 37: Carbon monoxide (CO) emissions in Wales[23]

Note: The disaggregated emissions chart and summary statistics below may not add up to 100% due to rounding.

### 2.3.2 Carbon monoxide

Emissions of carbon monoxide in Wales were estimated to be 95.0 kt in 2024, as shown in **Figure 37**, and have decreased by 62% since 2005. Emissions in Wales accounted for 9% of the UK total for carbon monoxide in 2024.

The long-term carbon monoxide trend is being driven by transport sources, where emissions have decreased by 85% since 2005. Within transport, the largest decrease was from passenger cars (1A3bi), where emissions fell by 87%, and emissions from other road transport[24] (1A3b, excluding 1A3bi) decreased by 91%. This reflects the turnover of the road transport fleet to vehicles compliant with more recent Euro standards, the fitting of emission control systems in petrol vehicles, and the increased uptake of less emissive vehicle technologies, including electric vehicles.

The industrial combustion sector makes up the largest contribution to carbon monoxide emissions throughout the time series. Within industrial combustion, iron and steel (1A2a) was the largest source in 2024, accounting for 53% of sector emissions. Due to plant closures, emissions from iron and steel activity under 2C1 have reduced by 45% between 2023 and 2024, which is driving the overall decrease in Wales' carbon monoxide emissions (24%) between these two years.

23 Other industries presented in the bubble graph inset in Figure 37 relate to combustion emissions in the chemical, non-ferrous metals, pulp paper and print and other industries.

24 Other road transport includes light duty vehicles, heavy duty vehicles and buses, mopeds and motorcycles, gasoline evaporation and automobile road abrasion.

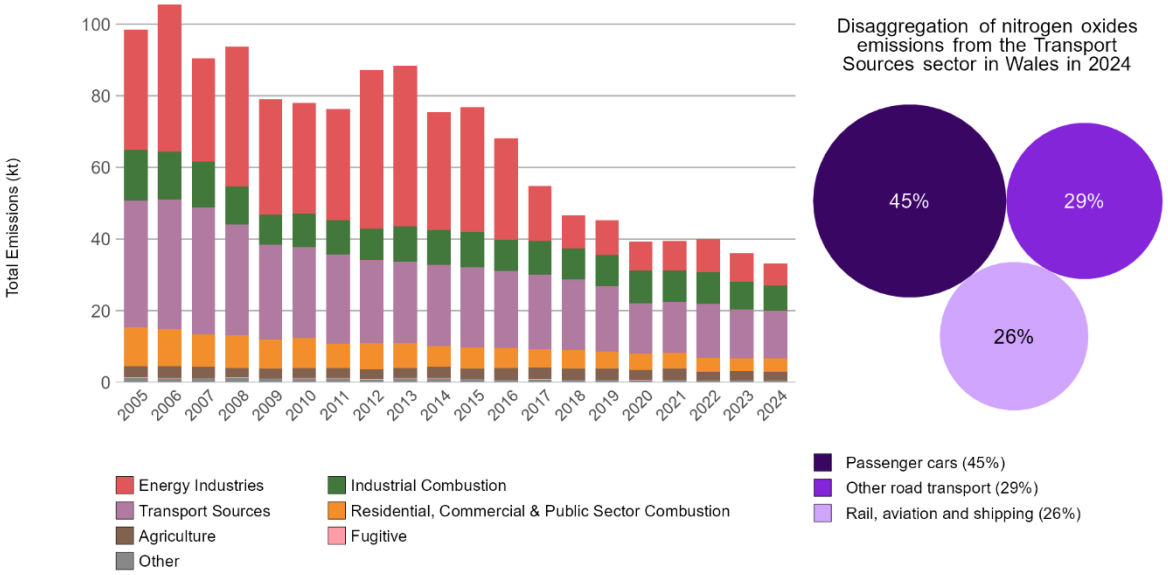


Figure 38: Nitrogen oxides ($NO_x$) emissions in Wales

Note: The disaggregated emissions chart and summary statistics below may not add up to 100% due to rounding.

### 2.3.3 Nitrogen oxides

Emissions of nitrogen oxides in Wales were estimated to be 33.1 kt in 2024, as shown in **Figure 38**, and have decreased by 66% since 2005. Emissions in Wales accounted for 6% of the UK total for nitrogen oxides in 2024.

Since 2005, the overall decrease in nitrogen oxides emissions has been mainly associated with reductions from energy industries, which has decreased by 82%. Within this sector, the largest decrease was from power generation (1A1a), where emissions fell by 89%. This reflects the reduction in coal use at Aberthaw power station from 2013 onwards, particularly between 2017 and 2019, as well as the wider reduction in fossil fuel use for electricity generation.

Since 2017, the transport sources sector makes the largest contribution to nitrogen oxides emissions, with emissions from passenger cars (1A3bi) accounting for 45% of transport emissions, followed by other road transport[25] (1A3b, excluding 1A3bi) at 29%, and rail, aviation and shipping (1A3a, 1A3c, 1A3dii and 1A3eii) at 26%. Despite this, emissions from transport sources have decreased by 62% since 2005, due to the successive introduction of tighter Euro emission standards, the increasing number of vehicles compliant with more recent Euro standards, and the uptake of less emissive vehicles, including electric vehicles. The decrease in emissions in 2020 is likely due to travel restrictions during the COVID-19 pandemic resulting in reduced traffic volumes.

Emissions from road transport (1A3b) have continued to decrease, due to the continued turnover of the vehicle fleet to less emissive vehicles. This is primarily what is driving the 8% decrease of nitrogen oxide emissions between 2023 and 2024.

[25] Other road transport includes light duty vehicles, heavy duty vehicles and buses, mopeds and motorcycles, gasoline evaporation and automobile road abrasion.

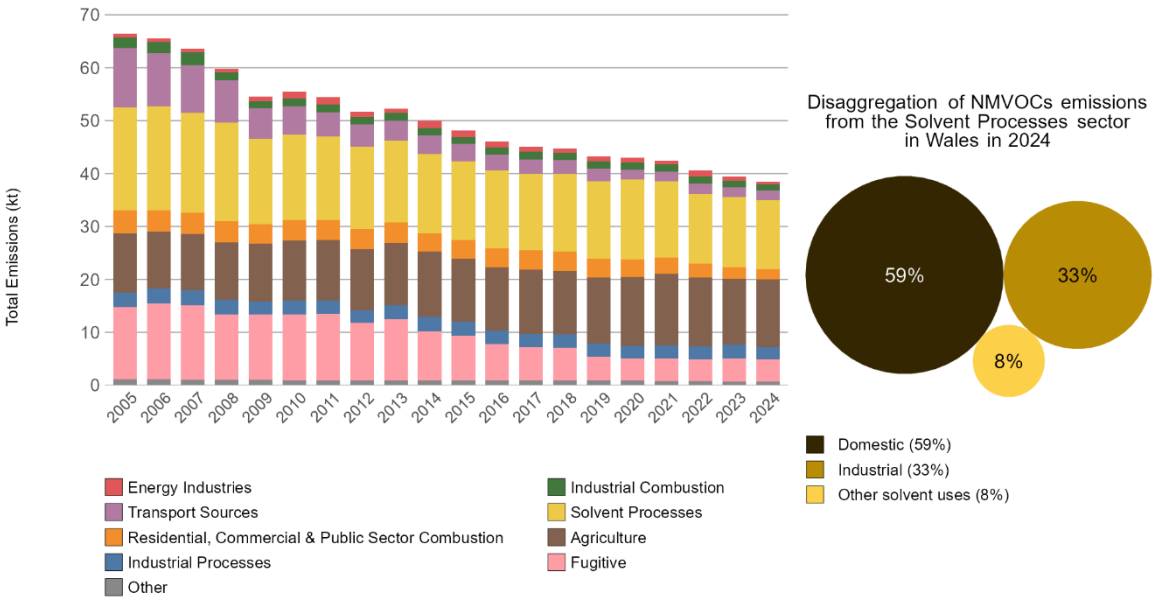


Figure 39: Non-methane volatile organic compounds (NMVOC) emissions in Wales

Note: The disaggregated emissions chart and summary statistics below may not add up to 100% due to rounding.

### 2.3.4 NMVOCs

Emissions of NMVOCs in Wales were estimated to be 38.4 kt in 2024, as shown in **Figure 39**, and have decreased by 42% since 2005. Emissions in Wales accounted for 5% of the UK total for NMVOCs in 2024.

The solvent processes sector is an important source throughout the time series. Within solvent processes, domestic solvent use (2D3a) was the largest source in 2024, accounting for 59% of sector emissions.

Both fugitive sources and transport sources have seen the largest decreases in emissions since 2005. Emissions from fugitive sources decreased by 69%, including reductions from fuel extraction, distribution and storage sources (1B1a, 1B1b, 1B2a, 1B2ai, 1B2av, 1B2b and 1B2c). Transport source emissions decreased by 83%, which reflects reductions in road transport emissions, including evaporative losses of fuel vapour from petrol vehicles, the increasing proportion of diesel-fuelled vehicles in the passenger fleet, and the introduction of petrol vapour recovery systems at filling stations.

NMVOC emissions also decreased by 3% between 2023 and 2024. This decrease is mainly due to a decrease in energy industry emissions from solid fuel manufacturing/coke ovens (1A1c).

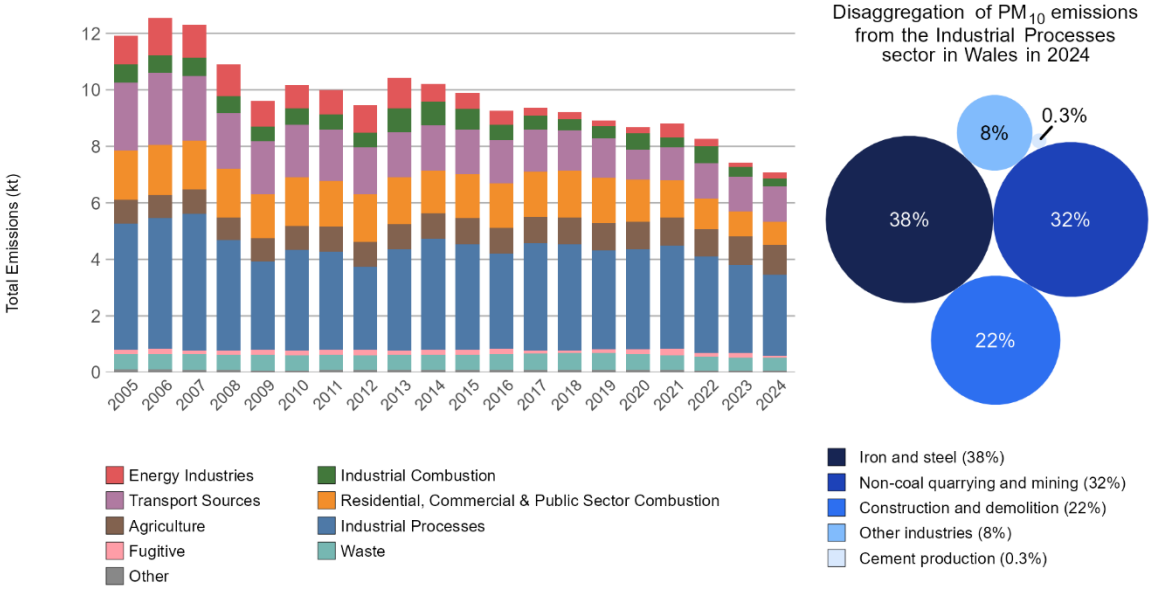


Figure 40: Particulate matter < 10 µm ($PM_{10}$) emissions in Wales[26]

Note: The disaggregated emissions chart and summary statistics below may not add up to 100% due to rounding.

### 2.3.5 $PM_{10}$

Emissions of $PM_{10}$ in Wales were estimated to be 7.1 kt in 2024, as shown in **Figure 40**, and have decreased by 41% since 2005. Emissions in Wales accounted for 7% of the UK total for $PM_{10}$ in 2024.

The industrial processes sector makes up the largest contribution to $PM_{10}$ emissions throughout the time series, although emissions have decreased by 36% since 2005. Within industrial processes, iron and steel (2C1) was the largest source in 2024, accounting for 38% of the industrial processes sector emissions. Due to site closures, $PM_{10}$ emissions from iron and steel decreased by 27% since 2005, and by 10% between 2023 and 2024. This is primarily driving the 5% decrease in Wales' $PM_{10}$ emissions between 2023 and 2024.

Another significant source in industrial processes is non-coal quarrying and mining (2A5a), which contributed 32% of the industrial processes sector emissions in 2024, and has decreased by 43% since 2005.

26 Other industries presented in the bubble graph inset in Figure 40 relate to emissions from glass production, storage handling and transport of chemical products, nitric acid production, titanium dioxide production, soda ash production, aluminium production, lead production, zinc production, copper production, other mineral products, other chemical industry, other metal production, pulp and paper industry, wood processing, other product use, other industrial processes.

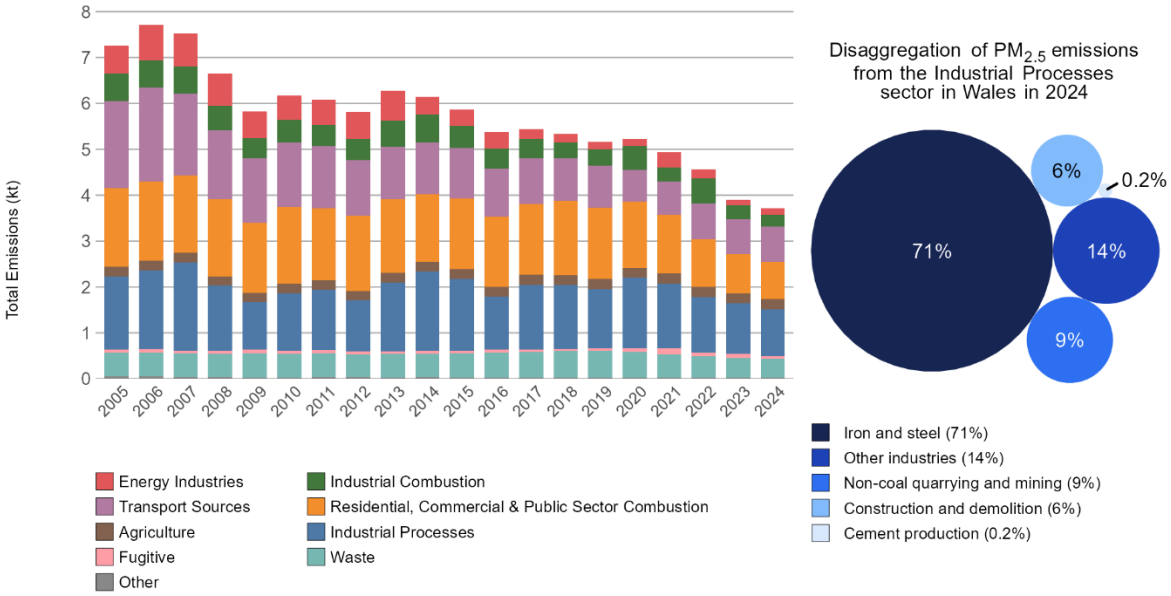


Figure 41: Particulate matter < 2.5 µm ($PM_{2.5}$) emissions in Wales[27]

Note: The disaggregated emissions chart and summary statistics below may not add up to 100% due to rounding.

### 2.3.6 $PM_{2.5}$

Emissions of $PM_{2.5}$ in Wales were estimated to be 3.7 kt in 2024, as shown in **Figure 41**, and have decreased by 49% since 2005. Emissions in Wales accounted for 7% of the UK total for $PM_{2.5}$ in 2024.

The industrial processes sector has been the largest sector since 2020, although emissions from this source have decreased by 35% since 2005. Within industrial processes, iron and steel (2C1) was the dominant source in 2024, accounting for 71% of the industrial processes sector emissions. Due to site closures, $PM_{2.5}$ emissions from iron and steel decreased by 5% since 2023, which is primarily driving the 5% decrease in Wales' $PM_{2.5}$ emissions between 2023 and 2024.

Emissions from residential, commercial and public sector combustion are also a key source for Wales. Emissions have decreased by 52% since 2005, reflecting reduced use of coal and solid smokeless fuel use in domestic combustion (1A4bi).

Emissions from transport sources have also decreased by 60%, with the largest decreases from rail, aviation and shipping (1A3a, 1A3c, 1A3dii and 1A3eii), which decreased by 74%, other road transport[28] (1A3b, excluding 1A3bi), which decreased by 44%, and passenger cars (1A3bi), which decreased by 81%. The decrease in emissions from road transport reflects the turnover of the road transport fleet, with an increasing number of vehicles compliant with more recent Euro standards, as well as the uptake of less emissive vehicles, including electric vehicles.

[27] Other industries presented in the bubble graph inset in Figure 41 relate to emissions from combustion from vehicle manufacture, pulp, paper and print, and non-ferrous metal.

[28] Other road transport includes light duty vehicles, heavy duty vehicles and buses, mopeds and motorcycles, gasoline evaporation and automobile road abrasion.

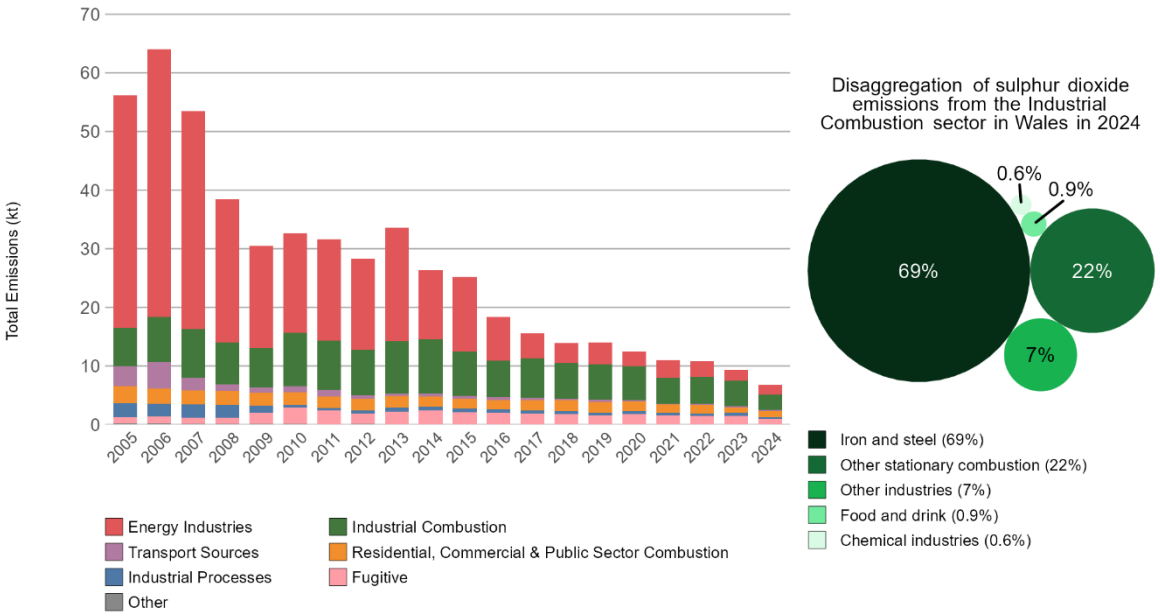


Figure 42: Sulphur dioxide ($SO_2$) emissions in Wales[29]

Note: The disaggregated emissions chart and summary statistics below may not add up to 100% due to rounding.

### 2.3.7 Sulphur dioxide

Emissions of sulphur dioxide in Wales were estimated to be 6.8 kt in 2024, as shown in **Figure 42**, and have decreased by 88% since 2005. Emissions in Wales accounted for 8% of the UK total for sulphur dioxide in 2024.

Across much of the time series, energy industries made the largest contribution to sulphur dioxide emissions, however emissions from this source have decreased by 96% since 2005. This is largely due to 99% decrease in emissions from power generation (1A1a) due to shifting away from using high sulphur content fuels in the energy production and industrial sectors and switching to low sulphur content fuels such as biomass-based fuels.

As a result, the industrial combustion sector has been the largest source since 2017, although emissions from this source have decreased by 60% since 2005. Within industrial combustion, iron and steel (1A2a) was the largest source in 2024, accounting for 69% of sector emissions. Due to site closures, emissions from iron and steel decreased by 44% between 2023 and 2024. This is driving the 28% decrease in Wales' sulphur dioxide emissions since 2023.

29 Other industries presented in the bubble graph inset in Figure 42 relate to combustion emissions in the chemical, non-ferrous metals, pulp paper and print and other industries.

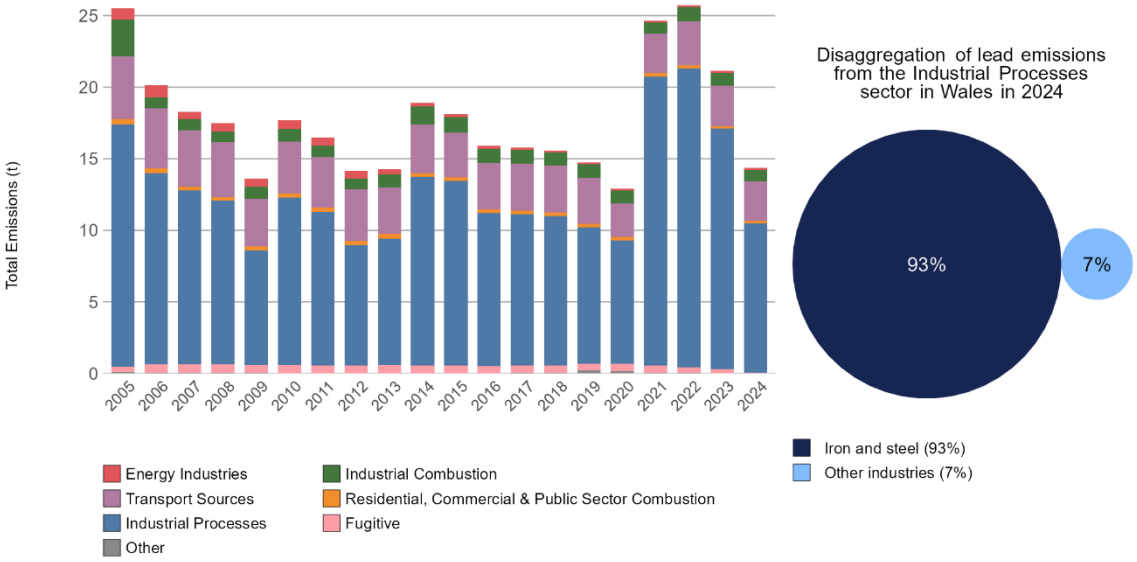


Figure 43: Lead (Pb) emissions in Wales[30]

Note: The disaggregated emissions chart and summary statistics below may not add up to 100% due to rounding.

### 2.3.8 Lead

Emissions of lead in Wales were estimated to be 14.4 t in 2024, as shown in **Figure 43**, and have decreased by 44% since 2005. Emissions in Wales accounted for 12% of the UK total for lead in 2024.

The industrial processes sector makes up the largest contribution to lead emissions throughout the time series. Within industrial processes in 2024, iron and steel (2C1) was the dominant source, accounting for 93% of sector emissions. Lead emissions in Wales remain strongly influenced by changes in iron and steel activity, which explains the greater year-to-year variability seen in the time series compared with some other pollutants.

Since 2005, industrial processes emissions have decreased by 39%, and emissions from iron and steel (2C1) specifically have decreased by 33%. Due to recent site closures, iron and steel (2C1) emissions have continued to decrease, which is driving the 32% decrease in Wales' overall lead emissions between 2023 and 2024.

[30] Other industries presented in the bubble graph inset in Figure 43 relate to emissions from glass production, storage handling and transport of chemical products, nitric acid production, titanium dioxide production, soda ash production, aluminium production, lead production, zinc production, copper production, other mineral products, other chemical industry, other metal production, pulp and paper industry, wood processing, other product use, other industrial processes.

**Table 4** below provides a summary of the percentage contribution of each sector for each pollutant in 2024. The table is shaded according to the overall contribution of that sector to the pollutant total, (with darker shades representing greater contribution). Important sectors indicated by the table are industrial combustion (the highest contributor of CO and $SO_2$ emissions), and industrial processes (the highest contributor of $PM_{10}$, $PM_{2.5}$, and Pb emissions).

Residential, commercial & public sector combustion is a major source of emissions, particularly for B[a]P and $PM_{2.5}$, whilst industrial processes are also important, especially for emissions of Pb, $PM_{10}$ and $PM_{2.5}$. This table also highlights that although emissions from the agriculture sector are not significant when considering all pollutants, it is of very high significance when considering emissions of NH3; the same is true for NMVOC emissions from solvent processes.

Table 4: Source emission contributions ranked by sector, Wales, 2024

| Sector | $NH_3$ | CO | $NO_x$ | NMVOC | $PM_{10}$ | $SO_2$ | Pb | $PM_{2.5}$ | B[a]P | PCDD /Fs | Hg |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Agriculture | 93.8% | NA | 7.2% | 33.2% | 14.9% | NA | NA | 6.0% | NA | NA | NA |
| Energy Industries | IE | 3.1% | 18.4% | 1.4% | 2.8% | 25.2% | 1.4% | 3.8% | 2.7% | 4.3% | 12.0% |
| Fugitive | IE | 2.3% | 0.0% | 11.0% | 0.9% | 13.8% | 0.4% | 1.2% | 1.3% | IE | IE |
| Industrial Combustion | IE | 44.5% | 21.2% | 2.8% | 4.1% | 38.0% | 5.4% | 7.0% | 0.6% | 8.7% | 35.2% |
| Industrial Processes | 0.2% | 19.5% | IE | 6.0% | 40.7% | 5.0% | 72.3% | 27.7% | 1.4% | 30.3% | 28.5% |
| Residential, Commercial & Public Sector Combustion | 0.1% | 16.0% | 11.5% | 5.1% | 11.9% | 14.5% | 1.1% | 21.9% | 85.3% | 24.2% | 5.6% |
| Solvent Processes | IE | NA | NA | 33.7% | IE | NA | NA | IE | IE | IE | NA |
| Transport Sources | 1.0% | 12.6% | 40.2% | 5.0% | 17.5% | 3.1% | 19.2% | 20.5% | 2.4% | 3.7% | 5.6% |
| Waste | 1.3% | 2.0% | IE | IE | 6.2% | IE | IE | 11.2% | 6.2% | 28.5% | 12.8% |
| Other | 3.7% | 0.1% | 1.5% | 1.8% | 1.0% | 0.4% | 0.2% | 0.7% | 0.1% | 0.2% | 0.3% |

* The sector: “other” includes all “other” categories in the inventory and also a number of categories that are insignificant for a specific pollutant. These have been marked in the table as “IE” (used in inventory reporting for “Included Elsewhere”). A breakdown of what is included within this category in respect to each pollutant can be found in Table 32.

The maps below show the emission totals for Wales, excluding large industrial point sources and shipping. Units are in tonnes, except Pb in kg, per square kilometre in 2024. Details on the methodology for these can be found in Appendix B and in the Spatial Emissions Methodology for NAEI report (Tsagatakis, et al., 2025), found here: https://naei.energysecurity.gov.uk/reports/uk-spatial-emissions-methodology-report-national-atmospheric-emissions-inventory-2023

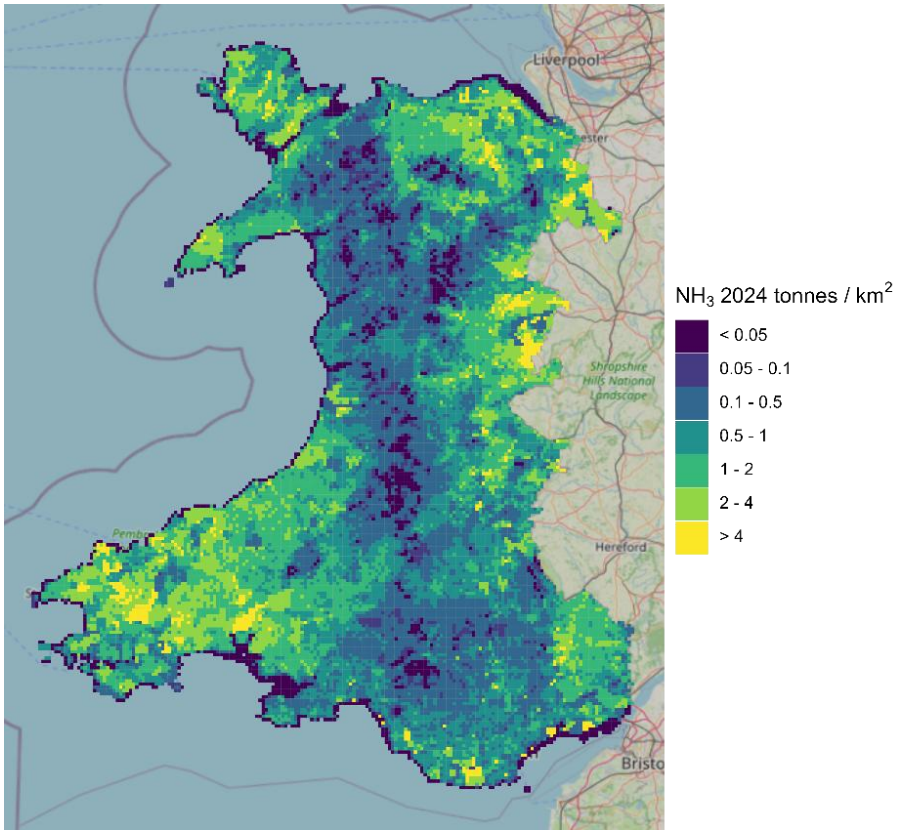


Figure 44: Ammonia ($NH_3$) emissions in Wales, 2024

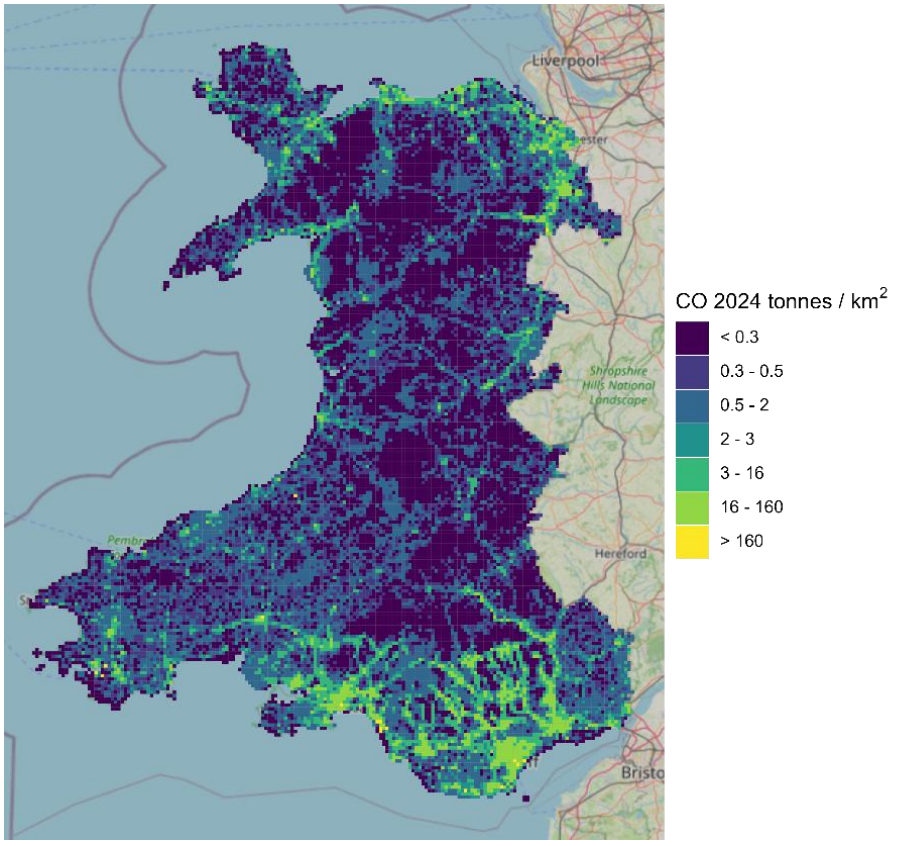


Figure 45: Carbon monoxide (CO) emissions in Wales, 2024

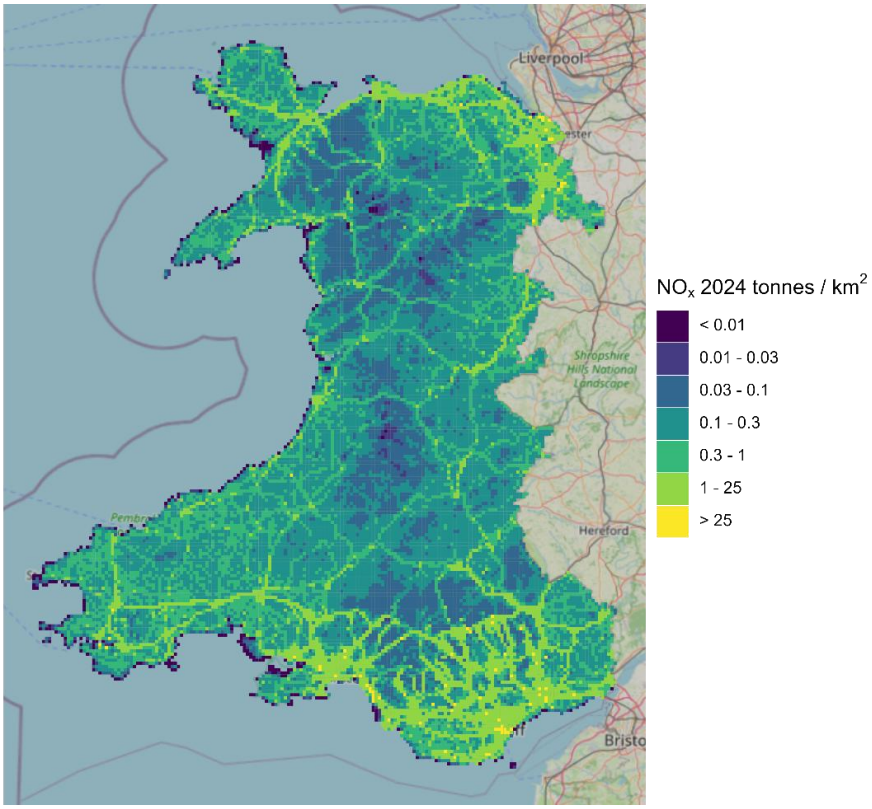


Figure 46: Nitrogen oxides ($NO_x$) emissions in Wales, 2024

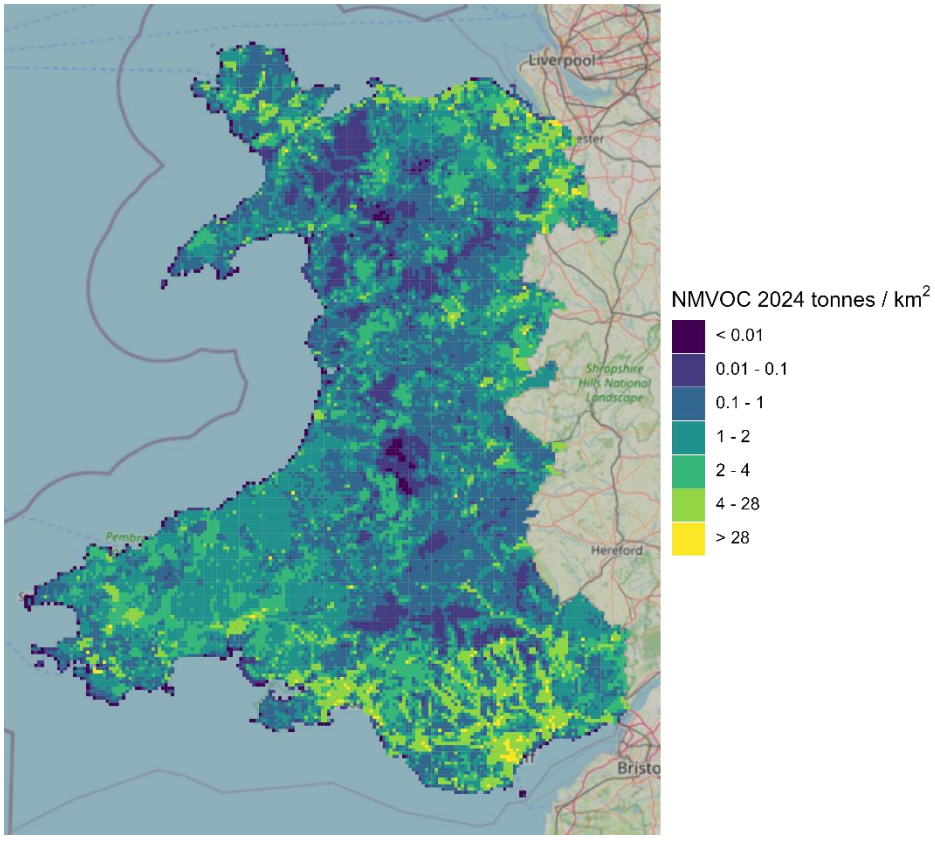


Figure 47: Non-methane volatile organic compounds (NMVOC) emissions in Wales, 2024

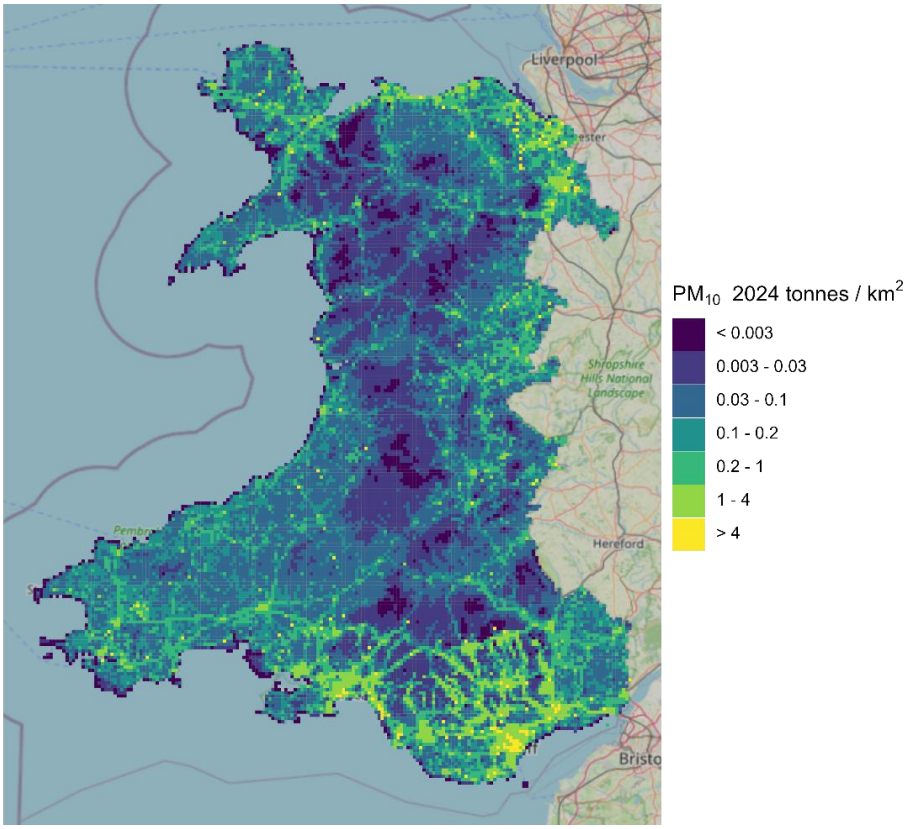


Figure 48: Particulate matter < 10 µm ($PM_{10}$) emissions in Wales, 2024

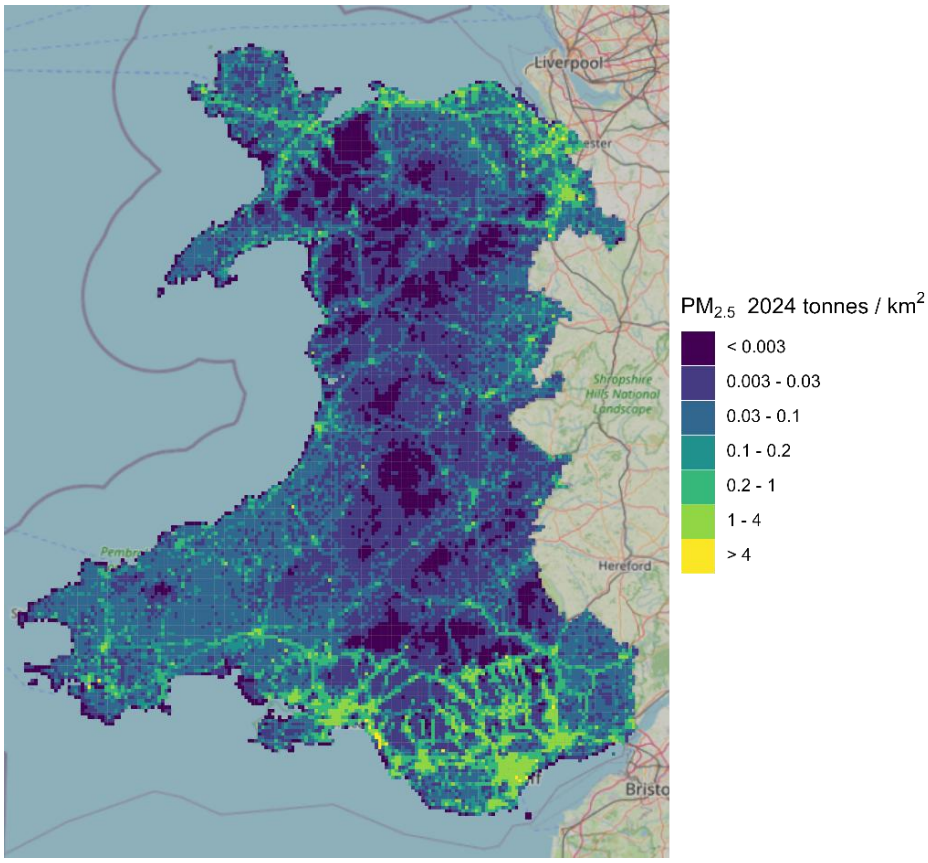


Figure 49: Particulate matter < 2.5 µm ($PM_{2.5}$) emissions in Wales, 2024

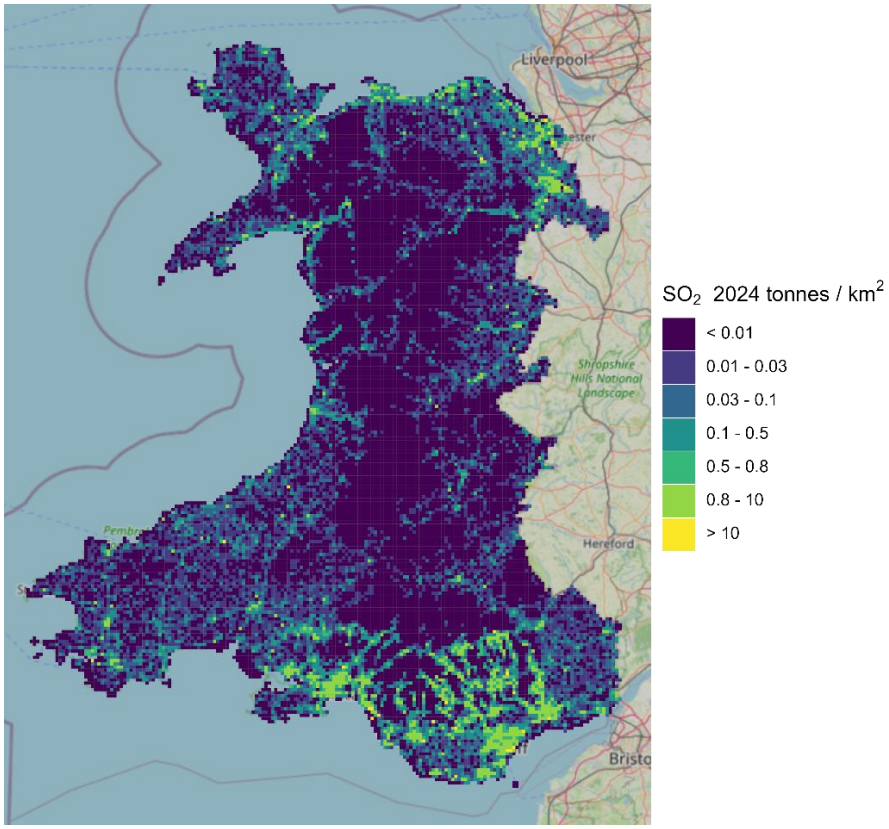


Figure 50: Sulphur dioxide ($SO_2$) emissions in Wales, 2024

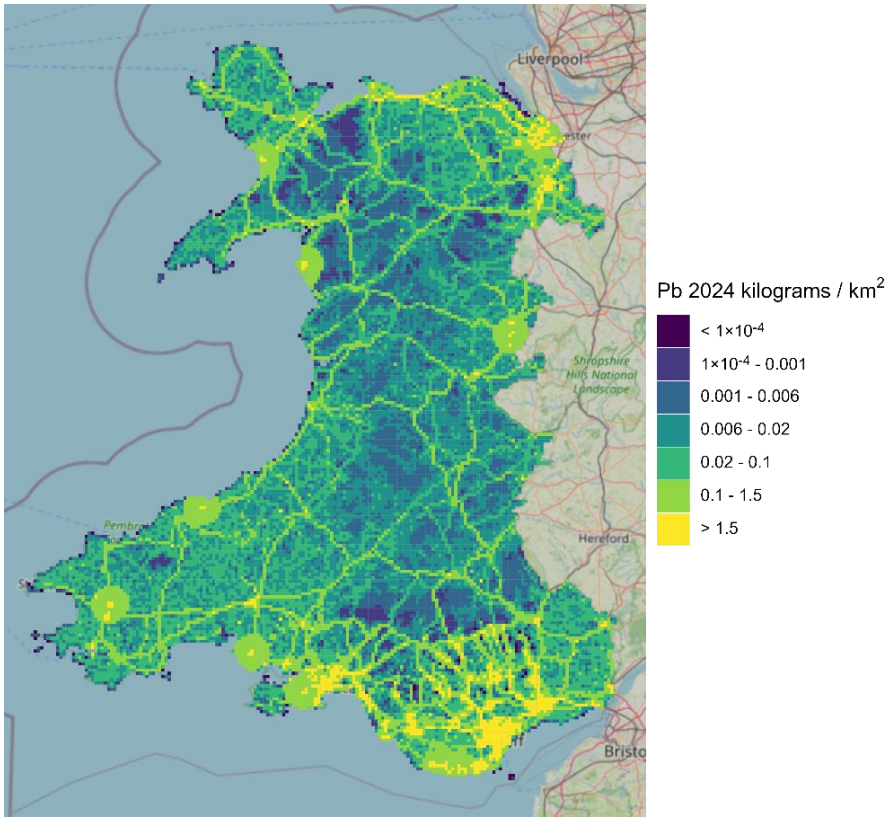


Figure 51: Lead (Pb) emissions in Wales, 2024

## 2.4 NORTHERN IRELAND

The following section summarises emissions in Northern Ireland for the eight priority air pollutants: $NH_3$, CO, $NO_X$, NMVOCs, $PM_{10}$, $PM_{2.5}$, $SO_2$, and Pb. Information is also presented for emissions of PCDD/Fs, B[a]P, and Hg, with more detailed information for these three pollutants presented in **Appendix C**. Emissions of PCDD/Fs, B[a]P, and Hg should be considered as experimental statistics only[31]. **Appendix F** presents the inventory data summary tables for England and the DGs, whilst **Appendix G** presents source category mapping used in the report**.**

**Figure 52** shows emissions of all eleven air pollutants as a percentage of the 2005 total. For Northern Ireland, the pollutants that have seen the greatest rate of change within the time series are summarised below, with detailed descriptions for all pollutants provided in the following sections.

Ammonia is the only pollutant where emissions are higher in 2024 than in 2005. This reflects the continued importance of agricultural sources, particularly dairy cattle manure management and organic and inorganic nitrogen fertiliser use.

The greatest rate of decline is observed for sulphur dioxide emissions, principally due to the decline in sulphur-containing solid fuels, such as coal, being burnt in the UK.

The graph also shows a marked increase in B[a]P emissions between 2014 and 2020, followed by a sharp decrease to 2024. By 2024, B[a]P emissions were below their 2005 level. This short-term variability is mainly associated with changes in domestic burning in Northern Ireland, which is discussed further in **Appendix C**.

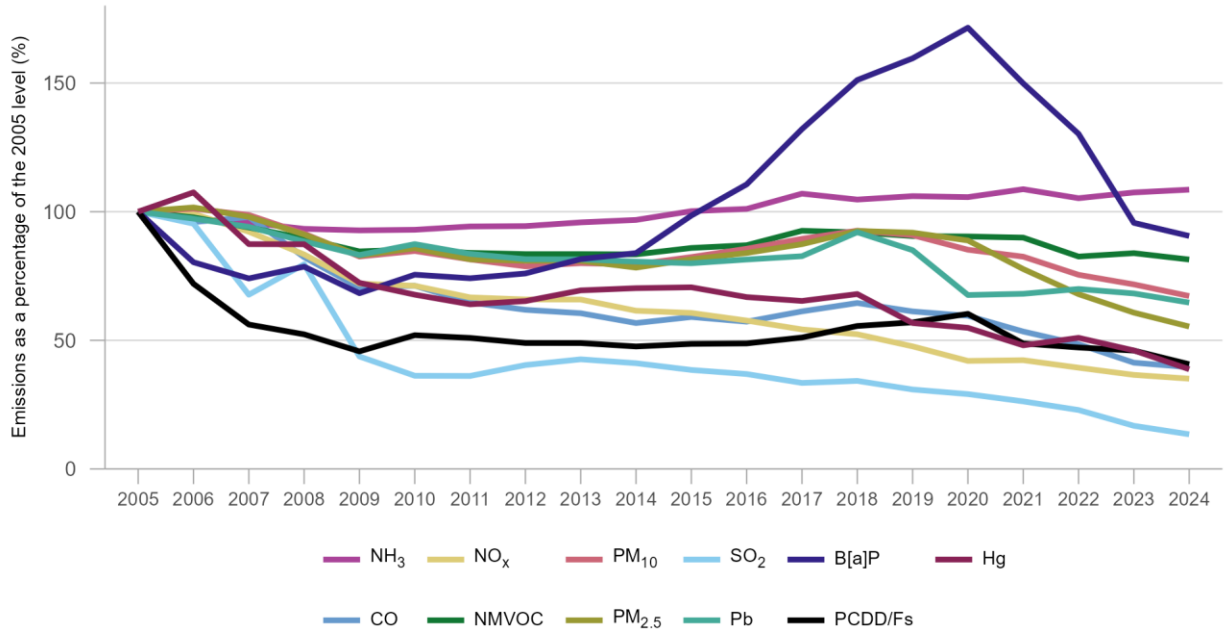


Figure 52: Northern Ireland trends for all pollutants as a percentage of the 2005 level

31 The emission estimates are considered experimental. While the inventories and trends have been interrogated and to ensure the suitability of methods for the most important sources, it is recognised that data quality on a subnational level is generally poor. As a result, these emission estimates are currently considered experimental only, and require further work to evaluate the methods used, to identify alternative methods that are more suitable, and to reduce the uncertainty in the early part of the time series. More information on the inventory methods used for B[a]P, PCDD/Fs, and Hg is available in Appendix C.

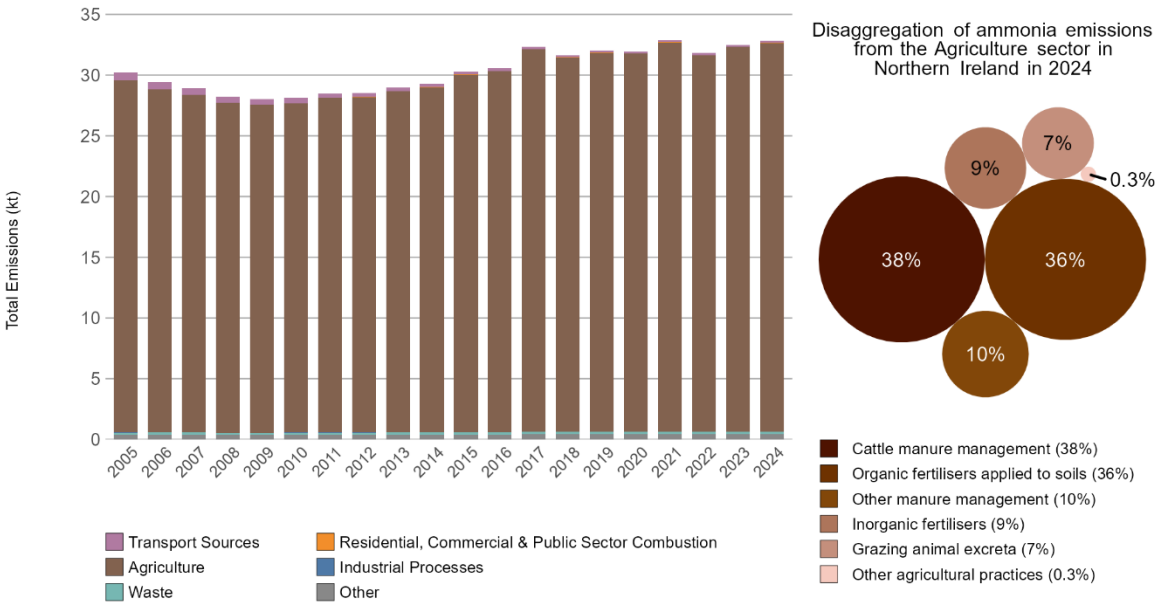


Figure 53: Ammonia ($NH_3$) emissions in Northern Ireland

Note: The disaggregated emissions chart and summary statistics below may not add up to 100% due to rounding.

### 2.4.1 Ammonia

The total ammonia emissions for Northern Ireland are shown in **Figure 53**. A disaggregation of the largest sector is shown in the bubble chart. The sectors definitions are provided in **Appendix G**.

Emissions of ammonia in Northern Ireland were estimated to be 32.8 kt in 2024, and have increased by 9% since 2005. Emissions in Northern Ireland accounted for 13% of the UK total for ammonia in 2024.

The agriculture sector makes up the largest contribution to ammonia emissions throughout the time series, and represented 98% of total ammonia emissions in 2024. Since 2005, emissions from agricultural sources have increased by 10%. Since 2012, ammonia emissions have increased largely due to increasing dairy cow numbers and emissions associated with dairy and other dairy manure management (3B1). This sector (3B1) accounted for 38% of agricultural ammonia emissions in 2024.

In addition, inorganic fertilisers (3Da1) are another important source for Northern Ireland. Emissions from this source have increased by 33% since 2005, and increased by 17% since 2023. Emissions from this source is primarily driving the 1% increase in Northern Ireland's ammonia emissions between 2023 and 2024.

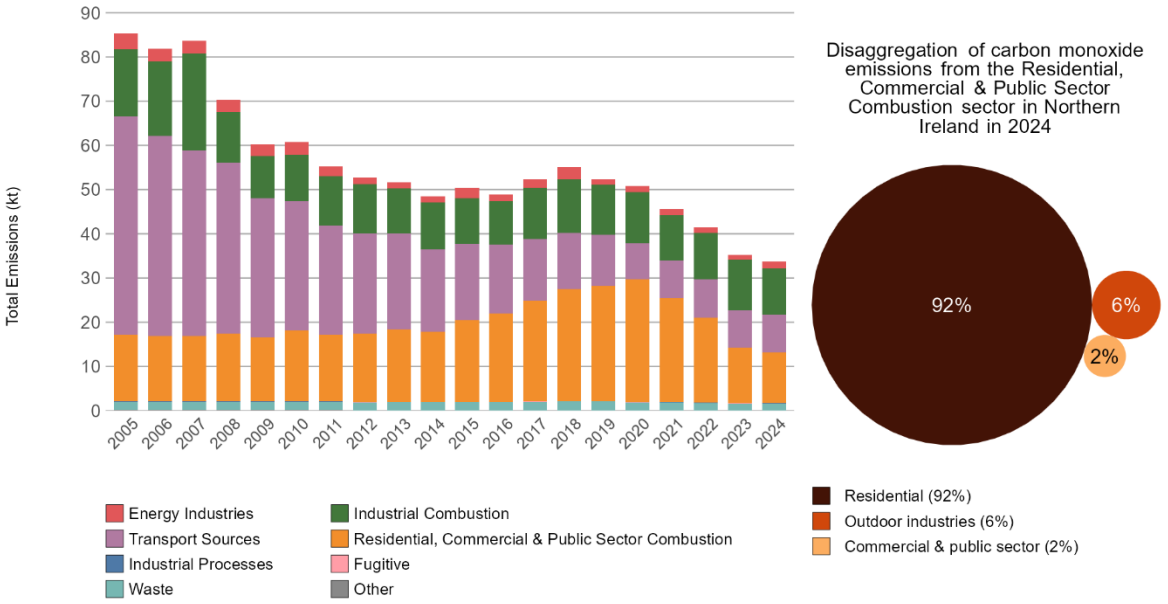


Figure 54: Carbon monoxide (CO) emissions in Northern Ireland[32]

Note: The disaggregated emissions chart and summary statistics below may not add up to 100% due to rounding.

### 2.4.2 Carbon monoxide

Emissions of carbon monoxide in Northern Ireland were estimated to be 33.8 kt in 2024, as shown in **Figure 54**, and have decreased by 60% since 2005. Emissions in Northern Ireland accounted for 3% of the UK total for carbon monoxide in 2024.

The residential, commercial and public sector combustion sector has been the largest source since 2015. Within the residential, commercial and public sector, residential combustion (1A4b) was the dominant source in 2024, accounting for 92% of sector emissions. Despite this, emissions from residential combustion have been decreasing in recent years due to reduced use of coal and solid fuels for residential heating. As such, emissions from residential combustion decreased by 9% since 2023, and this is driving the 4% decrease in Northern Ireland's overall carbon monoxide emissions between 2023 and 2024.

The transport sources sector is also a significant source of carbon monoxide emissions, and emissions have decreased by 83% since 2005. Within transport, the largest decrease was from passenger cars (1A3bi), where emissions fell by 86%. Emissions from other road transport[33] (1A3b, excluding 1A3bi) decreased by 90%, while emissions from rail, aviation and shipping (1A3a, 1A3c, 1A3dii and 1A3eii) decreased by 4%. This reflects the continuation and development of Euro standards, which required the fitting of emission controls, such as three-way catalytic converters, in new petrol vehicles. The shift away from petrol vehicles, improvements in catalyst repair rates, and the increasing uptake of less emissive vehicles have also contributed to the decrease.

32 Outdoor industries presented in the bubble graph inset in Figure 54 relate to combustion emissions from machinery in the agriculture, forestry and fishing industries.

33 Other road transport includes light duty vehicles, heavy duty vehicles and buses, mopeds and motorcycles, gasoline evaporation and automobile road abrasion.

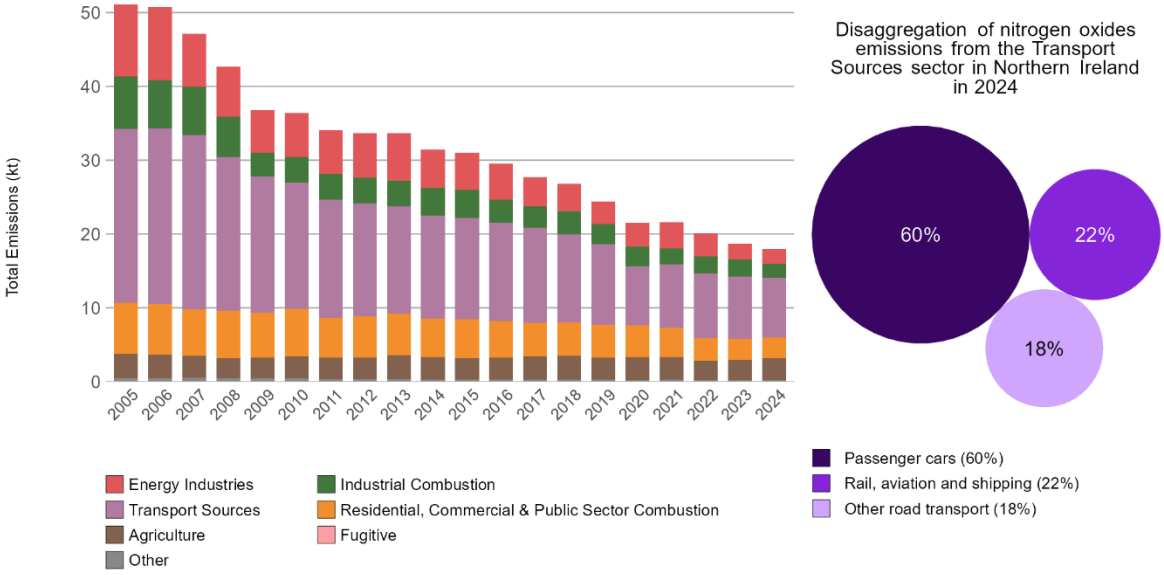


Figure 55: Nitrogen oxides ($NO_x$) emissions in Northern Ireland

Note: The disaggregated emissions chart and summary statistics below may not add up to 100% due to rounding.

### 2.4.3 Nitrogen oxides

Emissions of nitrogen oxides in Northern Ireland were estimated to be 17.9 kt in 2024, as shown in **Figure 55**, and have decreased by 65% since 2005. Emissions in Northern Ireland accounted for 3% of the UK total for nitrogen oxides in 2024.

The transport sources make up the largest contribution to nitrogen oxides emissions throughout the time series. Within transport, passenger cars (1A3bi) were the largest source in 2024, accounting for 60% of transport emissions. Despite this, emissions from transport sources have decreased by 66% since 2005, with emissions from other road transport[34] (1A3b, excluding 1A3bi) decreasing by 84% and emissions from passenger cars (1A3bi) decreasing by 59%. This reflects the successive introduction of tighter exhaust emission standards for vehicles, the increasing number of vehicles compliant with more recent Euro standards, and the uptake of less emissive vehicles, including electric vehicles. The decrease in emissions in 2020 is likely due to travel restrictions during the COVID-19 pandemic resulting in reduced traffic volumes. Since then, other road transport emissions have continued to decrease, with a 12% reduction in emissions since 2023. This is primarily driving Northern Ireland's 4% decrease in nitrogen oxides emissions between 2023 and 2024.

Energy industries also had a notable impact on the overall decrease, with emissions falling by 80% between 2005 and 2024. This reflects the transition away from coal and oil towards natural gas and renewable energy sources and the implementation of abatement technologies. There has also been a reduction in coal use due to closure of the coal plant at Kilroot power station, which was decommissioned at the end of September 2023. Kilroot has since come back online in mid-2024 with two new Open Cycle Gas Turbines (OCGTs). Emissions also decreased from industrial combustion, which fell by 73%, and residential, commercial and public sector combustion, which fell by 59%.

[34] Other road transport includes light duty vehicles, heavy duty vehicles and buses, mopeds and motorcycles, gasoline evaporation and automobile road abrasion.

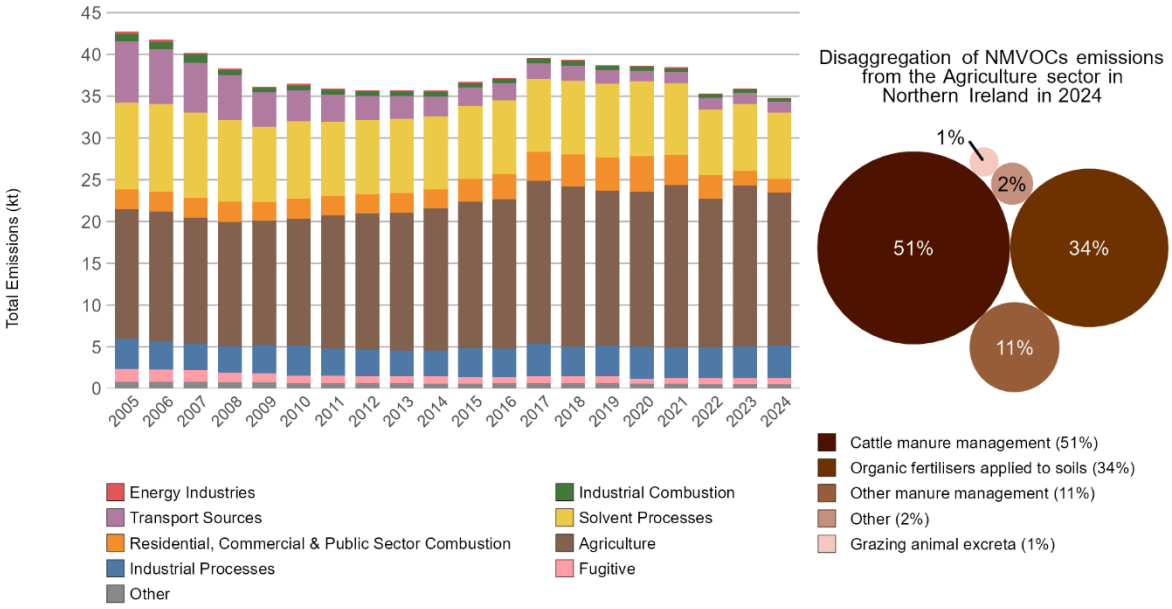


Figure 56: Non-methane volatile organic compounds (NMVOC) emissions in Northern Ireland

Note: The disaggregated emissions chart and summary statistics below may not add up to 100% due to rounding.

### 2.4.4 NMVOCs

Emissions of NMVOCs in Northern Ireland were estimated to be 34.8 kt in 2024, as shown in **Figure 56**, and have decreased by 19% since 2005. Emissions in Northern Ireland accounted for 5% of the UK total for NMVOCs in 2024.

The agriculture sector makes up the largest contribution to ammonia emissions throughout the time series, which have increased by 19% since 2005. This increase is mainly associated with emissions from livestock manure management and organic fertilisers applied to soils (3Da2). Cattle manure management (3B1) was the largest source in 2024, accounting for 51% of agricultural NMVOC emissions, followed by organic fertilisers applied to soils (3Da2), which accounted for 34%. In recent years, a reduction in manure spreading (3Da2a) is driving the 3% decrease in Northern Ireland's NMVOC emissions between 2023 and 2024.

The transport sources sector is also a key source of NMVOC emissions, and emissions from these sources have declined by 82% since 2005. Within transport, the largest decreases were from passenger cars (1A3bi), which decreased by 91%, and other road transport[35] (1A3b, excluding 1A3bi), which decreased by 73%. This reflects the increasing proportion of diesel vehicles in the passenger fleet, improved fuel economy, the introduction of petrol vapour recovery systems at filling stations, and the increasing uptake of less emissive vehicles.

[35] Other road transport includes light duty vehicles, heavy duty vehicles and buses, mopeds and motorcycles, gasoline evaporation and automobile road abrasion.

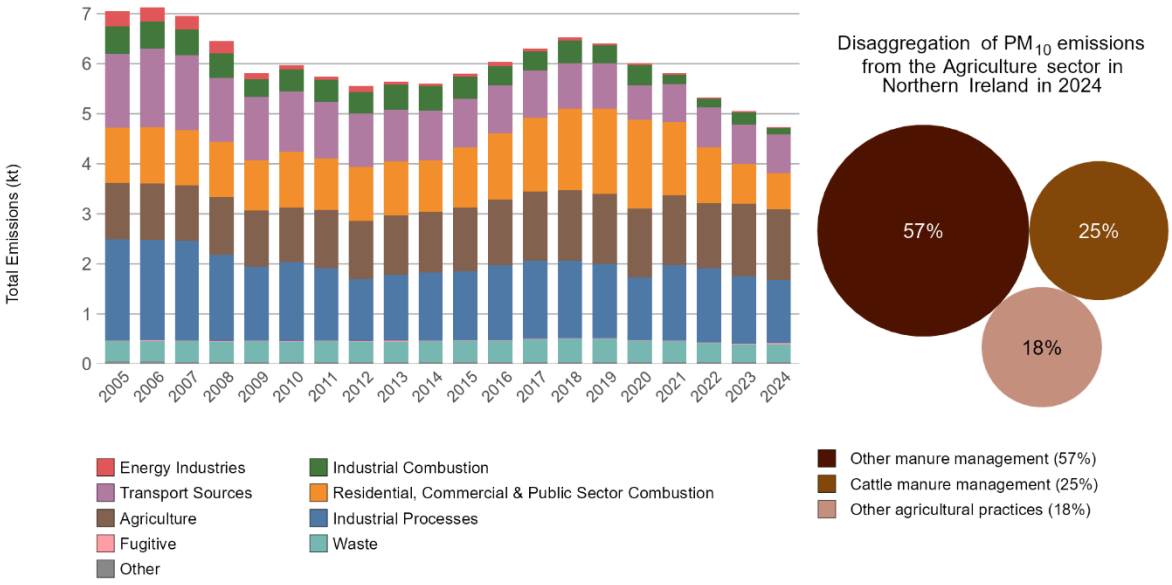


Figure 57: Particulate matter < 10 µm ($PM_{10}$) emissions in Northern Ireland

Note: The disaggregated emissions chart and summary statistics below may not add up to 100% due to rounding.

### 2.4.5 $PM_{10}$

Emissions of $PM_{10}$ in Northern Ireland were estimated to be 4.7 kt in 2024, as shown in **Figure 57**, and have decreased by 33% since 2005. Emissions in Northern Ireland accounted for 5% of the UK total for $PM_{10}$ in 2024.

Historically, the largest $PM_{10}$ source was the industrial processes sector, but since 2005 emissions from this source have decreased by 37%. Within this sector, the largest decrease was from non-coal quarrying and mining (2A5a), which decreased by 43% since 2005. In recent years, emissions from industrial processes have continued to decrease, and in 2023, other stationary combustion (1A2gviii) emissions decreased by 67%. This is driving the 6% decrease in Northern Ireland's overall $PM_{10}$ emissions between 2023 and 2024.

There was also a 9% reduction in emissions from residential, commercial and public sector combustion between 2023 and 2024, due to a reduction in the use of coal and solid fuels for residential heating.

Transport sources are also important for $PM_{10}$ emissions in Northern Ireland. Emissions from transport sources have decreased by 47%, reflecting reductions in exhaust emissions from vehicles due to the successive introduction of tighter emission standards, although non-exhaust $PM_{10}$ emissions from tyre and brake wear have partly offset these reductions. The decrease in emissions in 2020 is likely due to travel restrictions during the COVID-19 pandemic resulting in reduced traffic volumes.

As a result of emissions reductions in industrial process and transport, the agriculture sector made the largest contribution to $PM_{10}$ emissions in Northern Ireland in 2024. Within agriculture, other manure management (3B2, 3B3 and 3B4) was the largest source in 2024, accounting for 57% of agricultural $PM_{10}$ emissions.

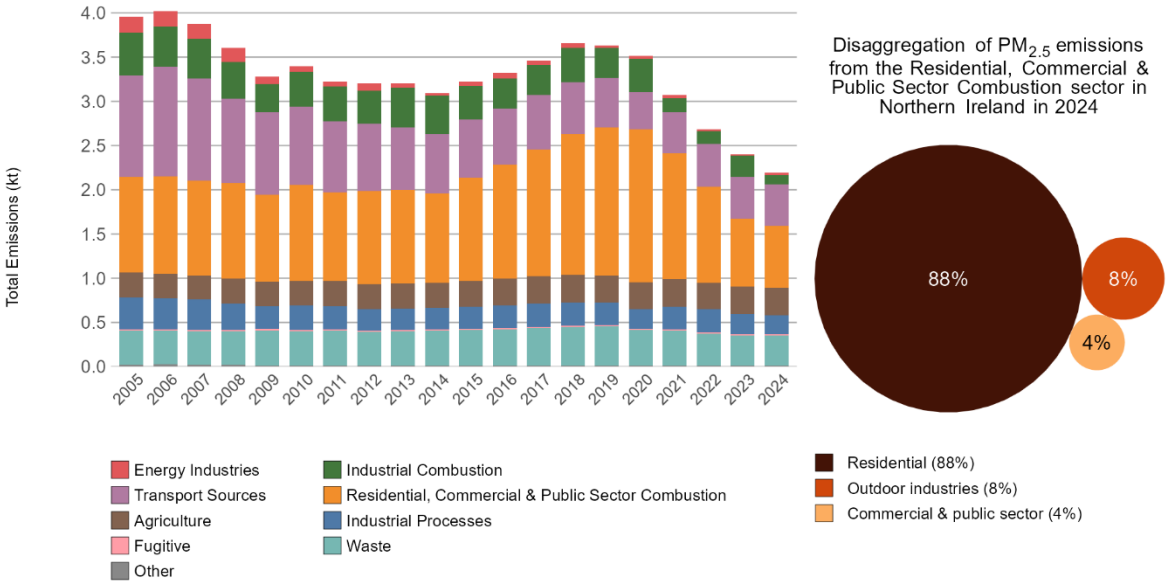


Figure 58: Particulate matter < 2.5 µm ($PM_{2.5}$) emissions in Northern Ireland[36]

Note: The disaggregated emissions chart and summary statistics below may not add up to 100% due to rounding.

### 2.4.6 $PM_{2.5}$

Emissions of $PM_{2.5}$ in Northern Ireland were estimated to be 2.2 kt in 2024, as shown in **Figure 58**, and have decreased by 45% since 2005. Emissions in Northern Ireland account for 4% of the UK total for $PM_{2.5}$ in 2024.

The residential, commercial and public sector combustion sector has been the largest source since 2008, although emissions have decreased by 35% since 2005, reflecting the reduction in coal and solid fuels burned in residential combustion. Within this sector, residential combustion (1A4b) was the dominant source in 2024, accounting for 88% of sector emissions in 2024.

Historically, transport sources have also been a significant contribution to $PM_{2.5}$ emissions, and since 2005 emissions from this source have decreased by 59%. Within transport, the largest decreases were from passenger cars (1A3bi), which decreased by 84%, rail, aviation and shipping (1A3a, 1A3c, 1A3dii and 1A3eii), which decreased by 76%, and other road transport[37] (1A3b, excluding 1A3bi), which decreased by 39%. This is due to the gradual turnover of the vehicle fleet to vehicles with more stringent exhaust emission standards. In recent years, the increased uptake of electric vehicles has also helped to reduce tailpipe $PM_{2.5}$ emissions.

$PM_{2.5}$ emissions decreased by 9% between 2023 and 2024, which is driven by reductions in other stationary combustion (1A2gviii) emissions and reduced coal and solid smokeless fuel use in the residential sector.

[36] Outdoor industries presented in the bubble graph inset in Figure 58 relate to combustion emissions from machinery in the agriculture, forestry and fishing industries.

[37] Other road transport includes light duty vehicles, heavy duty vehicles and buses, mopeds and motorcycles, gasoline evaporation and automobile road abrasion.

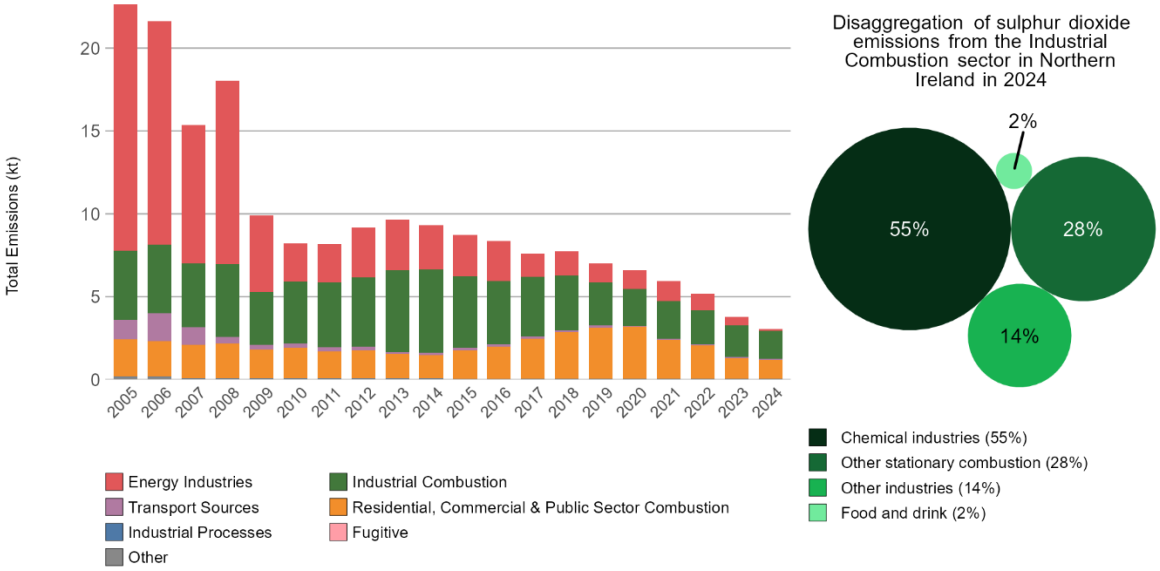


Figure 59: Sulphur dioxide ($SO_2$) emissions in Northern Ireland[38]

Note: The disaggregated emissions chart and summary statistics below may not add up to 100% due to rounding.

### 2.4.7 Sulphur dioxide

Emissions of sulphur dioxide in Northern Ireland were estimated to be 3.1 kt in 2024, as shown in **Figure 59**, and have decreased by 87% since 2005. Emissions in Northern Ireland accounted for 4% of the UK total for sulphur dioxide in 2024.

Historically, energy industries was the largest contributor to sulphur dioxide emissions, however, emissions have decreased by 99% since 2005. This decrease was almost entirely from power generation (1A1a), where emissions fell by 99% due to the reduction in power station emissions due to the transition away from coal and oil-fired generation, including the introduction of more efficient gas-fired generation and the wider expansion of the natural gas network in Northern Ireland. Emissions from this source have continued to decrease in recent years, with emissions from power generation decreasing by 80% since 2023. This is driving the 20% decrease in Northern Ireland's sulphur dioxide emissions between 2023 and 2024.

As emissions from energy industries have declined substantially since 2005, industrial combustion has become the larger source of sulphur dioxide emissions in Northern Ireland in recent years. Industrial combustion emissions fell by 12% between 2023 and 2024, largely driven by a reduction in coal and solid fuel use in other stationary combustion (1A2gviii).

38 Outdoor industries presented in the bubble graph inset in Figure 59 relate to combustion emissions from machinery in the agriculture, forestry and fishing industries.

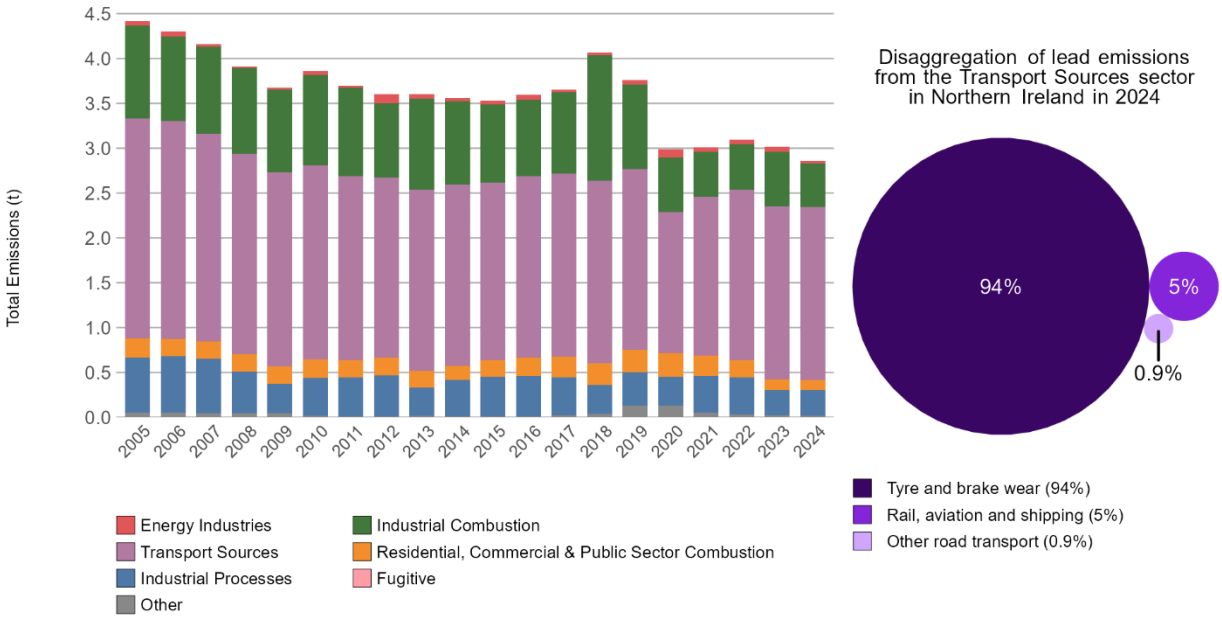


Figure 60: Lead emissions (Pb) in Northern Ireland

Note: The disaggregated emissions chart and summary statistics below may not add up to 100% due to rounding.

### 2.4.8 Lead

Emissions of lead in Northern Ireland were estimated to be 2.9 t in 2024, as shown in **Figure 60**, and have decreased by 35% since 2005. Emissions in Northern Ireland accounted for 2% of the UK total for lead in 2024.

The transport sources sector makes up the largest contribution to lead emissions throughout the time series. Despite this, emissions from transport sources decreased by 21% since 2005. Lead emissions from transport are mainly driven by non-exhaust emissions, including tyre and brake wear, as these are not regulated in the same way as exhaust emissions. These emissions arise from mechanical wear caused by the interaction between vehicle tyres and the road surface and from brake use. In 2024, tyre and brake wear (1A3bvi) accounts for 94% of transport lead emissions. Therefore, changes in road transport emissions are closely linked to the number of vehicle-kilometres driven. The decrease in emissions in 2020 is likely due to travel restrictions during the COVID-19 pandemic resulting in reduced traffic volumes.

Emissions from industrial processes also decreased by 54% between 2005 and 2024. This was mainly associated with decreases from other industries, including foundries (2C7c), where emissions have decreased over the time series due to improved abatement techniques.

Similarly, emissions from industrial combustion have decreased by 53% since 2005. Industrial combustion emissions show a high degree of variability, particularly from other stationary combustion (1A2gviii), reflecting interannual variation in the use of fuels associated with higher levels of lead emissions, such as wood and municipal solid waste. Emissions from other stationary combustion (1A2gviii) have decreased by 55% since 2005, and decreased by 24% since 2023. This is what is primarily driving the 5% decrease in Northern Ireland's lead emissions between 2023 and 2024.

**Table 5** below provides a summary of the percentage contribution of each sector for each pollutant in 2024. The table is shaded according to the overall contribution of that sector to the pollutant total, (with darker shades representing greater contribution). Important sectors indicated by the table are agriculture (the highest contributor of $NH_3$, NMVOC and $PM_{10}$ emissions), industrial combustion (the highest contributor of $SO_2$ and Hg emissions), residential, commercial & public sector combustion (the highest contributor of CO, $PM_{2.5}$ and B[a]P emissions), and transport sources (the highest contributor of $NO_x$ and lead (Pb) emissions).

This table also highlights that although emissions from the agriculture sector are not significant when considering all pollutants, it is of very high significance when considering emissions of $NH_3$ and NMVOC; the same is true for dioxin and furan emissions from Waste.

Table 5: Source emission contributions ranked by sector, Northern Ireland, 2024

| Sector | $NH_3$ | CO | $NO_x$ | NMVOC | $PM_{10}$ | $SO_2$ | Pb | $PM_{2.5}$ | B[a]P | PCDD /Fs | Hg |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Agriculture | 97.5% | NA | 16.5% | 52.8% | 29.8% | NA | NA | 14.2% | NA | NA | NA |
| Energy Industries | IE | 4.5% | 11.0% | 0.2% | 0.5% | 3.6% | 1.0% | 1.0% | 0.4% | 1.0% | 7.3% |
| Fugitive | IE | 0.1% | 0.0% | 2.1% | 0.3% | 0.0% | 0.0% | 0.7% | 0.0% | IE | IE |
| Industrial Combustion | IE | 31.3% | 10.8% | 1.1% | 2.6% | 54.7% | 17.1% | 5.0% | 0.4% | 11.7% | 50.4% |
| Industrial Processes | 0.0% | 0.1% | IE | 11.0% | 26.8% | 0.8% | 9.9% | 9.8% | 0.3% | 0.9% | 3.1% |
| Residential, Commercial & Public Sector Combustion | 0.0% | 34.1% | 15.9% | 4.7% | 15.1% | 38.0% | 4.2% | 31.9% | 90.5% | 40.3% | 13.3% |
| Solvent Processes | IE | NA | NA | 22.7% | IE | NA | NA | IE | IE | IE | NA |
| Transport Sources | 0.5% | 25.1% | 44.8% | 3.9% | 16.5% | 2.3% | 67.3% | 21.4% | 1.8% | 4.5% | 10.3% |
| Waste | 0.6% | 4.6% | IE | IE | 7.6% | IE | IE | 15.4% | 6.7% | 41.4% | 15.5% |
| Other | 1.3% | 0.1% | 1.1% | 1.5% | 0.8% | 0.6% | 0.7% | 0.7% | 0.1% | 0.1% | 0.1% |

* The sector: “other” includes all “other” categories in the inventory and also a number of categories that are insignificant for a specific pollutant. These have been marked in the table as “IE” (used in inventory reporting for “Included Elsewhere”). A breakdown of what is included within this category in respect to each pollutant can be found in Table 32.

The maps below show the emission totals for Northern Ireland, excluding large industrial point sources and shipping. Units are in tonnes, except Pb in kg, per square kilometre in 2024. Details on the methodology for these can be found in Appendix B and in the Spatial Emissions Methodology for NAEI report (Tsagatakis, et al., 2025), found here: https://naei.energysecurity.gov.uk/reports/uk-spatial-emissions-methodology-report-national-atmospheric-emissions-inventory-2023

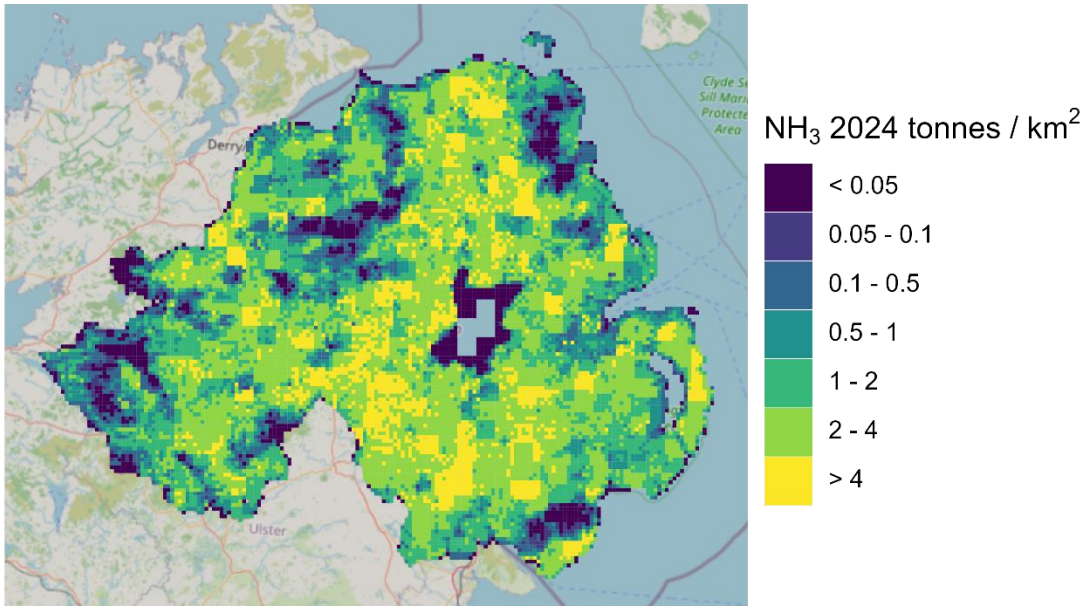


Figure 61: Ammonia ($NH_3$) emissions in Northern Ireland, 2024

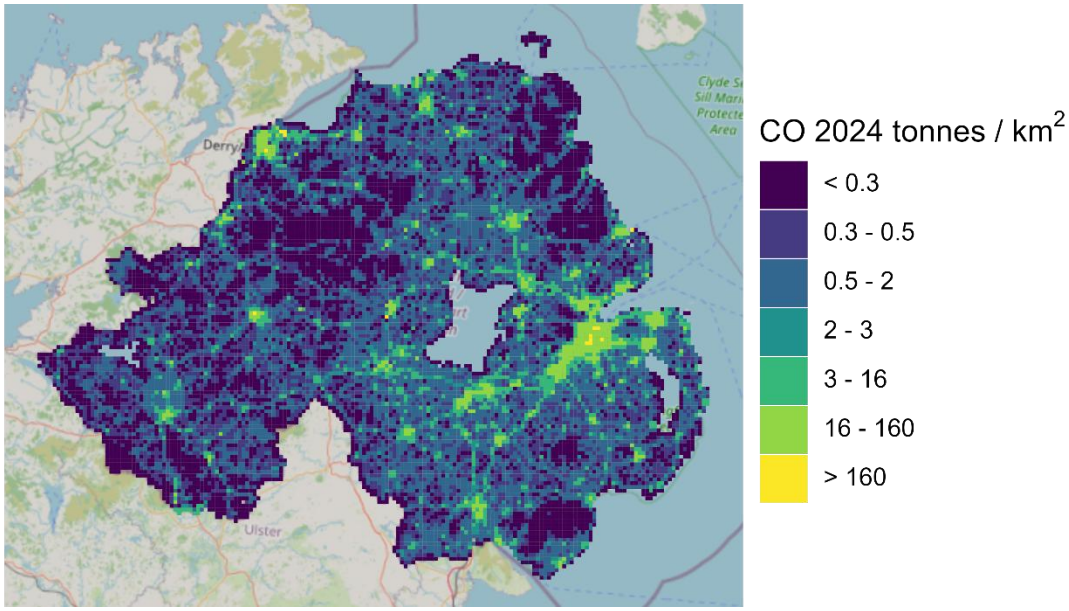


Figure 62: Carbon monoxide emissions in Northern Ireland, 2024

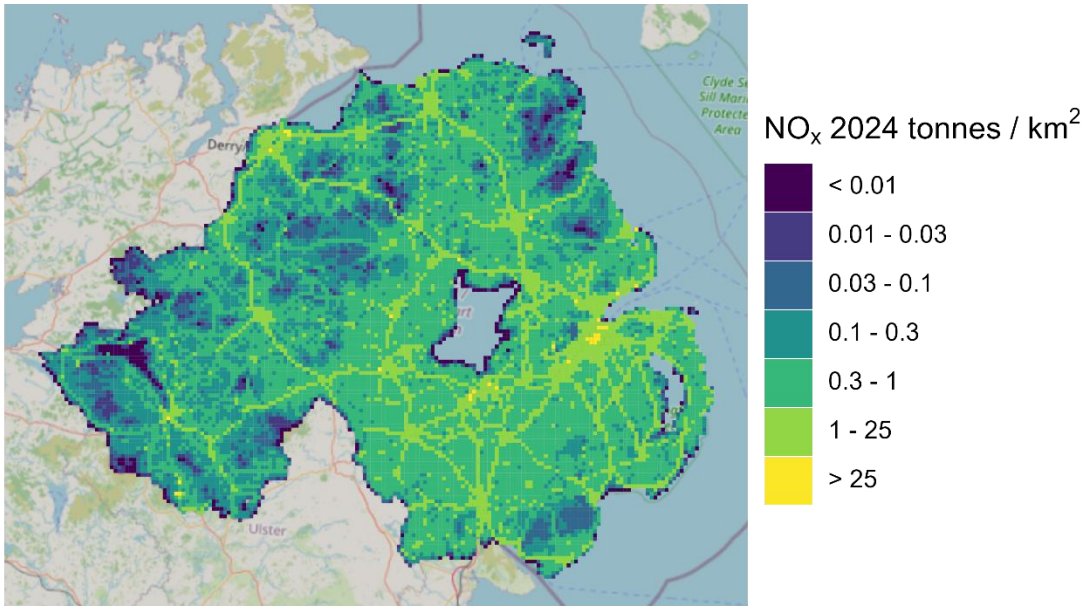


Figure 63: Nitrogen oxides ($NO_x$) emissions in Northern Ireland, 2024

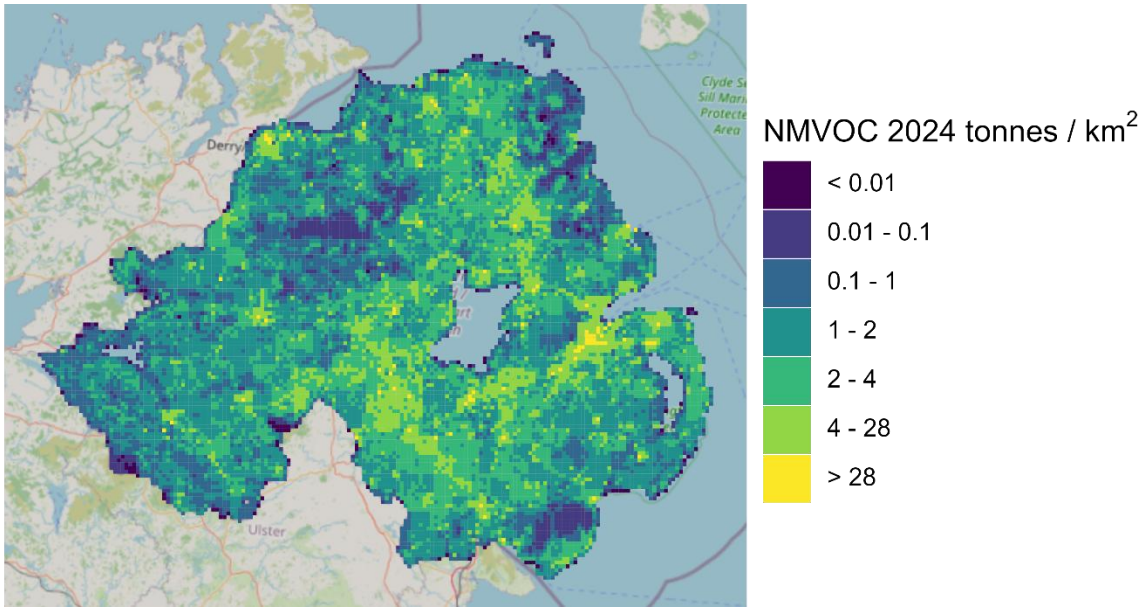


Figure 64: Non-methane volatile organic compounds (NMVOC) emissions in Northern Ireland, 2024

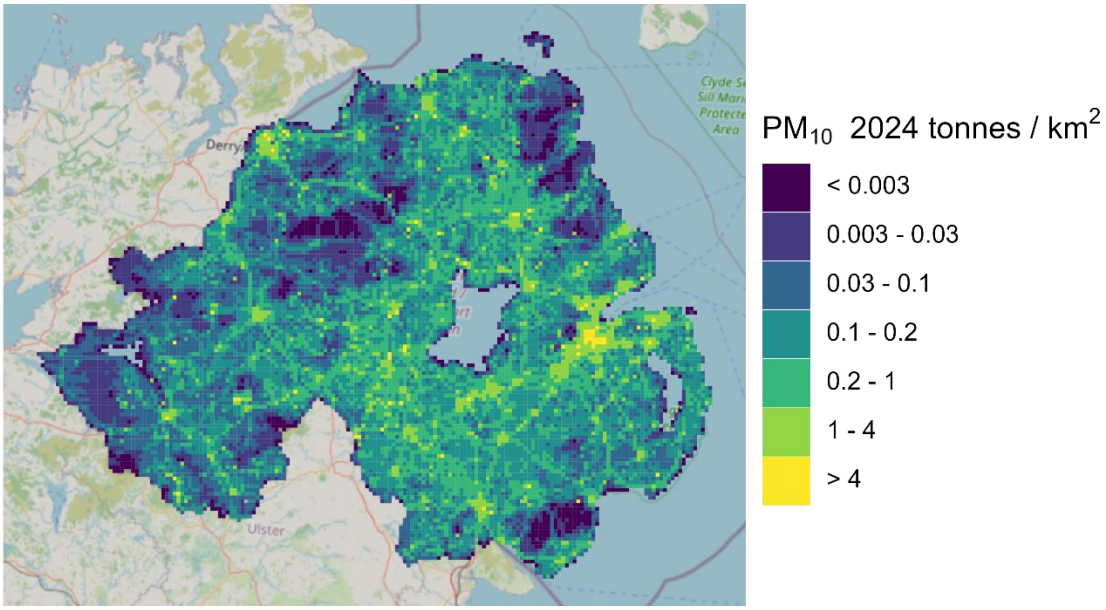


Figure 65: Particulate matter < 10 µm ($PM_{10}$) emissions in Northern Ireland, 2024

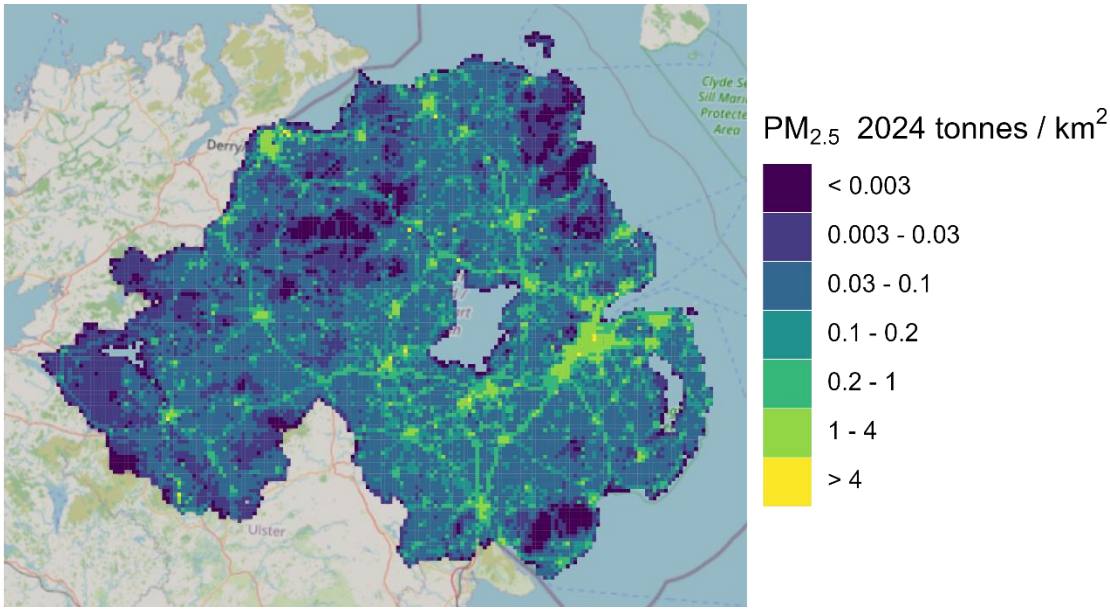


Figure 66: Particulate matter < 2.5 µm ($PM_{2.5}$) emissions in Northern Ireland, 2024

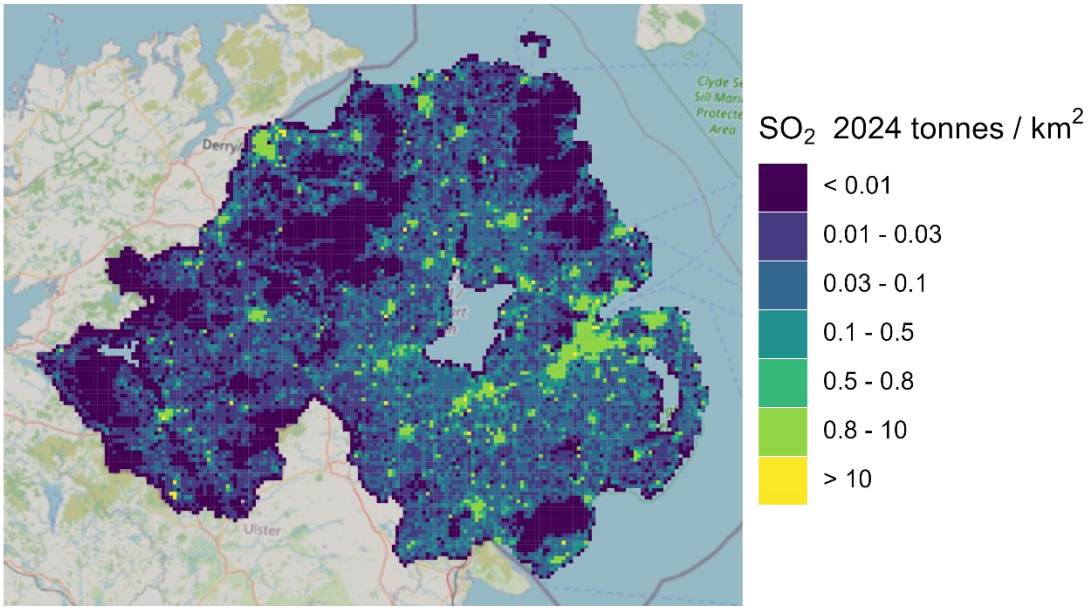


Figure 67: Sulphur dioxide ($SO_2$) emissions in Northern Ireland, 2024

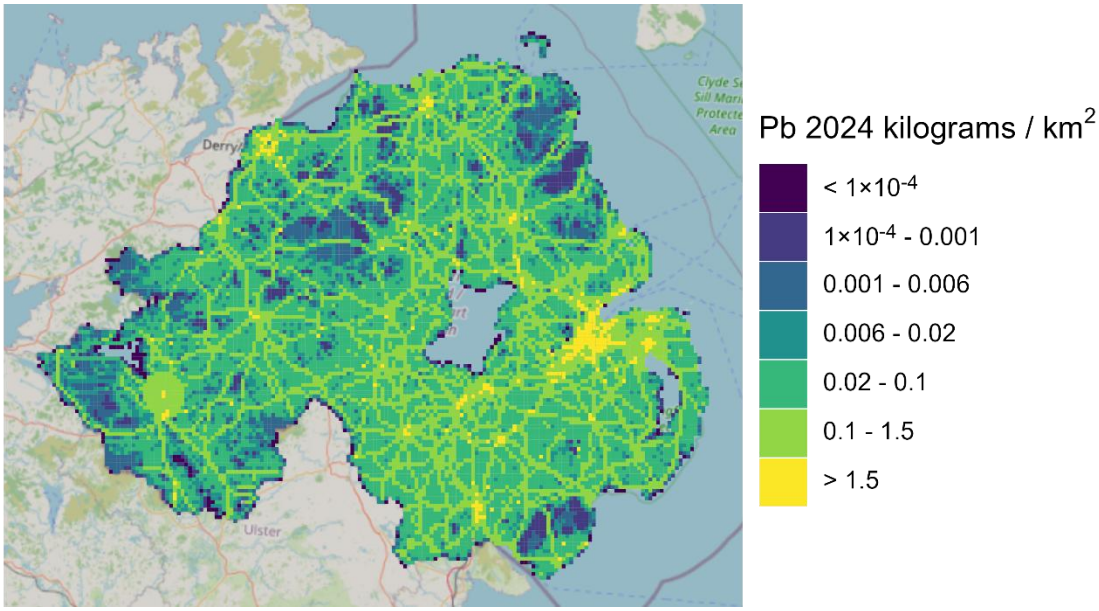


Figure 68: Lead (Pb) emissions in Northern Ireland, 2024

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# APPENDIX A: BACKGROUND TO INVENTORY DEVELOPMENT

The following sections provide further detail on the development of the API for England and the DGs. This is supporting information for **Section 1.1** of the main report.

The latest inventory data shows that the UK continues to meet international ceilings for $NO_X$, $NH_3$, NMVOC, $PM_{2.5}$ and $SO_2$ emissions. Further information on UK emissions trends can be found in the Defra Accredited Official Statistics Release: Emissions of air pollutants in the UK, 1970 to 2024, see: https://www.gov.uk/government/statistics/emissions-of-air-pollutants/emissions-of-air-pollutants-in-the-uk-background

## NATIONAL EMISSIONS CEILINGS REGULATIONS

The National Emission Ceilings Regulations 2018 (NECR)[39] transposes the obligations of the National Emission Ceilings Directives (Directive 2001/81/EC and 2016/2284/EU) into UK law.

The National Emissions Ceilings Regulations set UK level emission reduction commitments (ERCs) for $SO_2$, $NO_X$, NMVOC and $NH_3$ between 2010 and 2019. These have now been superseded by the current, more stringent ERCs which are applicable from 2020-29 and 2030 onwards for the total emissions of $SO_2$, $NO_x$, NMVOC, $NH_3$, and $PM_{2.5}$.

The UK has met its ERCs for $SO_2$, $NO_x$, NMVOC, $PM_{2.5}$ and $NH_3$ for 2020-2024[40].

## GOTHENBURG PROTOCOL

The UK, EU Member States, Central and Eastern European countries, the United States and Canada negotiated the 'multi-pollutant' protocol under the Convention on Long-Range Transboundary Air Pollution (CLRTAP) to address photochemical pollution, acidification, and eutrophication. The Protocol to Abate Acidification, Eutrophication and Ground-level Ozone was adopted in Gothenburg in December 2000 (Gothenburg Protocol) and amended in 2012, to include particulate matter (PM) and black carbon, and national ERCs to be achieved by 2020 and beyond[41].

It incorporates several measures to facilitate the reduction of emissions:

- Emission ceilings are specified for sulphur dioxide, nitrogen oxides, ammonia and NMVOCs, which were to be attained between 2010-2019;
- Variable emission reduction commitments for 2020 onwards, based on a percentage reduction from a 2005 baseline, are detailed for sulphur dioxide, nitrogen oxides, ammonia, NMVOCs, and $PM_{2.5}$;
- Emission limits are specified for sulphur, nitrogen oxides and NMVOCs from stationary sources;
- Emission limits are indicated for carbon monoxide, hydrocarbons, nitrogen oxides and particulates from new mobile sources;
- Environmental specifications for petrol and diesel fuels are given;
- Several measures to reduce ammonia emissions from the agriculture sector are required.
- A flexibility mechanism has been introduced to allow Parties, under clearly defined circumstances, to propose adjustments to their emissions inventories or ERCs[41].

The Gothenburg Protocol review report, published in 2022 by the UN Economic and Social Council[42], concluded further targeted emission reduction measures for $NO_x$, NMVOCs and methane would be necessary across sectors including agriculture, energy and transport and shipping[43]. Since the 2022 review,

39 https://www.legislation.gov.uk/uksi/2018/129/contents/made
40 https://naei.energysecurity.gov.uk/air-pollutants/why-do-we-estimate-aq-emissions
41 https://unece.org/environment-policy/air/protocol-abate-acidification-eutrophication-and-ground-level-ozone
42 https://unece.org/sites/default/files/2023-09/ECE_EB.AIR_150_Add.2_2305247E.pdf
43 https://unece.org/media/press/386648



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further technical negotiations and work to strengthen post-2030 targets have been initiated by CLRTAP working groups, although no new binding amendments have been finalised as of 2026[44].

## INDUSTRIAL REGULATION AND POLLUTANT RELEASE AND TRANSFER REGISTER (PRTR)

The Industrial Emissions Directive (IED, Directive 2010/75/EU) entered into force in 2011 and aims to minimise pollution from applicable industrial sources throughout the EU, consolidating previous legislation. This directive was also transposed into UK law[45]. Operators of particular industrial installations (IED Annex I) are required to obtain an integrated permit from the Environment Agency, Scottish Environment Protection Agency, Natural Resources Wales, or the Northern Ireland Environment Agency and apply Best Available Techniques (BAT). Local Authorities are the permitting authority for integrated permits for some types of activities in England and Wales. District councils in Northern Ireland regulate Northern Ireland Pollution Prevention Control (NI PPC) Regulations Part C activities. The Northern Ireland Environment Agency (NIEA) regulate Part A and B activities.

Enactment of the IED domestically for England and Wales was carried out through the Environmental Permitting (England and Wales) Regulations 2013 which amend the Environmental Permitting (England and Wales) Regulations 2010. Scotland and Northern Ireland similarly implemented the IED through analogous legislation: the Pollution Prevention and Control (Scotland) Regulations 2012 and the Pollution Prevention and Control (Industrial Emissions) Regulations (Northern Ireland) 2013. Note that subsequent amendments and revisions to legislation across England, Scotland, Wales and Northern Ireland have maintained these controls. The 2018 amending NI PPC Regulations transposed EU require with regard to medium combustion plants. The 2014 amending Regulations transposed EU energy efficiency requirements.

The regulations require these ‘Part A’ permits to consider and base permit conditions upon BAT, as defined in BAT conclusions (BATC) developed from the BAT reference documents, or ‘BREFs’, a review process facilitated by the European Integrated Pollution Prevention and Control (IPPC) Bureau, to assess environmental performance across industrial sectors. In this manner, the IED helps aid the technological development and performance of specific sites. While BATC published prior to when the UK left the EU can continue to apply, the UK does not need to meet the requirements of any new EU BATC, except for installations within Northern Ireland that are within scope of Article 4 of the Northern Ireland Protocol/Windsor Framework. The UK is therefore in the process of developing a BATC system[46].

The IED, along with the E-PRTR regulations (EC Regulation 166/2006), also transposed into UK law[47], includes a requirement to share and engage the public in determining the permit. All issued IED environmental permits are published on the UK Government website. As of 2025, the UK continues to meet its requirement for public access to emissions data through a dedicated reporting flow via the UK Pollutant Release and Transfer Register (UK-PRTR), with the latest emissions data available covering reporting up to 2024. In parallel, the UK maintains transparency on regulatory actions, including the publication of environmental permits issued under the Industrial Emissions Directive (IED) with permits from 2025 currently accessible online. Further updates or reforms to the UK-PRTR are anticipated to ensure alignment with evolving domestic environmental priorities[48].

## HEAVY METALS PROTOCOL

CLRTAP has been extended by a number of protocols, including the 1998 Protocol on Heavy Metals, to which the UK is a signatory. The Heavy Metals Protocol targets three particularly harmful substances: lead, cadmium, and mercury.

Countries are obliged to reduce their emissions of these three metals below their levels in 1990 (or an alternative year between 1985 and 1995). The protocol aims to cut emissions from industrial sources (iron and steel industry, non-ferrous metal industry), combustion processes (power generation, road transport)

44 https://unece.org/climate-change/press/addressing-transboundary-air-pollution-unece-coordinates-regional-action

45 https://www.legislation.gov.uk/eudr/2010/75/contents

46 https://www.gov.uk/government/publications/establishing-the-best-available-techniques-for-the-uk-uk-bat/establishing-the-best-available-techniques-for-the-uk-uk-bat

47 https://www.legislation.gov.uk/eur/2006/166/body/adopted

48 https://www.gov.uk/government/collections/industrial-emissions-directive-ied-environmental-permits-issued-2026-a-to-f

and waste incineration. The protocol specifies limit values for emissions from stationary sources and requires the use of BAT to minimise emissions from these sources, through the application of special filters or scrubbers for combustion sources, or mercury-free processes. The protocol also requires countries to phase out leaded petrol. Under the protocol, measures are introduced to lower heavy metal emissions from other products (such as mercury in batteries), and examples are given of management measures for other mercury-containing products, such as electrical components (thermostats, switches), measuring devices (thermometers, manometers, barometers), fluorescent lamps, dental amalgam, pesticides and paint.

The protocol was amended in 2012 to introduce more stringent emission limit values for particulate matter and the specific heavy metals (cadmium, lead, and mercury), applicable for specific combustion and other industrial emission sources. The emission source categories for the three heavy metals were also extended to the production of silico- and ferromanganese alloys. Amendments came into effect in 2022. The Minamata Convention on Mercury in 2013, raised the profile of mercury to a global level, and a treaty was negotiated under the United Nations Environment Programme (UNEP)[49].

## PERSISTENT ORGANIC POLLUTANTS (POPS) PROTOCOL AND THE STOCKHOLM CONVENTION

The UNECE adopted the Protocol on Persistent Organic Pollutants (POPs) in 1998, which focuses on a list of 16 substances that have been singled out according to agreed risk criteria. The substances comprise eleven pesticides, two industrial chemicals and three by-products/contaminants.

The objective of the Protocol is to eliminate any discharges, emissions, and losses of POPs. The Protocol bans the production and use of some products, whilst others are scheduled for elimination at a later stage. The Protocol includes provisions for dealing with the wastes of products that will be banned. It also obliges Parties to reduce their emissions of dioxins, furans, polycyclic aromatic hydrocarbons (PAHs; of which B[a]P is one) and hexachlorobenzene (HCB) below their levels in 1990 (or an alternative year between 1985 and 1995). For the incineration of municipal, hazardous, and medical waste, it lays down specific limit values. The Parties to the Protocol on POPs adopted decisions 2009/1 and 2009/2 to amend the Protocol to include seven new substances and implement revised obligations for some substances as well as emission limit values (ELVs) for waste incineration. These amendments came into force in January 2022 for 2009/1 and February 2023 for 2009/2.

In 2001, the Stockholm Convention on POPs was adopted which built on the 1998 Protocol raising the profile of POPs aimed at prohibiting, or gradually reducing, the production and use of persistent organic chemicals worldwide. There are currently 30 POPs listed in the Convention which fall into three broad categories: pesticides, industrial chemicals, and unintentional by-products of combustion and some industrial and non-industrial processes. An updated version of the UK's National Implementation Plan (NIP)[50] which sets out how the UK will implement their obligations under the Convention was published in 2022 and has been developed by Defra in agreement with the Scottish Government, Welsh Government, DAERA, and other relevant Government Departments and Agencies. The NIP also gives an overview of how internationally produced POPs are being managed in the UK and offers a UK Dioxins Action Plan for future actions[51]. Note that under Annex 2 of the Northern Ireland Protocol / Windsor Framework, Northern Ireland remains aligned with EU POPs legislation.

## SULPHUR CONTENT OF LIQUID FUELS DIRECTIVE

The EC's Directive to limit the sulphur content in gas oil and fuel oil has been transposed into UK regulations which were initially established in 2000 but were updated with Statutory Instruments brought into force across the DGs via the Sulphur Content of Liquid Fuel Regulations 2007 (England and Wales: SI79/2007; Scotland: SI 27/2007; Northern Ireland: SI 272/2007). The Sulphur Content of Liquid Fuels Directive (1999/32/EC) limits the sulphur content in gas oil to 0.1% by mass and in heavy fuel oil to 1% by mass[52]. This requirement entered the 2007 regulations, effective from January 2008 onwards. The main impact of

49 https://www.unep.org/resources/report/minamata-convention-mercury

50 https://www.pops.int/Implementation/NationalImplementationPlans/NIPTransmission/tabid/253/ctl/Download/mid/24304/Default.aspx?id=180&ObjID=28281

51 https://www.fao.org/faolex/results/details/en/c/LEX-FAOC214659

52 https://www.gov.uk/government/publications/report-on-sulphur-content-of-liquid-fuels



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these regulations has been to gradually drive down the maximum sulphur content of refinery products. Amendment regulations for the Sulphur Content of Liquid Fuels (England and Wales)[53], the Sulphur Content of Liquid Fuels (Scotland)[54], and the Sulphur Content of Liquid Fuels Regulations (Northern Ireland)[55] came into effect in 2014.

## DEVOLVED GOVERNMENTS' AIR QUALITY POLICY

The UK Government leads on the UK's input to International targets relating to Air Quality, with input from the Scottish Government, Welsh Government and Northern Ireland Government. Linked to the requirements of the EU Directives which have been transposed into UK law, e.g. the NECR, the Air Quality Strategy (AQS) for England, Scotland, Wales and Northern Ireland (Defra, 2007) sets out a framework of standards and objectives for the air pollutants of most concern at the time (sulphur dioxide, particulate matter, nitrogen oxides, polycyclic aromatic hydrocarbons, benzene, 1,3-butadiene, carbon monoxide, lead, ammonia and ozone). The AQS has since been superseded in all of the DGs, with the exception of Northern Ireland.

Defra published the Environmental Improvement Plan in 2023, which sets out action to be taken to improve air quality in England. The Government undertook a rapid review of this Plan in 2024, to ensure it is fit for purpose in delivering statutory targets. In December 2025, the Environmental Improvement Plan 2025[56] was published, which includes Goal 2: we will achieve clean air. It also references the Fit for the Future: 10 Year Health Plan for England, which sets out how the government is taking steps to reduce health harms of air pollution.

Similarly, the DGs have also developed national plans and strategies to drive effective action at the local level. Scotland's 'Cleaner air for Scotland 2: Towards a Better Place for Everyone', was published in 2021, and Wales' Clean Air Plan for Wales: Healthy Air, Healthy Wales' was published in August 2020. DAERA issued a Clean Air Strategy Public Discussion document for Northern Ireland in 2021, outlining trends, monitoring and regulatory requirements for air pollutants[57]. At the time of writing DAERA is finalising Northern Ireland's first Clean Air Strategy and once published will supersede the 2007 AQS[58].

## AIR QUALITY PLAN FOR NITROGEN DIOXIDE ($NO_2$) IN THE UK

In July 2017, the Government published the UK plan for tackling roadside $NO_2$ concentrations, followed by a supplement in October 2018. Together these are referred to as the '$NO_2$ plan'. The $NO_2$ plan set out how Government will achieve compliance with legal limits for nitrogen dioxide in the shortest possible time.

## AIR QUALITY STANDARD REGULATIONS

The Air Quality Standards Regulations 2010 set legally binding concentration limit values for seven key air pollutants, including $NO_X$, $SO_2$, $PM_{10}$ and CO and an exposure reduction target for $PM_{2.5}$. There are also target values for a further five substances (heavy metals and polycyclic aromatic hydrocarbons). This legislative framework was established to manage air quality and to avoid exceeding the air pollutant concentration limits known to be harmful to human health and the environment. Evidence requirements revolve around monitoring, assessment and reporting to ensure compliance with air quality standards. Where air quality standards are at risk of being exceeded, authorities are required to develop action plans, which may include emissions reductions strategies and pollution control measures[59].

53 https://www.legislation.gov.uk/uksi/2014/1975

54 https://www.legislation.gov.uk/ssi/2014/258

55 https://www.legislation.gov.uk/nisr/2014/147/made

56 https://www.gov.uk/government/publications/environmental-improvement-plan-2025/environmental-improvement-plan-eip-2025

57 https://www.daera-ni.gov.uk/sites/default/files/consultations/daera/20.21.066%20Draft%20Clean%20Air%20Strategy%20for%20NI%20-%20Public%20Discussion%20Doc%20Final%20V6.PDF

58 https://www.airqualityni.co.uk/air-quality/policy

59 https://www.avisoconsultancy.co.uk/legal-register/the-air-quality-standards-regulations-2010

# APPENDIX B: INVENTORY METHODOLOGY

This Appendix provides further detail on the methodology used to compile the emissions inventories and the data sources used during compilation. This information supports **Section 1.3** of the main report.

The disaggregation of the UK's air pollutant emissions to England and the DGs is part of a programme of ongoing data and methodology improvement. This programme spans both greenhouse gas and API and is driven by the developing requirements for sub-national reporting against emission targets and DG policy development.

## DATA AVAILABILITY

For many emission sources of air pollutants, the data available for England and the DGs are less detailed than for the UK as a whole and, for some sources, country-level data are not available at all. In particular, energy-balance data (i.e. fuel production, transformation, and sector-specific consumption data) are not available across the time series for England, Scotland, Wales, and Northern Ireland.

Sub-national energy statistics are published annually by the Department for Energy Security and Net Zero (DESNZ), within the quarterly Energy Trends publication (DESNZ, 2025b). These sub-national statistics are limited in their detail when compared to UK-level energy statistics, but do provide estimated fuel use data for England and the DGs for the following combustion source sectors: industry, commercial, agriculture (combustion sources) and residential.

These DESNZ sub-national energy statistics are based on local electricity and gas consumption patterns, as part of a project to develop Local Authority carbon dioxide emissions data. These statistics use local electricity and gas use data from the National Grid and the gas supply network operators. Solid and liquid fuel use is calculated using point source consumption data for major industrial sites, and a complex modelling process to distribute remaining UK fuel allocations that uses employment and population data and takes account of Energy Performance Certificates (EPCs) and Display Energy Certificates (DECs), as well as the patterns of gas and electricity consumption. The latest available data include Local Authority fuel use estimates available for solid, liquid, gas, and electricity use are available from 2005 for Great Britain, and since 2008 for Northern Ireland[60].

The DESNZ sub-national energy statistics are Accredited Official Statistics and are revised and improved each year through targeted sector research to reduce uncertainties in the modelling approach (DESNZ, 2025b). The lack of consistent and comprehensive fuel use data from across the DGs (especially for solid and liquid fuels) leads to significant uncertainty in the distribution of UK fuel use across the DGs. Expert judgement and proxy data are used to address data gaps and inconsistencies in energy use data over the time series. The DG emission estimates for earlier years in the inventory time series and the reported inventory trends are associated with higher uncertainty than the data and trends reported in the UK emissions inventory.

The DESNZ sub-national energy statistics are used to derive estimates for industry sector combustion of fuels such as fuel oil, gas oil and coal. These data are based predominantly on analysis of available point source data, supplemented by production and employment surveys, and in several sectors data on building EPC and DEC are used to provide a better indicator of the DG energy use than the production or employment indices.

For other important emission sources there are complete country-level datasets available, although some of these are less detailed than data used for the UK Inventory:

- Industrial process emissions are based on plant operator estimates reported to environmental agencies under regulatory systems such as the Industrial Emissions Directive (IED), and the Environmental Permitting (England and Wales) Regulations (EPR), the Pollution Prevention and Control (Industrial Emissions) Regulations (Northern Ireland) 2013, and the Environmental Authorisations (Scotland) Regulation 2018, that transposes this. Major sources include power

60 UK local and regional greenhouse gas emissions estimates: https://www.gov.uk/government/collections/uk-local-authority-and-regional-greenhouse-gas-emissions-statistics



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stations, cement and lime kilns, iron & steel works, aluminium, and other non-ferrous metal plant, and chemical industries.

- Emissions from oil and gas terminals and offshore platforms and rigs, are based on operator estimates reported to the DESNZ OPRED team through the Environmental Emissions Monitoring System (EEMS). Emissions from the offshore oil & gas exploration and production sector are not attributed to a specific DG inventory, but are reported within an "unallocated" category, whilst emissions from onshore oil & gas terminals are assigned to the appropriate DG inventories.
- Agricultural emissions are based on official livestock datasets, annual fertiliser use surveys, farm management practice surveys and detailed emission factors from recent literature sources. The methodology for compiling the inventory of $NH_3$ emissions from agriculture follows that of Carswell & Gilhespy (2025). Although a detailed, mostly Tier 3, methodology is used, it is not possible to fully represent many of the factors impacting emissions, for example animal stocking densities, soil type, daily weather etc, making emission estimates uncertain.
- Emissions from waste disposal activities are estimated based on modelled emissions from the UK pollutant emissions inventory (Elliott, et al., 2025) split out across the DGs based on local authority waste disposal activity reporting (www.wastedataflow.org) which provides an insight into the local shares of UK activity for recycling, landfilling, incineration and other treatment and disposal options. Waste incineration emissions are based on point source emissions data.
- Emissions from shipping activities are based on a bottom-up inventory. High-resolution terrestrial Automatic Identification System (AIS) vessel movement data for 2019 is supplied by the Department for Transport (DfT) Maritime Emission Model (MEM). It covers coastal shipping around the UK and voyages such as movements to and from offshore oil and gas rigs, voyages to/from crown dependencies and overseas territories and voyages from the UK to international ports. The UK shipping model's bottom-up estimates of emissions from domestic shipping are normalised to align with the DUKES fuel sold figures for national navigation. For the DG inventories, the UK shipping model is used as a basis. Data for 2019 are used as the base year, and port movement statistics (DfT, 2025d) are used to estimate fuel use and emissions back to 2005 and forecast to 2024.

For some sources where regional data are not available, current NAEI mapping grids have been used. These mapping grids are commonly based on census and other survey data that are periodically updated and used within UK emissions mapping and modelling work (Tsagatakis, et al., 2025).

## KEY COMPILATION RESOURCES

As a result of the more limited DG-specific activity and emission factor data, the emission estimates for the DG inventories are subject to greater uncertainty than the equivalent UK estimates. Installation-specific fuel use data for major industrial plants are available over the time series onwards under the EU Emissions Trading Scheme / UK Emissions Trading System (ETS), and from sites regulated under Environmental Permitting Regulations[61] / Industrial Emissions Directive (EPR/IED)/ NI PPC Regulations. The data quality from these environmental regulatory systems has evolved over the years as monitoring, reporting and quality checking methods and protocols have developed meaning that fuel use estimates in earlier years of the time series are subject to greater levels of uncertainty. This also impacts the accuracy of the reported emissions of air pollutants used within inventory compilation, such that more recent data are likely to be more accurate. The uncertainties in the DG inventories are discussed in more detail in **Appendix E**.

There are a number of resources that have been used to estimate the DG share of UK emissions for each emission source, including:

- NAEI point source database;
- NAEI emission mapping grid data;
- Local and regional data derived from analysis of activity data trends;
- Generic parameters and proxy data such as population or economic indicators such as Gross Value-Added data.

61 Environmental Permitting (England and Wales) Regulations, the Pollution Prevention and Control (Industrial Emissions) Regulations (Northern Ireland) 2013, and the Environmental Authorisations (Scotland) Regulation 2018

The main resources used within the DG inventories are outlined below.

## NAEI POINT SOURCE DATABASE

Operators of all EPR/IED-regulated industrial plant are required to submit annual emission estimates of a range of pollutants (including all of those pertinent to this report) to their local UK environmental regulatory agency, and these emission estimates are subject to established procedures of Quality Assurance and Quality Checking prior to publication.

These industrial point-source pollution inventories (held by the Environment Agency, the Scottish Environment Protection Agency, Natural Resources Wales and the Northern Ireland Environment Agency) are emission datasets that have been developing and improving since their inception in the mid-1990s. Robust and reliable data for installations in England and Wales have been widely available since around 1998, whilst the equivalent datasets in Scotland and Northern Ireland became available from the early 2000s.

NAEI point source data have been improved over recent years through the increasing quality and availability of these EPR/IED-regulated industrial pollution emission datasets, as well as through the availability of site-specific fuel use data for sites that operate within the ETS, which has been running since 2005. Annual data requests are also made directly to plant operators or trade associations in key sectors such as power stations, refineries, cement & lime manufacture, iron & steel manufacture, chemical industry and waste treatment and disposal, in order to procure more detailed emissions data and other parameters (such as production data).

By analysing the time series of data and reviewing the latest emission estimates, the point source data is amended as appropriate to fill in gaps and rectify any errors. This has been formalised in a recent upgrade to the processing in the NAEI, with the development of a new integrated database that ensures consistency in approach between sectors and sites. These finalised data are then used as the basis for the NAEI industrial emissions estimates. The location of each site is known and therefore, the point source database can be queried to extract all emissions information relevant to a given geographical area, and hence the DG-level inventories can be partly populated in this way.

The NAEI point source database is most useful for industries that are dominated by large EPR/IED-authorised plant, such as power stations, refineries, iron & steel manufacturing, cement, and lime kilns. For these sectors, the point source database covers nearly 100% of emissions, and is regarded to be the best available dataset for such sources, as it is based on reported energy use and emissions data derived from regulatory agency sources that are subject to quality checking and, in the case of ETS data, independent verification.

Annual revisions to the NAEI point source database are conducted when new data become available and/or when installation-level data are revised by operators, regulators or through enquiry by the UK inventory team to resolve data discrepancies which may be evident between reporting mechanisms.

## NAEI EMISSION MAPPING GRIDS

Emission maps for the whole of the UK are routinely produced for 25 pollutants, including all of the pollutants considered in the DG API. The maps are compiled at a 1km resolution and are produced annually. The mapped emissions data are available on the NAEI website at: https://naei.energysecurity.gov.uk/data/maps. For a more detailed description of the integration of point source data analysis and the development of UK emission maps, see the UK Spatial Emissions Methodology (Tsagatakis, et al., 2025). Note the DG inventories are based on the NAEI23 maps, as NAEI24 maps were not available at the time of compilation.

The emission maps are used by the UK inventory team and other organisations for a variety of Government policy support work at the national scale. In particular, the maps are used as input into a programme of air pollution modelling studies.

The geographical distribution of emissions across the UK is built up from distributions of emissions in each source sector. These source sector distributions are developed using a set of statistics appropriate to that sector. For large industrial ‘point’ sources, emissions are compiled from a variety of official UK sources (Environment Agency, Scottish Environment Protection Agency, Natural Resources Wales, Northern Ireland Environment Agency, and Local Authority data). For sources that are distributed widely across the UK



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(known as 'area' sources), a distribution map is generated using appropriate surrogate statistics for that sector. The method used for each source varies according to the data available but is commonly based on either local activity statistics such as raw material use, energy use, industrial production and employment data, housing and population data, road vehicle and fuel sales data, periodic census or socio-economic survey data.

Periodic surveys and censuses of industrial, commercial, residential, and other economic sectors provide indicators regarding the location and scale of a wide variety of activity data that can be used to disaggregate emissions totals, and these are commonly utilised within the NAEI mapping grids.

The key limitation to the use of mapping grids within inventory development is the difficulty in obtaining an accurate time series of emissions from a given sector, as the mapping grids are typically only updated every few years as more survey data becomes available. The data availability limitations inevitably impact the reliability of emission inventory estimates. Resources were focused on ensuring that the most significant sources are assessed most accurately across the time series, whilst less significant source sectors may be disaggregated using a mapping grid for all years in the time series.

## METHODOLOGICAL CHOICE BY NFR SECTOR

The table below provides a summary of the method and data availability for each sector in the DG inventories using the Nomenclature for Reporting (NFR) structure, which is the format currently required for the submission under the UNECE Convention on Long-Range Transboundary Air Pollution (CLRTAP).

Table 6: Disaggregation Methodologies for the DG Air Pollutant Inventories

| NFR Sector | Source | Disaggregation Method |
|---|---|---|
| 1A1a | Public electricity and heat production (all fuels) | All emissions from major fuels are derived from the point source database, which is based on annual emissions estimates reported to UK environmental regulators by IPC/IED-regulated industry and (since 2005) fuel use data available from the ETS, (Environment Agency, 2025a; Environment Agency, 2025b; SEPA, 2025a; SEPA, 2025b; Natural Resources Wales, 2025a; Natural Resources Wales, 2025b; Northern Ireland Environment Agency, 2025a; Northern Ireland Environment Agency, 2025b)<br>Exceptions are minor fuels: sewage gas use is estimated based on UK-wide estimates disaggregated using DG share of UK population (ONS, 2025a); landfill gas use is based on the emission of methane from landfills from the NAEI's Methane Emissions from Landfill Model (MELMod). |
| 1A1b | Petroleum refining (all fuels) | Point source data provided by plant operators to IPC/IED pollution inventories (see 1A1a). Further detail on combustion and process emissions provided by (Fuel Industries UK, 2025). |
| 1A1c | Coke & SSF production (all fuels) | Point source data provided by plant operators (see 1A1a).<br>Regional iron & steel production and fuel use data (ISSB, 2025).<br>UK fuel use data from DESNZ (DESNZ, 2025a). |
| | Nuclear fuel production (all fuels) | All emissions are in England. |
| | Colliery combustion and colliery methane production (all fuels) | Deep mined coal production, data from the Coal Authority (Coal Authority, 2025). |
| | Gas production, downstream network (all fuels) | ETS installation data for natural gas use from 2005-2024. (Environment Agency, 2025a; Environment Agency, 2025b; SEPA, 2025a; SEPA, 2025b; Natural Resources Wales, 2025a; Natural Resources Wales, 2025b; Northern Ireland Environment Agency, 2025a; Northern Ireland Environment Agency, 2025b). Colliery methane use based on deep-mined coal production, data from the Coal Authority (Coal Authority, 2025). |
| | Upstream oil & gas, including gas separation plant (all fuels) | DESNZ OPRED (DESNZ, 2025d) EEMS inventory. Point source data for $NO_X$, $SO_2$, VOC, CO. Note that $PM_{10}$, $PM_{2.5}$, Pb, B[a]P, PCDD/Fs and Hg use the DG split from $CO_2$ point source data as a proxy at the source and activity level. |

| NFR Sector | Source | Disaggregation Method |
|---|---|---|
| 1A2a | Blast furnaces, sinter plant, and fuel combustion at iron & steel plants | Point source data provided by plant operators (see 1A1a), supplemented by site-specific breakdown of emissions by source from Tata Steel (Tata Steel, 2025). |
| 1A2b | Combustion in non-ferrous metals manufacturing industry | Pollution Inventory, ETS (Environment Agency, 2025a; Environment Agency, 2025b; SEPA, 2025a; SEPA, 2025b; Natural Resources Wales, 2025a; Natural Resources Wales, 2025b; Northern Ireland Environment Agency, 2025a; Northern Ireland Environment Agency, 2025b) and IDBR and employment data (ONS, 2025a).<br>Overall analysis of the 1A2b,c,d,e and point source emissions and employment by sector used to constrain the DG totals to previous 1A2 DG estimates, using 1A2g Other Industry as residual allocation for emissions in the UK inventory not assigned to 1A2b,c,d, or e.<br>Detailed analysis conducted for 2008-2018; 1A2b,c,d,e 2005-2008 DG trends matched with UK trends due to data limitations for the detailed industry sub-sector activities at DG level.<br>Coal use in autogeneration derived from Energy Trends publications (DESNZ, 2025b).<br>Exceptions: All $NH_3$ production and methanol production (both 1A2c) is located in England. |
| 1A2c | Combustion in chemical manufacturing industry, $NH_3$ production | |
| 1A2d | Combustion in paper, pulp, and print manufacturing industry | |
| 1A2e | Combustion in food processing, beverages, and tobacco manufacturing industry | |
| 1A2f | Combustion in minerals industries: cement and lime | Cement: Point source data from plant operators (see 1A1a). Site-specific cement production capacities and UK-wide cement industry fuel use data (Mineral Products Association, 2025).<br>All lime production is in England, and it is also assumed that all scrap tyre combustion occurs in England. |
| 1A2g | Refractory & ceramic production | Regional GDP data (ONS, 2025a). |
| | Other industrial combustion (oils) | Sub-national energy statistics, DESNZ (DESNZ, 2025b), and analysis of point source data derived from ETS and IED data. Environment Agency (Environment Agency, 2025b), SEPA (SEPA, 2025a), NRW (Natural Resources Wales, 2025a) and NIEA (Northern Ireland Environment Agency, 2025a). Overall analysis of the 1A2b,c,d,e and g sectors used to constrain the DG totals to previous 1A2 DG estimates, using 1A2g Other Industry as residual. |
| | Other industrial combustion (SSF, coke) | |
| | Other industrial combustion (coal) | |
| | Other industrial combustion & auto-generators (gas) | Natural gas consumption data from gas network operators: National Grid (National Grid, 2025), Northern Gas Networks (Northern Gas Networks, 2025), (Scotia Gas Networks, 2025), (Wales & West Utilities, 2025), Airtricity (Airtricity, 2025), (Firmus Energy, 2025). Sub-national energy statistics, DESNZ (DESNZ, 2025b), and analysis of point source data derived from ETS and IED data. (Environment Agency, 2025b), (SEPA, 2025a), (Natural Resources Wales, 2025a), (Northern Ireland Environment Agency, 2025a). |
| | Other industrial combustion (wood) | Regional Gross Value Added (GVA) data (ONS, 2025b). |
| | Industrial on-road machinery (all fuels) | Updated mapping grids (2023) for NRMM used in construction, generators, seaports, refrigerated transport, and other industry. For forklifts, mining and quarrying sources, older mapping grids are interpolated between 2007 and 2010, with the 2011 grid used for later years. |
| 1A3ai (i) | Aircraft – international take-off and landing (all fuels) | Civil Aviation Authority (CAA, 2024), UK airport statistics. All take-off and landing cycle emissions for each flight assigned to DG of origin and destination airport. |
| 1A3aii (i) | Aircraft – domestic take-off and landing (all fuels) | |
| 1A3bi, 1A3bii, 1A3biii, | Road Transport | Vehicle km, DfT (for GB), NI Department for Regional Development (DRD) up until 2015 (for later years, GB growth factors are then applied as data no longer available).<br>Emission factors: COPERT 5.8 (Emisia, 2025). |



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| NFR Sector | Source | Disaggregation Method |
|---|---|---|
| 1A3biv,<br>1A3bv,<br>1A3bv,<br>1A3bvii | | Fuel efficiency: Road Freight Statistics, (DfT, 2025a).<br>Composition of fleet: GB - Vehicle Licensing Statistics Report (DfT, 2025b).<br>Traffic data: National Traffic Statistics, (DfT, 2025c) (England, Scotland, Wales: 1990-2023).<br>Traffic and Travel Information, (DRDNI, 2013) (DRDNI, 2016) (NI: 2005-2015).<br>Fuel consumption: Digest of UK Energy Statistics (1990-2024) (DESNZ, 2025a). |
| 1A3c | Railways: intercity, regional and freight | UK's Department for Transport Rail Emissions Model (REM), as well as emission and electricity consumption estimates for the Network Rail network in Great Britain (Rail Safety and Standards Board, 2024). Mapping grids are used for each rail type, with data for 2019 and 2023 available. Interpolation between 2019-2023, and 2019 mapping grids are extrapolated back to earlier time series. |
| 1A3dii | Coastal shipping (all fuels) | Maritime emissions modelling framework (DfT, 2025f)<br>Estimates for all inland waterways are based on population (ONS, 2025a). |
| 1A3eii | Aircraft support vehicles (gas oil) | Regional aircraft movements (DfT, 2025e). |
| 1A4a | Railways – stationary combustion | Sub-national energy statistics (DESNZ, 2025b) Natural gas use all in England. |
| | Industrial & commercial combustion | Sub-national energy statistics (DESNZ, 2025b) and analysis of point source data and public and commercial mapping grids from regional employment data by sector. Gas use data supplemented by data from gas network operators (same references as 1A2g). |
| | Public sector combustion | |
| 1A4bi | Domestic combustion | For petroleum fuels and natural gas, analysis is from sub-national energy statistics, (DESNZ, 2025b) and Housing Condition Survey data. Domestic peat combustion data from CEH (Personal communication, 2018). Northern Ireland gas use in the residential sector is based on estimates from all energy suppliers in Northern Ireland (Firmus Energy, 2025; Airtricity, 2025). Domestic wood and solid fuel combustion mapping grids based on Defra surveys looking at domestic burning practices in 2020 and 2025 (Defra, 2020) (Defra, 2025b). |
| 1A4bii | Household and gardening mobile machinery (all fuels) | Population data (ONS, 2025a). |
| 1A4ci | Agriculture – Stationary combustion | Agricultural employment data (ONS, 2025a) used for allocation of solid and gaseous fuels. Regional energy statistics (DESNZ, 2025b) used for petroleum-based fuels. N Ireland gas use data for agriculture sector based on 2005 estimate for the sector provided by Phoenix Natural Gas (Phoenix Natural Gas, 2007). |
| 1A4cii | Agriculture – mobile machinery | Agricultural non-road mapping grid. |
| 1A4ciii | Fishing vessels | Maritime emissions modelling framework (DfT, 2025f) |
| 1A5b | Military aircraft and naval shipping | Regional GVA data (ONS, 2025b). |
| 1B1a | Deep-mined coal | Regional deep mine production (Coal Authority, 2025). Emissions from closed coal mines derived from WSP report (Fernando, 2011), updated to account for deviations from the projected closure dates assumed in the original study. |
| 1B1b | Charcoal, Coke & SSF production | Charcoal production estimates based on regional GVA data (ONS, 2025b).<br>Coal feed to coke ovens, ISSB, WS, DESNZ and (1999-2004) PI. 2005 onwards: ETS (Environment Agency, 2025b; SEPA, 2025b; Natural Resources Wales, 2025b; Northern Ireland Environment Agency, 2025b).Coal feed to coke ovens, ISSB, WS, DESNZ and (1999-2004) PI. 2005 onwards: ETS (Environment Agency, 2025b; SEPA, 2025b; Natural Resources Wales, 2025b; Northern Ireland Environment Agency, 2025b). |

| NFR Sector | Source | Disaggregation Method |
|---|---|---|
| | Iron & steel flaring | Data to disaggregate emissions from 2005 onwards is proved by the operators of integrated steelworks themselves. |
| 1B2ai | Upstream oil & gas: offshore oil loading, well testing. | All emissions occur offshore (and therefore are unallocated). |
| | Upstream oil & gas: process emissions, onshore oil loading, oil terminal storage | Emissions derived from DESNZ OPRED (DESNZ, 2025d) EEMS point source dataset. |
| 1B2aiv | Refinery process emissions (drainage, tankage, general) | Point source data provided by plant operators (see 1A1a), (Fuel Industries UK, 2025) and analysed using the NAEI point source database. |
| 1B2av | Petrol terminal storage and loading, Refinery road and rail haulage emissions | Point source data provided by plant operators (see 1A1a), supplemented by refinery road/rail loading estimates from Fuel Industries UK (Fuel Industries UK, 2025). |
| | Petrol station emissions from delivery, vehicle refuelling, storage tanks and spillages | Regional road transport distribution based on analysis of vehicle km data for different vehicle types and the resultant fuel use distributions. Hence, references as 1A3b. |
| 1B2b | Gasification processes | Regional GDP data (ONS, 2025a). |
| | Upstream gas production: terminal storage, well testing, process emissions | All well testing emissions offshore (therefore all Unallocated).<br>Process and storage emissions based on operator-reported data from EEMS (DESNZ, 2025d) and PI/SPRI (Environment Agency, 2025a; SEPA, 2025a; Natural Resources Wales, 2025a). |
| | Gas leakage from supply infrastructure | Leakage data provided by gas network operators (National Grid, 2025; Northern Gas Networks, 2023; Wales & West Utilities, 2025; Scotia Gas Networks, 2025; Airtricity, 2025). |
| 1B2c | Upstream oil & gas: flaring & venting | Emissions derived from the EEMS dataset (DESNZ, 2025d). |
| | Refinery flaring | Point source data provided by plant operators (see 1A1a) supplemented by data from the trade association (Fuel Industries UK, 2025). |
| 2A1 | Slag cement production | Point source data provided by plant operators (see 1A1a). |
| 2A3 | Glass industry process emissions | Point source data provided by plant operators (see 1A1a).<br>Exceptions are emissions from production of flat glass, frits, and lead crystal, all of which only occur in England. Glass ballotini emissions are not reported by operators, and so emissions in each DG are assumed proportional to emissions from other glass production processes. |
| 2A5 | Construction, asphalt manufacture | Regional GDP data (ONS, 2025a). |
| | Quarrying (aggregates) | Emissions based on 2014 mines mapping grid applied to all years. Regional quarry production data and quarry location information (British Geological Survey, 2025). |
| 2A6 | Bricks and ceramics | All fletton brick production in England.<br>Non-fletton brick estimates based on point source data provided by plant operators (see 1A1a).<br>Process emissions from concrete batching plants, ceramics and refractory manufacture based on regional GDP statistics (ONS, 2025a). |
| 2B2 | Nitric acid production | Point source data provided by plant operators (see 1A1a). Now all England. |
| 2B3 | Adipic acid production | All emissions are in England. |
| 2B6 | Chemical industry – titanium dioxide | All emissions are in England. |
| 2B7 | Chemical industry – soda ash manufacture | All emissions are in England. |



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| NFR Sector | Source | Disaggregation Method |
|---|---|---|
| 2B10 | Ship purging | All emissions occur offshore (and therefore are unallocated). |
| | Chemical industry process emissions | Mapping grids for chromium, magnesia, nitric acid use, phosphate-based fertilisers, pigment manufacture, and reforming.<br>Coal tar and bitumen processes, and ammonia use in the chemical industry based on point source data provided by plant operators (see 1A1a).<br>Other chemical industry sources (i.e. alkyl lead, ammonia-based fertiliser, carbon black, sulphuric acid use, solvent and oil recovery, and sulphuric acid production) are based on population statistics (ONS, 2025a), regional GDP data (ONS, 2025a) or assumed to all be in England. |
| 2C1 | Industrial process emissions from SMEs, hot & cold steel rolling emissions, lead battery manufacture, zinc alloy and semis production, and zinc oxide production | Regional GDP data (ONS, 2025a). |
| | Process emissions from: blast furnaces, electric arc furnaces, basic oxygen furnaces, primary aluminium production & anode baking, non-ferrous metal processes | Point source data provided by plant operators (see 1A1a), plus supplementary data provided by Tata Steel (Tata Steel, 2025) and the ISSB (ISSB, 2025). |
| | Flaring & stockpile emissions at iron & steelworks | Regional iron & steel production and fuel use data (ISSB, 2025). |
| 2C3 | Alumina production | All emissions are in Scotland. |
| | Primary and secondary aluminium production | Estimates based on point source data provided by plant operators (see 1A1a). |
| 2C4 | Magnesium alloying | Regional GDP data (ONS, 2025a). |
| 2C5 | Secondary lead manufacture | Estimates based on point source data provided by plant operators (see 1A1a). |
| | Lead battery manufacture | Regional GDP data (ONS, 2025a). |
| 2C6 | Zinc oxide, alloy, and semis production | Regional GDP data (ONS, 2025a). |
| | Non-ferrous metal processes | All emissions are in England. |
| 2C7 | Nickel and tin production | Regional GDP data (ONS, 2025a). |
| | Other non-ferrous metal production processes | All emissions are in England. |
| | Copper alloy and semis production and secondary copper production | Estimates based on point source data provided by plant operators (see 1A1a). |
| | Foundries | Foundries based on mapping grids, derived through methods described above in NAEI Emission Mapping Grids. |
| 2D3a | Aerosol and non-aerosol products (cosmetics & toiletries, household products, paint thinners), | Population data, (ONS, 2025a). |
| | Agrochemical use | Based on arable land mapping grids, derived through methods described in Section B.2.2. |
| | Non-aerosol products - automotive products | Regional road transport distribution based on analysis of vehicle km data for different vehicle types and the resultant fuel use distributions (see 1A3b). |
| | Hand Sanitiser – Non-Healthcare use | Population data (ONS, 2025a). |

| NFR Sector | Source | Disaggregation Method |
|---|---|---|
| | Hand Sanitiser – Healthcare use | NHS staff numbers (National Health Service, 2025). |
| 2D3b | Road dressings | Road dressing mapping grid, based on mapping grids, derived through methods described in the NAEI Emission Mapping Grids section above. |
| | Bitumen use | Population data (ONS, 2025a). |
| | Asphalt manufacture | Regional GDP data (ONS, 2025a). |
| 2D3d | Trade & retail decorative paints | Population data (ONS, 2025a). |
| | Industrial coatings: Aircraft, agricultural and construction vehicles, coil coating, leather coating | Regional GDP data (ONS, 2025a). |
| | Industrial coatings: wood, metal, plastic, marine, vehicle refinishing | Various coatings mapping distribution grids are used based on surveys of locations of such processes, derived through methods described in the NAEI Emission Mapping Grids section above. |
| | Industrial coatings: film, metal packaging, automotive, drum, textile, paper | Point source data provided by plant operators (see 1A1a). |
| 2D3e | Domestic surface cleaning | Population data (ONS, 2025a). |
| | Leather coating and degreasing | Regional GDP data (ONS, 2025a). |
| 2D3f | Dry cleaning (solvent use) | Dry cleaning mapping grid, derived through methods described in the NAEI Emission Mapping Grids section above. |
| 2D3g | Rubber & plastic products | Population data, (ONS, 2025a). |
| | Foam blowing | Regional GDP data (ONS, 2025a). |
| | Industrial coating manufacture: adhesives, inks, solvents and pigments, tyre manufacture | Various industry-specific coatings mapping distribution grids, derived through methods described in the NAEI Emission Mapping Grids section above. |
| 2D3h | Printing – flexible packaging, publication gravure | Point source data provided by plant operators (see 1A1a). |
| | Other printing sources | Population data (ONS, 2025a). |
| 2D3i | Seed oil extraction | All emissions are in England. |
| | Wood impregnation – creosote, LOSP | Wood impregnation mapping grid. |
| | Industrial adhesives and sealants | Regional GDP data (ONS, 2025a). |
| | Solvent Use | Population data (ONS, 2025a). |
| | Aircraft and Runways | UK airport data (CAA, 2024). |
| 2G | Cigarette smoking and fireworks | Population data (ONS, 2025a). |
| | Lubricant use in road vehicle engines | Regional road transport distribution based on analysis of vehicle km data for different vehicle types and the resultant fuel use distributions, see 1A3b. |
| 2H1 | Paper production | GDP data (ONS, 2025a). |
| 2H2 | Cider & wine manufacture, sugar beet processing and sugar manufacture | All emissions are allocated to England in the absence of relevant spatial datasets. |
| | Spirit manufacture | Point source data provided by plant operators (see 1A1a). |
| | Brewery emissions | Brewing mapping grid and point source database. |
| | Food & drink process industries: meat & fish, margarine, cakes & biscuits, animal feed, coffee roasting, animal rendering | Population used to disaggregate emissions (ONS, 2025a). |



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| NFR Sector | Source | Disaggregation Method |
|---|---|---|
| | Other food & drink processes: bread baking, malting. | Point source data provided by plant operators (see 1A1a). |
| 2H3 | Other industry Part B process emissions | Regional GDP data (ONS, 2025a), |
| 2I | Wood impregnation - general | Population used to disaggregate emissions (ONS, 2025a). |
| | Wood product process emissions (including creosote use) | Wood coating mapping grid, derived through methods described in the NAEI Emission Mapping Grids section above. |
| 2K | Transformers, capacitors and fragmentisers | Population used to disaggregate emissions (ONS, 2025a). |
| 3A | Manure management | DG splits for manure management based on regional pollutant-specific emissions data provided by (Carswell A., 2025). The UK IIR provides more details on this (Elliott, et al., 2025). |
| 3B | Inorganic N fertilisers | DG splits for fertilisers based on regional pollutant-specific emissions data provided by Rothamsted Research (Carswell A., 2025). The UK IIR provides more details on this (Elliott, et al., 2025). |
| 3D | Agricultural soil emissions | DG splits for agricultural soils based on regional pollutant-specific emissions data provided by Rothamsted Research (Carswell A., 2025). The UK IIR provides more details on this (Elliott, et al., 2025). |
| 3F | Field burning of agricultural wastes | Field burning estimates from Rothamsted Research (Carswell A., 2025). The UK IIR provides more details on this (Elliott, et al., 2025). |
| 5A | Landfills | DG-specific models based on country-specific waste landfilling data from the Waste Data Interrogator systems (Environment Agency, 2025c), (Scottish Environment Protection Agency, 2025), (Natural Resources Wales, 2025), (DAERA, 2025a). |
| | Waste disposal – batteries, measurement and control equipment, electrical equipment, lighting fluorescent tubes | Population used to disaggregate emissions (ONS, 2025a). |
| 5B | Composting (at household) | Population data (ONS, 2025a). |
| | Composting (at permit sites) | Regional GDP data (ONS, 2025a). |
| | Anaerobic Digestion | Population data (ONS, 2025a). |
| 5C1 | Incineration: MSW, crematoria, chemical waste | Point source data provided by plant operators (see 1A1a). |
| | Incineration: Clinical waste, sewage sludge | Population data (ONS, 2025a). |
| | Incineration: animal carcasses | Based on arable land mapping grids, based on mapping grids, derived through methods described in the NAEI Emission Mapping Grids section above. |
| 5C2 | Open-burning of waste | Population data (ONS, 2025a). |
| | Agricultural waste burning (not animal carcasses) | Based on arable land mapping grids, based on mapping grids, derived through methods described in the NAEI Emission Mapping Grids section above. |
| 5D1 | Sewage sludge decomposition | Population data (ONS, 2025a). |
| 5E | Accidental fires – vehicles, dwellings, other buildings, Bonfire night | Population data (ONS, 2025a). Data for bonfire night in Northern Ireland provided by DAERA (DAERA, 2024). |
| | Regeneration of activated carbon | Regional GDP data (ONS, 2025a). |
| 6A | Other sources: infant emissions from nappies, domestic pets, house and garden machinery | Population data (ONS, 2025a), except domestic pets (Aegerter, 2017). |

| NFR Sector | Source | Disaggregation Method |
|---|---|---|
| | Non-agricultural horses, professional horses | Driver for non-agricultural horses based on activity data time series from Rothamsted Research and UKCEH (Carswell A., 2025). |
| | Parks, gardens, and golf courses | Data on fertiliser use, Rothamsted (Carswell A., 2025). The UK IIR provides more details on this (Elliott, et al., 2025). |

## OTHER REGIONAL DATA

In recent years, the NAEI team has aimed to develop a consistent time series of detailed datasets to inform DG and local emission inventories and pollutant mapping campaigns. Examples of such datasets that have been used in this study include:

- **Sub-national fuel use data** for natural gas, solid fuel and petroleum-based fuels, from National Grid (National Grid, 2025), other gas network operators, the Coal Authority (Coal Authority, 2025) and DESNZ (DESNZ, 2025c). The UK energy mapping team, part of DESNZ, has been involved in the on-going development of the DESNZ sub-national energy statistics which provide limited data from 2004 to 2024. These data are used to underpin many of the air pollutant emission estimates from small-scale (non-regulated) combustion sources such as residential, commercial, public administration and small-scale industrial sectors.
- The **Road Transport** emissions database uses emission factors (g/km) for different types of vehicles, which depend on the fuel type (petrol or diesel) and are influenced by the drive cycle or average speeds on the different types of roads; traffic activity for each DG region, including distance and average speed travelled by each type of vehicle on each type of road; DG-specific fleet data on petrol/diesel car mix, car engine size and fleet composition (i.e. age distribution) for cars, light goods vehicles (LGVs) and rigid heavy goods vehicles (HGVs) based on data from the Driver and Vehicle Licensing Agency (DVLA); the age of the fleet determines the proportion of vehicles manufactured in conformity with different exhaust emission regulations.
- **Aircraft emissions** are derived from the Civil Aviation Authority's database of flight movements and aircraft fleet information (CAA, 2024), fuel use data (DESNZ, 2025a), and emission factors from international guidance and research (Intergovernmental Panel on Climate Change, IPCC) to derive emission estimates for aircraft cruise, take-off and landing cycles.
- **Regional iron and steel production data**, and regional fuel use data in the iron and steel industry (Tata Steel, 2025), (ISSB, 2025).
- Site-specific emissions data split by combustion and process sources for all UK refineries, and refinery production capacities (Fuel Industries UK, 2025).
- **Regional housing and population data** (ONS, 2025c) and (ONS, 2025d).
- **Regional economic activity and industrial production indices** (ONS, 2025a).



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# APPENDIX C: EXPERIMENTAL INVENTORIES FOR BENZO[A]PYRENE, DIOXINS AND FURANS, AND MERCURY

## BACKGROUND

In addition to the core suite of air pollutants that have been reported in the DG inventories, for which source data and inventory methods are well-established, this publication includes an experimental set of inventory statistics of: (i) benzo[a]pyrene (B[a]P), (ii) dioxins and furans (PCDD/Fs), and (iii) mercury (Hg). These are toxic pollutants, emission estimates for which are included within the scope of UK inventory submissions under the Convention on Long-Range Transboundary Air Pollution (CLRTAP).

DG-level estimates have been developed for these three pollutants, and the data quality at sub-national level is such that the data are regarded as experimental statistics only. These inventories have the potential to enhance the evidence-base for decision-making processes and identify priorities for action, both on a national and local scale. However, without further work to assess the completeness, interrogate outliers, and apply good practice gap-filling techniques to installation-level data, or to study regional variations of unregulated combustion (such as residential burning) to consider country-specific trends, the inventory estimates will remain highly uncertain and should only be used for indicative purposes.

**Benzo[a]pyrene, B[a]P**, is a toxic polycyclic aromatic hydrocarbon (PAH), one of a group of persistent organic pollutants (POPs) that contain two or more benzene rings. The International Agency for Research on Cancer has determined that B[a]P is a carcinogen. Its primary mechanism for formation is incomplete combustion, predominantly from vehicle exhausts, wood and coal fires, whilst trace amounts are also found in cigarette smoke.

Like other POPs, B[a]P accumulates in organisms that are exposed to it; it binds strongly to sediments, soils and other solid matter, and it is stable so remains in the environment making it a concern at a local and a global scale. Industrial emissions in the UK are controlled through the UK Pollution, Prevention and Control (PPC) Regulations and the subsequent Industrial Emissions Directive (IED).

**Dioxins and furans (PCDD/Fs)** are toxic chemicals which are not intentionally manufactured but are released to the atmosphere as by-products from a number of processes including waste incineration, fuel combustion (industrial, domestic and transport), and metal processing. As with B[a]P, trace amounts are found in cigarette smoke. PCDD/Fs released to the air are deposited to ground, and watercourses, where livestock and fish may ingest them; PCDD/Fs bio-accumulate and concentrate through food chains, are stable and persistent in the environment, and hence can be transported long distances and even re-suspended to the atmosphere, again making them a local and global concern. Humans may ingest or inhale PCDD/Fs, and whilst health effects depend on the precise speciation, several PCDD/Fs substances are determined to be carcinogenic. Industrial emissions of PCDD/Fs are controlled through the PPC Regulations, IED and Waste Incineration Directive (WID) and associated UK regulations.

**Mercury (Hg)** is a heavy metal neurotoxin, and in its organic form, methylmercury (MeHg) is associated with neurocognitive deficiencies in foetuses and can cause cardiovascular issues in adults. Acute exposure to elemental mercury can also lead to the irritation of the lung causing coughing, chest pain, and shortness of breath, with very high levels impacting the central nervous system. Atmospheric mercury chemistry is complex and, once emitted, cycles between the atmosphere, land, and surface waters through a series of physical and chemical transformations that can have far-reaching impacts on the environment and biological toxicity. Once deposited it can be transformed and bioaccumulated by aquatic organisms or resuspended for deposition elsewhere. Bioaccumulation represents the primary route to exposure for humans and wildlife, with the exact toxicity related to the speciation of mercury. Emissions of Hg in the UK are regulated by the 1998 Protocol on Heavy Metals, which obliges signatories to reduce emissions below 1990 levels, as well as specifying limit values for emissions from stationary sources and requires the use of Best Available Techniques (BAT) to minimise emissions as far as possible. The protocol was amended in 2012 to introduce more stringent emission limit values applicable to specific combustion and industrial emissions sources.

# DEVELOPMENT OF EXPERIMENTAL INVENTORIES

The DG inventories for B[a]P, PCDD/Fs, and Hg have been derived using the same methodology as for the other air pollution inventories, that is to derive the best available 'driver' data to disaggregate the reported UK emissions totals from the latest IIR (Elliott, et al., 2025). To maximise the use of resources available to develop these experimental inventories, the Inventory Agency has sought to prioritise analysis to derive accurate DG estimates as far as practicable for Key Categories. Future work may help to further refine the data, methods and extend the analysis to further improve the evidence base for inventory stakeholders.

The methods used to derive emissions estimates for the most important sources mirrors those outlined in **Table 6** above (in Appendix B), with more simplistic methods for less important categories being used (such as the use of carbon emissions information from point sources for sectors that are small emitters of B[a]P, PCDD/Fs, or Hg).

### Key Category Emission Sources

For **B[a]P**, the IIR Appendix 2.3 describes the UK inventory Key Category Analysis for the latest year of emissions data, 2024, indicating that the only key category is residential combustion (NFR sector 1A4bi), due to the very high emissions reported for residential fuel combustion, driven in recent years by the burning of wood in residential fireplaces, stoves and boilers.

For **PCDD/Fs**, the IIR describes six key categories in 2024 emissions:

- NFR 5E: accidental fires. The most significant sources here are the emissions from fires in dwellings and other buildings, and also PCDD/F emissions on bonfire night.
- NFR 1A4bi: residential fuel combustion. Similar to for B[a]P, the highest emission source in 2023 is emissions from residential fuel combustion, and wood burning in particular, following a decline in coal and anthracite burning over time, replaced in recent years by a growth in wood use. The recent trend in wood use is somewhat uncertain however recent work with Defra to incorporate the results of the Domestic Burning Practices in the UK survey (Defra, 2025b) has improved the data used to estimate emissions from domestic combustion.
- NFR 5C2: waste burning. PCDD/F emissions are derived from both agricultural waste burning, which has all but disappeared as an activity in recent years, but also from small-scale waste burning. As noted above for B[a]P, the activity data and emission factors to accurately estimate these emissions are scarce, and hence these emission estimates are associated with quite high uncertainty.
- NFR 1A2gviii: other industrial combustion of fuels. These emissions are dominated by emissions from burning of solid fuels: wood, coal, and biomass.
- NFR 2C1: Iron and steel process emissions. Emissions of PCDD/Fs are primarily from sinter plant in integrated iron and steel works.
- NFR 1A1a: power generation. A key source for many pollutants. However, there has been a substantial reduction in the magnitude of emissions from this source since 1990.
- NFR 1A3bi: Road transport: Passenger cars Emissions from road transport are associated with compounds previously added to leaded petrol. Consequently, the emissions of PCDD/F decrease in line with lead emissions from the Road Transport.
- sector

For **Hg**, the IIR describes nine key categories in 2024:

- NFR 1A1a: public electricity generation. Emissions are dominated by coal use in power stations and have declined significantly since the 2005 base year as a result of the phase out of coal use in electricity generation over this period.
- NFR 5C1bv: crematoria. Emissions have declined by roughly a third across the time series but interannual trends remain volatile.
- NFR 1A2gviii: other industrial combustion – as with 1A1a, the emissions from this sector are related to amount of Hg content within the fuels used industrially, with coal typically having the highest mercury content and thus the greatest contribution to emissions, but also petroleum coke and biomass contributing to emissions from this sector considerably.



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- NFR 1A2f: stationary combustion in non-metallic minerals production – as with 1A1a, the emissions from this sector, which relate to the production of cement, are related to the Hg content of the fuels used and are most sensitive to variability in coal combustion.
- NFR 5A: biological treatment of waste – solid waste disposal on land. Emissions of Hg are primarily related to the disposal of measurement and control equipment.
- NFR 2C1: iron and steel production. As with 1A1a, emissions from the iron and steel production sector arise from dust particles in electric arc furnaces and during sinter production.
- NFR: 1A4bi: residential stationary combustion. Once again, emissions here are related to the combustion of fuels which have a larger Hg content, with coal, solid smokeless fuels (SSF), wood, and petroleum coke the dominant fuels.
- NFR 1A3bi: road transport emissions. Mercury emissions from road transport are associated with the combustion of fuels containing trace amounts of Hg.
- NFR 2C7c: other metal production. Emissions here are principally associated with processes at foundries, and are intrinsically tied to levels of steel production in the UK and as such are sensitive to changes in activity, and also to the Hg content of scrap metal melted in furnaces.

**Inventory Uncertainty**

Inventories for persistent organic pollutants (POPs) are more uncertain than those for gaseous pollutants, particulate matter, and heavy metals. This is largely due to a limited number of emission factor measurements on which to base emission estimates and the complexity of dealing with POPs as families of congeners[62] (PCDD/PCDFs, PCBs, PAHs). The issue is further exacerbated by a lack of good quality activity data for some important sources, such as bonfire night and residential outdoor wood burning.

Where emissions in the DG and UK inventories are based on installation-level data reported by operators, the emissions data reported for PCDD/Fs and B[a]P are typically less complete than for other pollutants (e.g. $NO_X$, $SO_2$, $PM_{10}$) due to the reporting thresholds within the regulators' inventories[63]. This is the case for high-emitting sectors including energy, industrial combustion, industrial process and waste management sources such as incineration. Through analysis of the reported time series by many installations, the Inventory Agency further notes that reporting of POPs is typically more susceptible to reporting errors by operators, often by several orders of magnitude. This limits the ability to derive accurate activity data and emission factors for many POPs emission sources, adding to the overall level of uncertainty in UK and DG reported levels and trends of POPs emissions.

Therefore, in the compilation of the UK inventory for these species, the Inventory Agency makes every effort to (i) identify outliers in the reported data by installation operators, and (ii) apply inventory good practice gap-filling techniques (such as data interpolation and extrapolation, or use of year to year trends in other reported emissions as a proxy) to derive a more consistent, complete and accurate inventory time series.

Emissions from sectors that are not required to, or do not routinely report are more uncertain, such as the domestic combustion of wood and coal. For the UK inventory, the Digest of UK Energy Statistics (DUKES) is used to inform the activity (or amount) of fuel that is consumed in a given year. Sub-national energy statistics and emission maps, based predominantly on periodic user surveys and available data from censuses and housing condition surveys, are used to estimate the DG shares of this UK activity. The fuel use data at DG-level is less uncertain for metered fuels (i.e. natural gas and electricity), but more uncertain for those fuels that are the main source of POPs emissions, such as wood and coal.

Mercury emissions are considered to be slightly less uncertain than the inventory for lead, another toxic heavy metal. There are lower levels of uncertainty for certain sources where regulation has driven data collection and reporting of the amount of fuel combusted. The differences in uncertainties between heavy metals are impacted by the relative contribution of these lower uncertainty sources. Characterising the metal content of the fuel itself can be challenging, however, and is highly sensitive to the heterogeneity of the fuel used. The uncertainty is also influenced by the relative contribution of sources for which data are less widely available or more uncertain, such as the distribution of fuel used in domestic combustion or the distribution of facilities using mercury cells in chloralkali production processes.

[62] Congeners are chemicals that are related to each other by origin, structure, or function.

[63] The Regulator Inventories are comprised of the Environment Agency's Pollution Inventory (PI); the Natural Resources Wales' Welsh Emissions Inventory (WEI), the Scottish Environment Protection Agency's Scottish Pollutant Release Inventory (SPRI), and the Northern Ireland Environment Agency Pollution Inventory (NIPI).

The UK inventory quantifies Tier 1 uncertainty aggregation estimates for B[a]P. The method has been replicated here, following the same procedure as outlined in **Appendix E**, with the results presented in the table below.

Table 7: Tier 1 Uncertainty Aggregation for B[a]P for Each DG

| | Emissions | | | Estimated uncertainty | | |
|---|---|---|---|---|---|---|
| **DG** | **2005 (kg)** | **2024 (kg)** | **Trend (%)** | **2005 (%)** | **2024 (%)** | **Trend (%)** |
| England | 3600 | 3955 | 10% | 74% | 107% | 134% |
| Scotland | 478 | 592 | 24% | 127% | 132% | 224% |
| Wales | 518 | 324 | -37% | 99% | 139% | 114% |
| Northern Ireland | 297 | 269 | -9% | 147% | 129% | 177% |

The UK inventory does not quantify the uncertainty of the PCDD/Fs or Hg inventory using an error propagation approach, and therefore no similar estimates for the DG inventories are possible.

## KEY SOURCES AND EMISSION TRENDS

### Benzo[a]pyrene

UK emissions of B[a]P are formed principally in non-optimal combustion conditions, in particular in the combustion of solid and liquid fuels. Whilst emissions declined significantly between 1990 and 2007, as a result of the decline of the primary aluminium production sector in the UK and the cessation of anode baking, emissions have increased across the time series presented here. This is driven almost entirely by trends in the residential combustion sub-sector (NFR 1A4b), and in particular the use of wood and coal in fireplaces. This source dominates the UK and DG inventories for B[a]P across all years of the time series.

### Dioxins and Furans

PCDD/Fs are primarily formed during incomplete combustion. In the UK, for example, the key source categories are primarily in the small-scale combustion (NFR 1A4) and waste management (NFR 5) sectors. Since the combustion of solid and liquid fuels are more complex and often heterogeneous, the PCDD/Fs emissions from their combustion are greater than those from gaseous fuels. Emissions of PCDD/Fs declined significantly between 1990 and 2003 (Elliott, et al., 2025), with a steadier decline observed across the reported time series here (2005-2024). Sector-specific trends are;

- **Power station emissions**: emissions of PCDD/Fs from combustion for electricity generation at power stations have declined across the time series, reflecting the reduced amount of coal in the energy mix for this sector.
- **Road transport emissions**: emissions from road transport declined considerably between 1990 and 2005, after the phase out of leaded petrol from general sale by the end of 1999. Since then, improvements in engine efficiencies, driven by the requirements of EURO standards adoption, have continued to reduce emissions from this sector.
- **Small Stationary Combustion**: PCDD/Fs emissions in this sector are dominated by residential burning of coal and wood. Coal use has declined significantly over the time series, whilst wood burning in the residential sector has increased substantially in the last 10-15 years across the UK and has become one of the main source categories for PCDD/Fs emissions in recent years.
- **Waste management**: PCDD/Fs emissions from waste management sources have been substantially reduced across the time series in the UK, primarily driven by the introduction of more stringent regulatory controls for incineration of wastes through: technical guidance for waste incineration processes regulated under the integrated process control (IPC) regime (Environment Agency, 1996); the EU Waste Incineration Directive (2000/76/EC); and subsequent UK regulations such as the Environmental Permitting (England and Wales) Regulations 2010 SI 2010 No.675.



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There are long-term reductions across the time series in the amount of household waste burned on domestic open fires resulting in a decrease in emissions from this source.

**Mercury**

In the UK, emissions of Hg across the time series emerge from three main sources: energy generation at power stations (NFR 1A1), activity at crematoria (NFR 5C) and through its use in industrial processes, most commonly in mercury cells within chloralkali production to produce caustic soda and chlorine. As a result, the trends exhibited are largely related to the activities within these sectors, most notably:

- **Power stations**: highest emission rates of Hg are associated with the use of coal at power stations, and so emissions have declined considerably between 2005 and 2024 as a result of the reduction in the use of coal in the electricity-generating fuel mix.
- **Chloralkali process emissions**: emissions have declined as a result of reduced use of mercury cells in the production process, and due to improved techniques being used at installations, driven in part by the Environmental Permitting Regulations (England and Wales), the Pollution Prevention and Control (Industrial Emissions) Regulations (Northern Ireland), and the Environmental Authorisations (Scotland) Regulation. There are insignificant emissions from chloralkali production from 2020 due to the move away from mercury technology.
- **Crematoria emissions**: show a decline across the time series between 2005 and 2024 but are subject to volatile interannual trends and are highly sensitive to changes in activity at different crematoria sites.

# BENZO[A]PYRENE, DIOXINS AND FURANS, AND MERCURY INVENTORIES FOR ENGLAND, SCOTLAND, WALES, AND NORTHERN IRELAND

## England

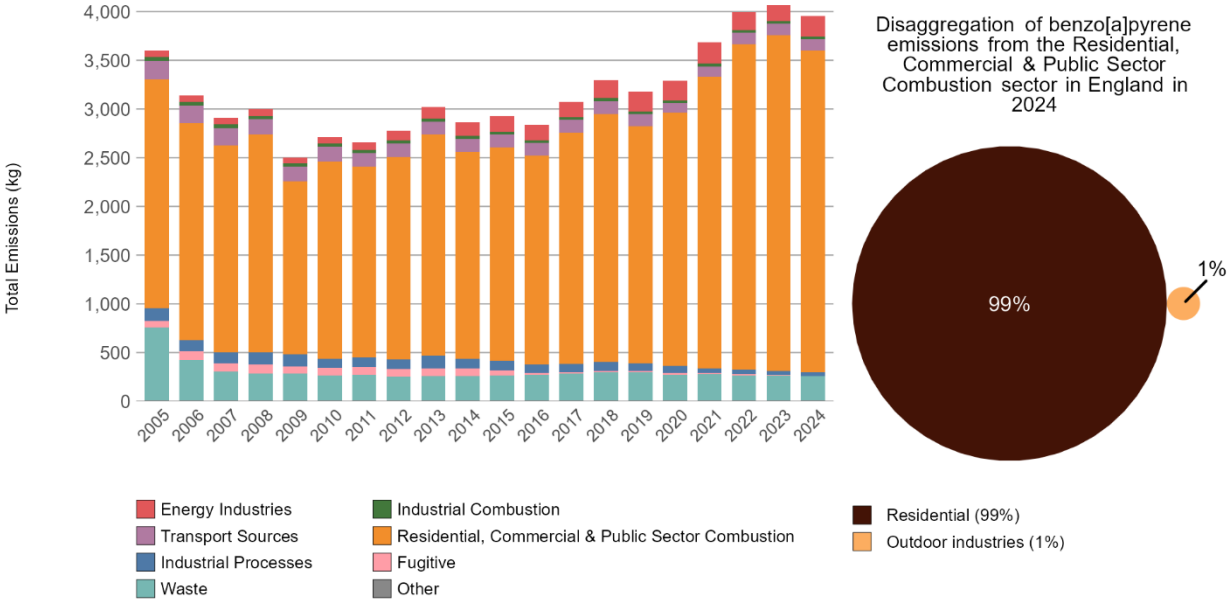


Figure 69: Benzo[a]pyrene (B[a]P) emissions in England[64]

Note: The disaggregated emissions chart may not add up to 100% due to rounding.

### *Benzo[a]pyrene*

Emissions of B[a]P in England were estimated to be 3,955 kg in 2024, representing 77% of the UK total for B[a]P. Emissions have increased by about 10% since 2005, when they were approximately 3,600 kg. There was a sharp decline in emissions between 2005 and 2009, largely due to reductions in agricultural waste burning (5C2). However, emissions have increased in more recent years, primarily due to rising contributions from domestic combustion (1A4bi). In 2024, emissions from the residential, commercial & public sector combustion sector accounted for 83% of the B[a]P emissions from England, with the vast majority stemming from domestic wood burning. As well as an increase in overall domestic wood use, as reported in the survey into Domestic Burning Practices in the UK (Defra, 2025b), there is an increasing fraction of 'dry wood' being burnt in recent years. 'Dry wood' has a higher emission factor for B[a]P than other types of wood logs. Furthermore, for B[a]P, research from the Emission Factors for Domestic Solid Fuels (EFDSF) project (Defra, 2025a) shows that Ecodesign and Advanced stoves have higher emission factors than older stoves when burning wood logs.

64 Outdoor industries presented in the bubble graph inset in Figure 69 relate to combustion emissions from machinery in the agriculture, forestry and fishing industries



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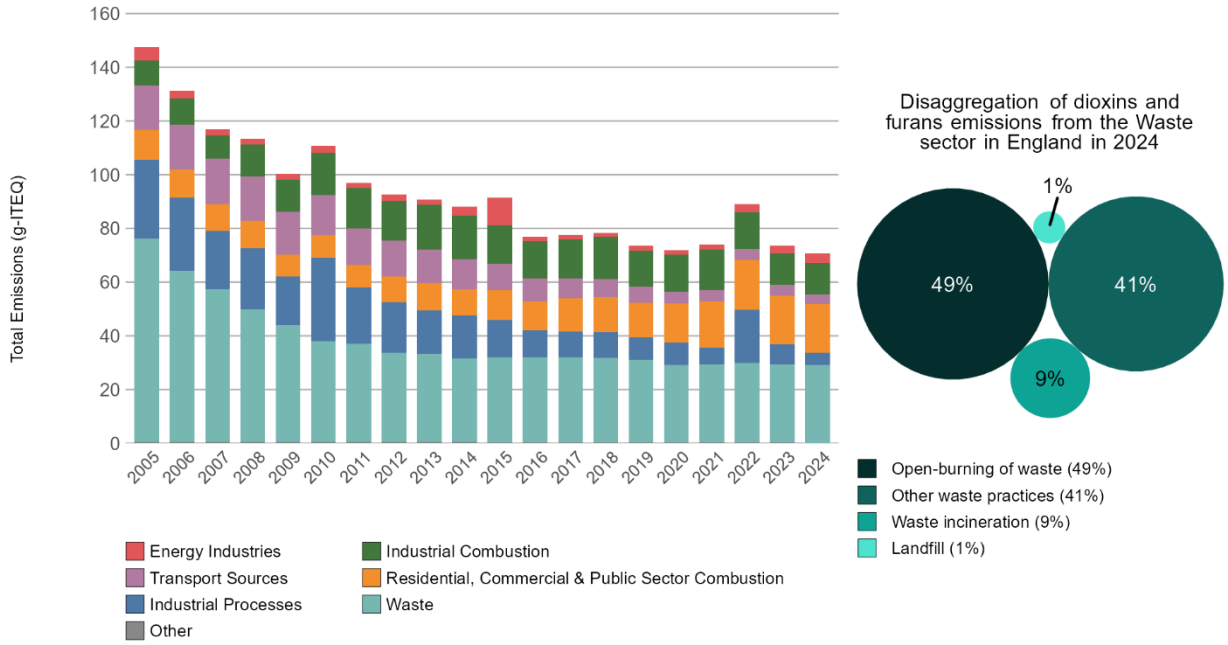


Figure 70: Dioxins and furans (PCDD/F) emissions in England

Note: The disaggregated emissions chart may not add up to 100% due to rounding.

### *Dioxins and Furans*

Emissions of PCDD/Fs in England were estimated to be 71 g international toxic equivalents (I-TEQ)[65] in 2024, representing approximately 78% of the UK's total PCDD/F emissions. Emissions have declined by 52% since 2005, when emissions were estimated to be 148 g I-TEQ. PCDD/F emissions in England mainly arise from the waste sector, followed by the residential sector. Emissions of PCDD/Fs have decreased steadily since 2005, reflecting the reduction in coal use at power stations (1A1a), stricter regulatory controls, and the promotion of alternative waste disposal and recycling methods to reduce small-scale open burning of household and garden waste. However, a noticeable increase occurred from 2021 to 2022, primarily driven by higher emissions from sinter production in the iron and steel sector (2C1), then fell again in 2023 and 2024.

65 I-TEQ are used for groups of pollutants, such as PCDD/Fs, and involve weighting the mass of individual compounds based on the toxicity relative to the most toxic compound in the group of compounds.

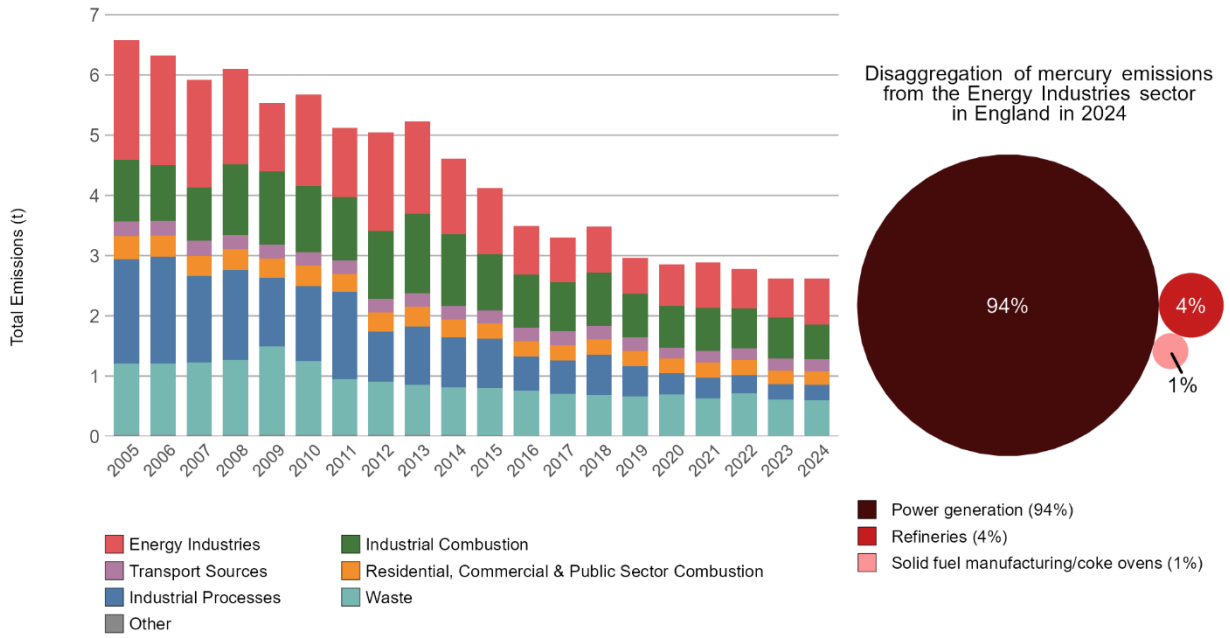


Figure 71: Mercury (Hg) emissions in England

Note: The disaggregated emissions chart may not add up to 100% due to rounding.

*Mercury*

Emissions of Hg in England were estimated to be 2.6 tonnes in 2024, showing a decline of 60% since 2005, when emissions were around 6.6 tonnes. In 2024, emissions in England accounted for 81% of the UK total for Hg. The largest sector in 2024 is energy industries. Emissions from this source has declined by 62% since 2005, primarily due to the phasedown of coal combustion. Another key source of emissions in 2024 is from the waste sector, mainly from crematoria under 5C1bv (51%) and solid waste disposal on land under 5A (46%), with a small fraction (3%) from other waste practices.

Since 2005, the overall decreased in Hg emissions are mainly associated with industrial processes, in particular chloralkali process emissions (2B10a) which have decreased by 99.9% since the start of the time series.

The maps below show the emission totals for England, excluding large industrial point sources and shipping. Units are in kilograms for Hg and B[a]P, and grams for PCDD/Fs, per square kilometre in 2024. Details on the methodology for these can be found in Appendix B and in the Spatial Emissions Methodology for NAEI report (Tsagatakis, et al., 2025), found here: UK Spatial Emissions Methodology - National Atmospheric Emissions Inventory 2023 | National Atmospheric Emissions Inventory



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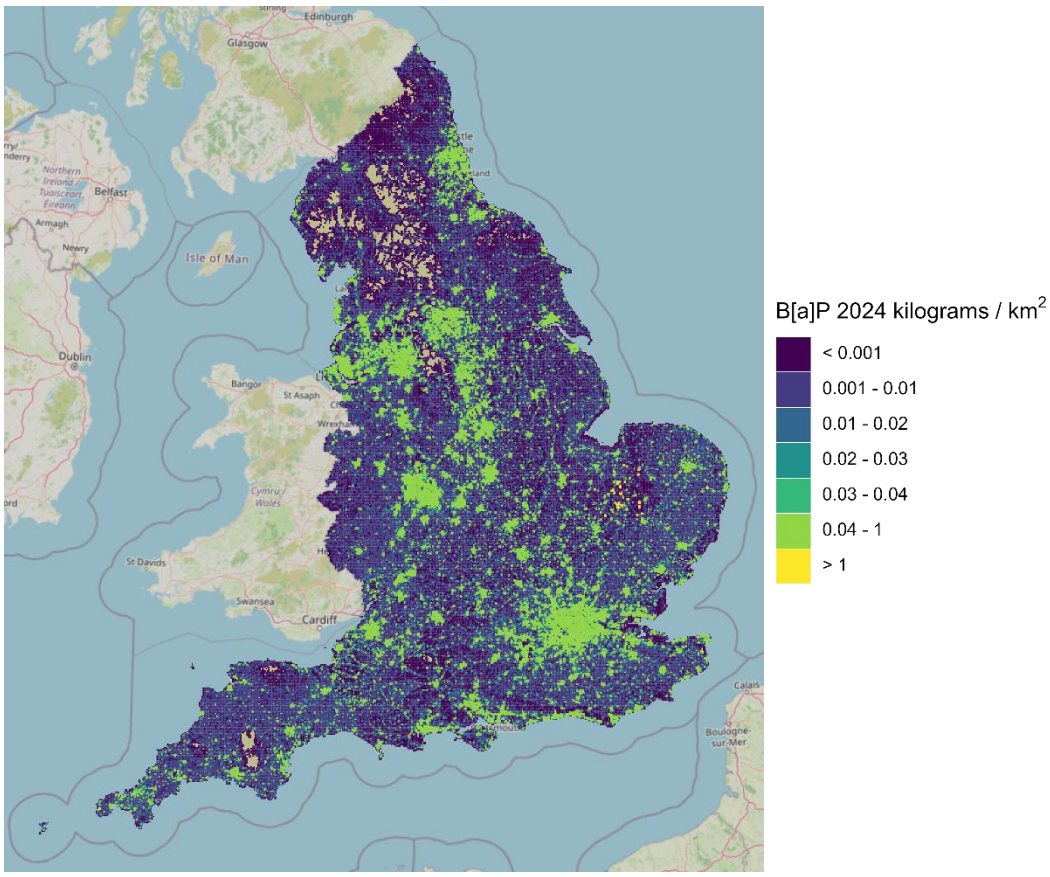


Figure 72: Benzo[a]pyrene (B[a]P) emissions in England, 2024

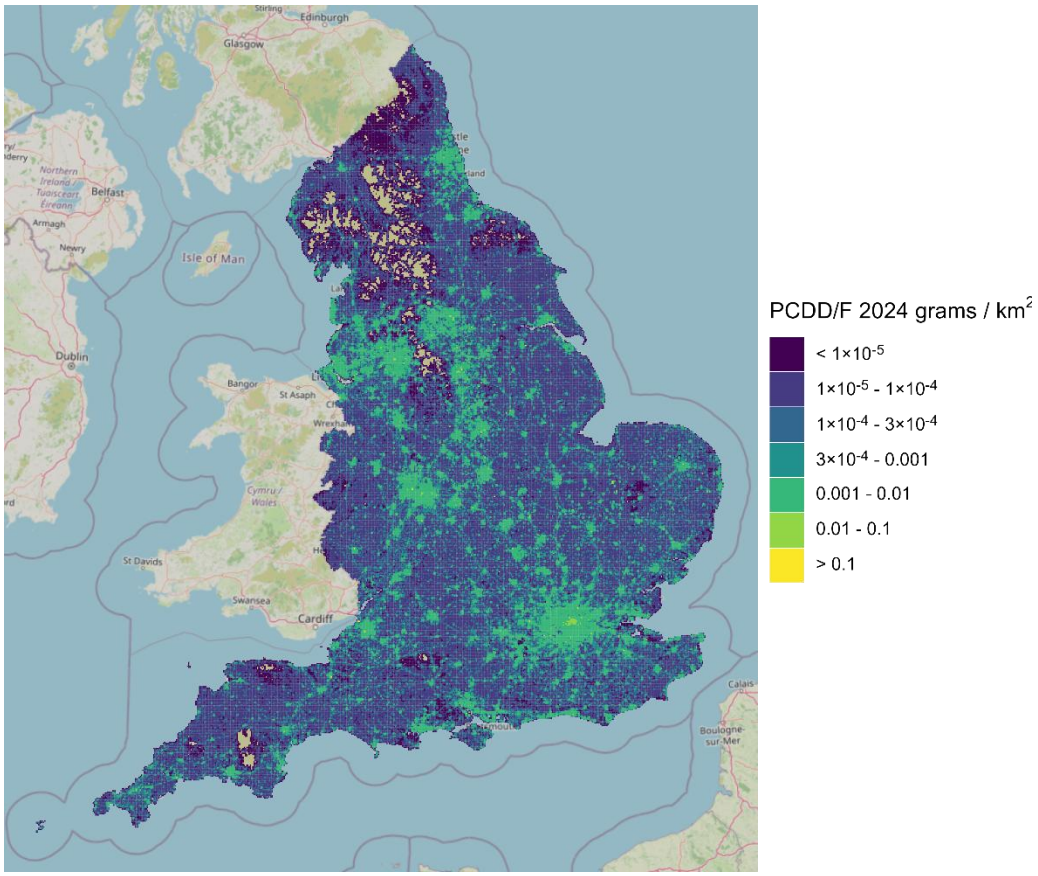


Figure 73: Dioxins and furans (PCDD/F) emissions in England, 2024

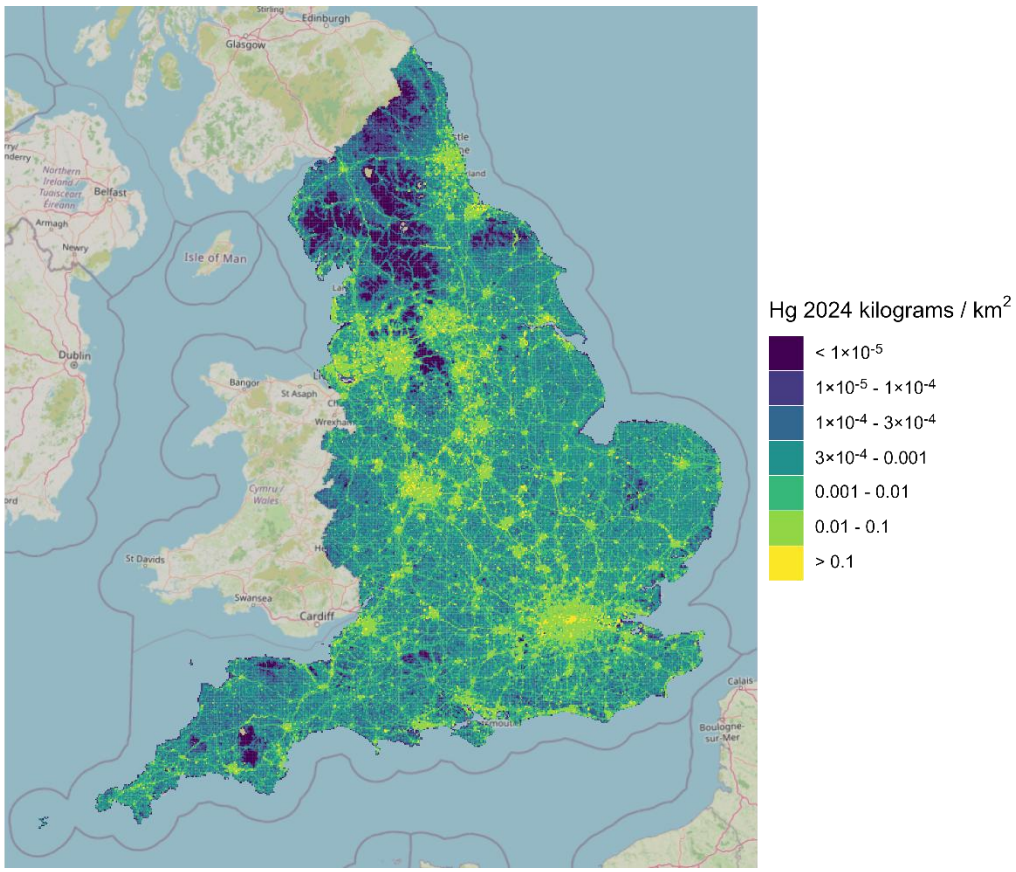


Figure 74: Mercury (Hg) emissions in England, 2024

## Scotland

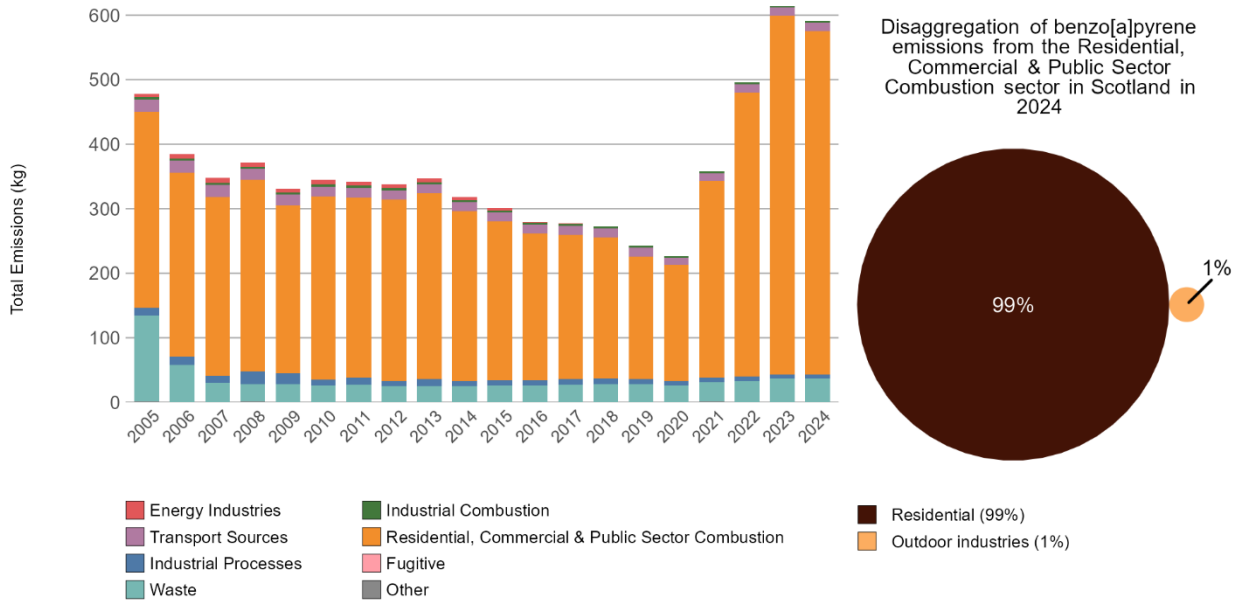


Figure 75: Benzo[a]pyrene (B[a]P) emissions in Scotland[66]

Note: The disaggregated emissions chart may not add up to 100% due to rounding.

### *Benzo[a]pyrene*

Emissions of B[a]P in Scotland were estimated to be 592 kg in 2024, representing approximately 12% of the UK total. Emissions have increased by about 24% since 2005, when they were around 478 kg. The long-term reduction has largely been driven by a fall in agricultural waste burning. However, emissions have risen sharply in recent years due to increased wood used in domestic combustion (1A4bi), an outcome of incorporating the survey into Domestic Burning Practices in the UK (Defra, 2025b). As well as an increase in overall domestic wood use, there is an increasing fraction of 'dry wood' being burnt in recent years which have a higher emission factor for B[a]P than other types of wood logs. Furthermore, for B[a]P, research from the EFDSF project (Defra, 2025a) shows that Ecodesign and Advanced stoves have higher emission factors than older stoves when burning wood logs. In 2024, the residential, commercial & public sector combustion sector accounted for 90% of emissions from Scotland, with a significant proportion linked to the burning of wood in homes.

66 Outdoor industries presented in the bubble graph inset in Figure 75 relate to combustion emissions from machinery in the agriculture, forestry and fishing industries.

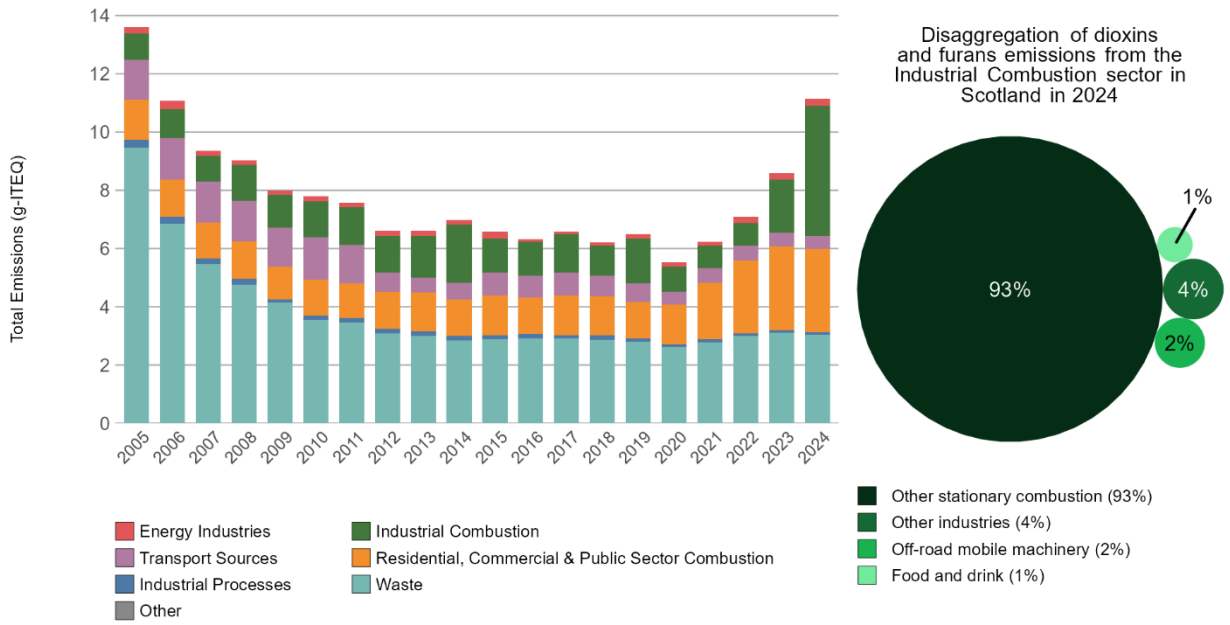


Figure 76: Dioxins and furans (PCDD/F) emissions in Scotland

Note: The disaggregated emissions chart may not add up to 100% due to rounding.

### *Dioxins and Furans*

Emissions of PCDD/Fs in Scotland were estimated to be 11 g international toxic equivalents (I-TEQ)[67] in 2024, representing approximately 12% of the UK total. Emissions have declined by about 18% since 2005, when they were around 14 g I-TEQ. This reduction has been primarily driven by falling emissions from the waste sector, which remains the dominant contributor, although emissions from the residential, commercial & public sector combustion were also high as a result of the increase in wood burning practices. The overall decline in PCDD/F emissions since 2005 aligns with the reduced use of coal in power generation, the introduction of stricter waste regulatory controls, and efforts to promote alternative waste disposal and recycling methods, which have likely contributed to reductions in small-scale open burning of household and garden waste. In 2024, the largest sources of PCDD/F emissions were industrial combustion emissions, which increased significantly between 2023 and 2024, particularly other stationary combustion (1A2gviii). This is due to increases in plant biomass burning in Scotland.

67 I-TEQ are used for groups of pollutants, such as PCDD/Fs, and involve weighting the mass of individual compounds based on the toxicity relative to the most toxic compound in the group of compounds.



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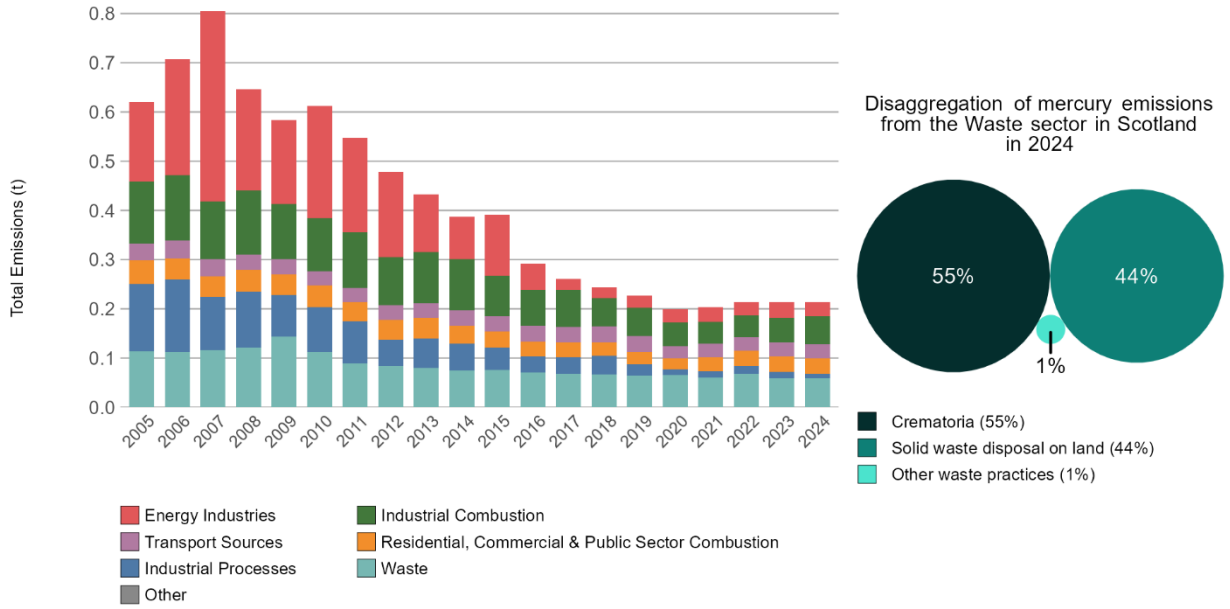


Figure 77: Mercury (Hg) emissions in Scotland

Note: The disaggregated emissions chart may not add up to 100% due to rounding.

*Mercury*

Emissions of Hg in Scotland were estimated to be 0.2 tonnes in 2024, showing a decline of 66% since 2005, when emissions were estimated to be 0.6 tonnes. In 2024, Scotland accounted for 7% of the UK's total Hg emissions. This sustained reduction has primarily resulted from decreased combustion in power and heat generation (1A1a) and chloralkali process emissions (2B10a). Emissions from the energy industries have remained very small since 2017, following the end of coal-fired electricity generation in Scotland. Since 2016, crematoria have consistently been the largest source within the waste sector, contributing 55% of Scotland's waste-related Hg emissions in 2024.

The maps below show the emission totals for Scotland, excluding large industrial point sources and shipping. Units are in kilograms for Hg and B[a]P, and grams for PCDD/Fs, per square kilometre in 2024. Details on the methodology for these can be found in Appendix B and in the Spatial Emissions Methodology for NAEI report (Tsagatakis, et al., 2025), found here: UK Spatial Emissions Methodology - National Atmospheric Emissions Inventory 2023 | National Atmospheric Emissions Inventory

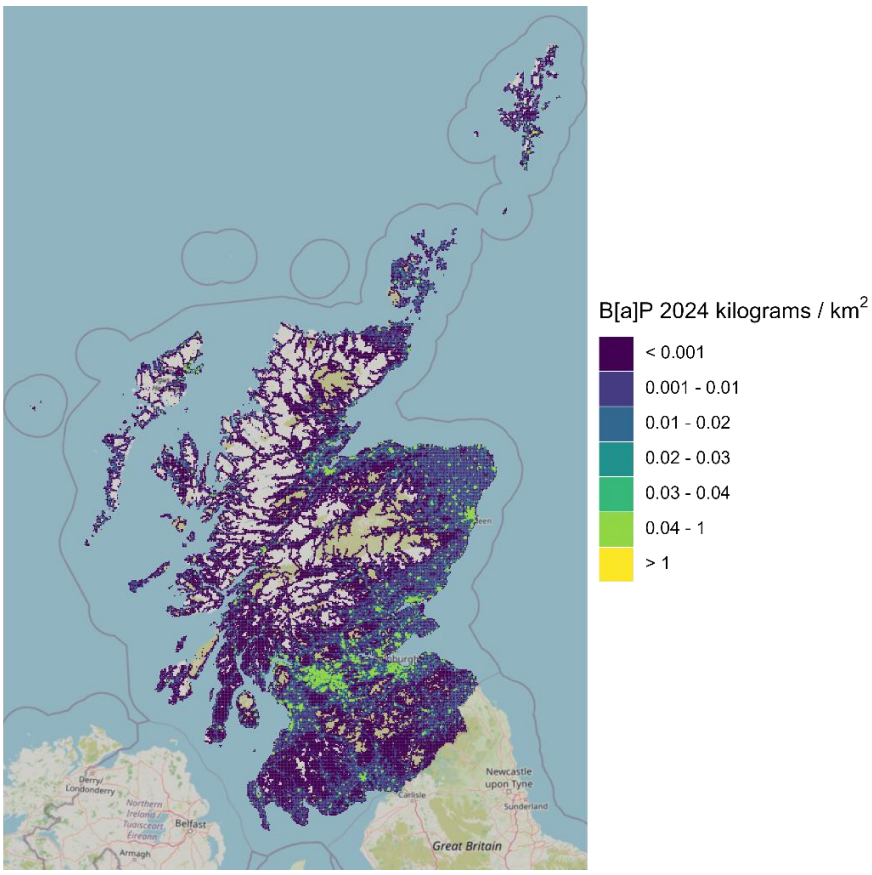


Figure 78: Benzo[a]pyrene (B[a]P) emissions in Scotland, 2024

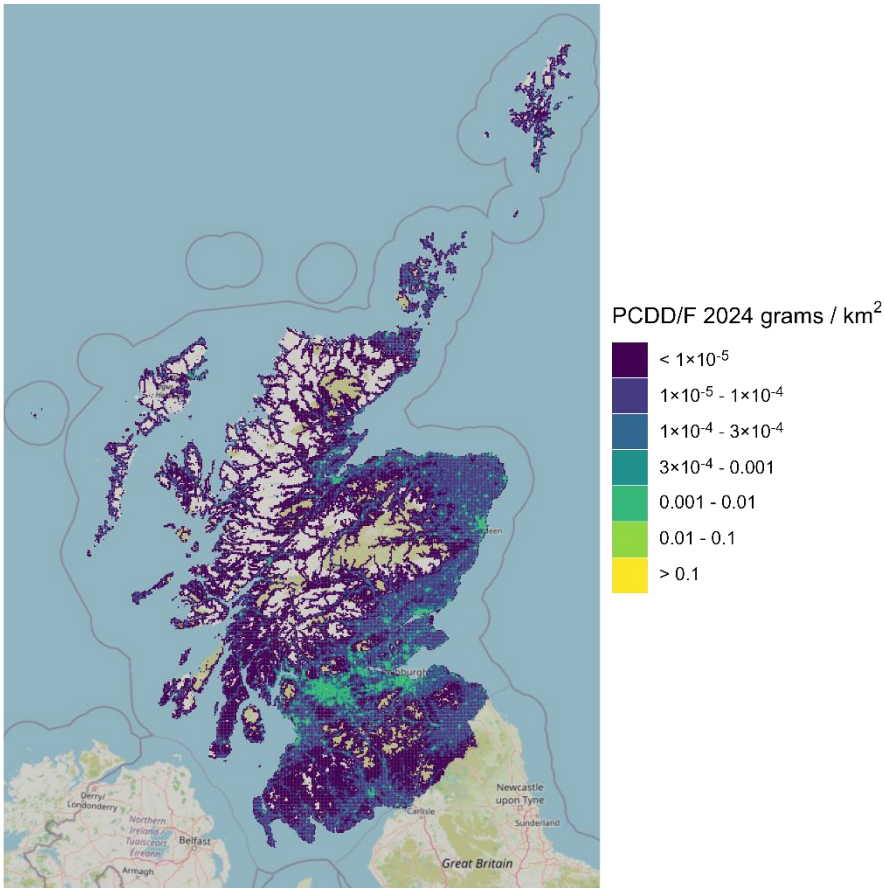

Figure 79: Dioxins and furans (PCDD/F) emissions in Scotland, 2024

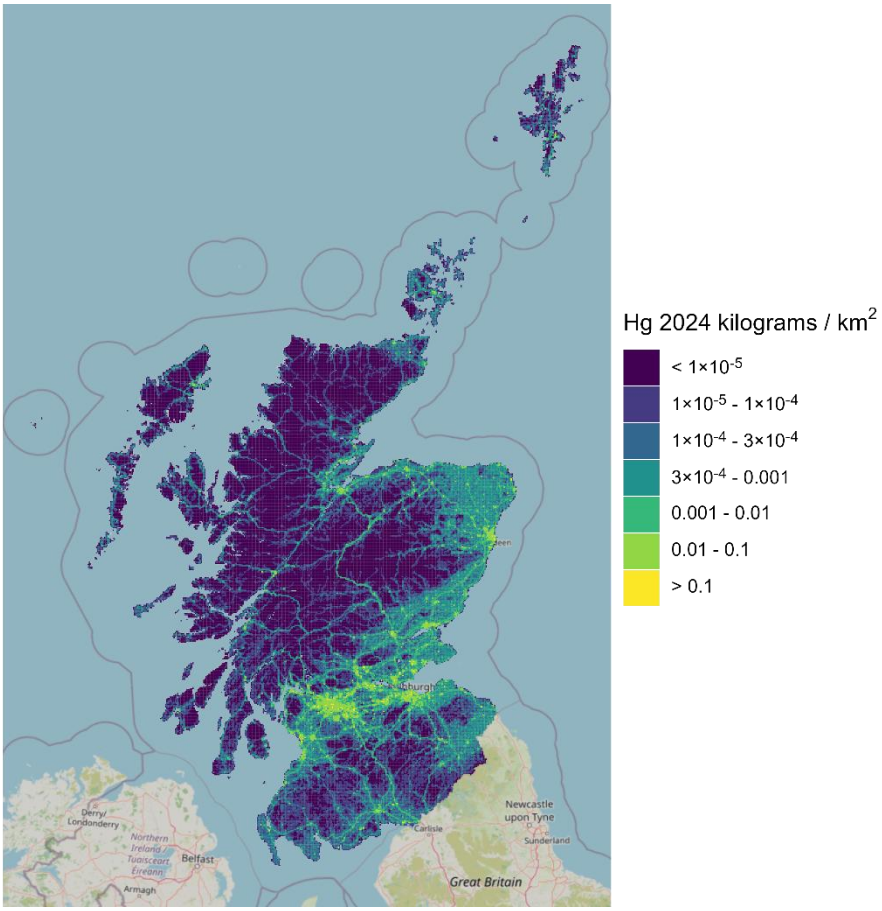


Figure 80: Mercury (Hg) emissions in Scotland, 2024

## Wales

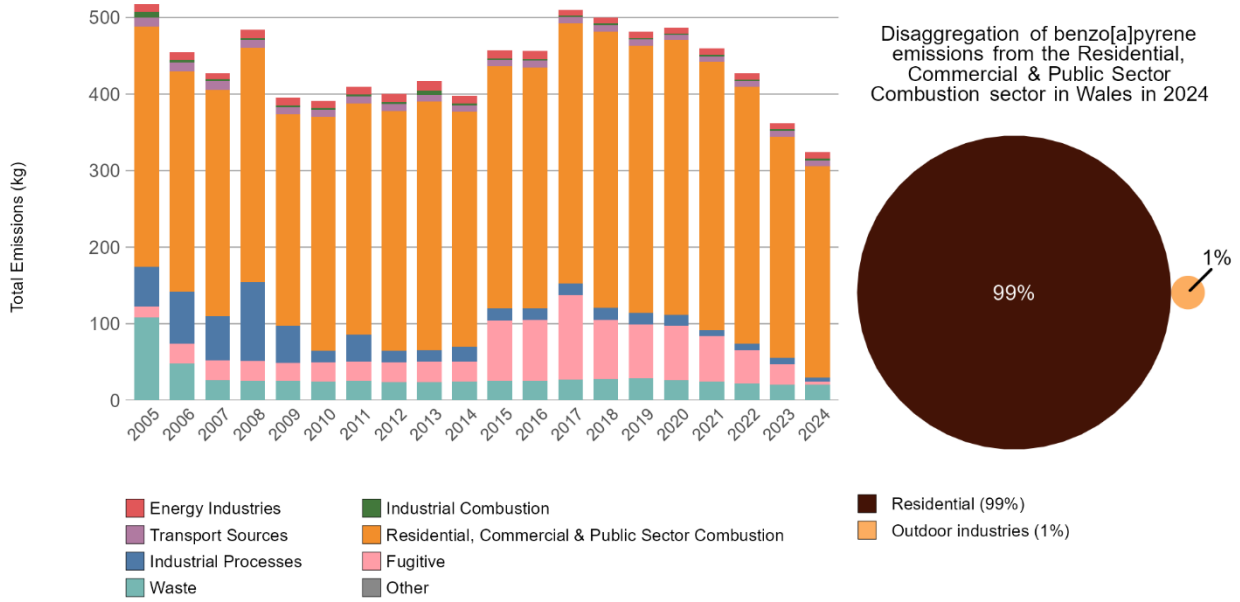


Figure 81: Benzo[a]pyrene (B[a]P) emissions in Wales[68]

Note: The disaggregated emissions chart may not add up to 100% due to rounding.

### *Benzo[a]pyrene*

Emissions of B[a]P in Wales were estimated to be 324 kg in 2024, representing 6% of the UK total. Emissions have declined by 37% since 2005, when they were 518 kg. This reduction is primarily due to significant decreases in the industrial processes and waste sectors, which have fallen by approximately 91% and 81% respectively since 2005. However, these reductions have been partially offset in some years by increases in other sectors, particularly fugitive emissions, which are influenced by coal production. In 2024, 99% of emissions from the residential, commercial & public sector combustion sector were from residential sources (1A4bi), with only 1% from outdoor industries. In recent years, there is an increase in domestic wood burning, as reported in the survey into Domestic Burning Practices in the UK (Defra, 2025b). As well as an increase in overall domestic wood use, there is an increasing fraction of 'dry wood' being burnt in recent years which have a higher emission factor for B[a]P than other types of wood logs. Furthermore, for B[a]P, research from the EFDSF project (Defra, 2025a) shows that Ecodesign and Advanced stoves have higher emission factors than older stoves when burning wood logs.

68 Outdoor industries presented in the bubble graph inset in Figure 81 relate to combustion emissions from machinery in the agriculture, forestry and fishing industries.



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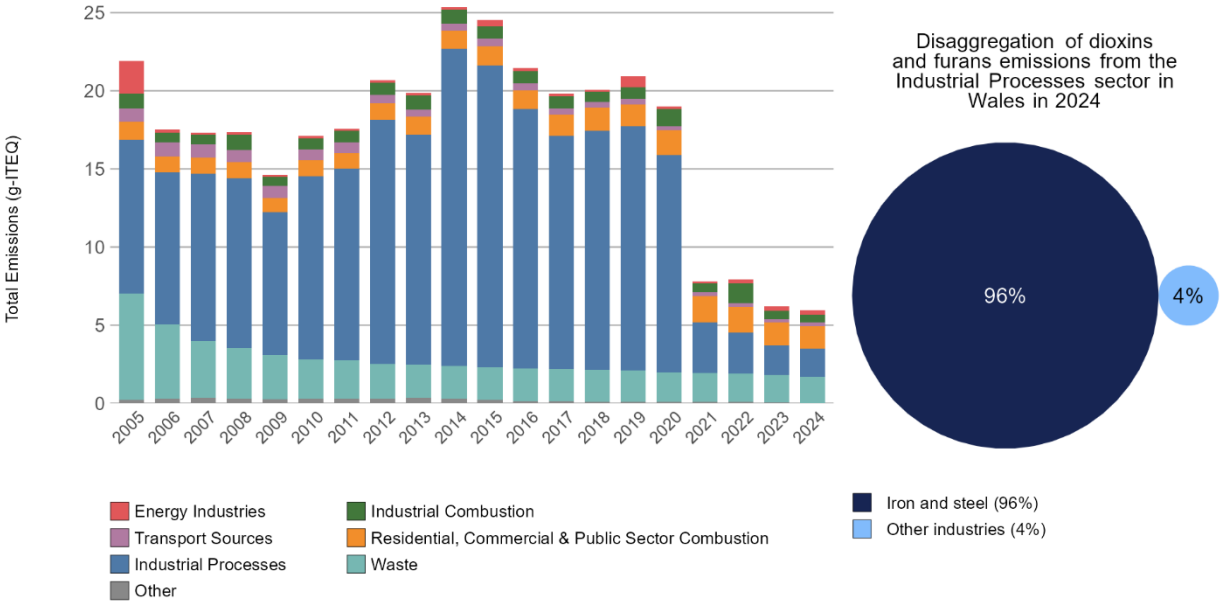


Figure 82: Dioxins and furans (PCDD/F) emissions in Wales

Note: The disaggregated emissions chart may not add up to 100% due to rounding.

### *Dioxins and Furans*

Emissions of PCDD/F in Wales were estimated to be 5.9 g international toxic equivalents (I-TEQ)[69] in 2024, representing 7% of the UK total. Emissions have declined by about 73% since 2005, when they were 21.9 g I-TEQ. This long-term reduction has been driven primarily by decreases in emissions from the industrial processes sector, notably within the iron and steel industry (2C1), where emissions from sinter production play a major role. The notable drop in emissions in recent years continues to reflect industrial decarbonisation efforts and tighter environmental controls. The large decrease between 2020 and 2021 is driven by a large drop in sinter production under the iron and steel industry (2C1). Nonetheless, iron and steel remains the largest source of PCDD/F emissions in 2024.

69 I-TEQ are used for groups of pollutants, such as PCDD/Fs, and involve weighting the mass of individual compounds based on the toxicity relative to the most toxic compound in the group of compounds.

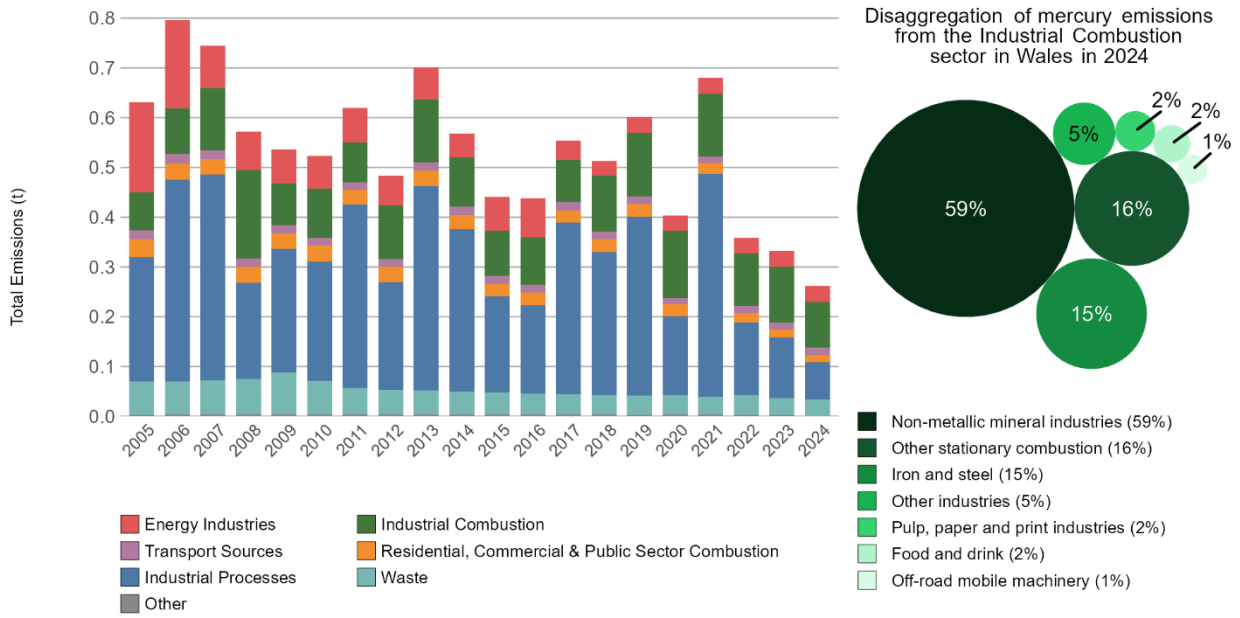


Figure 83: Mercury (Hg) emissions in Wales[70]

Note: The disaggregated emissions chart may not add up to 100% due to rounding.

*Mercury*

Emissions of Hg in Wales were estimated to be 0.3 tonnes in 2024, representing 8% of the UK total. Emissions have decreased by 59% since 2005, when they were around 0.6 tonnes. This is largely due to reductions in power and heat generation (1A1a) and chloralkali processes (2B10a) by approximately 83% and 100% respectively. These reductions are largely due to declining use of coal and liquid biofuels. However, this progress has been partially offset by significant increases in emissions from combustion in cement industries, which is estimated to have risen by over 233% between 2005 and 2024.

Despite these increases, overall emissions from industrial processes have still fallen by around 70% since 2005. Recent fluctuations in the time series are primarily due to activity changes at Port Talbot steelworks, where emissions from electric arc furnaces, sinter production, and blast furnaces vary significantly from year to year. In 2024, 82% of emissions from industrial processes originated from the iron and steel sector (2C1), underlining its dominant influence on Welsh totals.

The maps below show the emission totals for Wales, excluding large industrial point sources and shipping. Units are in kilograms for Hg and B[a]P, and grams for PCDD/Fs, per square kilometre in 2024. Details on the methodology for these can be found in Appendix B and in the Spatial Emissions Methodology for NAEI report (Tsagatakis, et al., 2025), found here: UK Spatial Emissions Methodology - National Atmospheric Emissions Inventory 2023 | National Atmospheric Emissions Inventory

70 Other industries presented in the bubble graph inset in Figure 83 relate to emissions from glass production, storage handling and transport of chemical products, nitric acid production, titanium dioxide production, soda ash production, aluminium production, lead production, zinc production, copper production, other mineral products, other chemical industry, other metal production, pulp and paper industry, wood processing, other product use, other industrial processes.



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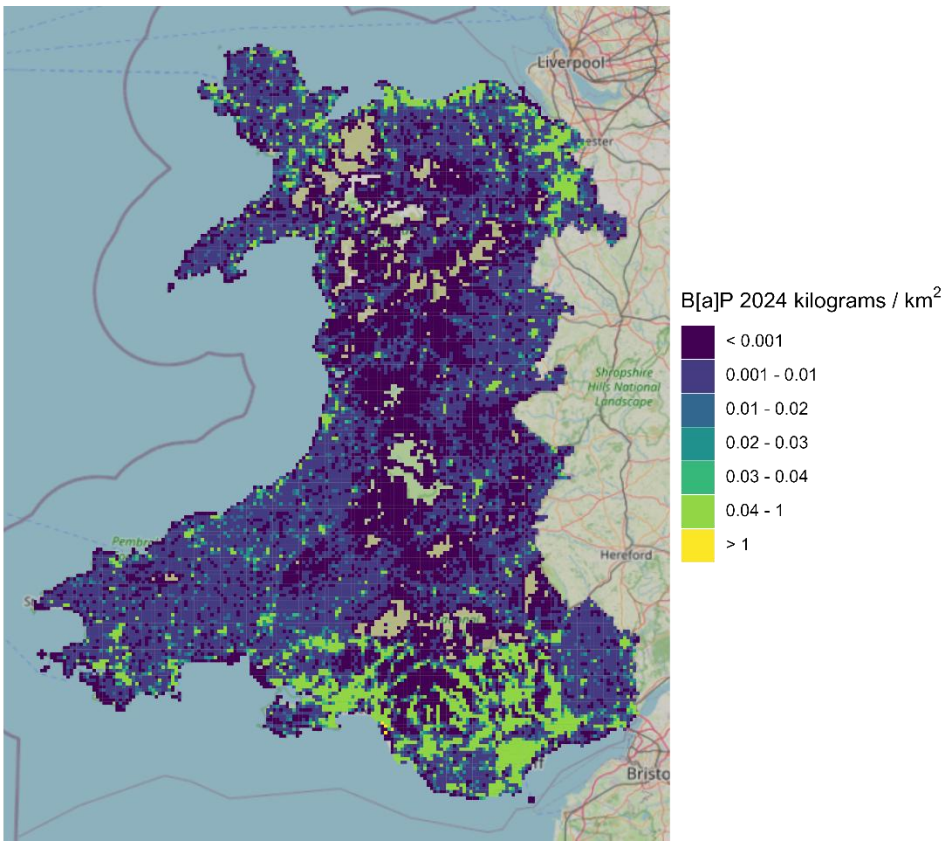


Figure 84: Benzo[a]pyrene (B[a]P) emissions in Wales, 2024

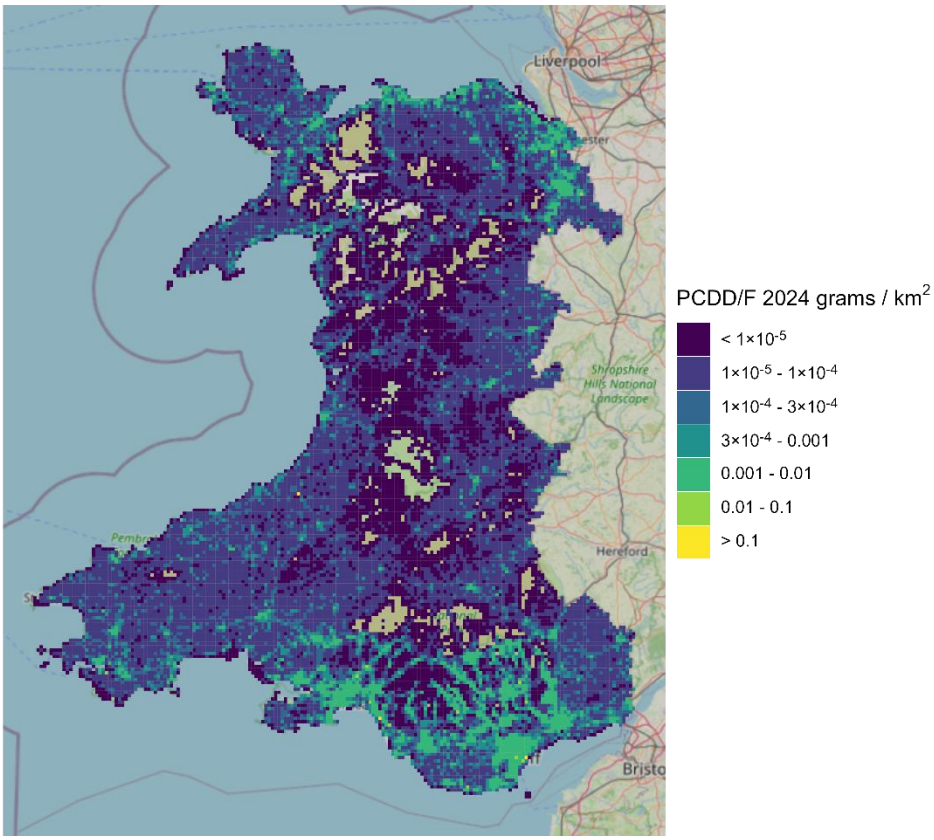


Figure 85: Dioxins and furans (PCDD/F) emissions in Wales, 2024

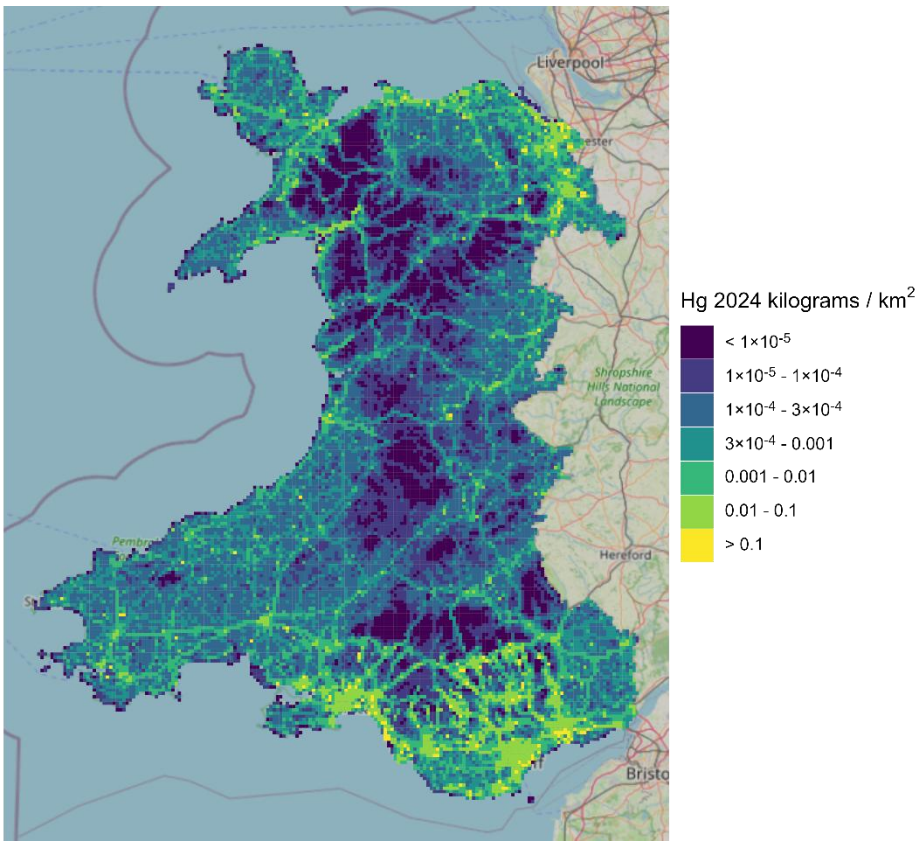


Figure 86: Mercury (Hg) emissions in Wales, 2024

## Northern Ireland

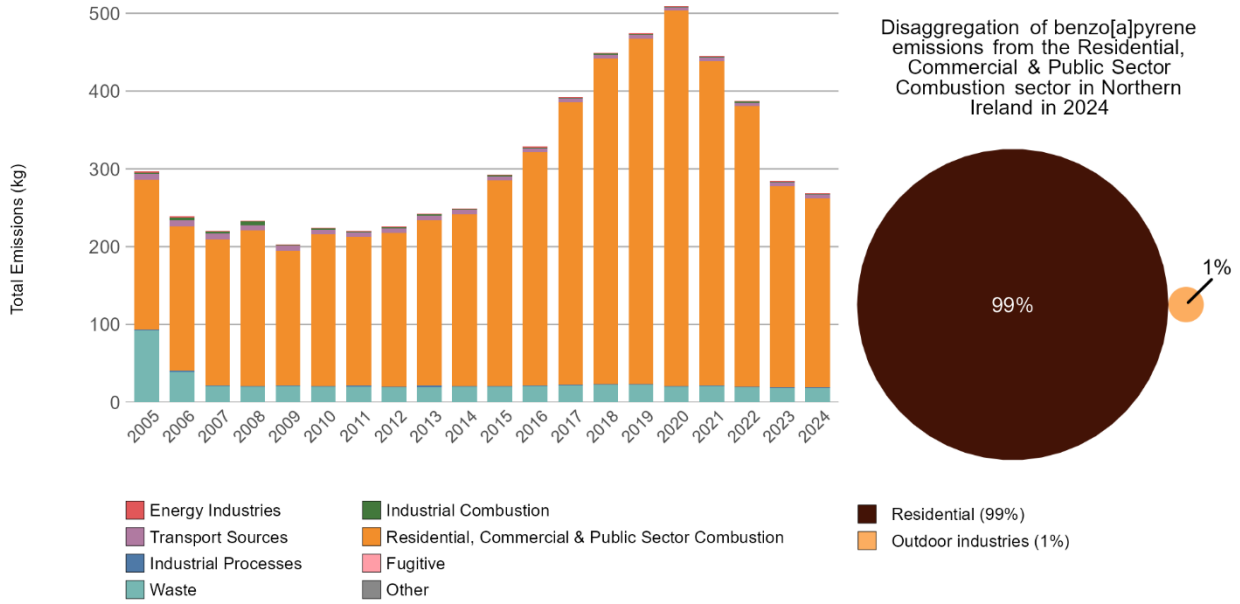


Figure 87: Benzo[a]pyrene (B[a]P) emissions in Northern Ireland[71]

Note: The disaggregated emissions chart may not add up to 100% due to rounding.

### *Benzo[a]pyrene*

Emissions of B[a]P in Northern Ireland were estimated to be 269 kg in 2024, representing approximately 5% of the UK total. While emissions have fluctuated over time, there has been a 9% reduction since 2005, when emissions were 297 kg. As in previous years, the vast majority of emissions originate from residential combustion, with solid fossil fuels, particularly smokeless solid fuels, remaining the primary contributors. In 2024, residential sources accounted for nearly 99% of emissions within the residential, commercial & public sector combustion sector, with outdoor industries contributing only 1%.

The increase in emissions, peaking in 2020, are being driven by an increase in overall domestic wood use, as reported in the survey into Domestic Burning Practices in the UK (Defra, 2025b). There is an increasing fraction of 'dry wood' being burnt in recent years which have a higher emission factor for B[a]P than other types of wood logs. Furthermore, research from the EFDSF project (Defra, 2025a) shows that Ecodesign and Advanced stoves have higher emission factors than older stoves when burning wood logs. However there has been a significant decrease since 2020, driven by reductions in residential wood use, especially standard domestic fireplaces and advanced domestic closed stoves.

71 Outdoor industries presented in the bubble graph inset in Figure 87 relate to combustion emissions from machinery in the agriculture, forestry and fishing industries.

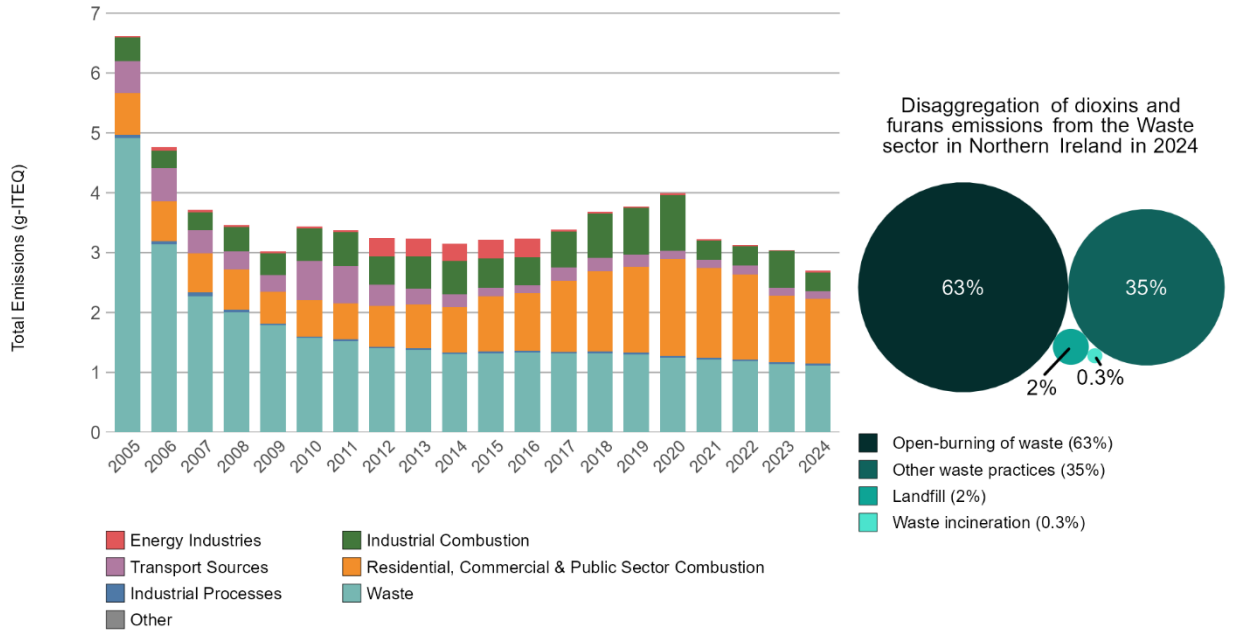


Figure 88: Dioxins and furans (PCDD/F) emissions in Northern Ireland

Note: The disaggregated emissions chart may not add up to 100% due to rounding.

### *Dioxins and Furans*

Emissions of PCDD/F in Northern Ireland were estimated to be 2.7 g international toxic equivalents (I-TEQ)[72] in 2024, representing 3% of the UK total. While emissions have fluctuated over time, there has been a 59% reduction since 2005, when emissions were 6.6 g I-TEQ. The initial decline between 2005 and 2009 was largely driven by increased use of natural gas replacing oils and solid fuels in residential combustion (1A4bi), as well as reductions in agricultural waste burning (5C2). However, since 2009, emissions began to rise again in the residential and unallocated industrial sectors (categories 1A4bi and 1A2gviii) due to growing use of wood and other biomass fuels. These increases are offset by decreases in other sectors such as waste and energy industries resulting in a relatively stable trend since 2010. In 2024, emissions from the waste sector were primarily from open burning of waste (5C2), which includes outdoor residential appliances and bonfires.

72 I-TEQ are used for groups of pollutants, such as dioxins and furans, and involve weighting the mass of individual compounds based on the toxicity relative to the most toxic compound in the group of compounds.



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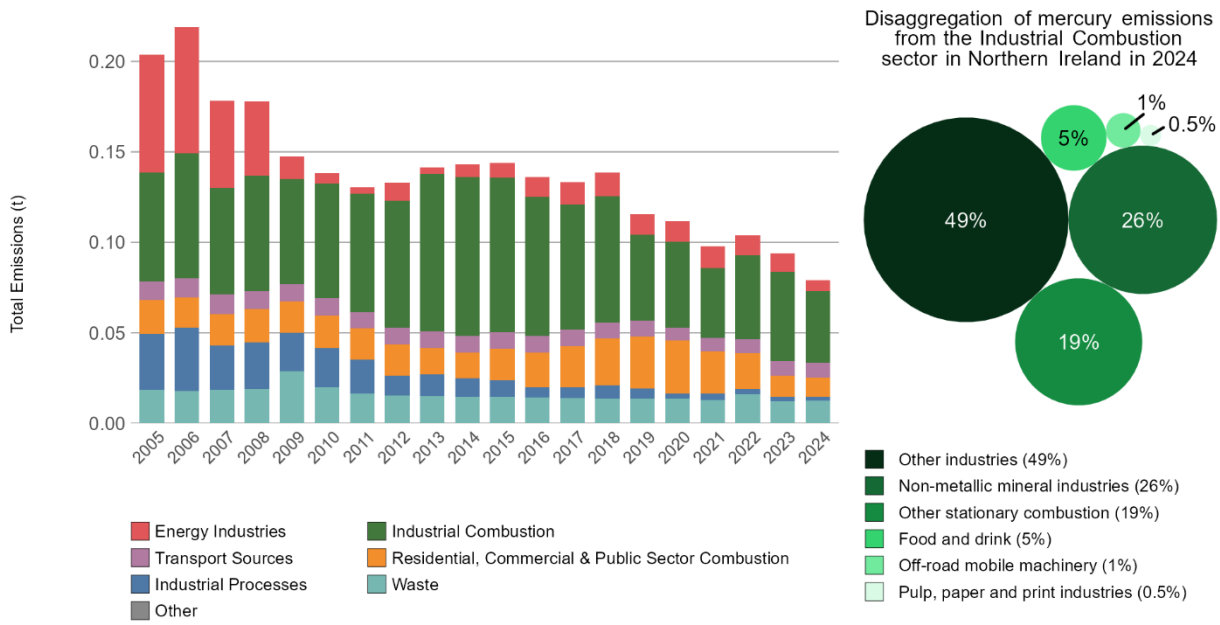


Figure 89: Mercury (Hg) emissions in Northern Ireland[73]

Note: The disaggregated emissions chart may not add up to 100% due to rounding.

*Mercury*

Emissions of Hg in Northern Ireland were estimated to be 0.1 tonnes in 2024, accounting for approximately 2% of the UK total. Since 2005, when emissions were 0.2 tonnes, emissions have declined by approximately 61% with reductions mainly driven by changes in combustion for power and heat generation (1A1a) and the elimination of chloralkali process (2B10a) emissions. The decrease in power sector emissions is largely due to reduced use of natural gas and power station oil. In 2024, the largest share of industrial combustion emissions came from other industries (49%, represents chemical and non-ferrous metals industries), followed by non-metallic mineral industries (26%) other stationary combustion (19%), and smaller contributions from the food and drink sector, off-road mobile machinery, and pulp, paper and print industries.

The maps below show the emission totals for Northern Ireland, excluding large industrial point sources and shipping. Units are in kilograms for Hg and B[a]P, and grams for PCDD/Fs, per square kilometre in 2024. Details on the methodology for these can be found in Appendix B and in the Spatial Emissions Methodology for NAEI report (Tsagatakis, et al., 2025), found here: [UK Spatial Emissions Methodology - National Atmospheric Emissions Inventory 2023 | National Atmospheric Emissions Inventory]

73 Other industries presented in the bubble graph inset in Figure 89 relate to combustion emissions in the chemical and non-ferrous metals.

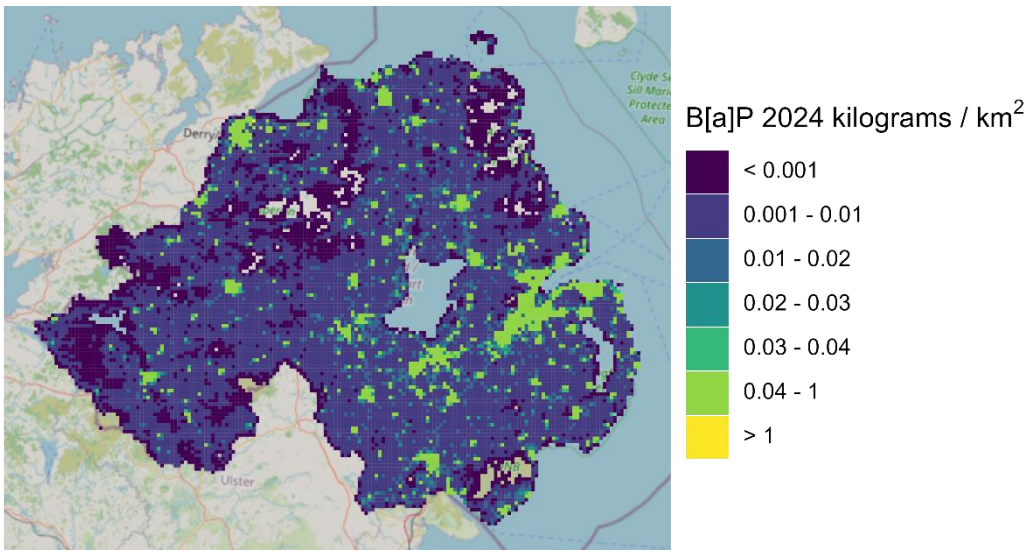


Figure 90: Benzo[a]pyrene (B[a]P) emissions in Northern Ireland, 2024

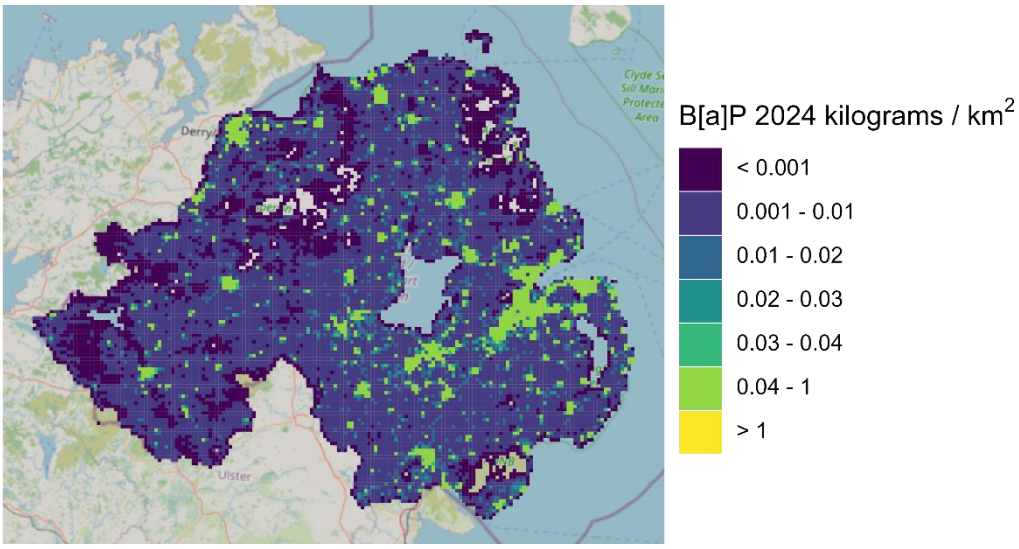


Figure 91: Dioxins and furans (PCDD/F) emissions in Northern Ireland, 2024

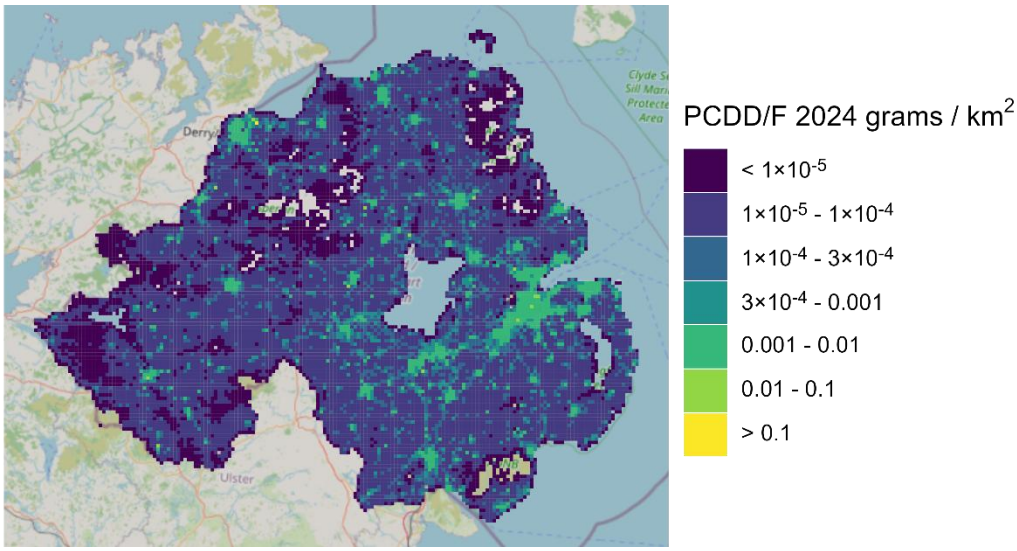


Figure 92: Mercury (Hg) emissions in Northern Ireland, 2024



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# APPENDIX D: RECALCULATIONS

Throughout the UK inventory, emission estimates are updated annually across the full time series in response to new research and revisions to data sources. These changes also have an impact on the calculation of the DG inventories. Further details on recalculations and method changes affecting each NFR sector are in chapter 8 'Recalculations and Methodology Changes' of the IIR (Elliott, et al., 2025). The tables below show the most significant changes for each pollutant in the most recent inventory for 2023. 'Change in 2005' and 'Change in 2023' refers to the change in emission estimate for 2005 and 2023 between the previous inventory and the current inventory. Categories with a low overall contribution to a pollutant across the inventory are reported under 'Other' as shown in the following tables and summarised in **Table 32**.

Table 8: Recalculations to 2005 and 2023 estimates for ammonia ($NH_3$) between previous and current inventory submissions

| Category | Reason for the change in emissions | England | | Scotland | | Wales | | Northern Ireland | |
|---|---|---|---|---|---|---|---|---|---|
| | | Change (kt) | Change (%) | Change (kt) | Change (%) | Change (kt) | Change (%) | Change (kt) | Change (%) |
| **Overall change (2005)** | | -0.62 | -0.3% | -0.068 | -0.2% | 0.27 | 1.2% | 0.13 | 0.4% |
| **Overall change (2023)** | | -3.2 | -1.8% | 0.94 | 3.0% | 0.20 | 0.9% | 0.70 | 2.2% |
| Energy Industries | This category is included under 'Other'. | | | | | | | | |
| Industrial Combustion | This category is included under 'Other'. | | | | | | | | |
| Transport Sources | In the early time series, recalculations are primarily driven by coastal shipping under 1A3dii, due to the shipping methodology updates under the Greenhouse Gas Inventory Improvement Programme (GHGI IP) shipping improvement. This involved incorporating 2019 international Automatic Identification System (AIS) data, revised emission factors and assumptions from the Department for Transport's (DfT) Maritime Emissions Model (MEM) and a fundamental shift from a "fuel used" to "fuel sold" approach, and using 2019 as a base year (instead of 2014).<br>In the later time series, recalculations are more driven by road transport sources under 1A3bi, as there was a 6% increase in petrol car proportion due to using actual Automatic Number Plate Recognition (ANPR) data for 2023. There is also an increase in Implied Emission Factors (IEFs) of around 1-5%. This is because there is an increase in vehicle kilometer (vkm)-based activity due to using latest ANPR data but no significant change in the Digest for UK Energy Statistics (DUKES). | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | -0.007 | 0.0% | -0.004 | -0.3% | < -0.0001 | -0.1% | < -0.0001 | -0.1% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | 0.12 | 3.1% | 0.011 | 2.9% | 0.007 | 3.4% | 0.001 | 0.9% |
| Solvent Processes | This category is included under 'Other'. | | | | | | | | |

| Category | Reason for the change in emissions | England | | Scotland | | Wales | | Northern Ireland | |
|---|---|---|---|---|---|---|---|---|---|
| | | Change (kt) | Change (%) | Change (kt) | Change (%) | Change (kt) | Change (%) | Change (kt) | Change (%) |
| Residential, Commercial & Public Sector Combustion | The recalculations in the early time series are primarily driven by recalculations to residential combustion (1A4bi) due to inclusion of outdoor wood burning (previously accounted for under 1A5a). Therefore this is a reallocation of emissions, rather than an overall recalculation. | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | 0.025 | 16% | 0.003 | 15% | 0.003 | 18% | 0.002 | 18% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | -0.009 | -3.3% | < -0.0001 | -2.1% | < -0.0001 | -1.8% | < -0.0001 | -1.0% |
| Industrial Processes | Recalculations are minor in the early time series.<br>In the later time series, recalculations are because of the updated gap filling methodology in the chemical industry (2B10a) for reported data, now interpolating rather than replacing default Below Reporting Threshold (BRT) fraction or extrapolation. There has also been updates to the emission factors for glass production (2A3). | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | < -0.0001 | 0.0% | < -0.0001 | -0.3% | < -0.0001 | 0.0% | < -0.0001 | 0.0% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | < -0.0001 | -0.1% | -0.002 | -4.0% | -0.002 | -3.0% | < -0.0001 | -3.7% |
| Agriculture | In the early time series, recalculations are primarily driven by crop residues applied to soils (3Da4) as there is now a new source under this code, which is $NH_3$ emissions from the decomposition of residues left on the soil surface.<br>In the later time series, recalculations in England and Northern Ireland are driven by Inorganic N-fertilisers (includes also urea application) under 3Da1 due to adjustments to the quantity of Urea applied with a urease inhibitor following re-analysis of the British Survey of Fertiliser Practice (BSFP) records for 2018 - 2023.<br>Explicit representation of the effect of the Red Tractor Scheme in England (only) from 2024 required a change in methodology. It was no longer possible to make year specific estimates of urease inhibitor uptake for 2018 to 2023 for any country. Instead, these were replaced with the long-term average for the period.<br>For Scotland, recalculations are driven by animal manure applied to soils (3Da2a), which is due to multiple revisions, including changes in N excretion associated with changes to milk yield (updated provisional 2023 England and Wales, and UK average milk yield (AUK) and Northern Ireland (Statistical Review of Northern Ireland) 2022 and 2023 yields to match published statistics which results in changes for all DGs for 2022 & 2023, slaughter-weight time series (from 2016-2019 and 2022-2023) and correction to dairy cow liveweight (affects all dairy animals across the entire time series); revision to spreading mitigation in all DG's as a result of using BSFP | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | 1.4 | 0.9% | 0.12 | 0.4% | 0.31 | 1.5% | 0.22 | 0.8% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | 1.6 | 1.1% | 1.4 | 4.8% | 0.40 | 1.9% | 0.86 | 2.8% |



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| Category | Reason for the change in emissions | England | | Scotland | | Wales | | Northern Ireland | |
|---|---|---|---|---|---|---|---|---|---|
| | | Change (kt) | Change (%) | Change (kt) | Change (%) | Change (kt) | Change (%) | Change (kt) | Change (%) |
| | data, updated % of manure diverted to anaerobic digestion time series, and N entering spreading affected by changes upstream.<br>For Wales, recalculations are driven by crop residues applied to soils (3Da4), as explained above. | | | | | | | | |
| Fugitive | This category is included under 'Other'. | | | | | | | | |
| Waste | In the early time series, the recalculations are primarily driven by solid waste disposal (5A), due to updated volumes of waste disposed; general reductions in Municipal Solid Waste (MSW) and Commercial and Industrial (C&I) for 1960-1996 results in reduced methane generation in subsequent years.<br>In the later time series, the recalculations are driven by anaerobic digestion (5B2) due to revised Office for National Statistics (ONS) data. There have also been recalculations to composting (5B1), due to updated data that were not available in time for compilation last year. | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | -0.024 | -0.5% | 0.012 | 2.5% | < -0.0001 | -0.2% | 0.001 | 0.9% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | -0.094 | -1.5% | -0.005 | -0.9% | -0.004 | -1.2% | < -0.0001 | 0.0% |
| Other | Recalculations across the entire time series are primarily driven by 6A. This is due to updated data on domestic pet emission factors and revised activity data for cats and dogs, applied to whole time series. A detailed 2015 population review for cats and dogs was used as the actual population for 2015, and the time series was adjusted using data from UK Pet Food. Wales has also seen significant recalculations to fugitive emissions from solid fuel transformation (1B1b), due to using a new mapping grid for coke production. | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | -2.0 | -17% | -0.19 | -17% | -0.037 | -4.0% | -0.086 | -18% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | -4.8 | -29% | -0.44 | -30% | -0.20 | -19% | -0.16 | -27% |

Table 9: Recalculations to 2005 and 2023 estimates for carbon monoxide (CO) between previous and current inventory submissions

| Category | Reason for the change in emissions | England | | Scotland | | Wales | | Northern Ireland | |
|---|---|---|---|---|---|---|---|---|---|
| | | Change (kt) | Change (%) | Change (kt) | Change (%) | Change (kt) | Change (%) | Change (kt) | Change (%) |
| **Overall change (2005)** | | **-3.6** | **-0.1%** | **-1.7** | **-0.8%** | **0.16** | **0.1%** | **-0.83** | **-1.0%** |
| **Overall change (2023)** | | **0.49** | **0.1%** | **2.0** | **2.0%** | **-0.18** | **-0.1%** | **-0.062** | **-0.2%** |
| Energy Industries | In the early time series, the reductions are driven by landfill gas used in power stations (1A1a) where the updates to volume of waste resulting in reduced methane generation.<br>In the later time series, recalculations in England are also | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | -0.080 | -0.1% | 0.100 | 1.0% | -0.003 | 0.0% | 0.011 | 0.3% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |

| Category | Reason for the change in emissions | England | | Scotland | | Wales | | Northern Ireland | |
|---|---|---|---|---|---|---|---|---|---|
| | | Change (kt) | Change (%) | Change (kt) | Change (%) | Change (kt) | Change (%) | Change (kt) | Change (%) |
| | driven by 1A1a, due to updated points data. For Scotland, the recalculation is driven by gas terminal and oil terminal fuel combustion under 1A1c, due to updated Emissions Trading Scheme (ETS) reported data. For Wales, the recalculation is driven more by DUKES changes to natural gas use in gas production. | -0.26 | -0.8% | 0.13 | 6.5% | 0.015 | 0.5% | -0.010 | -0.9% |
| Industrial Combustion | Recalculations in the early time series are primarily driven by DUKES revisions affecting other stationary combustion (1A2gviii), there has been a recategorisation of NAEI source codes to match aggregations for other fuels. Several codes have now been aggregated under other industrial combustion. It ultimately does not cause a recalculation at the NFR-level but you will see changes at the source code level. Impact varies significantly by fuel dependent on how much was previously allocated to the other categories.<br>In the later time series, recalculations are driven by 1A2gviii, as the DG calculations now use reported biocarbon emissions data as a proxy for emissions from biomass used in industrial combustion. | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | 0.023 | 0.0% | 0.070 | 0.2% | 0.18 | 0.2% | -0.66 | -4.2% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | -2.3 | -0.7% | 2.4 | 7.4% | -0.69 | -1.4% | 0.027 | 0.2% |
| Transport Sources | Recalculations in the early time series are primarily driven by gas oil reconciliation applied for inland waterways and port machinery, reducing fuel consumption by around 50-85%. There are also impacts from the shipping methodology updates under the Greenhouse Gas Inventory Improvement Programme (GHGI IP) shipping improvement. This involved incorporating 2019 international Automatic Identification System (AIS) data, revised emission factors and assumptions from the Department for Transport's (DfT) Maritime Emissions Model (MEM) and a fundamental shift from a “fuel used” to “fuel sold” approach, and using 2019 as a base year (instead of 2014).<br>In the later time series, this is primarily driven by car cold starts (1A3bi) due to the 6% increase in petrol car proportion due to using actual ANPR data for 2023. There is also an increase in IEFs of around 1-5%. This is because there is an increase in vkm-based activity due to using latest ANPR data but no significant change in DUKES. | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | -1.2 | -0.1% | -1.6 | -1.2% | -0.11 | -0.1% | -0.025 | -0.1% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | 6.4 | 2.8% | 0.082 | 0.3% | 0.58 | 5.1% | -0.010 | -0.1% |
| Solvent Processes | This category is included under 'Other'. | | | | | | | | |



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| Category | Reason for the change in emissions | England | | Scotland | | Wales | | Northern Ireland | |
|---|---|---|---|---|---|---|---|---|---|
| | | Change (kt) | Change (%) | Change (kt) | Change (%) | Change (kt) | Change (%) | Change (kt) | Change (%) |
| Residential, Commercial & Public Sector Combustion | The recalculations in the early time series are primarily driven by recalculations to residential combustion (1A4bi) due to inclusion of outdoor wood burning (previously accounted for under 1A5a). Therefore, this is a reallocation of emissions, rather than an overall recalculation.<br>In the later time series, recalculations are primarily driven by domestic combustion (1A4bi) due to a combination of impacts. This includes:<br>• revisions to DUKES data for wood use domestically (-2%)<br>• implementation of new method for assigning new wood to new appliances based on split provided by DUKES on the amount attributable to changes in wood being burnt from the purchase of new appliances, vs the change from meteorological effects (e.g. temperature changes)<br>• removal of assumptions relating to compliance with AQ DSFS Regulations for wet wood in England as now believed to be accounted for in the most recent Defra Domestic Burning Survey.<br>Overall this generally leads to negative revisions in the amount of dry and seasoned wood except for in ecodesign appliances where this is outweighed by assigning additional wood use to new appliances. Wet wood is revised upwards across appliances and is compounded in ecodesign stoves. | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | 5.5 | 2.3% | 0.39 | 1.3% | 0.74 | 2.8% | 0.49 | 3.4% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | 1.3 | 0.6% | 0.013 | 0.0% | 0.24 | 1.5% | 0.34 | 2.8% |
| Industrial Processes | Recalculations are minor in the early time series.<br>Recalculations in the later time series are primarily driven by cigarettes under other product use (2G), due to updated HM Revenue & Customs (HMRC) data for other tobacco products. | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | < -0.0001 | 0.0% | < -0.0001 | 0.0% | < -0.0001 | 0.0% | < -0.0001 | 0.0% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | -0.001 | 0.0% | < -0.0001 | 0.0% | < -0.0001 | 0.0% | < -0.0001 | -1.2% |
| Agriculture | This category is included under 'Other'. | | | | | | | | |
| Fugitive | Recalculations are minor in the early time series.<br>In the later time series, recalculations are driven by oil terminal and gas terminal gas flaring (1B2c) due to adjusting the pre-processing of ETS data, affecting England and Scotland only. Emissions were previously allocated to combustion, these are now allocated correctly to gas flaring.<br>Recalculations are minor in the later time series for Wales and Northern Ireland. | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | < -0.0001 | 0.0% | < -0.0001 | 0.0% | < -0.0001 | 0.0% | < -0.0001 | 0.0% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | -0.030 | -2.2% | -0.11 | -8.8% | < -0.0001 | 0.0% | < -0.0001 | 3.3% |
| Waste | | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |

| Category | Reason for the change in emissions | England | | Scotland | | Wales | | Northern Ireland | |
|---|---|---|---|---|---|---|---|---|---|
| | | Change (kt) | Change (%) | Change (kt) | Change (%) | Change (kt) | Change (%) | Change (kt) | Change (%) |
| | The recalculations across the time series are being driven by other waste (5E) are due to UK level revisions to bonfire activity data and the addition of emission factors for bonfire night burning, affecting all DGs. Scotland and Wales also have some minor revisions to incineration of animal carcasses (5C1bv) due to updated mapping grid using UKCEH land cover maps; previously using static data rolled for the entire time series. | -2.3 | -7.2% | -0.24 | -7.7% | -0.082 | -3.2% | -0.27 | -13% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | -2.3 | -7.9% | -0.16 | -4.0% | -0.15 | -7.4% | -0.29 | -16% |
| Other | The recalculations in the early time series are primarily driven by reductions to outdoor wood burning, which was previously accounted for under 1A5a, but these are now under 1A4bi. This is a re-allocation rather than recalculation. In the later time series, recalculations are driven by military aircraft (1A5b) updated data that were not available in time for last year. Note the DG level driver for this source is Gross Domestic Product (GDP). | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | -5.5 | -54% | -0.47 | -52% | -0.56 | -74% | -0.38 | -74% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | -2.3 | -49% | -0.34 | -63% | -0.18 | -66% | -0.12 | -66% |

Table 10: Recalculations to 2005 and 2023 estimates for nitrogen oxides ($NO_X$) between previous and current inventory submissions

| Category | Reason for the change in emissions | England | | Scotland | | Wales | | Northern Ireland | |
|---|---|---|---|---|---|---|---|---|---|
| | | Change (kt) | Change (%) | Change (kt) | Change (%) | Change (kt) | Change (%) | Change (kt) | Change (%) |
| **Overall change (2005)** | | **-62** | **-4.7%** | **-41** | **-20%** | **-5.1** | **-4.9%** | **-2.9** | **-5.4%** |
| **Overall change (2023)** | | **-29** | **-6.7%** | **-11** | **-16%** | **-1.9** | **-5.0%** | **-1.3** | **-6.7%** |
| Energy Industries | In the early time series, the recalculations in England are primarily driven by power stations (1A1a) revisions to points data on MSW volumes used in combustion. For Scotland, there are also recalculations due to revised landfill gas due to updated volumes of waste disposed at landfill and therefore lower methane generation. In the later time series, recalculations for England are also driven by power stations, natural gas use due to updates to DUKES and EFs based on 2022 Net Calorific Values (NCVs), rather than 2010 values. The latter is also driving the minor recalculations for Wales and Northern Ireland. For Scotland, the recalculations to gas terminal and oil terminal combustion are driving recalculations, due to updated ETS reported data | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | 0.059 | 0.0% | 0.16 | 0.4% | -0.005 | 0.0% | 0.024 | 0.2% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | 0.35 | 0.6% | 0.53 | 8.4% | 0.078 | 1.0% | 0.006 | 0.3% |
| | | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |



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| Category | Reason for the change in emissions | England | | Scotland | | Wales | | Northern Ireland | |
|---|---|---|---|---|---|---|---|---|---|
| | | Change (kt) | Change (%) | Change (kt) | Change (%) | Change (kt) | Change (%) | Change (kt) | Change (%) |
| Industrial Combustion | In the early time series, recalculations are primarily driven by stationary combustion in food, drink and tobacco (1A2e). This is largely due to addressing time series inconsistencies in DUKES between 1998-2009 and replacing inconsistent older / gap filled data with more recent data. In the later time series, recalculations are primarily due to revisions in gas use in multiple sectors within DUKES largely affecting other industrial combustion (1A2gviii). | -3.4 | -2.0% | -0.43 | -2.6% | -0.46 | -3.2% | -0.29 | -3.9% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | -0.26 | -0.4% | 0.62 | 7.7% | -0.46 | -5.7% | -0.064 | -2.8% |
| Transport Sources | Across the time series, for all DGs, recalculations are primarily driven by the shipping methodology updates under the GHGI IP shipping improvement. This involved incorporating 2019 international AIS data, revised emission factors and assumptions from the DfT's MEM and a fundamental shift from a “fuel used” to “fuel sold” approach, and using 2019 as a base year (instead of 2014). | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | -51 | -8.2% | -33 | -31% | -3.9 | -9.9% | -2.4 | -9.4% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | -20 | -9.7% | -7.9 | -21% | -1.1 | -7.3% | -1.3 | -13% |
| Solvent Processes | This category is included under 'Other'. | | | | | | | | |
| Residential, Commercial & Public Sector Combustion | Recalculations to the early time series are primarily from fishing vessels (1A4cii) due to the GHGIIP shipping methodology updates, as described above. Public sector combustion (1A4ai) was also revised downwards on account of addressing the DUKES inconsistencies between 1998-2009, also described above.<br>In the later time series, the recalculations are primarily driven by the shipping methodology updates. | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | -1.4 | -1.0% | -7.0 | -26% | -0.46 | -4.1% | -0.021 | -0.3% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | -3.6 | -5.3% | -3.6 | -27% | -0.30 | -7.6% | -0.18 | -5.9% |
| Industrial Processes | This category is included under 'Other'. | | | | | | | | |
| Agriculture | In the early time series, recalculations are primarily driven by urine and dung deposited by grazing other cattle under 3Da3 due to a correction to dairy cow liveweight (affects all dairy animals across the entire time series).<br>In the later time series, recalculations in England are also driven by 3Da3. However, for Scotland, Wales and Northern Ireland, recalculations are driven by Inorganic N-fertilisers (includes also urea application) under 3Da1 due to a large re-estimate of the quantity of fertiliser nitrogen spread to grassland in Northern Ireland in 2023, following re-placement of a rolled estimate with results of Farm Business Survey, plus a smaller re-calculation for Scotland in the year 2023 where the nitrogen application is based on a rolling 3-year average on the Dairy farm type. | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | 0.059 | 0.3% | 0.008 | 0.2% | 0.010 | 0.3% | 0.011 | 0.3% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | 0.084 | 0.5% | 0.068 | 2.0% | 0.013 | 0.5% | 0.27 | 11% |

| Category | Reason for the change in emissions | England | | Scotland | | Wales | | Northern Ireland | |
|---|---|---|---|---|---|---|---|---|---|
| | | Change (kt) | Change (%) | Change (kt) | Change (%) | Change (kt) | Change (%) | Change (kt) | Change (%) |
| Fugitive | Recalculations are minor in the early time series.<br>In the later time series, recalculations for England are driven more by gas terminal flaring (1B2c) due to adjusting the pre-processing of ETS data, affecting England and Scotland only. Emissions were previously allocated to combustion, these are now allocated correctly to gas flaring. For Scotland, recalculations are driven more by oil terminal gas flaring (1B2c), for the same reasons.<br>Recalculations are minor in the later time series for Wales and Northern Ireland. | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | < -0.0001 | 0.0% | < -0.0001 | 0.0% | < -0.0001 | 0.0% | < -0.0001 | 0.0% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | -0.012 | -4.1% | -0.38 | -36% | < -0.0001 | 0.0% | < -0.0001 | 3.3% |
| Waste | This category is included under 'Other'. | | | | | | | | |
| Other | Recalculations across the time series, and for all DGs, are primarily driven by recalculations to naval sources (1A5b) which were revised downward due to the application of updated DfT Maritime emission factors. | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | -6.6 | -27% | -0.60 | -30% | -0.29 | -19% | -0.18 | -30% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | -5.2 | -36% | -0.44 | -38% | -0.15 | -21% | -0.13 | -36% |

Table 11: Recalculations to 2005 and 2023 estimates for NMVOCs between previous and current inventory submissions

| Category | Reason for the change in emissions | England | | Scotland | | Wales | | Northern Ireland | |
|---|---|---|---|---|---|---|---|---|---|
| | | Change (kt) | Change (%) | Change (kt) | Change (%) | Change (kt) | Change (%) | Change (kt) | Change (%) |
| **Overall change (2005)** | | **-4.8** | **-0.5%** | **-1.2** | **-0.7%** | **0.046** | **0.1%** | **0.033** | **0.1%** |
| **Overall change (2023)** | | **4.5** | **0.9%** | **0.63** | **0.4%** | **-0.19** | **-0.5%** | **-0.19** | **-0.5%** |
| Energy Industries | Recalculations are minor in the early time series.<br>In the later time series, recalculations are primarily driven by gas production (1A1c), due to revisions to DUKES data. | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | -0.001 | 0.0% | 0.003 | 0.2% | < -0.0001 | 0.0% | < -0.0001 | 0.1% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | 0.084 | 4.3% | 0.046 | 9.2% | 0.056 | 7.1% | < -0.0001 | 1.2% |
| Industrial Combustion | In the early time series, recalculations are primarily driven by stationary combustion in food, drink and tobacco (1A2e). This is largely due to addressing time series inconsistencies in DUKES between 1998-2009 and replacing inconsistent older / gap filled data with more recent data.<br>In the later time series, recalculations for England primarily due to revisions in gas use in multiple sectors within DUKES largely affecting other industrial combustion (1A2gviii). For Scotland, the recalculation is driven more by the methodology update to DG | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | -0.023 | -0.1% | 0.013 | 0.5% | -0.016 | -0.8% | 0.009 | 1.1% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | -0.25 | -1.8% | 0.064 | 4.2% | -0.032 | -2.6% | 0.005 | 1.2% |



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| Category | Reason for the change in emissions | England | | Scotland | | Wales | | Northern Ireland | |
|---|---|---|---|---|---|---|---|---|---|
| | | Change (kt) | Change (%) | Change (kt) | Change (%) | Change (kt) | Change (%) | Change (kt) | Change (%) |
| | calculations to now use reported biocarbon emissions data as a proxy for emissions from biomass used in industrial combustion. | | | | | | | | |
| Transport Sources | In the early time series, recalculations are primarily driven by the shipping methodology updates under the GHGI IP shipping improvement. This involved incorporating 2019 international AIS data, revised emission factors and assumptions from the DfT's MEM and a fundamental shift from a "fuel used" to "fuel sold" approach, and using 2019 as a base year (instead of 2014).<br>This is also primarily driving the recalculations in the later time series for Scotland, Wales and Northern Ireland. However, for England, the later time series recalculations are more driven by road transport, specifically cars cold start (1A3bi) and cars evaporative (1A3bv) due to the 6% increase in petrol car proportion due to using actual ANPR data for 2023. There is also an increase in IEFs of around 1-5%. This is because there is an increase in vkm-based activity due to using latest ANPR data but no significant change in DUKES. | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | -1.6 | -0.8% | -0.80 | -3.9% | -0.090 | -0.8% | -0.060 | -0.8% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | 0.49 | 1.4% | -0.047 | -1.2% | 0.064 | 3.5% | -0.038 | -2.8% |
| Solvent Processes | In the early time series, recalculations are primarily driven by domestic solvent use including fungicides (2D3a). This is due to an amended professional cleaning product method to utilise more product specific data, as opposed to assuming the same emission factor as for domestic products. This is appropriate as professional cleaning is likely to be more detergent based, as opposed to air freshener and polish.<br>This also impacts the later time series as well, although recalculations for England and Scotland in the later time series are more driven by aerosols (also 2D3a) where we have updated pesticide usage data for 2023. | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | -3.2 | -1.0% | -0.36 | -1.2% | -0.031 | -0.2% | -0.081 | -0.8% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | 2.5 | 1.0% | 0.46 | 1.9% | -0.50 | -3.7% | -0.29 | -3.5% |
| Residential, Commercial & Public Sector Combustion | The recalculations in the early time series for England are primarily driven by recalculations to residential combustion (1A4bi) due to inclusion of outdoor wood burning (previously accounted for under 1A5a). Therefore this is a reallocation of emissions, rather than an overall recalculation. For Scotland, the recalculations are driven more by fishing vessels (1A4ciii) due to the shipping methodology updates as described above. Wales and Northern Ireland are impacted by both of these recalculations as well as updates to agriculture stationary combustion (1A4ci) where we are now using an updated | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | 0.76 | 1.9% | -0.095 | -1.8% | 0.17 | 4.1% | 0.10 | 4.6% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | -0.022 | -0.1% | -0.072 | -1.7% | 0.080 | 4.0% | 0.100 | 5.9% |

| Category | Reason for the change in emissions | England | | Scotland | | Wales | | Northern Ireland | |
|---|---|---|---|---|---|---|---|---|---|
| | | Change (kt) | Change (%) | Change (kt) | Change (%) | Change (kt) | Change (%) | Change (kt) | Change (%) |
| | mapping grid for straw burning; previously this was static and rolled data. For these DGs, this is also the main recalculation in the later time series.<br>In the later time series, England's recalculations are driven more by 1A4bi due to a combination of impacts. This includes:<br>• revisions to DUKES data for wood use domestically (-2%)<br>• implementation of new method for assigning new wood to new appliances based on split provided by DUKES on the amount attributable to changes in wood being burnt from the purchase of new appliances, vs the change from meteorological effects (e.g. temperature changes)<br>• removal of assumptions relating to compliance with AQ DSFS Regulations for wet wood in England as now believed to be accounted for in the most recent Defra Domestic Burning Survey.<br>Overall this generally leads to negative revisions in the amount of dry and seasoned wood except for in ecodesign appliances where this is outweighed by assigning additional wood use to new appliances. Wet wood is revised upwards across appliances and is compounded in ecodesign stoves. | | | | | | | | |
| Industrial Processes | Recalculations are minor in the early time series.<br>In the later time series, recalculations are primarily driven by food and drink processes (2H2) due to revised beer production from HMRC's Alcohol Bulletin data tables. In Northern Ireland, the recalculations are driven more by revisions to population data as it relates to bread baking (also under 2H2). | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | < -0.0001 | 0.0% | < -0.0001 | 0.0% | < -0.0001 | 0.0% | < -0.0001 | 0.0% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | 0.017 | 0.0% | -0.16 | -0.2% | -0.070 | -2.7% | 0.011 | 0.3% |
| Agriculture | In the early time series, recalculations are primarily driven by manure management (non-dairy cattle) 3B1b. In the later time series, recalculations for England and Northern Ireland are being driven by spread manure of broiler chickens (3Da2c). For Scotland, the recalculations are driven more by spread manure from dairy cows (3Da2a), and for Wales, recalculations are driven by silage housing for other cattle (3B1b). Changes in NMVOC emissions arise from changes to inventory outputs of gross energy intake and Volatile solids (VS) excretion (silage store, silage feeding, house and grazing), as well as the $NH_3$ | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | 0.46 | 0.6% | 0.034 | 0.2% | 0.099 | 0.9% | 0.064 | 0.4% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | -0.17 | -0.2% | 0.22 | 1.5% | 0.10 | 0.8% | -0.008 | 0.0% |



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| Category | Reason for the change in emissions | England | | Scotland | | Wales | | Northern Ireland | |
|---|---|---|---|---|---|---|---|---|---|
| | | Change (kt) | Change (%) | Change (kt) | Change (%) | Change (kt) | Change (%) | Change (kt) | Change (%) |
| | (manure store and spread manure) as these are used in NMVOC calculations. Changes in $NH_3$ emissions are described above. | | | | | | | | |
| Fugitive | Recalculations are minor in the early time series. In the later time series, recalculations are driven by gas leakage (1B2b) due to an updated UK weighted average for natural gas derived from reported gas operator data. For Northern Ireland, there are also minor revisions to the activity data from DUKES for lead replacement petrol / Super premium unleaded and Premium unleaded petrol, which actually impacts EFs calculations. | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | -0.012 | 0.0% | < -0.0001 | 0.0% | < -0.0001 | 0.0% | < -0.0001 | 0.0% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | 2.0 | 4.1% | 0.12 | 1.3% | 0.15 | 3.5% | -0.019 | -2.5% |
| Waste | This category is included under 'Other'. | | | | | | | | |
| Other | The recalculations in the early time series are primarily driven by reductions to outdoor wood burning, which was previously accounted for under 1A5a, but these are now under 1A4bi. This is a re-allocation rather than recalculation. There were also large recalculations to landfill (5A) due to updated volumes of waste disposed; general reductions in MSW and C&I for 1960-1996 results in reduced methane generation in subsequent years. In the later time series, there are also recalculations due to industrial wastewater treatment (5D2) due to changing methodology to use EMEP/EEA guidebook NMVOC emission factor (15 mg/m3 NMVOC) for NMVOC emissions from treatment, instead of using an implied EF using Chemical Oxygen Demand (COD). The recalculated values have been benchmarked against municipal NMVOC estimates and in retrospect the previous values did seem too high, and these new values are within the expected range. | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | -1.2 | -7.5% | -0.028 | -1.7% | -0.084 | -6.9% | -0.004 | -0.5% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | -0.24 | -2.2% | -0.001 | -0.1% | -0.034 | -4.5% | 0.042 | 8.6% |

Table 12: Recalculations to 2005 and 2023 estimates for $PM_{10}$ between previous and current inventory submissions

| Category | Reason for the change in emissions | England | | Scotland | | Wales | | Northern Ireland | |
|---|---|---|---|---|---|---|---|---|---|
| | | Change (kt) | Change (%) | Change (kt) | Change (%) | Change (kt) | Change (%) | Change (kt) | Change (%) |
| **Overall change (2005)** | | **-13** | **-9.3%** | **-2.6** | **-14%** | **-0.79** | **-6.2%** | **-0.61** | **-7.9%** |
| **Overall change (2023)** | | **-5.0** | **-5.6%** | **-0.18** | **-1.7%** | **-0.17** | **-2.2%** | **-0.095** | **-1.8%** |
| Energy Industries | | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |

| Category | Reason for the change in emissions | England | | Scotland | | Wales | | Northern Ireland | |
|---|---|---|---|---|---|---|---|---|---|
| | | Change (kt) | Change (%) | Change (kt) | Change (%) | Change (kt) | Change (%) | Change (kt) | Change (%) |
| | Recalculations in the early time series are primarily driven by landfill gas used in power stations (1A1a), due to updated volumes of waste disposed at landfill and therefore lower methane generation.<br>In the later time series, recalculations are primarily driven by revisions to points data on MSW volumes used in combustion. | -0.006 | -0.1% | 0.008 | 0.4% | < -0.0001 | 0.0% | < -0.0001 | 0.3% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | 0.002 | 0.2% | 0.007 | 5.4% | 0.002 | 1.0% | < -0.0001 | 0.0% |
| Industrial Combustion | Recalculations in the early time series are primarily driven by DUKES revisions affecting other stationary combustion (1A2gviii), there has been a recategorisation of NAEI source codes to match aggregations for other fuels. Several codes have now been aggregated under other industrial combustion. It ultimately does not cause a recalculation at the NFR-level but you will see changes at the source code level. Impact varies significantly by fuel dependent on how much was previously allocated to the other categories.<br>In the later time series, recalculations are driven by 1A2gviii, as the DG calculations now use reported biocarbon emissions data as a proxy for emissions from biomass used in industrial combustion. | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | 0.085 | 0.9% | 0.012 | 1.1% | 0.031 | 4.9% | -0.043 | -7.2% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | -0.036 | -0.8% | 0.30 | 68% | -0.071 | -18% | < -0.0001 | -0.2% |
| Transport Sources | Across the time series, for all DGs, recalculations are primarily driven the shipping methodology updates under the GHGI IP shipping improvement. This involved incorporating 2019 international AIS data, revised emission factors and assumptions from the DfT's MEM and a fundamental shift from a “fuel used” to “fuel sold” approach, and using 2019 as a base year (instead of 2014). | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | -3.4 | -9.5% | -1.5 | -25% | -0.43 | -15% | -0.28 | -16% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | -0.24 | -1.3% | -0.061 | -2.6% | 0.012 | 1.0% | -0.035 | -4.2% |
| Solvent Processes | This category is included under 'Other'. | | | | | | | | |
| | | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |



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| Category | Reason for the change in emissions | England | | Scotland | | Wales | | Northern Ireland | |
|---|---|---|---|---|---|---|---|---|---|
| | | Change (kt) | Change (%) | Change (kt) | Change (%) | Change (kt) | Change (%) | Change (kt) | Change (%) |
| Residential, Commercial & Public Sector Combustion | The recalculations in the early time series are primarily driven by recalculations to residential combustion (1A4bi) due to inclusion of outdoor wood burning (previously accounted for under 1A5a). Therefore this is a reallocation of emissions, rather than an overall recalculation.<br>In the later time series, recalculations are primarily driven by 1A4bi due to a combination of impacts. This includes:<br>• revisions to DUKES data for wood use domestically (-2%)<br>• implementation of new method for assigning new wood to new appliances based on split provided by DUKES on the amount attributable to changes in wood being burnt from the purchase of new appliances, vs the change from meteorological effects (e.g. temperature changes)<br>• removal of assumptions relating to compliance with AQ DSFS Regulations for wet wood in England as now believed to be accounted for in the most recent Defra Domestic Burning Survey.<br>Overall this generally leads to negative revisions in the amount of dry and seasoned wood except for in ecodesign appliances where this is outweighed by assigning additional wood use to new appliances. Wet wood is revised upwards across appliances and is compounded in ecodesign stoves. For Scotland, the recalculation is driven more by the shipping updates, as described above, to fishing vessels under 1A4ciii. | 0.55 | 3.8% | -0.098 | -4.3% | 0.10 | 6.3% | 0.072 | 7.0% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | 0.34 | 3.1% | 0.054 | 3.1% | 0.062 | 7.6% | 0.069 | 9.5% |
| Industrial Processes | Across the time series, for all DGs, the recalculations are driven by construction (2A5b) revisions due to revised road construction methodology to take account of UK specific assumptions regarding road widths for all types of roads. | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | -9.7 | -18% | -0.89 | -21% | -0.41 | -8.5% | -0.27 | -12% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | -4.6 | -13% | -0.42 | -16% | -0.13 | -4.1% | -0.066 | -4.7% |
| Agriculture | Recalculations are minor across the time series, for all DGs. | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | < -0.0001 | 0.0% | < -0.0001 | 0.0% | < -0.0001 | 0.0% | < -0.0001 | 0.0% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | < -0.0001 | 0.0% | < -0.0001 | 0.0% | < -0.0001 | 0.0% | < -0.0001 | 0.0% |
| Fugitive | Recalculations are minor in the early time series.<br>In the later time series, recalculations for England are primarily driven by gas terminal flaring (1B2c), due to adjusting the pre-processing of ETS data, affecting England and Scotland only. Emissions were previously allocated to combustion, these are now allocated | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | < -0.0001 | 0.0% | < -0.0001 | 0.0% | < -0.0001 | 0.0% | < -0.0001 | 0.0% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |

| Category | Reason for the change in emissions | England | | Scotland | | Wales | | Northern Ireland | |
|---|---|---|---|---|---|---|---|---|---|
| | | Change (kt) | Change (%) | Change (kt) | Change (%) | Change (kt) | Change (%) | Change (kt) | Change (%) |
| | correctly to gas flaring. Scotland is more impacted by oil terminal gas flaring recalculations, for the same reason. For Northern Ireland, recalculations are driven by updating the charcoal data for 2023 from FAOStat, affecting sector 1B1b. | 0.001 | 0.2% | 0.005 | 5.7% | < -0.0001 | 0.1% | < -0.0001 | 3.3% |
| Waste | The recalculations across the time series are being driven by other waste (5E) are due to UK level revisions to bonfire activity data and the addition of emission factors for bonfire night burning, affecting all DGs. | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | -0.44 | -6.5% | -0.045 | -7.1% | -0.019 | -3.4% | -0.052 | -11% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | -0.44 | -6.9% | -0.037 | -4.1% | -0.026 | -5.6% | -0.054 | -13% |
| Other | The recalculations in the early time series are primarily driven by reductions to outdoor wood burning, which was previously accounted for under 1A5a, but these are now under 1A4bi. This is a re-allocation rather than recalculation.<br>In the later time series, recalculations are driven by road paving with asphalt (2D3b) due to implementing an improvement to use DUKES data as a proxy for non-energy use of Bitumen from 2015 onwards, as the 2014 is the last data year for the British Geological Survey (BGS) workbook. | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | -0.59 | -24% | -0.050 | -25% | -0.064 | -40% | -0.043 | -49% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | 0.020 | 1.4% | -0.020 | -15% | -0.014 | -16% | -0.008 | -18% |

Table 13: Recalculations to 2005 and 2023 estimates for sulphur dioxide ($SO_2$) between previous and current inventory submissions

| Category | Reason for the change in emissions | England | | Scotland | | Wales | | Northern Ireland | |
|---|---|---|---|---|---|---|---|---|---|
| | | Change (kt) | Change (%) | Change (kt) | Change (%) | Change (kt) | Change (%) | Change (kt) | Change (%) |
| **Overall change (2005)** | | **-26** | **-4.5%** | **-16** | **-16%** | **-4.7** | **-7.8%** | **-2.5** | **-9.9%** |
| **Overall change (2023)** | | **-2.2** | **-3.2%** | **-1.0** | **-10%** | **-0.39** | **-4.0%** | **-0.23** | **-5.7%** |
| Energy Industries | Recalculations are minor in the early time series.<br>In the later time series are driven primarily by refineries combustion (1A1b) due to minor recalculations to fuels reported in DUKES. | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | -0.001 | 0.0% | 0.019 | 0.0% | < -0.0001 | 0.0% | 0.002 | 0.0% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | 0.011 | 0.1% | 0.040 | 0.9% | -0.001 | -0.1% | 0.001 | 0.2% |
| | | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |



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| Category | Reason for the change in emissions | England | | Scotland | | Wales | | Northern Ireland | |
|---|---|---|---|---|---|---|---|---|---|
| | | Change (kt) | Change (%) | Change (kt) | Change (%) | Change (kt) | Change (%) | Change (kt) | Change (%) |
| Industrial Combustion | In the early time series, recalculations are primarily driven by combustion in the chemicals industry (1A2c) due to implementing an updated mapping grid for solid fuel used in chemical combustion. There's also an impact from food, drink and tobacco (1A2e). This is largely due to addressing time series inconsistencies in DUKES between 1998-2009 and replacing inconsistent older / gap filled data with more recent data.<br>In the later time series, the recalculations are driven by stationary combustion in non-metallic minerals (1A2f). This is due to new interpolated estimates exported from the NAEI cement model, where previously there were no data (as they were below reporting threshold). | -0.56 | -0.5% | 0.38 | 3.3% | 0.085 | 1.3% | 0.13 | 3.1% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | -0.15 | -0.7% | 0.14 | 10% | -0.13 | -2.9% | 0.036 | 1.9% |
| Transport Sources | Across the time series, for all DGs, recalculations are primarily driven the shipping methodology updates under the GHGI IP shipping improvement. This involved incorporating 2019 international AIS data, revised emission factors and assumptions from the DfT's MEM and a fundamental shift from a “fuel used” to “fuel sold” approach, and using 2019 as a base year (instead of 2014). | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | -24 | -58% | -14 | -59% | -4.6 | -57% | -2.5 | -68% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | -2.3 | -57% | -0.92 | -64% | -0.33 | -63% | -0.34 | -83% |
| Solvent Processes | This category is included under 'Other'. | | | | | | | | |
| Residential, Commercial & Public Sector Combustion | Recalculations in the early time series are primarily driven from fishing vessels (1A4cii) due to the GHGIIP shipping methodology updates, as described above.<br>In the later time series, there was a correction to 2023 figures for domestic combustion from petroleum coke and increases emissions from all domestic combustion sources by 19.6%. However, for Scotland, this increase is offset by the shipping recalculations. | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | -1.4 | -5.0% | -2.3 | -35% | -0.23 | -7.5% | -0.075 | -3.2% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | 0.58 | 5.0% | -0.25 | -12% | 0.043 | 4.6% | 0.080 | 6.8% |
| Industrial Processes | Recalculations are minor in the early time series.<br>In the later time series, recalculations are driven by iron and steel, particularly affecting England and Wales. Emissions from electric arc furnaces under 2C1 were recalculated for a site in England as, following consultation, previous estimates were too high for this site and so significantly lower estimates have been implemented. For Wales, a default Below Reporting Threshold (BRT) value was replaced with an interpolated data point. | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | 0.010 | 0.0% | < -0.0001 | 0.0% | 0.005 | 0.2% | < -0.0001 | 0.0% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | 0.010 | 0.2% | < -0.0001 | 0.2% | 0.031 | 7.2% | < -0.0001 | -2.7% |
| Agriculture | This category is included under 'Other'. | | | | | | | | |
| Fugitive | | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |

| Category | Reason for the change in emissions | England | | Scotland | | Wales | | Northern Ireland | |
|---|---|---|---|---|---|---|---|---|---|
| | | Change (kt) | Change (%) | Change (kt) | Change (%) | Change (kt) | Change (%) | Change (kt) | Change (%) |
| | Recalculations are minor in the early time series. In the later time series, recalculations are mostly affecting Scotland, which is due to revisions to oil terminal gas flaring (1B2c) due to adjusting the pre-processing of ETS data. | < -0.0001 | 0.0% | < -0.0001 | 0.0% | < -0.0001 | 0.0% | < -0.0001 | 0.0% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | -0.005 | -0.1% | -0.013 | -11% | < -0.0001 | 0.0% | < -0.0001 | 0.0% |
| Waste | This category is included under 'Other'. | | | | | | | | |
| Other | Recalculations in the early time series are primarily driven by naval shipping under 1A5b, due to application of EFs from DfT's MEM. This is also driving the recalculations in the later time series, particularly for England and Scotland. However, there have also been recalculations to residential outdoor bonfires under 5C2, as $SO_2$ EFs were not previously estimated in the domestic combustion model. These have now been included from the Emission Factors for Domestic Solid Fuels (EFDSF) project. This affects all DGs. There have also been revisions to incineration of animal carcasses (5C1bv) due to updated mapping grid using UKCEH land cover maps; previously using static data rolled for the entire time series. This is driving the recalculations for Scotland and Wales. | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | -0.063 | -1.0% | -0.006 | -1.0% | 0.001 | 0.4% | < -0.0001 | -0.1% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | -0.31 | -28% | -0.022 | -21% | -0.012 | -26% | -0.007 | -26% |

Table 14: Recalculations to 2005 and 2023 estimates for lead (Pb) between previous and current inventory submissions

| Category | Reason for the change in emissions | England | | Scotland | | Wales | | Northern Ireland | |
|---|---|---|---|---|---|---|---|---|---|
| | | Change (t) | Change (%) | Change (t) | Change (%) | Change (t) | Change (%) | Change (t) | Change (%) |
| **Overall change (2005)** | | **-0.34** | **-0.2%** | **-0.099** | **-0.7%** | **0.039** | **0.2%** | **-0.048** | **-1.1%** |
| **Overall change (2023)** | | **8.7** | **9.7%** | **0.46** | **5.9%** | **-5.3** | **-20%** | **0.13** | **4.5%** |
| Energy Industries | Recalculations across the time series are being driven by power stations (1A1a), due to revisions to points data on MSW volumes used in combustion. | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | 0.033 | 0.4% | -0.003 | -0.2% | < -0.0001 | 0.0% | < -0.0001 | 1.7% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | -0.004 | -0.2% | 0.020 | 17% | < -0.0001 | -0.2% | < -0.0001 | 0.7% |
| Industrial Combustion | In the early time series, recalculations are primarily driven by stationary combustion in food, drink and tobacco (1A2e). This is largely due to addressing time series inconsistencies in DUKES between 1998-2009 and replacing inconsistent older / gap filled data with more | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | -0.002 | 0.0% | 0.008 | 0.5% | 0.038 | 1.5% | -0.040 | -3.7% |



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| Category | Reason for the change in emissions | England | | Scotland | | Wales | | Northern Ireland | |
|---|---|---|---|---|---|---|---|---|---|
| | | Change (t) | Change (%) | Change (t) | Change (%) | Change (t) | Change (%) | Change (t) | Change (%) |
| | recent data.<br>In the later time series, recalculations are driven by other industrial combustion under 1A2gviii. This is as a result of a change in methodology to align splits of waste oil use with bottom up estimates from road transport rather than DUKES. | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | 2.7 | 40% | 0.50 | 63% | 0.22 | 33% | 0.14 | 28% |
| Transport Sources | Recalculations in the early time series are driven by domestic take-off and landing under 1A3aii(i), due to updated aviation cruise factors to align with 2023 EMEP/EEA guidebook. Fuel consumption factors are included in this Cruise factors update and therefore activities are affected.<br>In the later time series, there have been recalculations to break wear (1A3bvi), particularly affecting rural driving cars, caused by new vkm road speed and assumed average speeds, and increased lubricant use in road vehicle engines (2G) resulting from changes between vehicle-fuel type combinations in the Road Transport model. | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | -0.46 | -0.6% | -0.10 | -1.3% | -0.024 | -0.5% | -0.016 | -0.6% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | 0.018 | 0.0% | -0.014 | -0.2% | 0.020 | 0.7% | 0.005 | 0.2% |
| Solvent Processes | This category is included under 'Other'. | | | | | | | | |
| Residential, Commercial & Public Sector Combustion | The recalculations in the early time series are primarily driven by reductions to outdoor wood burning, which was previously accounted for under 1A5a, but these are now under 1A4bi. This is a re-allocation rather than recalculation. For England, there is also a large impact by miscellaneous industrial/ commercial combustion under 1A4ai, largely due to addressing time series inconsistencies in DUKES between 1998-2009 and replacing inconsistent older / gap filled data with more recent data.<br>In the later time series, the recalculations in England are more driven by 1A4bi due to a combination of impacts. This includes:<br>• revisions to DUKES data for wood use domestically (-2%)<br>• implementation of new method for assigning new wood to new appliances based on split provided by DUKES on the amount attributable to changes in wood being burnt from the purchase of new appliances, vs the change from meteorological effects (e.g. temperature changes)<br>• removal of assumptions relating to compliance with AQ DSFS Regulations for wet wood in England as now believed to be accounted for in the most recent Defra | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | 0.087 | 3.0% | -0.003 | -0.8% | 0.016 | 4.8% | 0.009 | 4.5% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | -0.035 | -1.6% | -0.011 | -3.2% | 0.005 | 3.2% | 0.006 | 5.2% |

| Category | Reason for the change in emissions | England | | Scotland | | Wales | | Northern Ireland | |
|---|---|---|---|---|---|---|---|---|---|
| | | Change (t) | Change (%) | Change (t) | Change (%) | Change (t) | Change (%) | Change (t) | Change (%) |
| | Domestic Burning Survey.<br>Overall this generally leads to negative revisions in the amount of dry and seasoned wood except for in ecodesign appliances where this is outweighed by assigning additional wood use to new appliances. Wet wood is revised upwards across appliances and is compounded in ecodesign stoves.<br>In comparison, recalculations to Scotland across the time series are more impacted by the shipping methodology updates under the Greenhouse Gas Inventory Improvement Programme (GHGI IP) shipping improvement. This involved incorporating 2019 international Automatic Identification System (AIS) data, revised emission factors and assumptions from the Department for Transport's (DfT) Maritime Emissions Model (MEM) and a fundamental shift from a “fuel used” to “fuel sold” approach, and using 2019 as a base year (instead of 2014).<br>Both Wales and Northern Ireland see a greater impact from the recalculations to agriculture combustion under 1A4ci, where we are now using an updated mapping grid for straw burning; previously this was static and rolled data. For these DGs, this is also the driving recalculation in the later time series. | | | | | | | | |
| Industrial Processes | Recalculations in the early time series are primarily driven by changes to foundries (2C7c) due to an update in extrapolation methods. Calculations now include iron castings since these now dominate the ONS dataset. In addition, the 2023 data are also affected by a revision of PRODCOM. The change to AD also impacts on the aggregate EFs calculated.<br>In the later time series, recalculations are minor for Scotland and Northern Ireland. For England and Wales, recalculations are driven by sinter production under 2C1, correcting an allocation of emissions; the decrease in Wales is equal to the increase in England. | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | 0.057 | 0.1% | 0.007 | 0.3% | 0.004 | 0.0% | < -0.0001 | 0.1% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | 6.0 | 23% | -0.038 | -4.9% | -5.5 | -25% | -0.018 | -5.9% |
| Agriculture | This category is included under 'Other'. | | | | | | | | |
| Fugitive | Recalculations are minor across the time series for England and Wales. (Note no emissions expected for Scotland nor Northern Ireland as there is no coke | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | < -0.0001 | 0.0% | < -0.0001 | 0.0% | < -0.0001 | 0.0% | < -0.0001 | 0.0% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |



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| Category | Reason for the change in emissions | England | | Scotland | | Wales | | Northern Ireland | |
|---|---|---|---|---|---|---|---|---|---|
| | | Change (t) | Change (%) | Change (t) | Change (%) | Change (t) | Change (%) | Change (t) | Change (%) |
| | production or solid smokeless fuel production in Scotland or Northern Ireland.) | < -0.0001 | 0.0% | < -0.0001 | 0.0% | < -0.0001 | 0.0% | < -0.0001 | 0.0% |
| Waste | This category is included under 'Other'. | | | | | | | | |
| Other | The recalculations across the time series for England and Scotland are primarily driven by reductions to outdoor wood burning, which was previously accounted for under 1A5a, but these are now under 1A4bi. This is a re-allocation rather than recalculation. For Wales, recalculations are driven more by recalculations to incineration from chemical waste (5C1bii). For Northern Ireland, recalculations are driven by other waste (5E) are due to UK level revisions to bonfire activity data and the addition of emission factors for bonfire night burning. | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | -0.063 | -3.5% | -0.004 | -2.4% | 0.005 | 5.6% | -0.002 | -3.8% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | -0.013 | -1.7% | -0.003 | -4.3% | -0.002 | -5.1% | 0.002 | 11% |

Table 15: Recalculations to 2005 and 2023 estimates for $PM_{2.5}$ between previous and current inventory submissions

| Category | Reason for the change in emissions | England | | Scotland | | Wales | | Northern Ireland | |
|---|---|---|---|---|---|---|---|---|---|
| | | Change (kt) | Change (%) | Change (kt) | Change (%) | Change (kt) | Change (%) | Change (kt) | Change (%) |
| **Overall change (2005)** | | **-4.7** | **-5.9%** | **-1.7** | **-15%** | **-0.42** | **-5.5%** | **-0.34** | **-7.9%** |
| **Overall change (2023)** | | **-0.91** | **-2.1%** | **0.17** | **3.1%** | **-0.070** | **-1.8%** | **-0.040** | **-1.6%** |
| Energy Industries | In the early time series, recalculations are driven by power stations (1A1a) due to revised landfill gas due to updated volumes of waste disposed at landfill and therefore lower methane generation. In the later time series, recalculations are driven by revisions to points data on MSW volumes used in combustion in power stations. | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | -0.008 | -0.2% | 0.007 | 0.7% | < -0.0001 | -0.1% | < 0.0001 | 0.4% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | 0.003 | 0.3% | 0.007 | 6.2% | 0.002 | 1.6% | < -0.0001 | 0.0% |
| Industrial Combustion | In the early time series, recalculations for England and Scotland are primarily driven by other industrial combustion under 1A2gviii. This is due to addressing time series inconsistencies in DUKES between 1998-2009 and replacing inconsistent older / gap filled data with more recent data. For Wales, recalculations are also driven by 1A2gviii due to the DG calculations now using reported biocarbon emissions data as a proxy for emissions from biomass used in industrial combustion. This is also what is driving the recalculations for all DGs in the later time series. For Northern Ireland, the | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | 0.020 | 0.2% | 0.005 | 0.5% | 0.025 | 4.3% | -0.027 | -5.3% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | -0.049 | -1.1% | 0.29 | 71% | -0.075 | -20% | < 0.0001 | 0.2% |

| Category | Reason for the change in emissions | England | | Scotland | | Wales | | Northern Ireland | |
|---|---|---|---|---|---|---|---|---|---|
| | | Change (kt) | Change (%) | Change (kt) | Change (%) | Change (kt) | Change (%) | Change (kt) | Change (%) |
| | recalculation is driven more by stationary combustion in non-metallic minerals (1A2f). This is due to new interpolated estimates exported from the NAEI cement model, where previously there were no data (as they were below reporting threshold). | | | | | | | | |
| Transport Sources | Across the time series, for all DGs, recalculations are primarily driven the shipping methodology updates under the GHGI IP shipping improvement. This involved incorporating 2019 international AIS data, revised emission factors and assumptions from the DfT's MEM and a fundamental shift from a “fuel used” to “fuel sold” approach, and using 2019 as a base year (instead of 2014). | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | -3.3 | -12% | -1.5 | -29% | -0.43 | -18% | -0.27 | -19% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | -0.25 | -2.2% | -0.065 | -4.4% | 0.007 | 0.9% | -0.035 | -6.8% |
| Solvent Processes | This category is included under 'Other'. | | | | | | | | |
| Residential, Commercial & Public Sector Combustion | The recalculations in the early time series for England, Wales and Northern Ireland are primarily driven by recalculations to residential combustion (1A4bi) due to inclusion of outdoor wood burning (previously accounted for under 1A5a). Therefore this is a reallocation of emissions, rather than an overall recalculation. However, for Scotland, the recalculations are more driven by fishing vessels under 1A4ciii, due to the shipping methodology updates as set out above.<br>In the later time series, recalculations are primarily driven by domestic combustion (1A4bi) due to a combination of impacts. This includes:<br>• revisions to DUKES data for wood use domestically (-2%)<br>• implementation of new method for assigning new wood to new appliances based on split provided by DUKES on the amount attributable to changes in wood being burnt from the purchase of new appliances, vs the change from meteorological effects (e.g. temperature changes)<br>• removal of assumptions relating to compliance with AQ DSFS Regulations for wet wood in England as now believed to be accounted for in the most recent Defra Domestic Burning Survey.<br>Overall this generally leads to negative revisions in the amount of dry and seasoned wood except for in ecodesign appliances where this is outweighed by assigning additional wood use to new appliances. Wet | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | 0.54 | 3.8% | -0.095 | -4.3% | 0.10 | 6.3% | 0.071 | 7.0% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | 0.35 | 3.3% | 0.055 | 3.3% | 0.063 | 7.9% | 0.069 | 9.8% |



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| Category | Reason for the change in emissions | England | | Scotland | | Wales | | Northern Ireland | |
|---|---|---|---|---|---|---|---|---|---|
| | | Change (kt) | Change (%) | Change (kt) | Change (%) | Change (kt) | Change (%) | Change (kt) | Change (%) |
| | wood is revised upwards across appliances and is compounded in ecodesign stoves. | | | | | | | | |
| Industrial Processes | Across the time series, for all DGs, the recalculations are driven by construction (2A5b) revisions due to revised road construction methodology to take account of UK specific assumptions regarding road widths for all types of roads. | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | -0.96 | -7.4% | -0.089 | -9.2% | -0.041 | -2.5% | -0.027 | -6.9% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | -0.38 | -5.5% | -0.052 | -11% | -0.024 | -2.1% | -0.013 | -5.3% |
| Agriculture | Recalculations are minor across the time series, for all DGs. | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | < -0.0001 | 0.0% | < -0.0001 | 0.0% | < -0.0001 | 0.0% | < -0.0001 | 0.0% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | < -0.0001 | 0.0% | < -0.0001 | 0.0% | < -0.0001 | 0.0% | < -0.0001 | 0.0% |
| Fugitive | Recalculations are minor in the early time series. In the later time series, recalculations are driven more by gas terminal (England) and oil terminal (Scotland) gas flaring under 1B1b due to adjusting the pre-processing of ETS data Emissions were previously allocated to combustion, these are now allocated correctly to gas flaring. For Wales and Northern Ireland, recalculations are driven by updating the charcoal data for 2023 from FAOStat, affecting sector 1B1b. | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | < -0.0001 | 0.0% | < -0.0001 | 0.0% | < -0.0001 | 0.1% | < 0.0001 | 0.0% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | 0.001 | 0.3% | 0.005 | 5.7% | < -0.0001 | 0.1% | < 0.0001 | 3.3% |
| Waste | Across the time series, for all DGs, recalculations are driven by revisions to bonfire activity data and the addition of emission factors for bonfire night burning. | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | -0.41 | -6.5% | -0.041 | -7.1% | -0.019 | -3.5% | -0.049 | -11% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | -0.41 | -6.9% | -0.035 | -4.1% | -0.024 | -5.5% | -0.050 | -13% |
| Other | Across the time series, for all DGs, recalculations are driven by reductions to outdoor wood burning, which was previously accounted for under 1A5a, but these are now under 1A4bi. This is a re-allocation rather than recalculation. | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | -0.59 | -38% | -0.051 | -39% | -0.063 | -57% | -0.042 | -64% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | -0.17 | -21% | -0.033 | -43% | -0.019 | -39% | -0.012 | -45% |

Table 16: Recalculations to 2005 and 2023 estimates for B[a]P between previous and current inventory submissions – note these are experimental statistics only

| Category | Reason for the change in emissions | England | | Scotland | | Wales | | Northern Ireland | |
|---|---|---|---|---|---|---|---|---|---|
| | | Change (kg) | Change (%) | Change (kg) | Change (%) | Change (kg) | Change (%) | Change (kg) | Change (%) |
| **Overall change (2005)** | | **-127** | **-3.4%** | **-8.4** | **-1.7%** | **-4.6** | **-0.9%** | **-13** | **-4.3%** |
| **Overall change (2023)** | | **-37** | **-0.9%** | **6.2** | **1.0%** | **2.5** | **0.7%** | **-3.1** | **-1.1%** |
| Energy Industries | Recalculations are minor in the early time series. In the later time series, recalculations in England and Wales are dominated by wood burned in power stations | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | < -0.0001 | 0.0% | < -0.0001 | 0.0% | < -0.0001 | 0.0% | < -0.0001 | 0.0% |

| Category | Reason for the change in emissions | England | | Scotland | | Wales | | Northern Ireland | |
|---|---|---|---|---|---|---|---|---|---|
| | | Change (kg) | Change (%) | Change (kg) | Change (%) | Change (kg) | Change (%) | Change (kg) | Change (%) |
| | under 1A1a. This is due to using operator reported incinerator data as opposed to ETS, causing a minor uplift. Recalculations for Scotland and Northern Ireland are minor in the later time series. | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | 0.011 | 0.0% | -0.002 | -1.2% | -0.004 | -0.1% | < -0.0001 | 0.0% |
| Industrial Combustion | Recalculations in the early time series are primarily driven by adjusting pre-2009 data using DUKES 2009-2015 estimates, affecting other industrial combustion 1A2gviii. In the later time series, recalculations for England and Northern Ireland are driven by updates DUKES data for wood treated with creosote for 1A2gviii. For Scotland and Wales, recalculations are driven more by DG calculations now using reported biocarbon emissions data as a proxy for emissions from biomass used in industrial combustion. | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | 0.009 | 0.0% | 0.009 | 0.3% | -0.022 | -0.3% | -0.005 | -0.3% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | -0.74 | -2.8% | 0.025 | 1.0% | -0.069 | -3.7% | -0.016 | -1.5% |
| Transport Sources | Recalculations across the time series for England, Wales and Northern Ireland are primarily driven by Non-Road Mobile Machinery (NRMM) sources under 1A3eii due to gas oil reconciliation applied for inland waterways and port machinery, reducing fuel consumption by around 50-85%. For Scotland, recalculations are more driven the shipping methodology updates under the GHGI IP shipping improvement. This involved incorporating 2019 international AIS data, revised emission factors and assumptions from the DfT's MEM and a fundamental shift from a “fuel used” to “fuel sold” approach, and using 2019 as a base year (instead of 2014). | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | -3.7 | -1.9% | -1.1 | -5.4% | -0.26 | -2.1% | -0.18 | -2.3% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | -0.51 | -0.4% | -0.20 | -1.5% | 0.033 | 0.4% | -0.073 | -1.5% |
| Solvent Processes | This category is included under 'Other'. | | | | | | | | |
| Residential, Commercial & Public Sector Combustion | Recalculations across the time series, for all DGs, are primarily driven by residential combustion 1A4bi, due to a combination of impacts. This includes:<br>• revisions to DUKES data for wood use domestically (-2%)<br>• implementation of new method for assigning new wood to new appliances based on split provided by DUKES on the amount attributable to changes in wood being burnt from the purchase of new appliances, vs the change from meteorological effects (e.g. temperature changes)<br>• removal of assumptions relating to compliance with AQ DSFS Regulations for wet wood in England as now believed to be accounted for in the most recent Defra Domestic Burning Survey. | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | 18 | 0.8% | 6.6 | 2.2% | 4.9 | 1.6% | 3.2 | 1.7% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | 95 | 2.8% | 20 | 3.7% | 10 | 3.6% | 12 | 5.0% |



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| Category | Reason for the change in emissions | England | | Scotland | | Wales | | Northern Ireland | |
|---|---|---|---|---|---|---|---|---|---|
| | | Change (kg) | Change (%) | Change (kg) | Change (%) | Change (kg) | Change (%) | Change (kg) | Change (%) |
| | Overall this generally leads to negative revisions in the amount of dry and seasoned wood except for in ecodesign appliances where this is outweighed by assigning additional wood use to new appliances. Wet wood is revised upwards across appliances and is compounded in ecodesign stoves. For Scotland, the recalculation is driven more by the shipping updates, as described above, to fishing vessels under 1A4ciii. | | | | | | | | |
| Industrial Processes | Recalculations are minor in the early time series. In the later time series, recalculations for England are driven by electric arc furnaces under 2C1, due to revising down activity data for a specific site in England as, through consultation, this was thought to be too high previously. For Scotland, Wales and Northern Ireland, recalculations are due to creosote use under 2I, due to revised ONS data that is interpolated for 2020-2024. | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | < -0.0001 | 0.0% | < -0.0001 | 0.0% | < -0.0001 | 0.0% | < -0.0001 | 0.0% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | -0.96 | -2.3% | -0.53 | -8.4% | -0.24 | -2.9% | -0.13 | -15% |
| Agriculture | This category is included under 'Other'. | | | | | | | | |
| Fugitive | There are no recalculations for Scotland and Northern Ireland in 2005 and 2023, and the recalculations are minor for England and Wales. | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | < -0.0001 | 0.0% | < -0.0001 | | < -0.0001 | 0.0% | < -0.0001 | |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | < -0.0001 | 0.0% | < -0.0001 | | < -0.0001 | 0.0% | < -0.0001 | |
| Waste | Recalculations across the time series, for all DGs, are driven by other waste (5E) are due to UK level revisions to bonfire activity data and the addition of emission factors for bonfire night burning. There have also been revisions to emission factors. | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | -120 | -14% | -12 | -8.3% | -7.0 | -6.1% | -15 | -14% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | -121 | -32% | -12 | -24% | -6.6 | -25% | -15 | -45% |
| Other | Across the time series, for all DGs, recalculations are driven by reductions to outdoor wood burning, which was previously accounted for under 1A5a, but these are now under 1A4bi. This is a re-allocation rather than recalculation. | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | -20 | -69% | -1.7 | -65% | -2.2 | -81% | -1.5 | -83% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | -8.2 | -52% | -1.3 | -65% | -0.69 | -63% | -0.48 | -66% |

Table 17: Recalculations to 2005 and 2023 estimates for PCDD/Fs between previous and current inventory submissions – note these are experimental statistics only

| Category | Reason for the change in emissions | England | | Scotland | | Wales | | Northern Ireland | |
|---|---|---|---|---|---|---|---|---|---|
| | | Change (g-ITQ) | Change (%) | Change (g-ITQ) | Change (%) | Change (g-ITQ) | Change (%) | Change (g-ITQ) | Change (%) |
| **Overall change (2005)** | | **-5.9** | **-3.8%** | **-0.65** | **-4.5%** | **-0.13** | **-0.6%** | **-0.63** | **-8.7%** |
| **Overall change (2023)** | | **-7.8** | **-9.6%** | **0.056** | **0.7%** | **-0.59** | **-8.7%** | **-0.65** | **-18%** |
| Energy Industries | Recalculations across the time series, for all DGs, are primarily driven by power stations (1A1a) revisions to points data on MSW volumes used in combustion. | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | 0.11 | 2.3% | -0.011 | -4.5% | < -0.0001 | 0.0% | 0.003 | 14% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | 0.042 | 1.5% | 0.042 | 24% | 0.002 | 0.9% | < 0.0001 | 4.9% |
| Industrial Combustion | Recalculations in the early time series for England and Northern Ireland are primarily driven by cement under 1A2f. This is due to new interpolated estimates exported from the NAEI cement model, where previously there were no data (below reporting threshold. Recalculations for Scotland and Wales are primarily driven by other industrial combustion under 1A2gviii as DG calculations now using reported biocarbon emissions data as a proxy for emissions from biomass used in industrial combustion.<br>In the later time series, recalculations for England are driven by other industrial combustion under 1A2gviii due to DUKES revisions to wood use. For Scotland, Wales and Northern Ireland, it is driven more by the biomass related recalculations. | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | -0.008 | -0.1% | -0.031 | -3.4% | 0.047 | 5.1% | 0.023 | 6.0% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | -1.4 | -11% | 0.71 | 63% | -0.27 | -33% | 0.032 | 5.6% |
| Transport Sources | Recalculations in the early time series for England are driven primarily by NRMM sources under 1A3eii due to gas oil reconciliation applied for inland waterways and port machinery, reducing fuel consumption by around 50-85%.<br>In the later time series, and for Scotland, Wales and Northern Ireland across the time series, the recalculations are driven by the shipping methodology updates under the GHGI IP shipping improvement. This involved incorporating 2019 international AIS data, revised emission factors and assumptions from the DfT's MEM and a fundamental shift from a “fuel used” to “fuel sold” approach, and using 2019 as a base year (instead of 2014). | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | -0.37 | -2.2% | -0.11 | -7.2% | -0.030 | -3.4% | -0.018 | -3.3% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | -0.100 | -2.5% | -0.022 | -4.4% | -0.008 | -3.2% | -0.010 | -7.4% |
| Solvent Processes | This category is included under 'Other'. | | | | | | | | |



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| Category | Reason for the change in emissions | England | | Scotland | | Wales | | Northern Ireland | |
|---|---|---|---|---|---|---|---|---|---|
| | | Change (g-ITQ) | Change (%) | Change (g-ITQ) | Change (%) | Change (g-ITQ) | Change (%) | Change (g-ITQ) | Change (%) |
| Residential, Commercial & Public Sector Combustion | Recalculations in the early time series for England are driven primarily by NRMM sources under 1A3Cii due to Defra's Agriculture in the UK data set had a lower index value for the reference year of 2018, leading to a 3.4% increase in most years for bottom-up NRMM agriculture. For Scotland, recalculations were driven more by domestic combustion under 1A4bi, due to an overhaul of calculations to use internally consistent parameters, including a review of moistures assumptions associated with fuel peat. For Wales and Northern Ireland, recalculations are more driven by agriculture stationary combustion (1A4ci) where we are now using an updated mapping grid for straw burning; previously this was static and rolled data.<br>In the later time series, recalculations for all DGs are primarily driven by residential combustion 1A4bi, due to a combination of impacts. This includes:<br>• revisions to DUKES data for wood use domestically (-2%)<br>• implementation of new method for assigning new wood to new appliances based on split provided by DUKES on the amount attributable to changes in wood being burnt from the purchase of new appliances, vs the change from meteorological effects (e.g. temperature changes)<br>• removal of assumptions relating to compliance with AQ DSFS Regulations for wet wood in England as now believed to be accounted for in the most recent Defra Domestic Burning Survey.<br>Overall, this generally leads to negative revisions in the amount of dry and seasoned wood except for in ecodesign appliances where this is outweighed by assigning additional wood use to new appliances. Wet wood is revised upwards across appliances and is compounded in ecodesign stoves. | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | 0.024 | 0.2% | 0.029 | 2.2% | 0.032 | 2.9% | 0.019 | 2.8% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | -0.91 | -4.8% | -0.14 | -4.7% | -0.051 | -3.4% | -0.008 | -0.7% |
| Industrial Processes | Recalculations across the time series for England, Scotland and Northern Ireland are driven by foundries under 2C7c, due to an update in extrapolation methods. Calculations now include iron castings since these now dominate the ONS dataset. In addition, the 2023 data are also affected by a revision of PRODCOM. The change to AD also impacts on the aggregate EFs calculated. For Wales, recalculations in the early time series are more driven by aluminium processes under 2C3, due to | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | 0.020 | 0.1% | 0.002 | 0.7% | -0.005 | -0.1% | < -0.0001 | 0.2% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | 0.053 | 0.7% | -0.003 | -3.1% | -0.008 | -0.4% | < -0.0001 | -0.5% |

| Category | Reason for the change in emissions | England | | Scotland | | Wales | | Northern Ireland | |
|---|---|---|---|---|---|---|---|---|---|
| | | Change (g-ITQ) | Change (%) | Change (g-ITQ) | Change (%) | Change (g-ITQ) | Change (%) | Change (g-ITQ) | Change (%) |
| | updated methods in reported emission data of gapfilling, replacing default Below Reporting Threshold (BRT) values. In the later time series, recalculations are driven by the 2C7c revisions. | | | | | | | | |
| Agriculture | This category is included under 'Other'. | | | | | | | | |
| Fugitive | This category is included under 'Other'. | | | | | | | | |
| Waste | Recalculations across the time series, for all DGs, are driven by other waste (5E) are due to UK level revisions to bonfire activity data and the addition of emission factors for bonfire night burning. There have also been revisions to emission factors. | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | -5.5 | -6.8% | -0.53 | -5.3% | -0.34 | -4.7% | -0.66 | -12% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | -5.4 | -16% | -0.53 | -15% | -0.31 | -15% | -0.66 | -37% |
| Other | Recalculations for England and Wales across the time series are driven by fugitive emissions from solid fuels (1B1b) due to using a new mapping grid for coke production. For Scotland and Northern Ireland, the recalculations are driven more by reductions to outdoor wood burning, which was previously accounted for under 1A5a, but these are now under 1A4bi. This is a re-allocation rather than recalculation. | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | -0.18 | -23% | -0.001 | -7.1% | 0.16 | 245% | < -0.0001 | -18% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | -0.004 | -1.9% | 0.003 | 40% | 0.047 | 235% | 0.001 | 40% |

Table 18: Recalculations to 2005 and 2023 estimates for Hg between previous and current inventory submissions – note these are experimental statistics only

| Category | Reason for the change in emissions | England | | Scotland | | Wales | | Northern Ireland | |
|---|---|---|---|---|---|---|---|---|---|
| | | Change (t) | Change (%) | Change (t) | Change (%) | Change (t) | Change (%) | Change (t) | Change (%) |
| **Overall change (2005)** | | **-0.013** | **-0.2%** | **-0.007** | **-1.2%** | **0.002** | **0.4%** | **0.002** | **1.2%** |
| **Overall change (2023)** | | **0.008** | **0.3%** | **0.006** | **2.8%** | **0.012** | **3.6%** | **0.000** | **-0.4%** |
| Energy Industries | Recalculations across the time series, for all DGs, are primarily driven by power stations (1A1a) revisions to points data on MSW volumes used in combustion. | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | 0.013 | 0.7% | -0.001 | -0.8% | < -0.0001 | 0.0% | < -0.0001 | 0.5% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | 0.003 | 0.5% | 0.007 | 27% | < -0.0001 | 0.7% | < -0.0001 | 0.7% |
| Industrial Combustion | Recalculations in the early time series for all DGs are primarily driven by combustion in chemicals manufacturing (1A2c). This is due to an updated mapping grid.<br>In the later time series, recalculations for England are due to revisions to gas use in multiple sectors within DUKES. For Scotland, recalculations are primarily due to 1A2gviii | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | -0.014 | -1.3% | 0.008 | 6.9% | 0.003 | 3.6% | 0.003 | 5.7% |



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| Category | Reason for the change in emissions | England | | Scotland | | Wales | | Northern Ireland | |
|---|---|---|---|---|---|---|---|---|---|
| | | Change (t) | Change (%) | Change (t) | Change (%) | Change (t) | Change (%) | Change (t) | Change (%) |
| | as DG calculations now using reported biocarbon emissions data as a proxy for emissions from biomass used in industrial combustion. For Wales, recalculations are driven more by cement under 1A2f. This is due to new interpolated estimates exported from the NAEI cement model, where previously there were no data (as they were below reporting threshold). For Northern Ireland, recalculations are due to recalculations to the DESNZ residual fuels datasets. | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | -0.001 | -0.2% | 0.004 | 7.8% | 0.001 | 1.3% | < 0.0001 | 0.6% |
| Transport Sources | Across the time series, for all DGs, recalculations are primarily driven the shipping methodology updates under the GHGI IP shipping improvement. This involved incorporating 2019 international AIS data, revised emission factors and assumptions from the DfT's MEM and a fundamental shift from a “fuel used” to “fuel sold” approach, and using 2019 as a base year (instead of 2014). | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | -0.016 | -6.2% | -0.012 | -27% | -0.001 | -6.5% | -0.001 | -11% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | -0.006 | -2.9% | -0.003 | -9.0% | < -0.0001 | 2.6% | -0.001 | -12% |
| Solvent Processes | This category is included under 'Other'. | | | | | | | | |
| Residential, Commercial & Public Sector Combustion | In the early time series, recalculations for England are driven by miscellaneous industrial/ commercial combustion under 1A4ai, largely due to addressing time series inconsistencies in DUKES between 1998-2009 and replacing inconsistent older / gap filled data with more recent data. For Scotland, recalculations are driven more by the shipping methodology update, described above. For Wales and Northern Ireland, recalculations are driven more by residential combustion (1A4bi) due to inclusion of outdoor wood burning (previously accounted for under 1A5a. Therefore this is a reallocation of emissions, rather than an overall recalculation. In the later time series, recalculations to England, Wales and Northern Ireland are driven by residential combustion (1A4bi) as there was a correction to 2023 figures for domestic combustion from petcoke and increases emissions from all domestic combustion sources by 19.6%. For Scotland, recalculations are driven more by the shipping methodology updates. | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | 0.002 | 0.4% | -0.002 | -4.6% | < -0.0001 | 0.5% | < -0.0001 | 0.7% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | 0.004 | 2.0% | < -0.0001 | -2.6% | < -0.0001 | 4.5% | < -0.0001 | 8.1% |
| Industrial Processes | Recalculations across the time series for England, Scotland and Northern Ireland are driven by foundries under 2C7c, due to an update in extrapolation methods. Calculations now include iron castings since these now dominate the ONS dataset. In addition, the 2023 data are | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | 0.004 | 0.2% | < -0.0001 | 0.4% | < -0.0001 | 0.2% | < -0.0001 | 0.1% |

| Category | Reason for the change in emissions | England | | Scotland | | Wales | | Northern Ireland | |
|---|---|---|---|---|---|---|---|---|---|
| | | Change (t) | Change (%) | Change (t) | Change (%) | Change (t) | Change (%) | Change (t) | Change (%) |
| | also affected by a revision of PRODCOM. The change to AD also impacts on the aggregate EFs calculated. For Wales, recalculations in the early time series are more driven by sinter production (2C1). | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | 0.005 | 2.2% | -0.001 | -8.2% | 0.009 | 7.9% | < -0.0001 | -9.0% |
| Agriculture | This category is included under 'Other'. | | | | | | | | |
| Fugitive | This category is included under 'Other'. | | | | | | | | |
| Waste | In the early time series, recalculations for England, Scotland and Northern Ireland are driven by other waste (5E) due to UK level revisions to bonfire activity data and the addition of emission factors for bonfire night burning. For Wales, recalculations are driven more by incineration from chemical waste (5C1bii). In the later time series, recalculations to all DGs are driven more by cremation under 5C1bv due to minor changes in updated ONS death registration data, for 2023 only. | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | < -0.0001 | 0.0% | < -0.0001 | 0.1% | < -0.0001 | 0.8% | < -0.0001 | 0.5% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | 0.004 | 0.6% | < -0.0001 | 0.4% | < -0.0001 | 0.4% | < -0.0001 | -2.2% |
| Other | Across the time series, for all DGs, recalculations are driven by reductions to outdoor wood burning, which was previously accounted for under 1A5a, but these are now under 1A4bi. This is a re-allocation rather than recalculation. | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 | 2005 |
| | | -0.002 | -6.2% | < -0.0001 | -19% | < -0.0001 | -5.5% | < -0.0001 | -39% |
| | | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 | 2023 |
| | | < -0.0001 | -10% | < -0.0001 | -24% | < -0.0001 | -2.4% | < -0.0001 | -26% |



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# APPENDIX E: UNCERTAINTIES

Uncertainties in the UK inventory are associated with the availability and quality of activity data, emission factors, and the methodologies used in emissions calculations throughout the time series. These uncertainties are quantified in assessments using a Tier 1 uncertainty aggregation method. The Tier 1 methodology assesses the impact of the assumed uncertainty of individual parameters (such as emission factors and activity statistics) on the total uncertainty associated with emissions of each pollutant. Results from the Tier 1 methodology are presented in Chapter 1.7 of the IIR (Elliott, et al., 2025). For England's and the Devolved Governments' air pollutant inventories, uncertainties are assessed for the NECR and Gothenburg Protocol base year (2005) and the most recently reported year by source sector and by pollutant using the Tier 1 approach. Full details of the approach can be found in Chapter 5 of the EMEP/EEA Guidebook (2023).

Emissions uncertainties are calculated using the uncertainty in activity statistics and emission factors for each source, often provided by inventory compilation guidebooks or expert judgement. The uncertainty in the trend is also estimated by considering sensitivities due to correlation in emission factors or activity statistics between the base year and most recently reported year. Potential examples of this include cases where the total amount of a fuel used is known with greater certainty than how that fuel is divided by different source categories. In such cases, the uncertainties in the individual estimates are correlated, because they must sum to the total. These correlations are partly addressed by aggregating source categories into broader groups across NFR sectors before combining uncertainties. This approach results in some loss of detail but helps limit the effect of correlations on the overall result. In addition, the Tier 1 uncertainty approach does not allow for asymmetry to be incorporated into the calculations which can lead to unrepresentative uncertainty ranges. For example, ammonia emissions from 1A in 2005 have an uncertainty >100% so the calculated lower boundary is negative (see Appendix E Ammonia).

The inventories are derived by splitting the UK-wide emissions across the four countries and the unallocated region. This means that the overall UK uncertainty is increased by the extra uncertainty introduced when emissions are divided on a source-activity scale. To account for this, and to produce DG-specific uncertainties in a consistent way, we allocate the UK-wide activity uncertainty $U_A$ to each DG as follows, assuming the DG-specific activity uncertainties are independent:

$$\overline{U}_{Ai} = U_A w_i \frac{\sum_i E_i}{\sqrt{\sum_i w_i^2 E_i^2}}$$

Where $U_A$ is the percentage uncertainty in the UK activity, $w_i$ is the weighting factor for each DG representing the relative uncertainty in the activity, and $E_i$ is the emission for each DG. $w_i$ is calculated as follows:

$$w_i = \frac{1}{\sqrt{E_i}}$$

This assumes that each source comprises many similar sources (e.g. factories, houses and fields) is distributed throughout the UK, which combine independently.

With this assumption, combining the two above equations yields:

$$\overline{U}_{Ai} = U_A \sqrt{\frac{\sum_i E_i}{E_i}}$$

This approach means that the DG-specific activity uncertainty scales with square root of the ratio of UK emissions to DG emissions. The rationale for this is that smaller DGs have a smaller sample of data/number of individual sources. Therefore, it is expected that smaller DGs will have larger relative uncertainties.

By applying this DG-specific activity uncertainty to the UK-wide activity uncertainties derived for the IIR (Elliott, et al., 2025), it is possible to follow the formulaic approach outlined in Chapter 5 of the EMEP/EEA Guidebook (2023).

### Ammonia

Ammonia emission estimates are dominated by uncertainties from agricultural sources, which represent the majority of the national total ammonia emissions. Although England and the DGs use a detailed (largely Tier 3) approach to estimating emissions from agriculture, which accounts for different animal sub-categories and management systems, it is not possible to fully represent the many factors influencing emissions from what are often diffuse emission sources including, for example, animal stocking densities, daily weather, soil types and conditions. These are therefore reflected in the uncertainties associated with individual emission factors. The uncertainty parameters for agriculture have been updated to reflect the latest understanding in the 2026 submission.

Using the top row of **Table 19** as an example, ammonia emissions from 1A in England were 14.8 kt in 2005, with a 104% uncertainty (±15.3 kt), giving a range of -0.59 kt to 30.1 kt. However, since there are no methods to sequester AQ emissions captured in the NAEI, the realistic range is 0 kt to 30.1 kt. In 2024, emissions were 4.9 kt with a 64% uncertainty (±3.2 kt), resulting in a range of 1.8 kt to 8.1 kt. From 2005 to 2024, there was a reduction of 9.8 kt with a 5.1% uncertainty, making the reduction range 9.3 kt to 10.3 kt. The uncertainty as a percentage of the DG total is the sector uncertainty as a proportion of the DG total.

Table 19: Tier 1 uncertainties for ammonia emissions by NFR sector for each DG

| NFR sector | 2005 | | | 2024 | | | |
|---|---|---|---|---|---|---|---|
| | Emissions (kt) | Combined uncertainty for sector | Uncertainty as % of DG total | Emissions (kt) | Combined uncertainty for sector | Uncertainty as % of DG total | Uncertainty introduced into trend in DG total[a] |
| **England** | | | | | | | |
| 1A | 14.76 | 104.0% | 8.0% | 4.93 | 64.2% | 1.9% | 5.8% |
| 1B | 0.22 | 37.1% | 0.0% | 0.02 | 47.2% | 0.0% | 0.0% |
| 2A | 0.41 | 34.2% | 0.1% | 0.29 | 33.3% | 0.1% | 0.0% |
| 2B | 4.03 | 24.1% | 0.5% | 0.63 | 45.8% | 0.2% | 0.4% |
| 2C | 0.00 | 91.2% | 0.0% | 0.00 | 91.2% | 0.0% | 0.0% |
| 2D | 1.01 | 138.5% | 0.7% | 1.02 | 139.2% | 0.8% | 0.3% |
| 2G | 0.19 | 72.9% | 0.1% | 0.07 | 73.1% | 0.0% | 0.0% |
| 2H | 0.87 | 135.1% | 0.6% | 0.78 | 135.1% | 0.6% | 0.0% |
| 3B | 68.71 | 47.3% | 16.9% | 54.32 | 38.4% | 12.4% | 10.1% |
| 3D | 88.89 | 25.8% | 11.9% | 89.54 | 19.1% | 10.1% | 5.3% |
| 5A | 0.79 | 62.3% | 0.3% | 0.12 | 62.3% | 0.0% | 0.2% |
| 5C | 0.05 | 78.7% | 0.0% | 0.02 | 89.4% | 0.0% | 0.0% |
| 5B | 2.72 | 33.4% | 0.5% | 4.75 | 27.4% | 0.8% | 0.8% |
| 5D | 1.46 | 92.5% | 0.7% | 1.26 | 92.2% | 0.7% | 0.1% |
| 5E | 0.01 | 449.1% | 0.0% | 0.01 | 376.9% | 0.0% | 0.0% |
| 6A | 8.22 | 153.9% | 6.6% | 10.69 | 131.8% | 8.4% | 3.7% |
| **Total** | **192.32** | **23.2%** | **23.2%** | **168.45** | **18.2%** | **18.2%** | **13.4%** |
| **Scotland** | | | | | | | |
| 1A | 1.50 | 118.9% | 4.9% | 0.54 | 60.0% | 1.0% | 3.7% |
| 1B | 0.03 | 59.3% | 0.0% | 0.00 | 60.3% | 0.0% | 0.0% |
| 2A | 0.05 | 58.7% | 0.1% | 0.03 | 60.7% | 0.0% | 0.1% |
| 2B | 0.02 | 135.0% | 0.1% | 0.01 | 135.0% | 0.0% | 0.1% |
| 2D | 0.10 | 166.5% | 0.5% | 0.10 | 174.4% | 0.5% | 0.4% |
| 2G | 0.02 | 122.7% | 0.1% | 0.01 | 126.5% | 0.0% | 0.0% |
| 3B | 15.41 | 61.0% | 26.0% | 12.35 | 53.4% | 21.2% | 22.6% |
| 3D | 17.70 | 26.1% | 12.8% | 16.65 | 18.9% | 10.1% | 6.9% |
| 5A | 0.09 | 77.1% | 0.2% | 0.01 | 77.2% | 0.0% | 0.1% |
| 5C | 0.00 | 151.5% | 0.0% | 0.00 | 144.4% | 0.0% | 0.0% |
| 5B | 0.26 | 95.1% | 0.7% | 0.43 | 78.5% | 1.1% | 1.3% |
| 5D | 0.15 | 103.6% | 0.4% | 0.12 | 101.9% | 0.4% | 0.2% |
| 5E | 0.00 | 460.6% | 0.0% | 0.00 | 391.4% | 0.0% | 0.0% |
| 6A | 0.80 | 202.3% | 4.5% | 0.93 | 174.8% | 5.2% | 5.1% |
| **Total** | **36.13** | **29.8%** | **29.8%** | **31.18** | **24.1%** | **24.1%** | **24.5%** |
| **Wales** | | | | | | | |
| 1A | 0.96 | 118.7% | 5.1% | 0.31 | 61.5% | 0.8% | 4.7% |
| 1B | 0.11 | 44.5% | 0.2% | 0.04 | 46.6% | 0.1% | 0.2% |
| 2A | 0.05 | 57.8% | 0.1% | 0.02 | 72.0% | 0.1% | 0.1% |



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| NFR sector | 2005 | | | 2024 | | | |
|---|---|---|---|---|---|---|---|
| | Emissions (kt) | Combined uncertainty for sector | Uncertainty as % of DG total | Emissions (kt) | Combined uncertainty for sector | Uncertainty as % of DG total | Uncertainty introduced into trend in DG total[a] |
| 2B | 0.01 | 135.0% | 0.1% | 0.02 | 135.0% | 0.1% | 0.0% |
| 2D | 0.06 | 185.9% | 0.5% | 0.06 | 198.7% | 0.5% | 0.5% |
| 2G | 0.01 | 151.2% | 0.1% | 0.00 | 157.2% | 0.0% | 0.0% |
| 3B | 9.36 | 78.5% | 32.8% | 9.58 | 73.8% | 30.4% | 39.3% |
| 3D | 10.92 | 32.1% | 15.6% | 12.23 | 23.8% | 12.5% | 10.5% |
| 5A | 0.05 | 88.4% | 0.2% | 0.01 | 86.8% | 0.0% | 0.1% |
| 5C | 0.00 | 144.7% | 0.0% | 0.00 | 173.5% | 0.0% | 0.0% |
| 5B | 0.13 | 134.7% | 0.8% | 0.21 | 108.3% | 1.0% | 1.5% |
| 5D | 0.09 | 111.7% | 0.4% | 0.07 | 109.2% | 0.3% | 0.3% |
| 5E | 0.00 | 469.6% | 0.0% | 0.00 | 403.3% | 0.0% | 0.0% |
| 6A | 0.66 | 261.6% | 7.8% | 0.71 | 232.0% | 7.1% | 7.8% |
| **Total** | **22.42** | **37.5%** | **37.5%** | **23.26** | **33.7%** | **33.7%** | **41.7%** |
| **Northern Ireland** | | | | | | | |
| 1A | 0.66 | 132.6% | 2.9% | 0.20 | 76.9% | 0.5% | 2.8% |
| 1B | 0.00 | 120.4% | 0.0% | 0.00 | 163.5% | 0.0% | 0.0% |
| 2A | 0.00 | 383.3% | 0.0% | 0.01 | 104.7% | 0.0% | 0.0% |
| 2D | 0.03 | 215.1% | 0.2% | 0.03 | 230.9% | 0.2% | 0.3% |
| 2G | 0.01 | 190.5% | 0.0% | 0.00 | 195.2% | 0.0% | 0.0% |
| 3B | 13.96 | 65.1% | 30.1% | 15.36 | 56.9% | 26.7% | 34.7% |
| 3D | 15.07 | 31.4% | 15.7% | 16.64 | 22.9% | 11.6% | 9.2% |
| 5A | 0.04 | 94.2% | 0.1% | 0.01 | 94.9% | 0.0% | 0.1% |
| 5C | 0.00 | 227.1% | 0.0% | 0.00 | 210.7% | 0.0% | 0.0% |
| 5B | 0.08 | 169.5% | 0.4% | 0.14 | 135.3% | 0.6% | 0.9% |
| 5D | 0.05 | 124.4% | 0.2% | 0.04 | 119.6% | 0.2% | 0.2% |
| 5E | 0.00 | 458.3% | 0.0% | 0.00 | 388.1% | 0.0% | 0.0% |
| 6A | 0.33 | 300.5% | 3.2% | 0.38 | 268.8% | 3.1% | 4.1% |
| **Total** | **30.23** | **34.2%** | **34.2%** | **32.82** | **29.3%** | **29.3%** | **36.3%** |

[a] the method for calculating trend uncertainty follows the EMEP/ EEA Guidebook (EMEP/EEA Guidebook, 2023)

### Carbon monoxide

Carbon monoxide emissions occur almost exclusively from combustion of fuels, particularly by road transport. Emission estimates for road transport are moderately uncertain, as measurements are quite limited on some vehicle types and emissions are highly variable between vehicles and for different traffic conditions.

Emissions from stationary combustion processes are also variable and depend on the technology employed and the specific combustion conditions. Emission estimates from small and medium-sized installations are derived from emission factors based on relatively few measurements of emissions from different types of boilers. As a result of the high uncertainty in emission data for major sources, emission estimates for CO are much more uncertain than other pollutants such as $NO_X$ and $SO_2$ which are also emitted mainly from major combustion processes. Unlike the case of $NO_X$ and NMVOCs, a few sources dominate the inventory and there is less scope for errors to average out when the uncertainties in different sources are aggregated.

Note that no Tier 1 uncertainties are computed for the UK inventory, and as such DG estimates of uncertainty are not provided for this pollutant.

### Nitrogen oxides

Uncertainty in $NO_X$ emission estimates are driven by uncertainty in emissions from fuel combustion (sector 1A). The estimates for 1A are subject to relatively low uncertainty compared with the estimates for other sectors and, because 1A dominates the inventory, the higher uncertainties for the other sectors have very little impact on the overall uncertainty. Sources within 1A that drive the uncertainty include:

- **Road transport**: While there is a high level of confidence in activity data, there is substantial uncertainty in the emission factors for different vehicles. The emission factors vary depending on vehicle type, catalyst technology and driving conditions amongst other factors. There is some uncertainty in choosing how the emission factors are applied to UK data, but also in the emission factors themselves, which are based on measurements which vary significantly even when conditions are kept constant.

- **Non-road mobile machinery**: While this is a relatively small source (compared to road transport or power generation), the emission factors have similar issues to the road transport sector. Additionally, activity data is believed to be less reliable and therefore a significant contributor to the uncertainty.

Emission estimates for large stationary combustion plants are assumed to be substantially less uncertain than the estimates for mobile sources or small stationary combustion. This is because there are a large number of sites for which independent emission estimates are available, and no one site dominates emissions, meaning the uncertainties partly average out. Many of the larger point-sources are commonly derived from continuous emission measurement data and hence are regarded to be good quality and have low uncertainty associated with them.

Table 20: Tier 1 uncertainties for nitrogen oxide emissions by NFR sector for each DG

| NFR sector | 2005 | | | 2024 | | | |
|---|---|---|---|---|---|---|---|
| | Emissions (kt) | Combined uncertainty for sector | Uncertainty as % of DG total | Emissions (kt) | Combined uncertainty for sector | Uncertainty as % of DG total | Uncertainty introduced into trend in DG total[a] |
| **England** | | | | | | | |
| 1A | 1224.09 | 6.6% | 6.5% | 368.15 | 8.7% | 8.3% | 2.4% |
| 1B | 0.55 | 23.9% | 0.0% | 0.25 | 47.9% | 0.0% | 0.0% |
| 2B | 1.32 | 27.5% | 0.0% | 0.53 | 52.6% | 0.1% | 0.0% |
| 2C | 1.09 | 24.3% | 0.0% | 0.27 | 39.6% | 0.0% | 0.0% |
| 2G | 0.09 | 91.5% | 0.0% | 0.03 | 75.1% | 0.0% | 0.0% |
| 2H | 0.02 | 65.0% | 0.0% | 0.00 | 0.0% | 0.0% | 0.0% |
| 3B | 1.19 | 67.3% | 0.1% | 0.97 | 72.8% | 0.2% | 0.0% |
| 3D | 17.01 | 54.0% | 0.7% | 13.45 | 63.2% | 2.2% | 0.4% |
| 5C | 1.75 | 29.0% | 0.0% | 1.58 | 31.4% | 0.1% | 0.0% |
| 5E | 0.33 | 73.4% | 0.0% | 0.15 | 58.6% | 0.0% | 0.0% |
| 6A | 0.28 | 115.0% | 0.0% | 0.30 | 113.5% | 0.1% | 0.0% |
| **Total** | **1247.72** | **6.5%** | **6.5%** | **385.68** | **8.6%** | **8.6%** | **2.4%** |
| **Scotland** | | | | | | | |
| 1A | 153.94 | 8.9% | 8.6% | 57.01 | 13.4% | 12.5% | 5.8% |
| 1B | 0.72 | 39.7% | 0.2% | 0.64 | 47.8% | 0.5% | 0.2% |
| 2B | 0.01 | 57.2% | 0.0% | 0.01 | 57.2% | 0.0% | 0.0% |
| 2C | 0.01 | 59.4% | 0.0% | 0.00 | 30.2% | 0.0% | 0.0% |
| 2G | 0.01 | 131.2% | 0.0% | 0.00 | 124.0% | 0.0% | 0.0% |
| 2H | 0.00 | 67.4% | 0.0% | 0.00 | 0.0% | 0.0% | 0.0% |
| 3B | 0.25 | 96.3% | 0.2% | 0.20 | 101.5% | 0.3% | 0.1% |
| 3D | 4.55 | 76.4% | 2.2% | 3.08 | 66.3% | 3.3% | 0.6% |
| 5C | 0.14 | 77.1% | 0.1% | 0.15 | 86.0% | 0.2% | 0.1% |
| 5E | 0.03 | 75.9% | 0.0% | 0.01 | 73.1% | 0.0% | 0.0% |
| 6A | 0.03 | 365.3% | 0.1% | 0.02 | 391.8% | 0.1% | 0.1% |
| **Total** | **159.69** | **8.8%** | **8.8%** | **61.13** | **12.9%** | **12.9%** | **5.8%** |
| **Wales** | | | | | | | |
| 1A | 94.46 | 9.6% | 9.2% | 30.44 | 13.4% | 12.3% | 5.0% |
| 1B | 0.10 | 17.7% | 0.0% | 0.00 | 37.8% | 0.0% | 0.0% |
| 2B | 0.02 | 57.2% | 0.0% | 0.03 | 57.2% | 0.0% | 0.0% |
| 2C | 0.52 | 19.3% | 0.1% | 0.19 | 28.5% | 0.2% | 0.0% |
| 2G | 0.01 | 155.9% | 0.0% | 0.00 | 152.8% | 0.0% | 0.0% |
| 2H | 0.00 | 70.3% | 0.0% | 0.00 | 0.0% | 0.0% | 0.0% |
| 3B | 0.21 | 100.9% | 0.2% | 0.19 | 104.1% | 0.6% | 0.2% |
| 3D | 3.02 | 99.6% | 3.1% | 2.19 | 88.7% | 5.9% | 0.8% |
| 5C | 0.10 | 97.3% | 0.1% | 0.07 | 128.8% | 0.3% | 0.1% |
| 5E | 0.02 | 77.9% | 0.0% | 0.01 | 83.2% | 0.0% | 0.0% |
| 6A | 0.03 | 334.4% | 0.1% | 0.03 | 359.4% | 0.3% | 0.1% |
| **Total** | **98.49** | **9.7%** | **9.7%** | **33.15** | **13.6%** | **13.6%** | **5.1%** |
| **Northern Ireland** | | | | | | | |
| 1A | 47.72 | 13.9% | 13.0% | 14.92 | 18.6% | 15.5% | 6.3% |
| 1B | 0.00 | 60.5% | 0.0% | 0.00 | 61.7% | 0.0% | 0.0% |

| NFR sector | 2005 | | | 2024 | | | |
|---|---|---|---|---|---|---|---|
| | Emissions (kt) | Combined uncertainty for sector | Uncertainty as % of DG total | Emissions (kt) | Combined uncertainty for sector | Uncertainty as % of DG total | Uncertainty introduced into trend in DG total[a] |
| 2B | 0.00 | 57.2% | 0.0% | 0.00 | 57.2% | 0.0% | 0.0% |
| 2G | 0.00 | 190.9% | 0.0% | 0.00 | 188.7% | 0.0% | 0.0% |
| 2H | 0.00 | 73.2% | 0.0% | 0.00 | 0.0% | 0.0% | 0.0% |
| 3B | 0.13 | 116.4% | 0.3% | 0.14 | 111.5% | 0.8% | 0.3% |
| 3D | 3.20 | 90.7% | 5.7% | 2.83 | 100.2% | 15.8% | 3.1% |
| 5C | 0.05 | 155.6% | 0.1% | 0.03 | 199.0% | 0.4% | 0.2% |
| 5E | 0.02 | 77.0% | 0.0% | 0.01 | 90.7% | 0.1% | 0.0% |
| 6A | 0.01 | 517.1% | 0.1% | 0.01 | 543.0% | 0.4% | 0.2% |
| **Total** | **51.13** | **14.2%** | **14.2%** | **17.94** | **22.1%** | **22.1%** | **7.1%** |

[a] the method for calculating trend uncertainty follows the EMEP/ EEA Guidebook (EMEP/EEA Guidebook, 2023)

### Non-methane volatile organic compounds

Emissions of NMVOC come from a broad range of independent sources. As with $NO_X$, this causes the uncertainty in national emissions to average out, which is responsible for the relatively low uncertainty in the NMVOC inventory compared with most other pollutants in the NAEI. However, there continues to be high uncertainty in the EFs for many sectors (e.g. solvent use and industrial processes) and a lack of reliable activity data for sources such as agriculture and NRMM, leading to a higher overall uncertainty than the $NO_X$ and $SO_2$ inventories.

Table 21: Tier 1 uncertainties for non-methane volatile organic compounds (NMVOCs) emissions by NFR sector for each DG

| NFR sector | 2005 | | | 2024 | | | |
|---|---|---|---|---|---|---|---|
| | Emissions (kt) | Combined uncertainty for sector | Uncertainty as % of DG total | Emissions (kt) | Combined uncertainty for sector | Uncertainty as % of DG total | Uncertainty introduced into trend in DG total[a] |
| **England** | | | | | | | |
| 1A | 269.07 | 18.0% | 5.3% | 74.57 | 14.5% | 2.2% | 2.4% |
| 1B | 161.41 | 27.7% | 4.9% | 48.38 | 22.3% | 2.2% | 2.1% |
| 2A | 1.88 | 37.6% | 0.1% | 0.74 | 33.8% | 0.1% | 0.0% |
| 2B | 30.30 | 56.5% | 1.9% | 3.98 | 55.1% | 0.4% | 0.8% |
| 2C | 1.08 | 83.5% | 0.1% | 0.22 | 78.3% | 0.0% | 0.0% |
| 2D | 323.14 | 11.0% | 3.9% | 245.09 | 15.7% | 7.8% | 3.7% |
| 2G | 0.22 | 197.1% | 0.0% | 0.08 | 164.5% | 0.0% | 0.0% |
| 2H | 31.29 | 152.9% | 5.3% | 31.52 | 187.6% | 12.0% | 3.8% |
| 2I | 1.33 | 121.3% | 0.2% | 1.08 | 121.3% | 0.3% | 0.1% |
| 3B | 46.69 | 146.4% | 7.5% | 44.13 | 143.2% | 12.8% | 3.7% |
| 3D | 27.23 | 145.4% | 4.4% | 34.30 | 147.3% | 10.2% | 3.7% |
| 5A | 4.68 | 34.3% | 0.2% | 1.23 | 34.3% | 0.1% | 0.1% |
| 5C | 6.17 | 68.1% | 0.5% | 6.50 | 74.0% | 1.0% | 0.6% |
| 5D | 0.06 | 121.1% | 0.0% | 0.07 | 118.6% | 0.0% | 0.0% |
| 5E | 2.06 | 89.8% | 0.2% | 1.17 | 106.8% | 0.3% | 0.1% |
| 6A | 1.22 | 116.6% | 0.2% | 1.35 | 116.6% | 0.3% | 0.1% |
| **Total** | **907.83** | **13.2%** | **13.2%** | **494.41** | **22.0%** | **22.0%** | **8.2%** |
| **Scotland** | | | | | | | |
| 1A | 29.36 | 18.7% | 3.0% | 10.28 | 20.8% | 1.4% | 2.4% |
| 1B | 43.02 | 56.9% | 13.5% | 9.09 | 38.1% | 2.3% | 9.6% |
| 2A | 0.02 | 69.7% | 0.0% | 0.01 | 71.3% | 0.0% | 0.0% |
| 2B | 7.17 | 57.2% | 2.3% | 3.23 | 57.2% | 1.2% | 0.9% |
| 2C | 0.01 | 80.6% | 0.0% | 0.00 | 84.0% | 0.0% | 0.0% |
| 2D | 31.04 | 24.1% | 4.1% | 23.27 | 31.9% | 4.9% | 5.3% |
| 2G | 0.02 | 220.4% | 0.0% | 0.01 | 194.2% | 0.0% | 0.0% |
| 2H | 50.80 | 21.9% | 6.2% | 90.29 | 21.3% | 12.6% | 8.5% |
| 2I | 0.10 | 226.7% | 0.1% | 0.07 | 234.3% | 0.1% | 0.1% |
| 3B | 11.67 | 138.5% | 8.9% | 9.64 | 131.0% | 8.3% | 3.8% |

| NFR sector | 2005 | | | 2024 | | | |
|---|---|---|---|---|---|---|---|
| | Emissions (kt) | Combined uncertainty for sector | Uncertainty as % of DG total | Emissions (kt) | Combined uncertainty for sector | Uncertainty as % of DG total | Uncertainty introduced into trend in DG total[a] |
| 3D | 5.87 | 101.0% | 3.3% | 4.95 | 80.6% | 2.6% | 0.9% |
| 5A | 0.56 | 56.9% | 0.2% | 0.15 | 57.1% | 0.1% | 0.1% |
| 5C | 0.61 | 159.4% | 0.5% | 0.98 | 151.2% | 1.0% | 1.1% |
| 5D | 0.00 | 127.8% | 0.0% | 0.00 | 123.1% | 0.0% | 0.0% |
| 5E | 0.21 | 96.7% | 0.1% | 0.11 | 126.2% | 0.1% | 0.1% |
| 6A | 0.11 | 179.9% | 0.1% | 0.09 | 187.6% | 0.1% | 0.1% |
| **Total** | **180.58** | **18.6%** | **18.6%** | **152.19** | **16.4%** | **16.4%** | **14.7%** |
| **Wales** | | | | | | | |
| 1A | 18.30 | 19.0% | 5.2% | 5.49 | 25.3% | 3.6% | 3.3% |
| 1B | 13.66 | 30.2% | 6.2% | 4.25 | 24.0% | 2.7% | 2.7% |
| 2A | 0.02 | 69.0% | 0.0% | 0.01 | 80.8% | 0.0% | 0.0% |
| 2B | 0.33 | 52.6% | 0.3% | 0.23 | 54.7% | 0.3% | 0.0% |
| 2C | 0.54 | 83.4% | 0.7% | 0.25 | 89.1% | 0.6% | 0.1% |
| 2D | 19.46 | 29.1% | 8.5% | 12.96 | 40.6% | 13.7% | 10.6% |
| 2G | 0.01 | 237.5% | 0.0% | 0.00 | 215.5% | 0.0% | 0.0% |
| 2H | 1.72 | 163.2% | 4.2% | 1.74 | 186.1% | 8.4% | 2.6% |
| 2I | 0.08 | 245.8% | 0.3% | 0.06 | 252.9% | 0.4% | 0.3% |
| 3B | 7.97 | 154.5% | 18.5% | 8.34 | 160.4% | 34.8% | 14.4% |
| 3D | 3.29 | 115.4% | 5.7% | 4.44 | 116.1% | 13.4% | 5.6% |
| 5A | 0.31 | 71.6% | 0.3% | 0.09 | 69.6% | 0.2% | 0.1% |
| 5C | 0.53 | 190.1% | 1.5% | 0.42 | 243.2% | 2.7% | 2.1% |
| 5D | 0.00 | 135.4% | 0.0% | 0.00 | 129.8% | 0.0% | 0.0% |
| 5E | 0.12 | 101.9% | 0.2% | 0.06 | 139.5% | 0.2% | 0.1% |
| 6A | 0.13 | 169.7% | 0.3% | 0.11 | 176.4% | 0.5% | 0.3% |
| **Total** | **66.47** | **23.1%** | **23.1%** | **38.45** | **40.9%** | **40.9%** | **19.5%** |
| **Northern Ireland** | | | | | | | |
| 1A | 10.97 | 22.8% | 5.8% | 3.44 | 33.1% | 3.3% | 4.7% |
| 1B | 1.58 | 39.8% | 1.5% | 0.75 | 33.0% | 0.7% | 0.7% |
| 2A | 0.00 | 380.2% | 0.0% | 0.00 | 110.2% | 0.0% | 0.0% |
| 2B | 0.07 | 57.2% | 0.1% | 0.06 | 57.2% | 0.1% | 0.0% |
| 2C | 0.00 | 93.9% | 0.0% | 0.00 | 95.1% | 0.0% | 0.0% |
| 2D | 10.37 | 41.6% | 10.1% | 7.91 | 51.8% | 11.8% | 13.1% |
| 2G | 0.01 | 264.2% | 0.0% | 0.00 | 244.6% | 0.0% | 0.0% |
| 2H | 3.48 | 61.6% | 5.0% | 3.72 | 69.5% | 7.4% | 5.3% |
| 2I | 0.05 | 308.7% | 0.3% | 0.05 | 270.8% | 0.4% | 0.4% |
| 3B | 10.04 | 149.1% | 35.0% | 11.40 | 151.9% | 49.7% | 24.2% |
| 3D | 5.44 | 153.4% | 19.5% | 6.97 | 136.6% | 27.4% | 10.5% |
| 5A | 0.25 | 78.5% | 0.5% | 0.06 | 79.4% | 0.1% | 0.2% |
| 5C | 0.33 | 247.8% | 1.9% | 0.29 | 290.0% | 2.4% | 2.8% |
| 5D | 0.00 | 156.1% | 0.0% | 0.00 | 145.6% | 0.0% | 0.0% |
| 5E | 0.13 | 146.7% | 0.5% | 0.10 | 162.7% | 0.5% | 0.3% |
| 6A | 0.06 | 231.2% | 0.3% | 0.05 | 240.3% | 0.4% | 0.4% |
| **Total** | **42.77** | **42.1%** | **42.1%** | **34.82** | **58.6%** | **58.6%** | **30.4%** |

[a] the method for calculating trend uncertainty follows the EMEP/ EEA Guidebook (EMEP/EEA Guidebook, 2023)

### Particulate matter

The emission inventory for $PM_{10}$ and $PM_{2.5}$ is subject to high uncertainty. This stems from both uncertainties in the emission factors and the activity data. For many source categories, emissions data and/or emission factors are available for total particulate matter only and emissions of $PM_{10}$ and $PM_{2.5}$ must be estimated based on assumptions about the size distribution of particle emissions from that source.

Many sources of particulate matter are diffuse or fugitive in nature e.g. emissions from agriculture, metal processing, or quarries. These emissions are difficult to measure, and in some cases have never been measured satisfactorily, leading to particularly high uncertainty in emission estimates for fugitive sources.



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Emission estimates for combustion of fuels are generally considered more reliable than those for industrial processes, quarrying and construction. Many parts of the inventory would need to be substantially improved before the overall uncertainty in PM could be reduced to the levels seen for $SO_2$, $NO_X$ or NMVOCs.

Table 22: Tier 1 uncertainties for $PM_{2.5}$ emissions by NFR sector for each DG

| NFR sector | 2005 | | | 2024 | | | |
|---|---|---|---|---|---|---|---|
| | Emissions (kt) | Combined uncertainty for sector | Uncertainty as % of DG total | Emissions (kt) | Combined uncertainty for sector | Uncertainty as % of DG total | Uncertainty introduced into trend in DG total[a] |
| **England** | | | | | | | |
| 1A | 54.04 | 13.9% | 10.0% | 25.63 | 32.9% | 21.2% | 9.7% |
| 1B | 0.80 | 334.9% | 3.6% | 0.57 | 474.2% | 6.8% | 1.7% |
| 2A | 5.60 | 119.2% | 8.9% | 3.21 | 124.2% | 10.0% | 1.1% |
| 2B | 0.40 | 72.4% | 0.4% | 0.10 | 389.0% | 1.0% | 0.5% |
| 2C | 2.75 | 156.8% | 5.7% | 0.53 | 205.0% | 2.7% | 1.6% |
| 2D | 0.45 | 227.0% | 1.4% | 0.44 | 202.6% | 2.3% | 0.5% |
| 2G | 2.09 | 203.3% | 5.6% | 0.71 | 191.3% | 3.4% | 1.2% |
| 2H | 0.49 | 484.7% | 3.2% | 0.35 | 495.0% | 4.3% | 0.6% |
| 2I | 0.80 | 246.0% | 2.6% | 0.72 | 246.0% | 4.5% | 1.2% |
| 3B | 1.43 | 219.0% | 4.2% | 1.24 | 217.5% | 6.8% | 1.7% |
| 3D | 0.55 | 312.7% | 2.3% | 0.54 | 318.2% | 4.3% | 1.1% |
| 5A | 0.00 | 62.3% | 0.0% | 0.00 | 62.3% | 0.0% | 0.0% |
| 5C | 4.15 | 95.7% | 5.3% | 4.57 | 97.5% | 11.2% | 6.7% |
| 5E | 1.71 | 260.4% | 5.9% | 1.02 | 319.1% | 8.2% | 2.1% |
| 6A | 0.02 | 1200.7% | 0.3% | 0.02 | 1211.6% | 0.7% | 0.2% |
| Total | 75.28 | 19.0% | 19.0% | 39.65 | 30.4% | 30.4% | 12.5% |
| **Scotland** | | | | | | | |
| 1A | 7.77 | 17.4% | 13.8% | 4.79 | 92.6% | 68.4% | 46.3% |
| 1B | 0.19 | 207.2% | 3.9% | 0.11 | 223.0% | 3.7% | 2.1% |
| 2A | 0.45 | 99.9% | 4.5% | 0.22 | 97.0% | 3.4% | 1.6% |
| 2B | 0.03 | 90.7% | 0.3% | 0.01 | 102.9% | 0.1% | 0.1% |
| 2C | 0.09 | 318.3% | 2.8% | 0.02 | 250.7% | 0.7% | 1.4% |
| 2D | 0.03 | 309.9% | 1.0% | 0.03 | 282.3% | 1.2% | 0.3% |
| 2G | 0.21 | 215.4% | 4.6% | 0.07 | 205.5% | 2.1% | 1.8% |
| 2H | 0.05 | 485.0% | 2.2% | 0.03 | 495.3% | 2.3% | 0.1% |
| 2I | 0.06 | 311.8% | 1.9% | 0.05 | 317.4% | 2.4% | 1.5% |
| 3B | 0.30 | 226.5% | 6.9% | 0.25 | 215.0% | 8.3% | 2.9% |
| 3D | 0.09 | 275.6% | 2.5% | 0.09 | 247.7% | 3.6% | 1.0% |
| 5A | 0.00 | 77.1% | 0.0% | 0.00 | 77.2% | 0.0% | 0.0% |
| 5C | 0.37 | 249.3% | 9.4% | 0.72 | 200.0% | 22.1% | 19.8% |
| 5E | 0.17 | 262.9% | 4.6% | 0.10 | 327.2% | 5.0% | 1.7% |
| 6A | 0.00 | 1322.9% | 0.3% | 0.00 | 1305.1% | 0.3% | 0.2% |
| Total | 9.79 | 20.7% | 20.7% | 6.48 | 72.9% | 72.9% | 50.6% |
| **Wales** | | | | | | | |
| 1A | 4.84 | 21.8% | 14.6% | 1.98 | 39.5% | 21.0% | 12.4% |
| 1B | 0.07 | 184.6% | 1.7% | 0.04 | 245.9% | 2.9% | 0.7% |
| 2A | 0.30 | 84.1% | 3.5% | 0.17 | 68.4% | 3.1% | 1.7% |
| 2B | 0.03 | 90.4% | 0.4% | 0.02 | 119.3% | 0.8% | 0.3% |
| 2C | 1.06 | 85.6% | 12.6% | 0.74 | 101.5% | 20.3% | 4.6% |
| 2D | 0.02 | 276.0% | 0.9% | 0.02 | 226.5% | 1.2% | 0.3% |
| 2G | 0.12 | 224.5% | 3.8% | 0.04 | 216.4% | 2.2% | 1.1% |
| 2H | 0.02 | 485.4% | 1.4% | 0.01 | 495.7% | 1.8% | 0.2% |
| 2I | 0.05 | 326.0% | 2.2% | 0.04 | 331.3% | 3.6% | 1.9% |
| 3B | 0.20 | 261.0% | 7.1% | 0.20 | 264.0% | 14.2% | 5.0% |
| 3D | 0.02 | 230.1% | 0.6% | 0.02 | 252.4% | 1.6% | 0.6% |
| 5A | 0.00 | 88.4% | 0.0% | 0.00 | 86.8% | 0.0% | 0.0% |
| 5C | 0.42 | 245.4% | 14.1% | 0.36 | 277.8% | 27.0% | 19.1% |
| 5E | 0.10 | 264.9% | 3.6% | 0.06 | 331.1% | 5.0% | 1.5% |
| 6A | 0.00 | 1285.9% | 0.4% | 0.00 | 1262.0% | 0.7% | 0.3% |
| Total | 7.26 | 25.9% | 25.9% | 3.72 | 43.0% | 43.0% | 24.0% |

| NFR sector | 2005 | | | 2024 | | | |
|---|---|---|---|---|---|---|---|
| | Emissions (kt) | Combined uncertainty for sector | Uncertainty as % of DG total | Emissions (kt) | Combined uncertainty for sector | Uncertainty as % of DG total | Uncertainty introduced into trend in DG total[a] |
| **Northern Ireland** | | | | | | | |
| 1A | 2.90 | 25.4% | 18.6% | 1.30 | 46.3% | 27.5% | 18.0% |
| 1B | 0.01 | 500.4% | 1.9% | 0.01 | 500.4% | 3.3% | 0.8% |
| 2A | 0.24 | 94.8% | 5.7% | 0.14 | 105.7% | 7.0% | 1.9% |
| 2B | 0.00 | 691.1% | 0.0% | 0.00 | 700.0% | 0.1% | 0.0% |
| 2C | 0.01 | 211.3% | 0.5% | 0.00 | 460.4% | 0.5% | 0.1% |
| 2D | 0.01 | 329.0% | 0.7% | 0.01 | 246.5% | 1.2% | 0.4% |
| 2G | 0.07 | 239.5% | 4.3% | 0.02 | 232.1% | 2.5% | 1.4% |
| 2H | 0.01 | 485.7% | 1.7% | 0.01 | 496.1% | 2.1% | 0.3% |
| 2I | 0.03 | 375.7% | 2.7% | 0.03 | 345.1% | 5.4% | 3.2% |
| 3B | 0.27 | 245.2% | 16.6% | 0.30 | 241.8% | 32.8% | 12.1% |
| 3D | 0.02 | 266.5% | 1.0% | 0.01 | 268.6% | 1.8% | 0.5% |
| 5A | 0.00 | 94.2% | 0.0% | 0.00 | 94.9% | 0.0% | 0.0% |
| 5C | 0.27 | 303.3% | 20.9% | 0.25 | 332.0% | 38.0% | 29.2% |
| 5E | 0.11 | 348.9% | 9.8% | 0.09 | 428.3% | 17.1% | 4.9% |
| 6A | 0.00 | 1481.7% | 0.4% | 0.00 | 1487.6% | 0.6% | 0.3% |
| **Total** | **3.96** | **34.9%** | **34.9%** | **2.19** | **60.6%** | **60.6%** | **37.0%** |

[a] the method for calculating trend uncertainty follows the EMEP/ EEA Guidebook (EMEP/EEA Guidebook, 2023)

Table 23: Tier 1 uncertainties for $PM_{10}$ emissions by NFR sector for each DG

| NFR sector | 2005 | | | 2024 | | | |
|---|---|---|---|---|---|---|---|
| | Emissions (kt) | Combined uncertainty for sector | Uncertainty as % of DG total | Emissions (kt) | Combined uncertainty for sector | Uncertainty as % of DG total | Uncertainty introduced into trend in DG total[a] |
| **England** | | | | | | | |
| 1A | 65.96 | 12.1% | 6.1% | 33.75 | 30.0% | 12.7% | 7.0% |
| 1B | 1.30 | 156.6% | 1.5% | 0.58 | 121.9% | 0.9% | 0.9% |
| 2A | 34.20 | 69.5% | 18.0% | 23.58 | 82.9% | 24.4% | 4.9% |
| 2B | 0.55 | 66.1% | 0.3% | 0.14 | 377.8% | 0.7% | 0.4% |
| 2C | 4.85 | 126.2% | 4.7% | 1.02 | 154.5% | 2.0% | 1.6% |
| 2D | 1.28 | 269.4% | 2.6% | 1.25 | 237.4% | 3.7% | 0.7% |
| 2G | 2.88 | 283.1% | 6.2% | 0.96 | 270.5% | 3.2% | 1.8% |
| 2H | 1.61 | 491.9% | 6.0% | 1.15 | 495.0% | 7.1% | 0.7% |
| 2I | 1.00 | 145.4% | 1.1% | 0.90 | 145.4% | 1.6% | 0.6% |
| 3B | 6.89 | 241.9% | 12.7% | 6.08 | 247.6% | 18.8% | 4.5% |
| 3D | 4.82 | 323.0% | 11.8% | 4.73 | 327.1% | 19.3% | 5.5% |
| 5A | 0.01 | 62.3% | 0.0% | 0.01 | 62.3% | 0.0% | 0.0% |
| 5C | 4.45 | 94.4% | 3.2% | 4.84 | 96.2% | 5.8% | 4.0% |
| 5E | 1.84 | 260.4% | 3.6% | 1.10 | 319.1% | 4.4% | 1.2% |
| 6A | 0.03 | 1200.7% | 0.3% | 0.04 | 1211.6% | 0.6% | 0.2% |
| **Total** | **131.67** | **28.2%** | **28.2%** | **80.14** | **40.2%** | **40.2%** | **12.2%** |
| **Scotland** | | | | | | | |
| 1A | 9.43 | 15.1% | 9.1% | 5.74 | 52.4% | 28.3% | 20.2% |
| 1B | 0.51 | 369.9% | 11.9% | 0.11 | 74.7% | 0.8% | 8.0% |
| 2A | 2.68 | 83.8% | 14.3% | 1.81 | 98.1% | 16.7% | 6.0% |
| 2B | 0.05 | 90.8% | 0.3% | 0.01 | 96.6% | 0.1% | 0.1% |
| 2C | 0.10 | 285.9% | 1.8% | 0.02 | 215.7% | 0.4% | 0.9% |
| 2D | 0.10 | 330.5% | 2.0% | 0.09 | 301.2% | 2.5% | 0.5% |
| 2G | 0.29 | 291.7% | 5.4% | 0.09 | 280.3% | 2.4% | 2.1% |
| 2H | 0.15 | 492.1% | 4.6% | 0.10 | 495.3% | 4.7% | 0.2% |
| 2I | 0.07 | 240.4% | 1.1% | 0.06 | 247.7% | 1.4% | 1.1% |
| 3B | 0.87 | 219.7% | 12.1% | 0.77 | 219.7% | 15.9% | 5.9% |



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| NFR sector | 2005 | | | 2024 | | | |
|---|---|---|---|---|---|---|---|
| | Emissions (kt) | Combined uncertainty for sector | Uncertainty as % of DG total | Emissions (kt) | Combined uncertainty for sector | Uncertainty as % of DG total | Uncertainty introduced into trend in DG total[a] |
| 3D | 0.90 | 282.8% | 16.2% | 0.95 | 264.1% | 23.6% | 8.5% |
| 5A | 0.00 | 77.1% | 0.0% | 0.00 | 77.2% | 0.0% | 0.0% |
| 5C | 0.40 | 245.9% | 6.2% | 0.76 | 198.5% | 14.1% | 12.9% |
| 5E | 0.19 | 262.9% | 3.1% | 0.11 | 327.2% | 3.3% | 1.2% |
| 6A | 0.00 | 1322.9% | 0.3% | 0.00 | 1305.1% | 0.3% | 0.2% |
| **Total** | **15.73** | **30.7%** | **30.7%** | **10.62** | **46.3%** | **46.3%** | **28.1%** |
| **Wales** | | | | | | | |
| 1A | 5.83 | 18.6% | 9.1% | 2.58 | 36.4% | 13.3% | 9.0% |
| 1B | 0.16 | 203.4% | 2.7% | 0.06 | 67.1% | 0.6% | 1.5% |
| 2A | 2.57 | 69.4% | 15.0% | 1.59 | 72.7% | 16.3% | 6.7% |
| 2B | 0.05 | 90.4% | 0.4% | 0.04 | 106.4% | 0.7% | 0.2% |
| 2C | 1.55 | 62.8% | 8.1% | 1.09 | 68.8% | 10.7% | 2.0% |
| 2D | 0.07 | 282.0% | 1.7% | 0.06 | 233.3% | 2.1% | 0.5% |
| 2G | 0.17 | 298.5% | 4.2% | 0.05 | 288.0% | 2.1% | 1.3% |
| 2H | 0.07 | 492.5% | 2.8% | 0.05 | 495.7% | 3.2% | 0.3% |
| 2I | 0.06 | 258.6% | 1.3% | 0.05 | 265.4% | 1.9% | 1.4% |
| 3B | 0.50 | 232.0% | 9.7% | 0.64 | 249.6% | 22.7% | 9.7% |
| 3D | 0.34 | 323.6% | 9.3% | 0.41 | 349.2% | 20.3% | 8.0% |
| 5A | 0.00 | 88.4% | 0.0% | 0.00 | 86.8% | 0.0% | 0.0% |
| 5C | 0.44 | 243.7% | 9.1% | 0.38 | 276.5% | 14.9% | 12.2% |
| 5E | 0.11 | 264.9% | 2.4% | 0.06 | 331.1% | 2.8% | 1.0% |
| 6A | 0.00 | 1285.9% | 0.4% | 0.00 | 1262.0% | 0.5% | 0.2% |
| **Total** | **11.92** | **26.1%** | **26.1%** | **7.07** | **41.7%** | **41.7%** | **21.1%** |
| **Northern Ireland** | | | | | | | |
| 1A | 3.44 | 22.3% | 10.9% | 1.65 | 43.2% | 15.0% | 11.8% |
| 1B | 0.02 | 129.9% | 0.3% | 0.02 | 129.9% | 0.4% | 0.1% |
| 2A | 1.83 | 71.9% | 18.7% | 1.16 | 73.6% | 18.1% | 9.4% |
| 2B | 0.00 | 696.4% | 0.0% | 0.00 | 700.0% | 0.0% | 0.0% |
| 2C | 0.02 | 144.2% | 0.4% | 0.00 | 421.8% | 0.2% | 0.2% |
| 2D | 0.03 | 349.2% | 1.4% | 0.03 | 258.7% | 1.8% | 0.7% |
| 2G | 0.10 | 309.7% | 4.3% | 0.03 | 299.5% | 2.0% | 1.7% |
| 2H | 0.04 | 492.9% | 3.1% | 0.03 | 496.1% | 3.3% | 0.2% |
| 2I | 0.03 | 319.0% | 1.6% | 0.04 | 282.4% | 2.6% | 2.2% |
| 3B | 0.86 | 255.2% | 31.3% | 1.15 | 245.5% | 59.6% | 24.5% |
| 3D | 0.26 | 369.8% | 13.8% | 0.26 | 369.0% | 20.2% | 5.7% |
| 5A | 0.00 | 94.2% | 0.0% | 0.00 | 94.9% | 0.0% | 0.0% |
| 5C | 0.29 | 302.4% | 12.4% | 0.26 | 330.7% | 18.4% | 17.2% |
| 5E | 0.12 | 348.9% | 5.9% | 0.09 | 428.3% | 8.5% | 2.5% |
| 6A | 0.00 | 1481.7% | 0.3% | 0.00 | 1487.6% | 0.5% | 0.3% |
| **Total** | **7.05** | **43.1%** | **43.1%** | **4.74** | **70.4%** | **70.4%** | **34.2%** |

[a] the method for calculating trend uncertainty follows the EMEP/ EEA Guidebook (EMEP/EEA Guidebook, 2023)

### Sulphur dioxide

Sulphur dioxide emission estimates are largely determined by the sulphur content of solid and liquid fuels. The inventory - which includes comprehensive analysis of UK produced coals and fuel oils consumed by power stations and the agriculture, industry and domestic sectors - therefore contains accurate emission estimates for key sources.

However, between 2005 and the latest year, regulations have been tightened to control the sulphur content of various fuels and it has become a requirement for $SO_2$ emissions from large emitters (e.g. power stations, refineries and steelworks) to be reported accurately. As a result, the contribution of those fuels and sectors to the national total has reduced.

At the same time, the relative contribution of fuels and sectors that are subject to less regulation and for which less detailed data are available (namely petroleum coke used in the domestic sector) has increased. These sources have much higher uncertainty and help to increase the overall uncertainty in the latest year compared to 2005.

Table 24: Tier 1 uncertainties for sulphur dioxide ($SO_2$) emissions by NFR sector for each DG

| NFR sector | 2005 | | | 2024 | | | |
|---|---|---|---|---|---|---|---|
| | Emissions (kt) | Combined uncertainty for sector | Uncertainty as % of DG total | Emissions (kt) | Combined uncertainty for sector | Uncertainty as % of DG total | Uncertainty introduced into trend in DG total[a] |
| **England** | | | | | | | |
| 1A | 509.47 | 6.3% | 5.8% | 49.26 | 18.3% | 14.8% | 1.4% |
| 1B | 6.98 | 13.7% | 0.2% | 6.09 | 29.7% | 3.0% | 0.3% |
| 2A | 17.17 | 14.1% | 0.4% | 3.15 | 14.1% | 0.7% | 0.1% |
| 2B | 7.37 | 22.7% | 0.3% | 0.32 | 33.0% | 0.2% | 0.0% |
| 2C | 4.49 | 15.0% | 0.1% | 0.77 | 38.3% | 0.5% | 0.0% |
| 2G | 0.68 | 77.2% | 0.1% | 0.67 | 75.9% | 0.8% | 0.1% |
| 2H | 0.06 | 97.3% | 0.0% | 0.00 | 0.0% | 0.0% | 0.0% |
| 5C | 0.75 | 105.9% | 0.1% | 0.46 | 155.7% | 1.2% | 0.1% |
| 5E | 0.00 | 139.1% | 0.0% | 0.00 | 115.4% | 0.0% | 0.0% |
| **Total** | **546.98** | **5.9%** | **5.9%** | **60.74** | **15.2%** | **15.2%** | **1.5%** |
| **Scotland** | | | | | | | |
| 1A | 79.88 | 7.6% | 7.4% | 9.67 | 19.0% | 17.9% | 2.4% |
| 1B | 0.41 | 151.2% | 0.8% | 0.09 | 50.5% | 0.4% | 0.1% |
| 2B | 0.00 | 30.0% | 0.0% | 0.00 | 50.0% | 0.0% | 0.0% |
| 2C | 0.74 | 25.2% | 0.2% | 0.37 | 12.1% | 0.4% | 0.1% |
| 2G | 0.06 | 241.4% | 0.2% | 0.07 | 231.1% | 1.5% | 0.3% |
| 2H | 0.01 | 98.9% | 0.0% | 0.00 | 0.0% | 0.0% | 0.0% |
| 5C | 0.08 | 144.5% | 0.1% | 0.05 | 208.4% | 1.0% | 0.1% |
| 5E | 0.00 | 172.7% | 0.0% | 0.00 | 156.5% | 0.0% | 0.0% |
| **Total** | **81.18** | **7.5%** | **7.5%** | **10.25** | **18.0%** | **18.0%** | **2.5%** |
| **Wales** | | | | | | | |
| 1A | 52.77 | 7.9% | 7.5% | 5.48 | 15.6% | 12.6% | 1.7% |
| 1B | 1.03 | 13.0% | 0.2% | 0.94 | 28.6% | 4.0% | 0.5% |
| 2B | 0.01 | 30.0% | 0.0% | 0.00 | 0.0% | 0.0% | 0.0% |
| 2C | 2.29 | 15.8% | 0.6% | 0.30 | 42.5% | 1.9% | 0.2% |
| 2G | 0.04 | 309.2% | 0.2% | 0.04 | 312.7% | 1.7% | 0.3% |
| 2H | 0.00 | 101.0% | 0.0% | 0.00 | 0.0% | 0.0% | 0.0% |
| 5C | 0.04 | 137.2% | 0.1% | 0.02 | 115.9% | 0.3% | 0.0% |
| 5E | 0.00 | 195.5% | 0.0% | 0.00 | 184.3% | 0.0% | 0.0% |
| **Total** | **56.19** | **7.5%** | **7.5%** | **6.77** | **13.5%** | **13.5%** | **1.8%** |
| **Northern Ireland** | | | | | | | |
| 1A | 22.62 | 10.4% | 10.4% | 3.02 | 29.7% | 29.3% | 4.2% |
| 2B | 0.00 | 30.0% | 0.0% | 0.00 | 0.0% | 0.0% | 0.0% |
| 2G | 0.02 | 389.1% | 0.4% | 0.02 | 380.8% | 3.1% | 0.6% |
| 2H | 0.00 | 103.0% | 0.0% | 0.00 | 0.0% | 0.0% | 0.0% |
| 5C | 0.02 | 163.8% | 0.2% | 0.01 | 156.6% | 0.6% | 0.1% |
| 5E | 0.00 | 166.5% | 0.0% | 0.00 | 148.1% | 0.0% | 0.0% |
| **Total** | **22.67** | **10.4%** | **10.4%** | **3.05** | **29.5%** | **29.5%** | **4.2%** |

[a] the method for calculating trend uncertainty follows the EMEP/ EEA Guidebook (EMEP/EEA Guidebook, 2023)

### Lead

The Pb inventory is more uncertain than $SO_2$ and $NO_X$ inventories. The metal processing industries are mainly regulated under the Environmental Permitting Regulations (EPR) and the estimates provided by plant operators to the regulatory agencies and used in the national inventories are based on emission measurements or emission factors that have been researched for the specific process type. There is a moderate level of uncertainty associated with these annual emission estimates due to the discrete nature of the stack emissions monitoring techniques and determination of mass emission flow rates from point sources. Furthermore, the variability of lead content of raw materials such as fuels (e.g. coal) is such that the discrete Pb emission measurements only provide a snap-shot of the process and plant performance, and



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there is some uncertainty about how representative that result may be for use in scaling up to provide annual emission estimates.

These uncertainties are inherent within the inventories from environmental regulators of EPR industries and are unavoidable; the emissions data from EPR-regulated installations used in the compilation of these DG inventories are subject to a managed process of quality checking by the environmental regulatory agencies and are regarded as the best data available for inventory compilation.

The observed year-to-year variations in emission estimates are based on actual trends reported by plant operators and may reflect changes in lead content of raw materials. The uncertainty in emission monitoring applies to all pollutants to some degree, but more so for pollutants such as Pb for which (i) no continuous emission monitoring systems are available, and (ii) where fuel composition is known to be highly variable depending on the fuel source. This is not the case for species such as $NO_X$ and $SO_2$ where many regulated sites will use Continuous Emission Monitoring Systems and the fuel elemental composition is either not a significant factor in process emissions or does not vary as much as for heavy metals and other trace contaminants.

The emission estimates of Pb from other smaller-scale combustion and process sources from industrial and commercial activities are less well documented and the estimates are based on emission factors that are less certain than those based on regulatory emissions monitoring and reporting.

Table 25: Tier 1 uncertainties for lead emissions by NFR sector for each DG

| NFR sector | 2005 | | | 2024 | | | |
|---|---|---|---|---|---|---|---|
| | Emissions (t) | Combined uncertainty for sector | Uncertainty as % of DG total | Emissions (t) | Combined uncertainty for sector | Uncertainty as % of DG total | Uncertainty introduced into trend in DG total[a] |
| **England** | | | | | | | |
| 1A | 96.88 | 83.0% | 48.8% | 66.19 | 103.3% | 71.3% | 17.6% |
| 1B | 1.92 | 103.7% | 1.2% | 0.06 | 128.5% | 0.1% | 0.9% |
| 2A | 0.54 | 68.2% | 0.2% | 0.16 | 95.3% | 0.2% | 0.1% |
| 2B | 13.14 | 50.2% | 4.0% | 0.87 | 77.6% | 0.7% | 2.8% |
| 2C | 37.00 | 101.8% | 22.9% | 21.98 | 108.7% | 24.9% | 6.6% |
| 2G | 12.86 | 182.9% | 14.3% | 4.12 | 182.6% | 7.8% | 3.9% |
| 2I | 2.17 | 92.5% | 1.2% | 2.30 | 92.5% | 2.2% | 1.2% |
| 5C | 0.24 | 63.2% | 0.1% | 0.14 | 71.5% | 0.1% | 0.0% |
| 5E | 0.03 | 330.2% | 0.1% | 0.03 | 276.9% | 0.1% | 0.0% |
| **Total** | **164.79** | **55.9%** | **55.9%** | **95.85** | **76.0%** | **76.0%** | **19.5%** |
| **Scotland** | | | | | | | |
| 1A | 11.96 | 81.3% | 68.4% | 7.97 | 99.3% | 91.4% | 36.6% |
| 2A | 0.10 | 92.2% | 0.6% | 0.01 | 106.7% | 0.2% | 0.4% |
| 2C | 0.69 | 431.1% | 20.9% | 0.13 | 433.8% | 6.4% | 8.8% |
| 2G | 1.30 | 207.8% | 19.0% | 0.39 | 209.6% | 9.4% | 6.6% |
| 2I | 0.16 | 212.6% | 2.4% | 0.16 | 220.8% | 4.0% | 3.2% |
| 5C | 0.01 | 190.8% | 0.2% | 0.00 | 209.5% | 0.1% | 0.1% |
| 5E | 0.00 | 345.7% | 0.1% | 0.00 | 296.4% | 0.1% | 0.0% |
| **Total** | **14.22** | **74.0%** | **74.0%** | **8.66** | **92.2%** | **92.2%** | **38.3%** |
| **Wales** | | | | | | | |
| 1A | 8.16 | 75.1% | 24.0% | 3.93 | 124.6% | 34.0% | 14.0% |
| 1B | 0.40 | 107.1% | 1.7% | 0.05 | 115.3% | 0.4% | 1.0% |
| 2A | 0.01 | 181.8% | 0.0% | 0.01 | 111.6% | 0.1% | 0.0% |
| 2B | 0.71 | 135.0% | 3.8% | 0.06 | 240.0% | 0.9% | 3.2% |
| 2C | 15.33 | 108.9% | 65.5% | 9.99 | 117.8% | 81.8% | 10.6% |
| 2G | 0.75 | 225.8% | 6.7% | 0.22 | 229.4% | 3.6% | 2.3% |
| 2I | 0.13 | 233.0% | 1.2% | 0.13 | 240.4% | 2.2% | 1.6% |
| 5C | 0.02 | 117.1% | 0.1% | 0.00 | 234.6% | 0.0% | 0.0% |
| 5E | 0.00 | 357.7% | 0.0% | 0.00 | 311.9% | 0.0% | 0.0% |
| **Total** | **25.52** | **70.2%** | **70.2%** | **14.39** | **88.7%** | **88.7%** | **18.1%** |
| **Northern Ireland** | | | | | | | |
| 1A | 3.79 | 113.1% | 97.0% | 2.57 | 148.2% | 133.3% | 50.0% |

| NFR sector | 2005 | | | 2024 | | | |
|---|---|---|---|---|---|---|---|
| | Emissions (t) | Combined uncertainty for sector | Uncertainty as % of DG total | Emissions (t) | Combined uncertainty for sector | Uncertainty as % of DG total | Uncertainty introduced into trend in DG total[a] |
| 2A | 0.02 | 114.9% | 0.6% | 0.00 | 129.1% | 0.2% | 0.3% |
| 2C | 0.08 | 269.9% | 4.8% | 0.03 | 384.7% | 4.5% | 0.7% |
| 2G | 0.44 | 253.7% | 25.2% | 0.14 | 256.7% | 12.2% | 10.0% |
| 2I | 0.08 | 298.6% | 5.1% | 0.11 | 259.1% | 9.9% | 8.8% |
| 5C | 0.01 | 270.9% | 0.4% | 0.00 | 287.9% | 0.1% | 0.2% |
| 5E | 0.00 | 342.7% | 0.3% | 0.00 | 292.0% | 0.4% | 0.2% |
| **Total** | **4.42** | **100.5%** | **100.5%** | **2.86** | **134.3%** | **134.3%** | **51.8%** |

[a] the method for calculating trend uncertainty follows the EMEP/ EEA Guidebook (EMEP/EEA Guidebook, 2023)



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# APPENDIX F: SUMMARY TABLES

In these tables, 'Other' is inclusive of categories which are considered to contribute negligible emissions for a given pollutant. For example, in the case of nitrogen oxides, the 'Other' sector includes emissions from the industrial processes, waste, and other categories. The allocations of categories to the "Other" sector is presented in **Table 32**.

A full dataset is published alongside this report, available to download from the NAEI website.

## SUMMARY AIR POLLUTANT EMISSION ESTIMATES FOR ENGLAND

Table 26: Summary of Air Pollutant Emissions Estimates for England (2005, 2010, 2015, 2020-2024)*

| Pollutant | Sector | 2005 | 2010 | 2015 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|
| **$NH_3$ (kt)** | Transport Sources | 14.27 | 9.15 | 5.11 | 3.26 | 3.62 | 3.92 | 3.96 | 3.93 |
| | Residential, Commercial & Public Sector Combustion | 0.18 | 0.18 | 0.23 | 0.27 | 0.28 | 0.27 | 0.26 | 0.27 |
| | Agriculture | 157.60 | 150.86 | 159.49 | 149.02 | 153.22 | 149.13 | 151.04 | 143.87 |
| | Industrial Processes | 5.50 | 4.45 | 2.21 | 2.46 | 2.52 | 1.75 | 1.77 | 1.77 |
| | Waste | 5.02 | 5.09 | 6.43 | 6.56 | 6.73 | 6.26 | 6.27 | 6.15 |
| | Other | 9.75 | 10.41 | 10.98 | 11.15 | 11.83 | 12.09 | 11.96 | 12.46 |
| | **Total** | **192.32** | **180.15** | **184.44** | **172.73** | **178.20** | **173.41** | **175.27** | **168.45** |
| **CO (kt)** | Energy Industries | 67.35 | 60.94 | 54.00 | 39.44 | 42.39 | 34.93 | 31.37 | 34.00 |
| | Industrial Combustion | 588.55 | 343.92 | 378.01 | 321.68 | 337.07 | 335.46 | 326.09 | 317.24 |
| | Transport Sources | 1,389.56 | 732.51 | 421.20 | 207.78 | 227.50 | 232.42 | 231.11 | 227.11 |
| | Residential, Commercial & Public Sector Combustion | 249.32 | 239.92 | 232.45 | 235.76 | 243.89 | 239.35 | 223.26 | 216.01 |
| | Industrial Processes | 100.81 | 77.02 | 65.75 | 55.65 | 52.53 | 42.46 | 38.58 | 38.98 |

| Pollutant | Sector | 2005 | 2010 | 2015 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|
| | Fugitive | 5.04 | 4.65 | 2.88 | 1.89 | 1.85 | 1.73 | 1.36 | 1.42 |
| | Waste | 30.02 | 28.88 | 28.59 | 27.98 | 28.17 | 27.47 | 27.24 | 27.34 |
| | Other | 4.68 | 4.79 | 2.84 | 2.34 | 2.47 | 2.51 | 2.34 | 1.79 |
| | **Total** | **2,435.31** | **1,492.63** | **1,185.72** | **892.51** | **935.87** | **916.33** | **881.36** | **863.90** |
| **$NO_x$ (kt)** | Energy Industries | 344.30 | 208.35 | 148.18 | 65.23 | 63.53 | 61.39 | 57.69 | 54.81 |
| | Industrial Combustion | 164.66 | 97.02 | 92.38 | 74.53 | 71.98 | 71.53 | 65.84 | 63.36 |
| | Transport Sources | 566.98 | 407.64 | 344.66 | 200.18 | 204.87 | 206.18 | 190.28 | 180.16 |
| | Residential, Commercial & Public Sector Combustion | 135.64 | 111.67 | 87.78 | 76.15 | 77.52 | 65.31 | 64.22 | 65.01 |
| | Agriculture | 18.20 | 17.33 | 18.36 | 16.62 | 17.02 | 15.74 | 15.47 | 14.42 |
| | Fugitive | 0.50 | 0.54 | 0.17 | 0.23 | 0.11 | 0.16 | 0.28 | 0.24 |
| | Other | 17.44 | 16.31 | 10.06 | 8.42 | 9.93 | 9.00 | 9.08 | 7.67 |
| | **Total** | **1,247.72** | **858.86** | **701.58** | **441.35** | **444.96** | **429.32** | **402.86** | **385.68** |
| **NMVOC (kt)** | Energy Industries | 4.81 | 3.99 | 2.73 | 1.86 | 2.09 | 2.42 | 2.05 | 1.70 |
| | Industrial Combustion | 26.30 | 17.83 | 15.85 | 14.18 | 15.25 | 14.29 | 13.50 | 12.57 |
| | Transport Sources | 195.78 | 91.82 | 54.04 | 31.39 | 33.41 | 34.71 | 34.40 | 34.30 |
| | Solvent Processes | 323.14 | 278.46 | 271.78 | 272.50 | 258.12 | 239.44 | 248.32 | 245.09 |
| | Residential, Commercial & Public Sector Combustion | 41.33 | 33.29 | 28.70 | 28.55 | 29.95 | 29.10 | 27.02 | 25.67 |
| | Agriculture | 73.92 | 72.97 | 77.31 | 82.78 | 85.28 | 85.86 | 81.16 | 78.43 |



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| Pollutant | Sector | 2005 | 2010 | 2015 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|
| | Industrial Processes | 66.09 | 49.74 | 42.28 | 41.41 | 40.46 | 38.58 | 37.38 | 37.62 |
| | Fugitive | 161.41 | 95.51 | 66.41 | 46.38 | 47.84 | 49.78 | 52.15 | 48.38 |
| | Other | 15.04 | 12.84 | 11.37 | 11.13 | 11.07 | 10.86 | 10.77 | 10.65 |
| | **Total** | **907.83** | **656.45** | **570.50** | **530.18** | **523.47** | **505.04** | **506.75** | **494.41** |
| **$PM_{10}$ (kt)** | Energy Industries | 8.30 | 5.45 | 4.64 | 1.72 | 1.46 | 1.38 | 1.23 | 1.39 |
| | Industrial Combustion | 9.75 | 7.53 | 6.94 | 5.23 | 5.98 | 5.30 | 4.68 | 3.72 |
| | Transport Sources | 32.44 | 26.76 | 22.82 | 16.19 | 17.57 | 18.31 | 18.10 | 18.00 |
| | Residential, Commercial & Public Sector Combustion | 14.93 | 13.03 | 12.50 | 12.66 | 12.56 | 11.44 | 11.10 | 10.52 |
| | Agriculture | 11.71 | 11.52 | 11.42 | 11.29 | 11.80 | 11.47 | 10.95 | 10.81 |
| | Industrial Processes | 45.09 | 37.30 | 33.11 | 27.51 | 32.89 | 34.20 | 29.64 | 27.76 |
| | Fugitive | 1.30 | 1.40 | 0.98 | 0.65 | 0.63 | 0.62 | 0.60 | 0.58 |
| | Waste | 6.29 | 5.97 | 6.02 | 6.11 | 6.15 | 5.99 | 5.92 | 5.95 |
| | Other | 1.85 | 1.41 | 1.58 | 1.46 | 1.63 | 1.50 | 1.50 | 1.40 |
| | **Total** | **131.67** | **110.37** | **100.01** | **82.82** | **90.68** | **90.21** | **83.72** | **80.14** |
| **$SO_2$ (kt)** | Energy Industries | 358.02 | 150.18 | 91.34 | 24.33 | 22.50 | 20.18 | 19.98 | 19.03 |
| | Industrial Combustion | 103.01 | 87.22 | 48.72 | 29.60 | 25.39 | 22.76 | 21.08 | 15.99 |
| | Transport Sources | 17.40 | 6.22 | 4.11 | 1.57 | 1.46 | 1.92 | 1.79 | 1.63 |
| | Residential, Commercial & Public Sector Combustion | 25.86 | 19.84 | 11.96 | 10.75 | 10.75 | 13.14 | 12.13 | 12.40 |
| | Industrial Processes | 29.77 | 11.42 | 7.04 | 5.18 | 5.58 | 7.39 | 6.35 | 4.92 |

| Pollutant | Sector | 2005 | 2010 | 2015 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|
| | Fugitive | 6.98 | 16.20 | 11.18 | 6.17 | 5.71 | 5.35 | 5.20 | 6.09 |
| | Other | 5.93 | 1.94 | 1.35 | 0.82 | 0.76 | 0.75 | 0.82 | 0.68 |
| | **Total** | **546.98** | **293.02** | **175.70** | **78.41** | **72.16** | **71.48** | **67.35** | **60.74** |
| **Pb (t)** | Energy Industries | 8.77 | 2.10 | 2.38 | 1.89 | 1.83 | 2.01 | 2.09 | 3.92 |
| | Industrial Combustion | 11.43 | 11.20 | 13.04 | 9.47 | 9.63 | 9.35 | 9.41 | 8.51 |
| | Transport Sources | 72.26 | 52.86 | 49.47 | 37.14 | 46.28 | 49.99 | 51.42 | 51.12 |
| | Residential, Commercial & Public Sector Combustion | 2.95 | 2.63 | 2.12 | 2.21 | 2.34 | 2.31 | 2.09 | 2.14 |
| | Industrial Processes | 65.72 | 31.77 | 35.87 | 23.31 | 31.87 | 41.71 | 31.75 | 29.42 |
| | Fugitive | 1.92 | 1.67 | 1.03 | 0.30 | 0.26 | 0.22 | 0.13 | 0.06 |
| | Other | 1.75 | 0.64 | 0.26 | 4.87 | 1.88 | 1.02 | 0.77 | 0.66 |
| | **Total** | **164.79** | **102.88** | **104.17** | **79.19** | **94.08** | **106.60** | **97.66** | **95.85** |
| **$PM_{2.5}$ (kt)** | Energy Industries | 5.05 | 3.57 | 2.96 | 1.40 | 1.20 | 1.14 | 1.02 | 1.15 |
| | Industrial Combustion | 8.77 | 6.71 | 6.06 | 4.82 | 5.52 | 4.89 | 4.36 | 3.41 |
| | Transport Sources | 25.20 | 19.74 | 15.52 | 10.04 | 10.81 | 11.17 | 10.92 | 10.81 |
| | Residential, Commercial & Public Sector Combustion | 14.52 | 12.67 | 12.20 | 12.28 | 12.16 | 11.05 | 10.74 | 10.15 |
| | Agriculture | 1.98 | 1.93 | 1.91 | 1.85 | 1.91 | 1.87 | 1.80 | 1.78 |
| | Industrial Processes | 12.12 | 9.00 | 8.80 | 6.62 | 7.30 | 7.71 | 6.48 | 5.62 |
| | Fugitive | 0.80 | 0.87 | 0.71 | 0.60 | 0.59 | 0.59 | 0.58 | 0.57 |



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| Pollutant | Sector | 2005 | 2010 | 2015 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|
| | Waste | 5.86 | 5.58 | 5.64 | 5.76 | 5.80 | 5.63 | 5.57 | 5.60 |
| | Other | 0.97 | 0.69 | 0.66 | 0.59 | 0.67 | 0.62 | 0.62 | 0.58 |
| | **Total** | **75.28** | **60.76** | **54.46** | **43.96** | **45.96** | **44.67** | **42.09** | **39.65** |
| **B[a]P (kg)** | Energy Industries | 68.82 | 70.25 | 168.31 | 204.82 | 217.12 | 182.93 | 169.89 | 208.80 |
| | Industrial Combustion | 37.43 | 32.97 | 28.30 | 26.65 | 27.35 | 23.82 | 25.60 | 27.37 |
| | Transport Sources | 191.39 | 145.91 | 131.59 | 100.64 | 110.99 | 118.88 | 119.05 | 119.34 |
| | Residential, Commercial & Public Sector Combustion | 2,345.11 | 2,026.06 | 2,185.62 | 2,594.49 | 2,988.67 | 3,344.04 | 3,445.62 | 3,298.96 |
| | Industrial Processes | 136.29 | 93.80 | 98.76 | 72.14 | 44.74 | 43.45 | 40.88 | 39.32 |
| | Fugitive | 63.64 | 80.50 | 52.47 | 20.72 | 18.29 | 13.04 | 6.66 | 0.99 |
| | Waste | 748.43 | 257.40 | 259.66 | 264.10 | 266.42 | 257.87 | 254.60 | 254.12 |
| | Other | 9.29 | 6.93 | 7.06 | 7.52 | 8.85 | 7.53 | 7.43 | 6.59 |
| | **Total** | **3,600.39** | **2,713.81** | **2,931.77** | **3,291.08** | **3,682.42** | **3,991.56** | **4,069.73** | **3,955.49** |
| **PCDD/Fs (g-ITEQ)** | Energy Industries | 5.14 | 2.63 | 10.22 | 1.60 | 1.86 | 3.04 | 2.94 | 3.52 |
| | Industrial Combustion | 9.27 | 15.81 | 14.46 | 13.80 | 14.88 | 13.57 | 11.73 | 11.66 |
| | Transport Sources | 16.55 | 14.69 | 9.59 | 4.27 | 4.30 | 4.21 | 3.90 | 3.63 |
| | Residential, Commercial & Public Sector Combustion | 11.07 | 8.79 | 11.30 | 14.73 | 17.16 | 18.50 | 18.12 | 18.08 |
| | Industrial Processes | 29.52 | 30.92 | 13.89 | 8.16 | 6.34 | 19.84 | 7.49 | 4.54 |
| | Waste | 75.49 | 37.51 | 31.64 | 28.97 | 29.08 | 29.63 | 29.16 | 29.09 |
| | Other | 0.59 | 0.50 | 0.38 | 0.30 | 0.31 | 0.28 | 0.23 | 0.13 |

| Pollutant | Sector | 2005 | 2010 | 2015 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|
| | **Total** | **147.62** | **110.86** | **91.47** | **71.84** | **73.93** | **89.08** | **73.56** | **70.65** |
| **Hg (t)** | Energy Industries | 1.99 | 1.52 | 1.10 | 0.69 | 0.76 | 0.66 | 0.65 | 0.76 |
| | Industrial Combustion | 1.02 | 1.10 | 0.93 | 0.70 | 0.71 | 0.65 | 0.69 | 0.58 |
| | Transport Sources | 0.25 | 0.22 | 0.22 | 0.18 | 0.19 | 0.20 | 0.20 | 0.20 |
| | Residential, Commercial & Public Sector Combustion | 0.39 | 0.34 | 0.26 | 0.25 | 0.26 | 0.25 | 0.23 | 0.22 |
| | Industrial Processes | 1.73 | 1.25 | 0.81 | 0.35 | 0.33 | 0.29 | 0.25 | 0.25 |
| | Waste | 1.18 | 1.22 | 0.79 | 0.69 | 0.62 | 0.71 | 0.60 | 0.60 |
| | Other | 0.03 | 0.02 | 0.01 | 0.007 | 0.008 | 0.007 | 0.006 | 0.005 |
| | **Total** | **6.58** | **5.68** | **4.12** | **2.85** | **2.89** | **2.78** | **2.62** | **2.62** |

* The uncertainties in the data may be greater than the precision indicated by the table above. Some values are shown with additional decimal places for transparency; however this does not imply greater precision.



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# SUMMARY AIR POLLUTANT EMISSION ESTIMATES FOR SCOTLAND

Table 27: Summary of Air Pollutant Emissions Estimates for Scotland (2005, 2010, 2015, 2020-2024)*

| Pollutant | Sector | 2005 | 2010 | 2015 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|
| $NH_3$ (kt) | Transport Sources | 1.45 | 0.92 | 0.51 | 0.31 | 0.35 | 0.39 | 0.40 | 0.40 |
| | Residential, Commercial & Public Sector Combustion | 0.02 | 0.02 | 0.02 | 0.03 | 0.03 | 0.04 | 0.04 | 0.05 |
| | Agriculture | 33.12 | 30.78 | 31.40 | 30.68 | 30.37 | 29.77 | 30.39 | 29.00 |
| | Industrial Processes | 0.09 | 0.07 | 0.05 | 0.05 | 0.06 | 0.06 | 0.04 | 0.04 |
| | Waste | 0.50 | 0.50 | 0.61 | 0.60 | 0.62 | 0.58 | 0.58 | 0.56 |
| | Other | 0.95 | 0.93 | 0.94 | 0.95 | 1.01 | 1.04 | 1.04 | 1.12 |
| | **Total** | **36.13** | **33.22** | **33.53** | **32.63** | **32.46** | **31.87** | **32.49** | **31.18** |
| CO (kt) | Energy Industries | 10.37 | 12.31 | 6.68 | 2.50 | 2.79 | 2.47 | 2.19 | 1.99 |
| | Industrial Combustion | 42.69 | 28.57 | 29.52 | 28.60 | 29.72 | 30.12 | 34.42 | 42.05 |
| | Transport Sources | 134.97 | 73.98 | 43.38 | 20.89 | 23.93 | 24.35 | 24.11 | 24.05 |
| | Residential, Commercial & Public Sector Combustion | 31.54 | 31.48 | 26.94 | 20.31 | 25.32 | 28.87 | 30.77 | 29.50 |
| | Industrial Processes | 0.41 | 3.41 | 2.42 | 1.83 | 1.92 | 1.61 | 1.49 | 1.48 |
| | Fugitive | 0.96 | 0.91 | 1.17 | 1.22 | 1.10 | 1.13 | 1.17 | 1.29 |
| | Waste | 2.87 | 2.74 | 2.69 | 2.58 | 3.08 | 3.47 | 3.89 | 3.88 |
| | Other | 0.43 | 0.44 | 0.26 | 0.20 | 0.22 | 0.22 | 0.21 | 0.16 |
| | **Total** | **224.25** | **153.85** | **113.07** | **78.13** | **88.06** | **92.24** | **98.25** | **104.40** |
| $NO_x$ (kt) | Energy Industries | 43.63 | 38.00 | 24.46 | 8.08 | 9.30 | 7.56 | 6.83 | 6.54 |

| Pollutant | Sector | 2005 | 2010 | 2015 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|
| | Industrial Combustion | 15.99 | 10.11 | 9.03 | 7.86 | 7.54 | 7.97 | 8.78 | 10.83 |
| | Transport Sources | 72.81 | 53.71 | 49.04 | 29.78 | 31.37 | 31.90 | 30.00 | 28.81 |
| | Residential, Commercial & Public Sector Combustion | 20.37 | 17.21 | 14.21 | 10.60 | 10.86 | 9.60 | 9.87 | 10.42 |
| | Agriculture | 4.80 | 4.47 | 4.37 | 3.98 | 4.05 | 3.56 | 3.45 | 3.28 |
| | Fugitive | 0.72 | 0.35 | 0.42 | 0.81 | 0.68 | 0.74 | 0.69 | 0.64 |
| | Other | 1.39 | 1.36 | 0.78 | 0.63 | 0.76 | 0.71 | 0.73 | 0.61 |
| | **Total** | **159.69** | **125.21** | **102.32** | **61.73** | **64.56** | **62.03** | **60.36** | **61.13** |
| **NMVOC (kt)** | Energy Industries | 1.86 | 1.19 | 0.79 | 0.56 | 0.55 | 0.57 | 0.54 | 0.45 |
| | Industrial Combustion | 2.46 | 1.85 | 1.64 | 1.46 | 1.49 | 1.51 | 1.57 | 1.81 |
| | Transport Sources | 19.64 | 9.62 | 5.95 | 3.42 | 3.72 | 3.93 | 3.92 | 3.97 |
| | Solvent Processes | 31.04 | 26.75 | 25.91 | 25.22 | 24.20 | 22.56 | 23.88 | 23.27 |
| | Residential, Commercial & Public Sector Combustion | 5.32 | 4.72 | 3.67 | 2.50 | 3.31 | 3.84 | 4.24 | 4.02 |
| | Agriculture | 17.54 | 17.16 | 15.75 | 16.37 | 15.99 | 16.15 | 14.88 | 14.59 |
| | Industrial Processes | 58.12 | 60.84 | 69.29 | 84.39 | 86.10 | 88.00 | 90.13 | 93.62 |
| | Fugitive | 43.02 | 22.26 | 21.39 | 11.10 | 10.32 | 9.25 | 9.17 | 9.09 |
| | Other | 1.57 | 1.30 | 1.13 | 1.06 | 1.19 | 1.31 | 1.40 | 1.37 |
| | **Total** | **180.58** | **145.69** | **145.52** | **146.08** | **146.86** | **147.12** | **149.74** | **152.19** |
| **$PM_{10}$ (kt)** | Energy Industries | 1.75 | 1.38 | 0.49 | 0.16 | 0.21 | 0.13 | 0.14 | 0.12 |



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| Pollutant | Sector | 2005 | 2010 | 2015 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|
| | Industrial Combustion | 1.03 | 0.69 | 0.56 | 0.34 | 0.33 | 0.33 | 0.73 | 1.67 |
| | Transport Sources | 4.42 | 3.25 | 2.78 | 1.93 | 2.16 | 2.28 | 2.25 | 2.25 |
| | Residential, Commercial & Public Sector Combustion | 2.18 | 1.96 | 1.59 | 1.13 | 1.43 | 1.57 | 1.79 | 1.70 |
| | Agriculture | 1.77 | 1.80 | 1.79 | 1.79 | 1.78 | 1.81 | 1.72 | 1.72 |
| | Industrial Processes | 3.34 | 2.83 | 2.38 | 1.93 | 2.39 | 2.50 | 2.16 | 2.10 |
| | Fugitive | 0.51 | 0.43 | 0.24 | 0.11 | 0.10 | 0.09 | 0.10 | 0.11 |
| | Waste | 0.58 | 0.55 | 0.55 | 0.54 | 0.67 | 0.76 | 0.86 | 0.86 |
| | Other | 0.15 | 0.11 | 0.12 | 0.10 | 0.12 | 0.11 | 0.11 | 0.10 |
| | **Total** | **15.73** | **13.00** | **10.49** | **8.05** | **9.18** | **9.58** | **9.86** | **10.62** |
| **$SO_2$ (kt)** | Energy Industries | 53.63 | 65.00 | 17.62 | 1.86 | 2.17 | 2.39 | 4.40 | 5.65 |
| | Industrial Combustion | 11.78 | 4.71 | 3.01 | 1.71 | 1.61 | 1.35 | 1.47 | 1.65 |
| | Transport Sources | 9.77 | 1.83 | 1.16 | 0.49 | 0.48 | 0.59 | 0.51 | 0.50 |
| | Residential, Commercial & Public Sector Combustion | 4.22 | 2.63 | 1.34 | 0.60 | 0.97 | 1.59 | 1.86 | 1.85 |
| | Industrial Processes | 0.82 | 0.64 | 0.72 | 0.58 | 0.53 | 0.46 | 0.45 | 0.44 |
| | Fugitive | 0.41 | 0.15 | 0.11 | 0.14 | 0.14 | 0.11 | 0.10 | 0.09 |
| | Other | 0.56 | 0.19 | 0.13 | 0.08 | 0.07 | 0.08 | 0.08 | 0.07 |
| | **Total** | **81.18** | **75.15** | **24.08** | **5.46** | **5.96** | **6.56** | **8.87** | **10.25** |
| **Pb (t)** | Energy Industries | 1.54 | 1.22 | 0.60 | 0.21 | 0.22 | 0.23 | 0.13 | 0.11 |
| | Industrial Combustion | 1.76 | 1.61 | 1.25 | 1.03 | 1.00 | 1.04 | 1.30 | 1.90 |

| Pollutant | Sector | 2005 | 2010 | 2015 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|
| | Transport Sources | 8.13 | 6.11 | 5.70 | 4.10 | 5.72 | 5.79 | 5.67 | 5.57 |
| | Residential, Commercial & Public Sector Combustion | 0.39 | 0.35 | 0.28 | 0.22 | 0.27 | 0.31 | 0.33 | 0.34 |
| | Industrial Processes | 2.25 | 1.36 | 1.33 | 0.76 | 0.87 | 1.15 | 0.73 | 0.69 |
| | Fugitive | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | Other | 0.15 | 0.05 | 0.01 | 0.42 | 0.16 | 0.08 | 0.06 | 0.05 |
| | **Total** | **14.22** | **10.70** | **9.18** | **6.74** | **8.23** | **8.62** | **8.23** | **8.66** |
| **$PM_{2.5}$ (kt)** | Energy Industries | 1.05 | 0.88 | 0.32 | 0.13 | 0.18 | 0.11 | 0.12 | 0.10 |
| | Industrial Combustion | 0.95 | 0.63 | 0.51 | 0.32 | 0.30 | 0.30 | 0.70 | 1.61 |
| | Transport Sources | 3.60 | 2.48 | 1.99 | 1.27 | 1.39 | 1.46 | 1.43 | 1.42 |
| | Residential, Commercial & Public Sector Combustion | 2.12 | 1.91 | 1.55 | 1.10 | 1.38 | 1.52 | 1.74 | 1.65 |
| | Agriculture | 0.39 | 0.38 | 0.37 | 0.36 | 0.36 | 0.36 | 0.35 | 0.34 |
| | Industrial Processes | 0.87 | 0.64 | 0.59 | 0.42 | 0.48 | 0.50 | 0.42 | 0.40 |
| | Fugitive | 0.19 | 0.18 | 0.18 | 0.11 | 0.10 | 0.09 | 0.10 | 0.11 |
| | Waste | 0.54 | 0.51 | 0.51 | 0.51 | 0.63 | 0.72 | 0.81 | 0.81 |
| | Other | 0.08 | 0.05 | 0.05 | 0.04 | 0.05 | 0.04 | 0.04 | 0.04 |
| | **Total** | **9.79** | **7.65** | **6.06** | **4.25** | **4.86** | **5.11** | **5.70** | **6.48** |
| **B[a]P (kg)** | Energy Industries | 5.32 | 7.25 | 4.27 | 0.41 | 0.30 | 0.29 | 0.13 | 0.08 |
| | Industrial Combustion | 3.37 | 3.64 | 2.77 | 2.64 | 2.69 | 2.33 | 2.63 | 3.07 |



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| Pollutant | Sector | 2005 | 2010 | 2015 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|
| | Transport Sources | 19.36 | 15.31 | 13.79 | 10.48 | 11.81 | 12.77 | 12.83 | 12.88 |
| | Residential, Commercial & Public Sector Combustion | 303.48 | 284.12 | 246.28 | 180.58 | 305.74 | 440.67 | 556.09 | 532.97 |
| | Industrial Processes | 12.05 | 8.56 | 8.46 | 6.73 | 7.00 | 6.12 | 5.75 | 5.55 |
| | Fugitive | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | Waste | 133.44 | 25.56 | 25.19 | 25.21 | 29.82 | 32.83 | 36.42 | 36.51 |
| | Other | 0.93 | 0.69 | 0.69 | 0.72 | 0.85 | 0.72 | 0.70 | 0.62 |
| | **Total** | **477.95** | **345.14** | **301.45** | **226.75** | **358.20** | **495.73** | **614.56** | **591.68** |
| **PCDD/Fs (g-ITEQ)** | Energy Industries | 0.24 | 0.18 | 0.25 | 0.15 | 0.13 | 0.22 | 0.22 | 0.24 |
| | Industrial Combustion | 0.90 | 1.22 | 1.17 | 0.86 | 0.78 | 0.78 | 1.82 | 4.46 |
| | Transport Sources | 1.37 | 1.47 | 0.80 | 0.44 | 0.49 | 0.50 | 0.46 | 0.44 |
| | Residential, Commercial & Public Sector Combustion | 1.38 | 1.23 | 1.35 | 1.37 | 1.96 | 2.50 | 2.88 | 2.86 |
| | Industrial Processes | 0.26 | 0.14 | 0.14 | 0.10 | 0.09 | 0.10 | 0.09 | 0.08 |
| | Waste | 9.46 | 3.54 | 2.88 | 2.61 | 2.77 | 2.98 | 3.10 | 3.04 |
| | Other | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| | **Total** | **13.61** | **7.80** | **6.59** | **5.53** | **6.23** | **7.09** | **8.58** | **11.13** |
| **Hg (t)** | Energy Industries | 0.16 | 0.23 | 0.12 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 |
| | Industrial Combustion | 0.13 | 0.11 | 0.08 | 0.05 | 0.04 | 0.04 | 0.05 | 0.06 |
| | Transport Sources | 0.03 | 0.03 | 0.03 | 0.02 | 0.03 | 0.03 | 0.03 | 0.03 |
| | Residential, Commercial & Public Sector Combustion | 0.05 | 0.04 | 0.03 | 0.02 | 0.03 | 0.03 | 0.03 | 0.03 |

| Pollutant | Sector | 2005 | 2010 | 2015 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|
| | Industrial Processes | 0.14 | 0.09 | 0.05 | 0.01 | 0.01 | 0.02 | 0.01 | 0.01 |
| | Waste | 0.11 | 0.11 | 0.08 | 0.07 | 0.06 | 0.07 | 0.06 | 0.06 |
| | Other | 0.001 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | **Total** | **0.62** | **0.61** | **0.39** | **0.20** | **0.20** | **0.21** | **0.21** | **0.21** |

* The uncertainties in the data may be greater than the precision indicated by the table above. Some values are shown with additional decimal places for transparency; however this does not imply greater precision.



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# SUMMARY AIR POLLUTANT EMISSION ESTIMATES FOR WALES

Table 28: Summary of Air Pollutant Emissions Estimates for Wales (2005, 2010, 2015, 2020-2024)*

| Pollutant | Sector | 2005 | 2010 | 2015 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|
| $NH_3$ (kt) | Transport Sources | 0.90 | 0.56 | 0.31 | 0.18 | 0.20 | 0.22 | 0.23 | 0.23 |
| | Residential, Commercial & Public Sector Combustion | 0.02 | 0.02 | 0.03 | 0.03 | 0.03 | 0.02 | 0.02 | 0.02 |
| | Agriculture | 20.28 | 19.13 | 21.04 | 21.75 | 22.09 | 21.28 | 21.90 | 21.81 |
| | Industrial Processes | 0.07 | 0.08 | 0.07 | 0.06 | 0.08 | 0.06 | 0.06 | 0.04 |
| | Waste | 0.27 | 0.26 | 0.31 | 0.32 | 0.32 | 0.30 | 0.30 | 0.29 |
| | Other | 0.88 | 0.83 | 0.93 | 0.86 | 0.89 | 0.91 | 0.87 | 0.87 |
| | **Total** | **22.42** | **20.88** | **22.69** | **23.20** | **23.61** | **22.81** | **23.38** | **23.26** |
| CO (kt) | Energy Industries | 6.16 | 7.40 | 7.32 | 3.25 | 3.45 | 3.06 | 3.10 | 2.90 |
| | Industrial Combustion | 87.66 | 69.19 | 83.51 | 80.43 | 70.74 | 38.96 | 47.98 | 42.26 |
| | Transport Sources | 77.11 | 41.56 | 24.12 | 11.27 | 12.05 | 12.48 | 12.09 | 11.93 |
| | Residential, Commercial & Public Sector Combustion | 26.90 | 26.81 | 25.17 | 23.98 | 22.23 | 19.75 | 15.93 | 15.25 |
| | Industrial Processes | 48.88 | 34.70 | 55.61 | 48.81 | 47.26 | 38.33 | 33.51 | 18.50 |
| | Fugitive | 3.11 | 6.38 | 4.64 | 6.19 | 6.00 | 7.94 | 10.07 | 2.20 |
| | Waste | 2.47 | 2.40 | 2.41 | 2.46 | 2.27 | 2.07 | 1.90 | 1.90 |
| | Other | 0.20 | 0.20 | 0.12 | 0.10 | 0.10 | 0.10 | 0.09 | 0.07 |
| | **Total** | **252.48** | **188.64** | **202.88** | **176.49** | **164.09** | **122.69** | **124.68** | **95.00** |
| $NO_x$ (kt) | Energy Industries | 33.68 | 30.86 | 34.85 | 8.02 | 8.15 | 9.21 | 7.91 | 6.09 |

| Pollutant | Sector | 2005 | 2010 | 2015 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|
| | Industrial Combustion | 14.04 | 9.43 | 9.91 | 9.20 | 8.84 | 8.81 | 7.68 | 7.01 |
| | Transport Sources | 35.42 | 25.46 | 22.26 | 13.85 | 14.15 | 15.06 | 13.71 | 13.33 |
| | Residential, Commercial & Public Sector Combustion | 10.79 | 8.27 | 6.02 | 4.60 | 4.52 | 3.83 | 3.60 | 3.82 |
| | Agriculture | 3.22 | 2.85 | 2.85 | 2.86 | 3.01 | 2.41 | 2.49 | 2.38 |
| | Fugitive | 0.10 | 0.14 | 0.16 | 0.06 | 0.06 | 0.03 | 0.03 | 0.004 |
| | Other | 1.24 | 1.04 | 0.83 | 0.62 | 0.70 | 0.56 | 0.59 | 0.51 |
| | **Total** | **98.49** | **78.04** | **76.89** | **39.21** | **39.41** | **39.91** | **36.01** | **33.15** |
| **NMVOC (kt)** | Energy Industries | 0.74 | 1.20 | 1.29 | 0.91 | 0.75 | 1.15 | 0.85 | 0.52 |
| | Industrial Combustion | 2.02 | 1.49 | 1.31 | 1.35 | 1.36 | 1.35 | 1.20 | 1.06 |
| | Transport Sources | 11.26 | 5.37 | 3.23 | 1.78 | 1.85 | 1.95 | 1.91 | 1.93 |
| | Solvent Processes | 19.46 | 16.09 | 14.86 | 15.10 | 14.39 | 13.13 | 13.24 | 12.96 |
| | Residential, Commercial & Public Sector Combustion | 4.24 | 3.96 | 3.55 | 3.33 | 3.07 | 2.64 | 2.09 | 1.97 |
| | Agriculture | 11.26 | 11.35 | 11.94 | 13.04 | 13.49 | 13.05 | 12.55 | 12.78 |
| | Industrial Processes | 2.70 | 2.54 | 2.64 | 2.45 | 2.57 | 2.39 | 2.57 | 2.29 |
| | Fugitive | 13.66 | 12.48 | 8.47 | 4.14 | 4.19 | 4.15 | 4.35 | 4.25 |
| | Other | 1.13 | 0.95 | 0.87 | 0.86 | 0.81 | 0.75 | 0.71 | 0.70 |
| | **Total** | **66.47** | **55.42** | **48.17** | **42.97** | **42.48** | **40.58** | **39.47** | **38.45** |
| **$PM_{10}$ (kt)** | Energy Industries | 1.02 | 0.83 | 0.57 | 0.22 | 0.49 | 0.28 | 0.17 | 0.20 |



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| Pollutant | Sector | 2005 | 2010 | 2015 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|
| | Industrial Combustion | 0.66 | 0.58 | 0.72 | 0.57 | 0.34 | 0.59 | 0.33 | 0.29 |
| | Transport Sources | 2.38 | 1.86 | 1.58 | 1.07 | 1.17 | 1.26 | 1.23 | 1.24 |
| | Residential, Commercial & Public Sector Combustion | 1.75 | 1.71 | 1.57 | 1.49 | 1.31 | 1.07 | 0.89 | 0.84 |
| | Agriculture | 0.84 | 0.85 | 0.91 | 0.97 | 0.99 | 0.99 | 1.02 | 1.05 |
| | Industrial Processes | 4.46 | 3.56 | 3.75 | 3.54 | 3.67 | 3.39 | 3.12 | 2.88 |
| | Fugitive | 0.16 | 0.17 | 0.16 | 0.17 | 0.22 | 0.14 | 0.17 | 0.06 |
| | Waste | 0.55 | 0.54 | 0.55 | 0.58 | 0.53 | 0.48 | 0.44 | 0.44 |
| | Other | 0.10 | 0.07 | 0.08 | 0.08 | 0.08 | 0.07 | 0.07 | 0.07 |
| | **Total** | **11.92** | **10.17** | **9.88** | **8.68** | **8.80** | **8.28** | **7.44** | **7.07** |
| **$SO_2$ (kt)** | Energy Industries | 39.69 | 16.96 | 12.67 | 2.44 | 3.00 | 2.71 | 1.93 | 1.70 |
| | Industrial Combustion | 6.49 | 9.09 | 7.55 | 5.84 | 4.39 | 4.56 | 4.29 | 2.57 |
| | Transport Sources | 3.49 | 1.07 | 0.58 | 0.20 | 0.17 | 0.27 | 0.19 | 0.21 |
| | Residential, Commercial & Public Sector Combustion | 2.87 | 2.13 | 1.62 | 1.71 | 1.40 | 1.37 | 0.99 | 0.98 |
| | Industrial Processes | 2.34 | 0.46 | 0.67 | 0.48 | 0.44 | 0.50 | 0.46 | 0.34 |
| | Fugitive | 1.03 | 2.84 | 2.00 | 1.76 | 1.54 | 1.40 | 1.47 | 0.94 |
| | Other | 0.26 | 0.09 | 0.06 | 0.04 | 0.03 | 0.03 | 0.04 | 0.03 |
| | **Total** | **56.19** | **32.64** | **25.15** | **12.46** | **10.98** | **10.85** | **9.37** | **6.77** |
| **Pb (t)** | Energy Industries | 0.77 | 0.61 | 0.22 | 0.15 | 0.14 | 0.16 | 0.14 | 0.20 |
| | Industrial Combustion | 2.61 | 0.89 | 1.08 | 0.90 | 0.76 | 0.99 | 0.86 | 0.78 |

| Pollutant | Sector | 2005 | 2010 | 2015 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|
| | Transport Sources | 4.37 | 3.62 | 3.12 | 2.34 | 2.78 | 3.06 | 2.84 | 2.76 |
| | Residential, Commercial & Public Sector Combustion | 0.34 | 0.29 | 0.26 | 0.23 | 0.22 | 0.20 | 0.16 | 0.16 |
| | Industrial Processes | 16.93 | 11.71 | 12.92 | 8.62 | 20.19 | 20.90 | 16.80 | 10.41 |
| | Fugitive | 0.40 | 0.55 | 0.53 | 0.48 | 0.48 | 0.39 | 0.29 | 0.05 |
| | Other | 0.09 | 0.03 | 0.008 | 0.20 | 0.07 | 0.04 | 0.03 | 0.02 |
| | **Total** | **25.52** | **17.70** | **18.13** | **12.92** | **24.64** | **25.75** | **21.13** | **14.39** |
| **$PM_{2.5}$ (kt)** | Energy Industries | 0.61 | 0.53 | 0.36 | 0.16 | 0.33 | 0.19 | 0.12 | 0.14 |
| | Industrial Combustion | 0.60 | 0.49 | 0.49 | 0.52 | 0.31 | 0.55 | 0.30 | 0.26 |
| | Transport Sources | 1.90 | 1.40 | 1.10 | 0.68 | 0.73 | 0.78 | 0.76 | 0.76 |
| | Residential, Commercial & Public Sector Combustion | 1.71 | 1.67 | 1.54 | 1.45 | 1.28 | 1.04 | 0.86 | 0.81 |
| | Agriculture | 0.22 | 0.21 | 0.22 | 0.22 | 0.22 | 0.22 | 0.22 | 0.22 |
| | Industrial Processes | 1.59 | 1.25 | 1.57 | 1.53 | 1.41 | 1.21 | 1.09 | 1.03 |
| | Fugitive | 0.07 | 0.07 | 0.06 | 0.09 | 0.12 | 0.08 | 0.10 | 0.04 |
| | Waste | 0.52 | 0.51 | 0.52 | 0.55 | 0.51 | 0.46 | 0.42 | 0.42 |
| | Other | 0.05 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 |
| | **Total** | **7.26** | **6.17** | **5.87** | **5.23** | **4.93** | **4.56** | **3.90** | **3.72** |
| **B[a]P (kg)** | Energy Industries | 10.26 | 9.10 | 11.13 | 8.00 | 8.55 | 8.20 | 8.15 | 8.80 |
| | Industrial Combustion | 7.67 | 2.25 | 2.02 | 1.98 | 1.97 | 1.74 | 1.82 | 1.93 |



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| Pollutant | Sector | 2005 | 2010 | 2015 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|
| | Transport Sources | 12.07 | 9.24 | 8.47 | 6.42 | 7.12 | 7.75 | 7.75 | 7.77 |
| | Residential, Commercial & Public Sector Combustion | 313.39 | 305.28 | 315.98 | 359.08 | 350.74 | 335.71 | 289.03 | 276.48 |
| | Industrial Processes | 52.11 | 15.32 | 15.75 | 14.39 | 7.74 | 8.41 | 8.01 | 4.62 |
| | Fugitive | 14.16 | 25.24 | 79.28 | 70.84 | 59.16 | 43.30 | 26.92 | 4.21 |
| | Waste | 107.78 | 24.02 | 24.67 | 25.87 | 23.91 | 21.62 | 20.07 | 20.07 |
| | Other | 0.54 | 0.39 | 0.39 | 0.41 | 0.48 | 0.41 | 0.40 | 0.35 |
| | **Total** | **517.98** | **390.84** | **457.69** | **486.98** | **459.69** | **427.15** | **362.15** | **324.23** |
| **PCDD/Fs (g-ITEQ)** | Energy Industries | 2.06 | 0.14 | 0.41 | 0.15 | 0.15 | 0.23 | 0.27 | 0.26 |
| | Industrial Combustion | 0.97 | 0.70 | 0.77 | 1.13 | 0.56 | 1.26 | 0.53 | 0.52 |
| | Transport Sources | 0.85 | 0.72 | 0.50 | 0.25 | 0.26 | 0.25 | 0.23 | 0.22 |
| | Residential, Commercial & Public Sector Combustion | 1.15 | 1.01 | 1.25 | 1.60 | 1.67 | 1.67 | 1.45 | 1.44 |
| | Industrial Processes | 9.85 | 11.73 | 19.31 | 13.88 | 3.24 | 2.61 | 1.92 | 1.80 |
| | Waste | 6.79 | 2.50 | 2.07 | 1.90 | 1.84 | 1.81 | 1.73 | 1.70 |
| | Other | 0.23 | 0.30 | 0.23 | 0.10 | 0.10 | 0.09 | 0.07 | 0.01 |
| | **Total** | **21.90** | **17.10** | **24.54** | **19.00** | **7.82** | **7.91** | **6.20** | **5.94** |
| **Hg (t)** | Energy Industries | 0.18 | 0.07 | 0.07 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 |
| | Industrial Combustion | 0.08 | 0.10 | 0.09 | 0.14 | 0.13 | 0.11 | 0.11 | 0.09 |
| | Transport Sources | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| | Residential, Commercial & Public Sector Combustion | 0.04 | 0.03 | 0.03 | 0.02 | 0.02 | 0.02 | 0.02 | 0.01 |

| Pollutant | Sector | 2005 | 2010 | 2015 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|
| | Industrial Processes | 0.25 | 0.24 | 0.19 | 0.16 | 0.45 | 0.15 | 0.12 | 0.07 |
| | Waste | 0.07 | 0.07 | 0.04 | 0.04 | 0.04 | 0.04 | 0.03 | 0.03 |
| | Other | 0.003 | 0.005 | 0.004 | 0.004 | 0.004 | 0.003 | 0.002 | 0.001 |
| | **Total** | **0.63** | **0.52** | **0.44** | **0.40** | **0.68** | **0.36** | **0.33** | **0.26** |

* The uncertainties in the data may be greater than the precision indicated by the table above. Some values are shown with additional decimal places for transparency; however this does not imply greater precision.



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# SUMMARY AIR POLLUTANT EMISSION ESTIMATES FOR NORTHERN IRELAND

Table 29: Summary of Air Pollutant Emissions Estimates for Northern Ireland (2005, 2010, 2015, 2020-2024)*

| Pollutant | Sector | 2005 | 2010 | 2015 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|
| $NH_3$ (kt) | Transport Sources | 0.63 | 0.42 | 0.23 | 0.14 | 0.15 | 0.16 | 0.16 | 0.16 |
| | Residential, Commercial & Public Sector Combustion | 0.01 | 0.01 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 |
| | Agriculture | 29.02 | 27.11 | 29.43 | 31.15 | 32.07 | 30.99 | 31.67 | 32.00 |
| | Industrial Processes | 0.007 | 0.007 | 0.005 | 0.008 | 0.007 | 0.02 | 0.01 | 0.009 |
| | Waste | 0.17 | 0.17 | 0.19 | 0.20 | 0.21 | 0.19 | 0.19 | 0.19 |
| | Other | 0.38 | 0.38 | 0.41 | 0.42 | 0.42 | 0.44 | 0.44 | 0.44 |
| | **Total** | **30.23** | **28.10** | **30.29** | **31.94** | **32.87** | **31.81** | **32.49** | **32.82** |
| CO (kt) | Energy Industries | 3.66 | 2.92 | 2.32 | 1.35 | 1.34 | 1.23 | 1.14 | 1.53 |
| | Industrial Combustion | 15.20 | 10.59 | 10.38 | 11.59 | 10.28 | 10.49 | 11.47 | 10.57 |
| | Transport Sources | 49.37 | 29.20 | 17.32 | 8.18 | 8.51 | 8.65 | 8.46 | 8.49 |
| | Residential, Commercial & Public Sector Combustion | 15.09 | 16.05 | 18.38 | 27.75 | 23.56 | 19.25 | 12.52 | 11.51 |
| | Industrial Processes | 0.10 | 0.09 | 0.06 | 0.05 | 0.05 | 0.05 | 0.04 | 0.03 |
| | Fugitive | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 |
| | Waste | 1.81 | 1.82 | 1.86 | 1.83 | 1.77 | 1.63 | 1.55 | 1.56 |
| | Other | 0.13 | 0.13 | 0.07 | 0.06 | 0.07 | 0.07 | 0.06 | 0.05 |
| | **Total** | **85.38** | **60.82** | **50.42** | **50.83** | **45.60** | **41.39** | **35.26** | **33.76** |
| $NO_x$ (kt) | Energy Industries | 9.80 | 5.93 | 5.06 | 3.16 | 3.54 | 3.14 | 2.17 | 1.97 |

| Pollutant | Sector | 2005 | 2010 | 2015 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|
| | Industrial Combustion | 7.09 | 3.49 | 3.78 | 2.65 | 2.23 | 2.36 | 2.27 | 1.94 |
| | Transport Sources | 23.58 | 17.13 | 13.73 | 8.05 | 8.57 | 8.71 | 8.43 | 8.03 |
| | Residential, Commercial & Public Sector Combustion | 6.91 | 6.46 | 5.23 | 4.26 | 3.92 | 3.07 | 2.88 | 2.85 |
| | Agriculture | 3.33 | 2.99 | 2.97 | 3.14 | 3.12 | 2.61 | 2.72 | 2.96 |
| | Fugitive | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | Other | 0.43 | 0.40 | 0.24 | 0.20 | 0.24 | 0.22 | 0.23 | 0.19 |
| | **Total** | **51.13** | **36.40** | **31.01** | **21.47** | **21.62** | **20.12** | **18.69** | **17.94** |
| **NMVOC (kt)** | Energy Industries | 0.35 | 0.21 | 0.15 | 0.08 | 0.12 | 0.08 | 0.06 | 0.08 |
| | Industrial Combustion | 0.85 | 0.59 | 0.54 | 0.50 | 0.45 | 0.44 | 0.42 | 0.37 |
| | Transport Sources | 7.34 | 3.73 | 2.24 | 1.25 | 1.31 | 1.36 | 1.34 | 1.35 |
| | Solvent Processes | 10.37 | 9.23 | 8.72 | 9.00 | 8.64 | 7.91 | 7.98 | 7.91 |
| | Residential, Commercial & Public Sector Combustion | 2.41 | 2.42 | 2.69 | 4.24 | 3.55 | 2.79 | 1.79 | 1.62 |
| | Agriculture | 15.47 | 15.16 | 17.56 | 18.59 | 19.45 | 17.81 | 19.30 | 18.37 |
| | Industrial Processes | 3.61 | 3.61 | 3.43 | 3.78 | 3.71 | 3.67 | 3.72 | 3.84 |
| | Fugitive | 1.58 | 0.87 | 0.79 | 0.59 | 0.64 | 0.70 | 0.73 | 0.75 |
| | Other | 0.79 | 0.69 | 0.62 | 0.62 | 0.59 | 0.54 | 0.52 | 0.52 |
| | **Total** | **42.77** | **36.51** | **36.74** | **38.65** | **38.46** | **35.31** | **35.88** | **34.82** |
| **$PM_{10}$ (kt)** | Energy Industries | 0.30 | 0.08 | 0.06 | 0.04 | 0.04 | 0.02 | 0.02 | 0.02 |



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| Pollutant | Sector | 2005 | 2010 | 2015 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|
| | Industrial Combustion | 0.55 | 0.45 | 0.44 | 0.40 | 0.18 | 0.17 | 0.25 | 0.12 |
| | Transport Sources | 1.48 | 1.20 | 0.98 | 0.69 | 0.75 | 0.79 | 0.79 | 0.78 |
| | Residential, Commercial & Public Sector Combustion | 1.10 | 1.12 | 1.20 | 1.77 | 1.47 | 1.12 | 0.79 | 0.72 |
| | Agriculture | 1.13 | 1.09 | 1.27 | 1.38 | 1.40 | 1.30 | 1.45 | 1.41 |
| | Industrial Processes | 2.02 | 1.57 | 1.38 | 1.25 | 1.50 | 1.49 | 1.34 | 1.27 |
| | Fugitive | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.02 |
| | Waste | 0.41 | 0.41 | 0.42 | 0.42 | 0.41 | 0.38 | 0.36 | 0.36 |
| | Other | 0.04 | 0.03 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 |
| | **Total** | **7.05** | **5.97** | **5.80** | **6.00** | **5.82** | **5.32** | **5.06** | **4.74** |
| **$SO_2$ (kt)** | Energy Industries | 14.88 | 2.31 | 2.49 | 1.14 | 1.22 | 1.00 | 0.55 | 0.11 |
| | Industrial Combustion | 4.17 | 3.71 | 4.30 | 2.20 | 2.26 | 2.04 | 1.89 | 1.67 |
| | Transport Sources | 1.19 | 0.27 | 0.16 | 0.06 | 0.06 | 0.10 | 0.07 | 0.07 |
| | Residential, Commercial & Public Sector Combustion | 2.23 | 1.83 | 1.70 | 3.14 | 2.37 | 2.01 | 1.25 | 1.16 |
| | Industrial Processes | 0.03 | 0.03 | 0.03 | 0.02 | 0.02 | 0.03 | 0.02 | 0.02 |
| | Fugitive | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | Other | 0.17 | 0.05 | 0.04 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 |
| | **Total** | **22.67** | **8.21** | **8.72** | **6.59** | **5.95** | **5.19** | **3.80** | **3.05** |
| **Pb (t)** | Energy Industries | 0.05 | 0.04 | 0.04 | 0.09 | 0.05 | 0.05 | 0.05 | 0.03 |
| | Industrial Combustion | 1.04 | 1.01 | 0.87 | 0.61 | 0.50 | 0.51 | 0.61 | 0.49 |

| Pollutant | Sector | 2005 | 2010 | 2015 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|
| | Transport Sources | 2.44 | 2.16 | 1.98 | 1.57 | 1.77 | 1.90 | 1.93 | 1.92 |
| | Residential, Commercial & Public Sector Combustion | 0.21 | 0.21 | 0.19 | 0.26 | 0.23 | 0.19 | 0.12 | 0.12 |
| | Industrial Processes | 0.62 | 0.42 | 0.44 | 0.33 | 0.41 | 0.42 | 0.28 | 0.28 |
| | Fugitive | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | Other | 0.05 | 0.02 | 0.007 | 0.13 | 0.05 | 0.03 | 0.02 | 0.02 |
| | **Total** | **4.42** | **3.86** | **3.53** | **2.99** | **3.01** | **3.09** | **3.02** | **2.86** |
| **$PM_{2.5}$ (kt)** | Energy Industries | 0.18 | 0.06 | 0.05 | 0.03 | 0.04 | 0.02 | 0.02 | 0.02 |
| | Industrial Combustion | 0.48 | 0.39 | 0.38 | 0.38 | 0.16 | 0.15 | 0.24 | 0.11 |
| | Transport Sources | 1.15 | 0.88 | 0.66 | 0.42 | 0.46 | 0.48 | 0.47 | 0.47 |
| | Residential, Commercial & Public Sector Combustion | 1.07 | 1.09 | 1.17 | 1.73 | 1.43 | 1.09 | 0.77 | 0.70 |
| | Agriculture | 0.28 | 0.27 | 0.29 | 0.30 | 0.31 | 0.30 | 0.32 | 0.31 |
| | Industrial Processes | 0.36 | 0.28 | 0.25 | 0.22 | 0.26 | 0.26 | 0.23 | 0.21 |
| | Fugitive | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| | Waste | 0.38 | 0.39 | 0.40 | 0.40 | 0.39 | 0.36 | 0.34 | 0.34 |
| | Other | 0.02 | 0.02 | 0.02 | 0.01 | 0.02 | 0.01 | 0.02 | 0.01 |
| | **Total** | **3.96** | **3.39** | **3.22** | **3.51** | **3.07** | **2.69** | **2.40** | **2.19** |
| **B[a]P (kg)** | Energy Industries | 1.83 | 0.89 | 0.95 | 0.94 | 1.00 | 0.84 | 0.78 | 0.96 |
| | Industrial Combustion | 1.73 | 1.26 | 1.13 | 1.10 | 1.07 | 0.92 | 1.02 | 1.06 |



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| Pollutant | Sector | 2005 | 2010 | 2015 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|
| | Transport Sources | 7.90 | 6.25 | 5.31 | 4.01 | 4.45 | 4.79 | 4.83 | 4.85 |
| | Residential, Commercial & Public Sector Combustion | 192.15 | 195.32 | 264.11 | 482.33 | 417.29 | 360.62 | 258.70 | 243.39 |
| | Industrial Processes | 1.17 | 0.92 | 0.89 | 0.87 | 0.93 | 0.81 | 0.74 | 0.69 |
| | Fugitive | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | Waste | 92.00 | 19.46 | 19.99 | 20.10 | 20.18 | 18.77 | 17.89 | 17.89 |
| | Other | 0.31 | 0.23 | 0.24 | 0.25 | 0.30 | 0.25 | 0.24 | 0.22 |
| | **Total** | **297.10** | **224.33** | **292.62** | **509.60** | **445.23** | **387.00** | **284.20** | **269.05** |
| **PCDD/Fs (g-ITEQ)** | Energy Industries | 0.02 | 0.03 | 0.31 | 0.03 | 0.02 | 0.02 | 0.02 | 0.03 |
| | Industrial Combustion | 0.40 | 0.55 | 0.50 | 0.93 | 0.32 | 0.32 | 0.61 | 0.32 |
| | Transport Sources | 0.53 | 0.66 | 0.14 | 0.14 | 0.14 | 0.14 | 0.13 | 0.12 |
| | Residential, Commercial & Public Sector Combustion | 0.70 | 0.60 | 0.92 | 1.62 | 1.50 | 1.42 | 1.12 | 1.09 |
| | Industrial Processes | 0.05 | 0.03 | 0.03 | 0.03 | 0.03 | 0.02 | 0.02 | 0.02 |
| | Waste | 4.91 | 1.57 | 1.32 | 1.24 | 1.21 | 1.19 | 1.14 | 1.12 |
| | Other | 0.004 | 0.004 | 0.003 | 0.003 | 0.004 | 0.004 | 0.004 | 0.003 |
| | **Total** | **6.62** | **3.44** | **3.22** | **3.99** | **3.23** | **3.13** | **3.05** | **2.70** |
| **Hg (t)** | Energy Industries | 0.07 | 0.005 | 0.008 | 0.01 | 0.01 | 0.01 | 0.01 | 0.006 |
| | Industrial Combustion | 0.06 | 0.06 | 0.09 | 0.05 | 0.04 | 0.05 | 0.05 | 0.04 |
| | Transport Sources | 0.01 | 0.009 | 0.009 | 0.007 | 0.008 | 0.008 | 0.008 | 0.008 |
| | Residential, Commercial & Public Sector Combustion | 0.02 | 0.02 | 0.02 | 0.03 | 0.02 | 0.02 | 0.01 | 0.01 |

| Pollutant | Sector | 2005 | 2010 | 2015 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|
| | Industrial Processes | 0.03 | 0.02 | 0.009 | 0.003 | 0.004 | 0.003 | 0.003 | 0.002 |
| | Waste | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.02 | 0.01 | 0.01 |
| | Other | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | **Total** | **0.20** | **0.14** | **0.14** | **0.11** | **0.10** | **0.10** | **0.09** | **0.08** |

* The uncertainties in the data may be greater than the precision indicated by the table above. Some values are shown with additional decimal places for transparency; however this does not imply greater precision.



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# SUMMARY AIR POLLUTANT EMISSION ESTIMATES FOR ENGLAND AND THE DEVOLVED GOVERNMENTS

Table 30: Summary of Air Pollutant Emissions Estimates for England and the DGs (2005, 2010, 2015, 2020-2024)*

| Pollutant | Region | Sector | 2005 | 2010 | 2015 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|---|
| $NH_3$ (kt) | England | Transport Sources | 14.27 | 9.15 | 5.11 | 3.26 | 3.62 | 3.92 | 3.96 | 3.93 |
| | England | Residential, Commercial & Public Sector Combustion | 0.18 | 0.18 | 0.23 | 0.27 | 0.28 | 0.27 | 0.26 | 0.27 |
| | England | Agriculture | 157.60 | 150.86 | 159.49 | 149.02 | 153.22 | 149.13 | 151.04 | 143.87 |
| | England | Industrial Processes | 5.50 | 4.45 | 2.21 | 2.46 | 2.52 | 1.75 | 1.77 | 1.77 |
| | England | Waste | 5.02 | 5.09 | 6.43 | 6.56 | 6.73 | 6.26 | 6.27 | 6.15 |
| | England | Other | 9.75 | 10.41 | 10.98 | 11.15 | 11.83 | 12.09 | 11.96 | 12.46 |
| | **England** | **Total** | **192.32** | **180.15** | **184.44** | **172.73** | **178.20** | **173.41** | **175.27** | **168.45** |
| | Scotland | Transport Sources | 1.45 | 0.92 | 0.51 | 0.31 | 0.35 | 0.39 | 0.40 | 0.40 |
| | Scotland | Residential, Commercial & Public Sector Combustion | 0.02 | 0.02 | 0.02 | 0.03 | 0.03 | 0.04 | 0.04 | 0.05 |
| | Scotland | Agriculture | 33.12 | 30.78 | 31.40 | 30.68 | 30.37 | 29.77 | 30.39 | 29.00 |
| | Scotland | Industrial Processes | 0.09 | 0.07 | 0.05 | 0.05 | 0.06 | 0.06 | 0.04 | 0.04 |
| | Scotland | Waste | 0.50 | 0.50 | 0.61 | 0.60 | 0.62 | 0.58 | 0.58 | 0.56 |
| | Scotland | Other | 0.95 | 0.93 | 0.94 | 0.95 | 1.01 | 1.04 | 1.04 | 1.12 |
| | **Scotland** | **Total** | **36.13** | **33.22** | **33.53** | **32.63** | **32.46** | **31.87** | **32.49** | **31.18** |
| | Wales | Transport Sources | 0.90 | 0.56 | 0.31 | 0.18 | 0.20 | 0.22 | 0.23 | 0.23 |
| | Wales | Residential, Commercial & Public Sector Combustion | 0.02 | 0.02 | 0.03 | 0.03 | 0.03 | 0.02 | 0.02 | 0.02 |

| Pollutant | Region | Sector | 2005 | 2010 | 2015 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|---|
| | Wales | Agriculture | 20.28 | 19.13 | 21.04 | 21.75 | 22.09 | 21.28 | 21.90 | 21.81 |
| | Wales | Industrial Processes | 0.07 | 0.08 | 0.07 | 0.06 | 0.08 | 0.06 | 0.06 | 0.04 |
| | Wales | Waste | 0.27 | 0.26 | 0.31 | 0.32 | 0.32 | 0.30 | 0.30 | 0.29 |
| | Wales | Other | 0.88 | 0.83 | 0.93 | 0.86 | 0.89 | 0.91 | 0.87 | 0.87 |
| | **Wales** | **Total** | **22.42** | **20.88** | **22.69** | **23.20** | **23.61** | **22.81** | **23.38** | **23.26** |
| | Northern Ireland | Transport Sources | 0.63 | 0.42 | 0.23 | 0.14 | 0.15 | 0.16 | 0.16 | 0.16 |
| | Northern Ireland | Residential, Commercial & Public Sector Combustion | 0.01 | 0.01 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 |
| | Northern Ireland | Agriculture | 29.02 | 27.11 | 29.43 | 31.15 | 32.07 | 30.99 | 31.67 | 32.00 |
| | Northern Ireland | Industrial Processes | 0.007 | 0.007 | 0.005 | 0.008 | 0.007 | 0.02 | 0.01 | 0.009 |
| | Northern Ireland | Waste | 0.17 | 0.17 | 0.19 | 0.20 | 0.21 | 0.19 | 0.19 | 0.19 |
| | Northern Ireland | Other | 0.38 | 0.38 | 0.41 | 0.42 | 0.42 | 0.44 | 0.44 | 0.44 |
| | **Northern Ireland** | **Total** | **30.23** | **28.10** | **30.29** | **31.94** | **32.87** | **31.81** | **32.49** | **32.82** |
| **CO (kt)** | England | Energy Industries | 67.35 | 60.94 | 54.00 | 39.44 | 42.39 | 34.93 | 31.37 | 34.00 |
| | England | Industrial Combustion | 588.55 | 343.92 | 378.01 | 321.68 | 337.07 | 335.46 | 326.09 | 317.24 |
| | England | Transport Sources | 1,389.56 | 732.51 | 421.20 | 207.78 | 227.50 | 232.42 | 231.11 | 227.11 |



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| Pollutant | Region | Sector | 2005 | 2010 | 2015 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|---|
| | England | Residential, Commercial & Public Sector Combustion | 249.32 | 239.92 | 232.45 | 235.76 | 243.89 | 239.35 | 223.26 | 216.01 |
| | England | Industrial Processes | 100.81 | 77.02 | 65.75 | 55.65 | 52.53 | 42.46 | 38.58 | 38.98 |
| | England | Fugitive | 5.04 | 4.65 | 2.88 | 1.89 | 1.85 | 1.73 | 1.36 | 1.42 |
| | England | Waste | 30.02 | 28.88 | 28.59 | 27.98 | 28.17 | 27.47 | 27.24 | 27.34 |
| | England | Other | 4.68 | 4.79 | 2.84 | 2.34 | 2.47 | 2.51 | 2.34 | 1.79 |
| | **England** | **Total** | **2,435.31** | **1,492.63** | **1,185.72** | **892.51** | **935.87** | **916.33** | **881.36** | **863.90** |
| | Scotland | Energy Industries | 10.37 | 12.31 | 6.68 | 2.50 | 2.79 | 2.47 | 2.19 | 1.99 |
| | Scotland | Industrial Combustion | 42.69 | 28.57 | 29.52 | 28.60 | 29.72 | 30.12 | 34.42 | 42.05 |
| | Scotland | Transport Sources | 134.97 | 73.98 | 43.38 | 20.89 | 23.93 | 24.35 | 24.11 | 24.05 |
| | Scotland | Residential, Commercial & Public Sector Combustion | 31.54 | 31.48 | 26.94 | 20.31 | 25.32 | 28.87 | 30.77 | 29.50 |
| | Scotland | Industrial Processes | 0.41 | 3.41 | 2.42 | 1.83 | 1.92 | 1.61 | 1.49 | 1.48 |
| | Scotland | Fugitive | 0.96 | 0.91 | 1.17 | 1.22 | 1.10 | 1.13 | 1.17 | 1.29 |
| | Scotland | Waste | 2.87 | 2.74 | 2.69 | 2.58 | 3.08 | 3.47 | 3.89 | 3.88 |
| | Scotland | Other | 0.43 | 0.44 | 0.26 | 0.20 | 0.22 | 0.22 | 0.21 | 0.16 |
| | **Scotland** | **Total** | **224.25** | **153.85** | **113.07** | **78.13** | **88.06** | **92.24** | **98.25** | **104.40** |
| | Wales | Energy Industries | 6.16 | 7.40 | 7.32 | 3.25 | 3.45 | 3.06 | 3.10 | 2.90 |
| | Wales | Industrial Combustion | 87.66 | 69.19 | 83.51 | 80.43 | 70.74 | 38.96 | 47.98 | 42.26 |
| | Wales | Transport Sources | 77.11 | 41.56 | 24.12 | 11.27 | 12.05 | 12.48 | 12.09 | 11.93 |
| | Wales | Residential, Commercial & Public Sector Combustion | 26.90 | 26.81 | 25.17 | 23.98 | 22.23 | 19.75 | 15.93 | 15.25 |

| Pollutant | Region | Sector | 2005 | 2010 | 2015 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|---|
| | Wales | Industrial Processes | 48.88 | 34.70 | 55.61 | 48.81 | 47.26 | 38.33 | 33.51 | 18.50 |
| | Wales | Fugitive | 3.11 | 6.38 | 4.64 | 6.19 | 6.00 | 7.94 | 10.07 | 2.20 |
| | Wales | Waste | 2.47 | 2.40 | 2.41 | 2.46 | 2.27 | 2.07 | 1.90 | 1.90 |
| | Wales | Other | 0.20 | 0.20 | 0.12 | 0.10 | 0.10 | 0.10 | 0.09 | 0.07 |
| | **Wales** | **Total** | **252.48** | **188.64** | **202.88** | **176.49** | **164.09** | **122.69** | **124.68** | **95.00** |
| | Northern Ireland | Energy Industries | 3.66 | 2.92 | 2.32 | 1.35 | 1.34 | 1.23 | 1.14 | 1.53 |
| | Northern Ireland | Industrial Combustion | 15.20 | 10.59 | 10.38 | 11.59 | 10.28 | 10.49 | 11.47 | 10.57 |
| | Northern Ireland | Transport Sources | 49.37 | 29.20 | 17.32 | 8.18 | 8.51 | 8.65 | 8.46 | 8.49 |
| | Northern Ireland | Residential, Commercial & Public Sector Combustion | 15.09 | 16.05 | 18.38 | 27.75 | 23.56 | 19.25 | 12.52 | 11.51 |
| | Northern Ireland | Industrial Processes | 0.10 | 0.09 | 0.06 | 0.05 | 0.05 | 0.05 | 0.04 | 0.03 |
| | Northern Ireland | Fugitive | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 |
| | Northern Ireland | Waste | 1.81 | 1.82 | 1.86 | 1.83 | 1.77 | 1.63 | 1.55 | 1.56 |
| | Northern Ireland | Other | 0.13 | 0.13 | 0.07 | 0.06 | 0.07 | 0.07 | 0.06 | 0.05 |
| | **Northern Ireland** | **Total** | **85.38** | **60.82** | **50.42** | **50.83** | **45.60** | **41.39** | **35.26** | **33.76** |
| **$NO_x$ (kt)** | England | Energy Industries | 344.30 | 208.35 | 148.18 | 65.23 | 63.53 | 61.39 | 57.69 | 54.81 |



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| Pollutant | Region | Sector | 2005 | 2010 | 2015 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|---|
| | England | Industrial Combustion | 164.66 | 97.02 | 92.38 | 74.53 | 71.98 | 71.53 | 65.84 | 63.36 |
| | England | Transport Sources | 566.98 | 407.64 | 344.66 | 200.18 | 204.87 | 206.18 | 190.28 | 180.16 |
| | England | Residential, Commercial & Public Sector Combustion | 135.64 | 111.67 | 87.78 | 76.15 | 77.52 | 65.31 | 64.22 | 65.01 |
| | England | Agriculture | 18.20 | 17.33 | 18.36 | 16.62 | 17.02 | 15.74 | 15.47 | 14.42 |
| | England | Fugitive | 0.50 | 0.54 | 0.17 | 0.23 | 0.11 | 0.16 | 0.28 | 0.24 |
| | England | Other | 17.44 | 16.31 | 10.06 | 8.42 | 9.93 | 9.00 | 9.08 | 7.67 |
| | **England** | **Total** | **1,247.72** | **858.86** | **701.58** | **441.35** | **444.96** | **429.32** | **402.86** | **385.68** |
| | Scotland | Energy Industries | 43.63 | 38.00 | 24.46 | 8.08 | 9.30 | 7.56 | 6.83 | 6.54 |
| | Scotland | Industrial Combustion | 15.99 | 10.11 | 9.03 | 7.86 | 7.54 | 7.97 | 8.78 | 10.83 |
| | Scotland | Transport Sources | 72.81 | 53.71 | 49.04 | 29.78 | 31.37 | 31.90 | 30.00 | 28.81 |
| | Scotland | Residential, Commercial & Public Sector Combustion | 20.37 | 17.21 | 14.21 | 10.60 | 10.86 | 9.60 | 9.87 | 10.42 |
| | Scotland | Agriculture | 4.80 | 4.47 | 4.37 | 3.98 | 4.05 | 3.56 | 3.45 | 3.28 |
| | Scotland | Fugitive | 0.72 | 0.35 | 0.42 | 0.81 | 0.68 | 0.74 | 0.69 | 0.64 |
| | Scotland | Other | 1.39 | 1.36 | 0.78 | 0.63 | 0.76 | 0.71 | 0.73 | 0.61 |
| | **Scotland** | **Total** | **159.69** | **125.21** | **102.32** | **61.73** | **64.56** | **62.03** | **60.36** | **61.13** |
| | Wales | Energy Industries | 33.68 | 30.86 | 34.85 | 8.02 | 8.15 | 9.21 | 7.91 | 6.09 |
| | Wales | Industrial Combustion | 14.04 | 9.43 | 9.91 | 9.20 | 8.84 | 8.81 | 7.68 | 7.01 |
| | Wales | Transport Sources | 35.42 | 25.46 | 22.26 | 13.85 | 14.15 | 15.06 | 13.71 | 13.33 |
| | Wales | Residential, Commercial & Public Sector Combustion | 10.79 | 8.27 | 6.02 | 4.60 | 4.52 | 3.83 | 3.60 | 3.82 |

| Pollutant | Region | Sector | 2005 | 2010 | 2015 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|---|
| | Wales | Agriculture | 3.22 | 2.85 | 2.85 | 2.86 | 3.01 | 2.41 | 2.49 | 2.38 |
| | Wales | Fugitive | 0.10 | 0.14 | 0.16 | 0.06 | 0.06 | 0.03 | 0.03 | 0.004 |
| | Wales | Other | 1.24 | 1.04 | 0.83 | 0.62 | 0.70 | 0.56 | 0.59 | 0.51 |
| | **Wales** | **Total** | **98.49** | **78.04** | **76.89** | **39.21** | **39.41** | **39.91** | **36.01** | **33.15** |
| | Northern Ireland | Energy Industries | 9.80 | 5.93 | 5.06 | 3.16 | 3.54 | 3.14 | 2.17 | 1.97 |
| | Northern Ireland | Industrial Combustion | 7.09 | 3.49 | 3.78 | 2.65 | 2.23 | 2.36 | 2.27 | 1.94 |
| | Northern Ireland | Transport Sources | 23.58 | 17.13 | 13.73 | 8.05 | 8.57 | 8.71 | 8.43 | 8.03 |
| | Northern Ireland | Residential, Commercial & Public Sector Combustion | 6.91 | 6.46 | 5.23 | 4.26 | 3.92 | 3.07 | 2.88 | 2.85 |
| | Northern Ireland | Agriculture | 3.33 | 2.99 | 2.97 | 3.14 | 3.12 | 2.61 | 2.72 | 2.96 |
| | Northern Ireland | Fugitive | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | Northern Ireland | Other | 0.43 | 0.40 | 0.24 | 0.20 | 0.24 | 0.22 | 0.23 | 0.19 |
| | **Northern Ireland** | **Total** | **51.13** | **36.40** | **31.01** | **21.47** | **21.62** | **20.12** | **18.69** | **17.94** |
| **NMVOC (kt)** | England | Energy Industries | 4.81 | 3.99 | 2.73 | 1.86 | 2.09 | 2.42 | 2.05 | 1.70 |
| | England | Industrial Combustion | 26.30 | 17.83 | 15.85 | 14.18 | 15.25 | 14.29 | 13.50 | 12.57 |
| | England | Transport Sources | 195.78 | 91.82 | 54.04 | 31.39 | 33.41 | 34.71 | 34.40 | 34.30 |



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| Pollutant | Region | Sector | 2005 | 2010 | 2015 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|---|
| | England | Solvent Processes | 323.14 | 278.46 | 271.78 | 272.50 | 258.12 | 239.44 | 248.32 | 245.09 |
| | England | Residential, Commercial & Public Sector Combustion | 41.33 | 33.29 | 28.70 | 28.55 | 29.95 | 29.10 | 27.02 | 25.67 |
| | England | Agriculture | 73.92 | 72.97 | 77.31 | 82.78 | 85.28 | 85.86 | 81.16 | 78.43 |
| | England | Industrial Processes | 66.09 | 49.74 | 42.28 | 41.41 | 40.46 | 38.58 | 37.38 | 37.62 |
| | England | Fugitive | 161.41 | 95.51 | 66.41 | 46.38 | 47.84 | 49.78 | 52.15 | 48.38 |
| | England | Other | 15.04 | 12.84 | 11.37 | 11.13 | 11.07 | 10.86 | 10.77 | 10.65 |
| | **England** | **Total** | **907.83** | **656.45** | **570.50** | **530.18** | **523.47** | **505.04** | **506.75** | **494.41** |
| | Scotland | Energy Industries | 1.86 | 1.19 | 0.79 | 0.56 | 0.55 | 0.57 | 0.54 | 0.45 |
| | Scotland | Industrial Combustion | 2.46 | 1.85 | 1.64 | 1.46 | 1.49 | 1.51 | 1.57 | 1.81 |
| | Scotland | Transport Sources | 19.64 | 9.62 | 5.95 | 3.42 | 3.72 | 3.93 | 3.92 | 3.97 |
| | Scotland | Solvent Processes | 31.04 | 26.75 | 25.91 | 25.22 | 24.20 | 22.56 | 23.88 | 23.27 |
| | Scotland | Residential, Commercial & Public Sector Combustion | 5.32 | 4.72 | 3.67 | 2.50 | 3.31 | 3.84 | 4.24 | 4.02 |
| | Scotland | Agriculture | 17.54 | 17.16 | 15.75 | 16.37 | 15.99 | 16.15 | 14.88 | 14.59 |
| | Scotland | Industrial Processes | 58.12 | 60.84 | 69.29 | 84.39 | 86.10 | 88.00 | 90.13 | 93.62 |
| | Scotland | Fugitive | 43.02 | 22.26 | 21.39 | 11.10 | 10.32 | 9.25 | 9.17 | 9.09 |
| | Scotland | Other | 1.57 | 1.30 | 1.13 | 1.06 | 1.19 | 1.31 | 1.40 | 1.37 |
| | **Scotland** | **Total** | **180.58** | **145.69** | **145.52** | **146.08** | **146.86** | **147.12** | **149.74** | **152.19** |
| | Wales | Energy Industries | 0.74 | 1.20 | 1.29 | 0.91 | 0.75 | 1.15 | 0.85 | 0.52 |
| | Wales | Industrial Combustion | 2.02 | 1.49 | 1.31 | 1.35 | 1.36 | 1.35 | 1.20 | 1.06 |

| Pollutant | Region | Sector | 2005 | 2010 | 2015 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|---|
| | Wales | Transport Sources | 11.26 | 5.37 | 3.23 | 1.78 | 1.85 | 1.95 | 1.91 | 1.93 |
| | Wales | Solvent Processes | 19.46 | 16.09 | 14.86 | 15.10 | 14.39 | 13.13 | 13.24 | 12.96 |
| | Wales | Residential, Commercial & Public Sector Combustion | 4.24 | 3.96 | 3.55 | 3.33 | 3.07 | 2.64 | 2.09 | 1.97 |
| | Wales | Agriculture | 11.26 | 11.35 | 11.94 | 13.04 | 13.49 | 13.05 | 12.55 | 12.78 |
| | Wales | Industrial Processes | 2.70 | 2.54 | 2.64 | 2.45 | 2.57 | 2.39 | 2.57 | 2.29 |
| | Wales | Fugitive | 13.66 | 12.48 | 8.47 | 4.14 | 4.19 | 4.15 | 4.35 | 4.25 |
| | Wales | Other | 1.13 | 0.95 | 0.87 | 0.86 | 0.81 | 0.75 | 0.71 | 0.70 |
| | **Wales** | **Total** | **66.47** | **55.42** | **48.17** | **42.97** | **42.48** | **40.58** | **39.47** | **38.45** |
| | Northern Ireland | Energy Industries | 0.35 | 0.21 | 0.15 | 0.08 | 0.12 | 0.08 | 0.06 | 0.08 |
| | Northern Ireland | Industrial Combustion | 0.85 | 0.59 | 0.54 | 0.50 | 0.45 | 0.44 | 0.42 | 0.37 |
| | Northern Ireland | Transport Sources | 7.34 | 3.73 | 2.24 | 1.25 | 1.31 | 1.36 | 1.34 | 1.35 |
| | Northern Ireland | Solvent Processes | 10.37 | 9.23 | 8.72 | 9.00 | 8.64 | 7.91 | 7.98 | 7.91 |
| | Northern Ireland | Residential, Commercial & Public Sector Combustion | 2.41 | 2.42 | 2.69 | 4.24 | 3.55 | 2.79 | 1.79 | 1.62 |
| | Northern Ireland | Agriculture | 15.47 | 15.16 | 17.56 | 18.59 | 19.45 | 17.81 | 19.30 | 18.37 |
| | Northern Ireland | Industrial Processes | 3.61 | 3.61 | 3.43 | 3.78 | 3.71 | 3.67 | 3.72 | 3.84 |



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| Pollutant | Region | Sector | 2005 | 2010 | 2015 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|---|
| | Northern Ireland | Fugitive | 1.58 | 0.87 | 0.79 | 0.59 | 0.64 | 0.70 | 0.73 | 0.75 |
| | Northern Ireland | Other | 0.79 | 0.69 | 0.62 | 0.62 | 0.59 | 0.54 | 0.52 | 0.52 |
| | **Northern Ireland** | **Total** | **42.77** | **36.51** | **36.74** | **38.65** | **38.46** | **35.31** | **35.88** | **34.82** |
| **$PM_{10}$ (kt)** | England | Energy Industries | 8.30 | 5.45 | 4.64 | 1.72 | 1.46 | 1.38 | 1.23 | 1.39 |
| | England | Industrial Combustion | 9.75 | 7.53 | 6.94 | 5.23 | 5.98 | 5.30 | 4.68 | 3.72 |
| | England | Transport Sources | 32.44 | 26.76 | 22.82 | 16.19 | 17.57 | 18.31 | 18.10 | 18.00 |
| | England | Residential, Commercial & Public Sector Combustion | 14.93 | 13.03 | 12.50 | 12.66 | 12.56 | 11.44 | 11.10 | 10.52 |
| | England | Agriculture | 11.71 | 11.52 | 11.42 | 11.29 | 11.80 | 11.47 | 10.95 | 10.81 |
| | England | Industrial Processes | 45.09 | 37.30 | 33.11 | 27.51 | 32.89 | 34.20 | 29.64 | 27.76 |
| | England | Fugitive | 1.30 | 1.40 | 0.98 | 0.65 | 0.63 | 0.62 | 0.60 | 0.58 |
| | England | Waste | 6.29 | 5.97 | 6.02 | 6.11 | 6.15 | 5.99 | 5.92 | 5.95 |
| | England | Other | 1.85 | 1.41 | 1.58 | 1.46 | 1.63 | 1.50 | 1.50 | 1.40 |
| | **England** | **Total** | **131.67** | **110.37** | **100.01** | **82.82** | **90.68** | **90.21** | **83.72** | **80.14** |
| | Scotland | Energy Industries | 1.75 | 1.38 | 0.49 | 0.16 | 0.21 | 0.13 | 0.14 | 0.12 |
| | Scotland | Industrial Combustion | 1.03 | 0.69 | 0.56 | 0.34 | 0.33 | 0.33 | 0.73 | 1.67 |
| | Scotland | Transport Sources | 4.42 | 3.25 | 2.78 | 1.93 | 2.16 | 2.28 | 2.25 | 2.25 |
| | Scotland | Residential, Commercial & Public Sector Combustion | 2.18 | 1.96 | 1.59 | 1.13 | 1.43 | 1.57 | 1.79 | 1.70 |
| | Scotland | Agriculture | 1.77 | 1.80 | 1.79 | 1.79 | 1.78 | 1.81 | 1.72 | 1.72 |

| Pollutant | Region | Sector | 2005 | 2010 | 2015 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|---|
| | Scotland | Industrial Processes | 3.34 | 2.83 | 2.38 | 1.93 | 2.39 | 2.50 | 2.16 | 2.10 |
| | Scotland | Fugitive | 0.51 | 0.43 | 0.24 | 0.11 | 0.10 | 0.09 | 0.10 | 0.11 |
| | Scotland | Waste | 0.58 | 0.55 | 0.55 | 0.54 | 0.67 | 0.76 | 0.86 | 0.86 |
| | Scotland | Other | 0.15 | 0.11 | 0.12 | 0.10 | 0.12 | 0.11 | 0.11 | 0.10 |
| | **Scotland** | **Total** | **15.73** | **13.00** | **10.49** | **8.05** | **9.18** | **9.58** | **9.86** | **10.62** |
| | Wales | Energy Industries | 1.02 | 0.83 | 0.57 | 0.22 | 0.49 | 0.28 | 0.17 | 0.20 |
| | Wales | Industrial Combustion | 0.66 | 0.58 | 0.72 | 0.57 | 0.34 | 0.59 | 0.33 | 0.29 |
| | Wales | Transport Sources | 2.38 | 1.86 | 1.58 | 1.07 | 1.17 | 1.26 | 1.23 | 1.24 |
| | Wales | Residential, Commercial & Public Sector Combustion | 1.75 | 1.71 | 1.57 | 1.49 | 1.31 | 1.07 | 0.89 | 0.84 |
| | Wales | Agriculture | 0.84 | 0.85 | 0.91 | 0.97 | 0.99 | 0.99 | 1.02 | 1.05 |
| | Wales | Industrial Processes | 4.46 | 3.56 | 3.75 | 3.54 | 3.67 | 3.39 | 3.12 | 2.88 |
| | Wales | Fugitive | 0.16 | 0.17 | 0.16 | 0.17 | 0.22 | 0.14 | 0.17 | 0.06 |
| | Wales | Waste | 0.55 | 0.54 | 0.55 | 0.58 | 0.53 | 0.48 | 0.44 | 0.44 |
| | Wales | Other | 0.10 | 0.07 | 0.08 | 0.08 | 0.08 | 0.07 | 0.07 | 0.07 |
| | **Wales** | **Total** | **11.92** | **10.17** | **9.88** | **8.68** | **8.80** | **8.28** | **7.44** | **7.07** |
| | Northern Ireland | Energy Industries | 0.30 | 0.08 | 0.06 | 0.04 | 0.04 | 0.02 | 0.02 | 0.02 |
| | Northern Ireland | Industrial Combustion | 0.55 | 0.45 | 0.44 | 0.40 | 0.18 | 0.17 | 0.25 | 0.12 |



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| Pollutant | Region | Sector | 2005 | 2010 | 2015 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|---|
| | Northern Ireland | Transport Sources | 1.48 | 1.20 | 0.98 | 0.69 | 0.75 | 0.79 | 0.79 | 0.78 |
| | Northern Ireland | Residential, Commercial & Public Sector Combustion | 1.10 | 1.12 | 1.20 | 1.77 | 1.47 | 1.12 | 0.79 | 0.72 |
| | Northern Ireland | Agriculture | 1.13 | 1.09 | 1.27 | 1.38 | 1.40 | 1.30 | 1.45 | 1.41 |
| | Northern Ireland | Industrial Processes | 2.02 | 1.57 | 1.38 | 1.25 | 1.50 | 1.49 | 1.34 | 1.27 |
| | Northern Ireland | Fugitive | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.02 |
| | Northern Ireland | Waste | 0.41 | 0.41 | 0.42 | 0.42 | 0.41 | 0.38 | 0.36 | 0.36 |
| | Northern Ireland | Other | 0.04 | 0.03 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 |
| | **Northern Ireland** | **Total** | **7.05** | **5.97** | **5.80** | **6.00** | **5.82** | **5.32** | **5.06** | **4.74** |
| **$SO_2$ (kt)** | England | Energy Industries | 358.02 | 150.18 | 91.34 | 24.33 | 22.50 | 20.18 | 19.98 | 19.03 |
| | England | Industrial Combustion | 103.01 | 87.22 | 48.72 | 29.60 | 25.39 | 22.76 | 21.08 | 15.99 |
| | England | Transport Sources | 17.40 | 6.22 | 4.11 | 1.57 | 1.46 | 1.92 | 1.79 | 1.63 |
| | England | Residential, Commercial & Public Sector Combustion | 25.86 | 19.84 | 11.96 | 10.75 | 10.75 | 13.14 | 12.13 | 12.40 |
| | England | Industrial Processes | 29.77 | 11.42 | 7.04 | 5.18 | 5.58 | 7.39 | 6.35 | 4.92 |
| | England | Fugitive | 6.98 | 16.20 | 11.18 | 6.17 | 5.71 | 5.35 | 5.20 | 6.09 |
| | England | Other | 5.93 | 1.94 | 1.35 | 0.82 | 0.76 | 0.75 | 0.82 | 0.68 |
| | **England** | **Total** | **546.98** | **293.02** | **175.70** | **78.41** | **72.16** | **71.48** | **67.35** | **60.74** |

| Pollutant | Region | Sector | 2005 | 2010 | 2015 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|---|
| | Scotland | Energy Industries | 53.63 | 65.00 | 17.62 | 1.86 | 2.17 | 2.39 | 4.40 | 5.65 |
| | Scotland | Industrial Combustion | 11.78 | 4.71 | 3.01 | 1.71 | 1.61 | 1.35 | 1.47 | 1.65 |
| | Scotland | Transport Sources | 9.77 | 1.83 | 1.16 | 0.49 | 0.48 | 0.59 | 0.51 | 0.50 |
| | Scotland | Residential, Commercial & Public Sector Combustion | 4.22 | 2.63 | 1.34 | 0.60 | 0.97 | 1.59 | 1.86 | 1.85 |
| | Scotland | Industrial Processes | 0.82 | 0.64 | 0.72 | 0.58 | 0.53 | 0.46 | 0.45 | 0.44 |
| | Scotland | Fugitive | 0.41 | 0.15 | 0.11 | 0.14 | 0.14 | 0.11 | 0.10 | 0.09 |
| | Scotland | Other | 0.56 | 0.19 | 0.13 | 0.08 | 0.07 | 0.08 | 0.08 | 0.07 |
| | **Scotland** | **Total** | **81.18** | **75.15** | **24.08** | **5.46** | **5.96** | **6.56** | **8.87** | **10.25** |
| | Wales | Energy Industries | 39.69 | 16.96 | 12.67 | 2.44 | 3.00 | 2.71 | 1.93 | 1.70 |
| | Wales | Industrial Combustion | 6.49 | 9.09 | 7.55 | 5.84 | 4.39 | 4.56 | 4.29 | 2.57 |
| | Wales | Transport Sources | 3.49 | 1.07 | 0.58 | 0.20 | 0.17 | 0.27 | 0.19 | 0.21 |
| | Wales | Residential, Commercial & Public Sector Combustion | 2.87 | 2.13 | 1.62 | 1.71 | 1.40 | 1.37 | 0.99 | 0.98 |
| | Wales | Industrial Processes | 2.34 | 0.46 | 0.67 | 0.48 | 0.44 | 0.50 | 0.46 | 0.34 |
| | Wales | Fugitive | 1.03 | 2.84 | 2.00 | 1.76 | 1.54 | 1.40 | 1.47 | 0.94 |
| | Wales | Other | 0.26 | 0.09 | 0.06 | 0.04 | 0.03 | 0.03 | 0.04 | 0.03 |
| | **Wales** | **Total** | **56.19** | **32.64** | **25.15** | **12.46** | **10.98** | **10.85** | **9.37** | **6.77** |
| | Northern Ireland | Energy Industries | 14.88 | 2.31 | 2.49 | 1.14 | 1.22 | 1.00 | 0.55 | 0.11 |



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| Pollutant | Region | Sector | 2005 | 2010 | 2015 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|---|
| | Northern Ireland | Industrial Combustion | 4.17 | 3.71 | 4.30 | 2.20 | 2.26 | 2.04 | 1.89 | 1.67 |
| | Northern Ireland | Transport Sources | 1.19 | 0.27 | 0.16 | 0.06 | 0.06 | 0.10 | 0.07 | 0.07 |
| | Northern Ireland | Residential, Commercial & Public Sector Combustion | 2.23 | 1.83 | 1.70 | 3.14 | 2.37 | 2.01 | 1.25 | 1.16 |
| | Northern Ireland | Industrial Processes | 0.03 | 0.03 | 0.03 | 0.02 | 0.02 | 0.03 | 0.02 | 0.02 |
| | Northern Ireland | Fugitive | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | Northern Ireland | Other | 0.17 | 0.05 | 0.04 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 |
| | **Northern Ireland** | **Total** | **22.67** | **8.21** | **8.72** | **6.59** | **5.95** | **5.19** | **3.80** | **3.05** |
| **Pb (t)** | England | Energy Industries | 8.77 | 2.10 | 2.38 | 1.89 | 1.83 | 2.01 | 2.09 | 3.92 |
| | England | Industrial Combustion | 11.43 | 11.20 | 13.04 | 9.47 | 9.63 | 9.35 | 9.41 | 8.51 |
| | England | Transport Sources | 72.26 | 52.86 | 49.47 | 37.14 | 46.28 | 49.99 | 51.42 | 51.12 |
| | England | Residential, Commercial & Public Sector Combustion | 2.95 | 2.63 | 2.12 | 2.21 | 2.34 | 2.31 | 2.09 | 2.14 |
| | England | Industrial Processes | 65.72 | 31.77 | 35.87 | 23.31 | 31.87 | 41.71 | 31.75 | 29.42 |
| | England | Fugitive | 1.92 | 1.67 | 1.03 | 0.30 | 0.26 | 0.22 | 0.13 | 0.06 |
| | England | Other | 1.75 | 0.64 | 0.26 | 4.87 | 1.88 | 1.02 | 0.77 | 0.66 |
| | **England** | **Total** | **164.79** | **102.88** | **104.17** | **79.19** | **94.08** | **106.60** | **97.66** | **95.85** |
| | Scotland | Energy Industries | 1.54 | 1.22 | 0.60 | 0.21 | 0.22 | 0.23 | 0.13 | 0.11 |

| Pollutant | Region | Sector | 2005 | 2010 | 2015 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|---|
| | Scotland | Industrial Combustion | 1.76 | 1.61 | 1.25 | 1.03 | 1.00 | 1.04 | 1.30 | 1.90 |
| | Scotland | Transport Sources | 8.13 | 6.11 | 5.70 | 4.10 | 5.72 | 5.79 | 5.67 | 5.57 |
| | Scotland | Residential, Commercial & Public Sector Combustion | 0.39 | 0.35 | 0.28 | 0.22 | 0.27 | 0.31 | 0.33 | 0.34 |
| | Scotland | Industrial Processes | 2.25 | 1.36 | 1.33 | 0.76 | 0.87 | 1.15 | 0.73 | 0.69 |
| | Scotland | Fugitive | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | Scotland | Other | 0.15 | 0.05 | 0.01 | 0.42 | 0.16 | 0.08 | 0.06 | 0.05 |
| | **Scotland** | **Total** | **14.22** | **10.70** | **9.18** | **6.74** | **8.23** | **8.62** | **8.23** | **8.66** |
| | Wales | Energy Industries | 0.77 | 0.61 | 0.22 | 0.15 | 0.14 | 0.16 | 0.14 | 0.20 |
| | Wales | Industrial Combustion | 2.61 | 0.89 | 1.08 | 0.90 | 0.76 | 0.99 | 0.86 | 0.78 |
| | Wales | Transport Sources | 4.37 | 3.62 | 3.12 | 2.34 | 2.78 | 3.06 | 2.84 | 2.76 |
| | Wales | Residential, Commercial & Public Sector Combustion | 0.34 | 0.29 | 0.26 | 0.23 | 0.22 | 0.20 | 0.16 | 0.16 |
| | Wales | Industrial Processes | 16.93 | 11.71 | 12.92 | 8.62 | 20.19 | 20.90 | 16.80 | 10.41 |
| | Wales | Fugitive | 0.40 | 0.55 | 0.53 | 0.48 | 0.48 | 0.39 | 0.29 | 0.05 |
| | Wales | Other | 0.09 | 0.03 | 0.008 | 0.20 | 0.07 | 0.04 | 0.03 | 0.02 |
| | **Wales** | **Total** | **25.52** | **17.70** | **18.13** | **12.92** | **24.64** | **25.75** | **21.13** | **14.39** |
| | Northern Ireland | Energy Industries | 0.05 | 0.04 | 0.04 | 0.09 | 0.05 | 0.05 | 0.05 | 0.03 |
| | Northern Ireland | Industrial Combustion | 1.04 | 1.01 | 0.87 | 0.61 | 0.50 | 0.51 | 0.61 | 0.49 |



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| Pollutant | Region | Sector | 2005 | 2010 | 2015 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|---|
| | Northern Ireland | Transport Sources | 2.44 | 2.16 | 1.98 | 1.57 | 1.77 | 1.90 | 1.93 | 1.92 |
| | Northern Ireland | Residential, Commercial & Public Sector Combustion | 0.21 | 0.21 | 0.19 | 0.26 | 0.23 | 0.19 | 0.12 | 0.12 |
| | Northern Ireland | Industrial Processes | 0.62 | 0.42 | 0.44 | 0.33 | 0.41 | 0.42 | 0.28 | 0.28 |
| | Northern Ireland | Fugitive | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | Northern Ireland | Other | 0.05 | 0.02 | 0.007 | 0.13 | 0.05 | 0.03 | 0.02 | 0.02 |
| | **Northern Ireland** | **Total** | **4.42** | **3.86** | **3.53** | **2.99** | **3.01** | **3.09** | **3.02** | **2.86** |
| **$PM_{2.5}$ (kt)** | England | Energy Industries | 5.05 | 3.57 | 2.96 | 1.40 | 1.20 | 1.14 | 1.02 | 1.15 |
| | England | Industrial Combustion | 8.77 | 6.71 | 6.06 | 4.82 | 5.52 | 4.89 | 4.36 | 3.41 |
| | England | Transport Sources | 25.20 | 19.74 | 15.52 | 10.04 | 10.81 | 11.17 | 10.92 | 10.81 |
| | England | Residential, Commercial & Public Sector Combustion | 14.52 | 12.67 | 12.20 | 12.28 | 12.16 | 11.05 | 10.74 | 10.15 |
| | England | Agriculture | 1.98 | 1.93 | 1.91 | 1.85 | 1.91 | 1.87 | 1.80 | 1.78 |
| | England | Industrial Processes | 12.12 | 9.00 | 8.80 | 6.62 | 7.30 | 7.71 | 6.48 | 5.62 |
| | England | Fugitive | 0.80 | 0.87 | 0.71 | 0.60 | 0.59 | 0.59 | 0.58 | 0.57 |
| | England | Waste | 5.86 | 5.58 | 5.64 | 5.76 | 5.80 | 5.63 | 5.57 | 5.60 |
| | England | Other | 0.97 | 0.69 | 0.66 | 0.59 | 0.67 | 0.62 | 0.62 | 0.58 |
| | **England** | **Total** | **75.28** | **60.76** | **54.46** | **43.96** | **45.96** | **44.67** | **42.09** | **39.65** |
| | Scotland | Energy Industries | 1.05 | 0.88 | 0.32 | 0.13 | 0.18 | 0.11 | 0.12 | 0.10 |

| Pollutant | Region | Sector | 2005 | 2010 | 2015 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|---|
| | Scotland | Industrial Combustion | 0.95 | 0.63 | 0.51 | 0.32 | 0.30 | 0.30 | 0.70 | 1.61 |
| | Scotland | Transport Sources | 3.60 | 2.48 | 1.99 | 1.27 | 1.39 | 1.46 | 1.43 | 1.42 |
| | Scotland | Residential, Commercial & Public Sector Combustion | 2.12 | 1.91 | 1.55 | 1.10 | 1.38 | 1.52 | 1.74 | 1.65 |
| | Scotland | Agriculture | 0.39 | 0.38 | 0.37 | 0.36 | 0.36 | 0.36 | 0.35 | 0.34 |
| | Scotland | Industrial Processes | 0.87 | 0.64 | 0.59 | 0.42 | 0.48 | 0.50 | 0.42 | 0.40 |
| | Scotland | Fugitive | 0.19 | 0.18 | 0.18 | 0.11 | 0.10 | 0.09 | 0.10 | 0.11 |
| | Scotland | Waste | 0.54 | 0.51 | 0.51 | 0.51 | 0.63 | 0.72 | 0.81 | 0.81 |
| | Scotland | Other | 0.08 | 0.05 | 0.05 | 0.04 | 0.05 | 0.04 | 0.04 | 0.04 |
| | **Scotland** | **Total** | **9.79** | **7.65** | **6.06** | **4.25** | **4.86** | **5.11** | **5.70** | **6.48** |
| | Wales | Energy Industries | 0.61 | 0.53 | 0.36 | 0.16 | 0.33 | 0.19 | 0.12 | 0.14 |
| | Wales | Industrial Combustion | 0.60 | 0.49 | 0.49 | 0.52 | 0.31 | 0.55 | 0.30 | 0.26 |
| | Wales | Transport Sources | 1.90 | 1.40 | 1.10 | 0.68 | 0.73 | 0.78 | 0.76 | 0.76 |
| | Wales | Residential, Commercial & Public Sector Combustion | 1.71 | 1.67 | 1.54 | 1.45 | 1.28 | 1.04 | 0.86 | 0.81 |
| | Wales | Agriculture | 0.22 | 0.21 | 0.22 | 0.22 | 0.22 | 0.22 | 0.22 | 0.22 |
| | Wales | Industrial Processes | 1.59 | 1.25 | 1.57 | 1.53 | 1.41 | 1.21 | 1.09 | 1.03 |
| | Wales | Fugitive | 0.07 | 0.07 | 0.06 | 0.09 | 0.12 | 0.08 | 0.10 | 0.04 |
| | Wales | Waste | 0.52 | 0.51 | 0.52 | 0.55 | 0.51 | 0.46 | 0.42 | 0.42 |
| | Wales | Other | 0.05 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 |



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| Pollutant | Region | Sector | 2005 | 2010 | 2015 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|---|
| | **Wales** | **Total** | **7.26** | **6.17** | **5.87** | **5.23** | **4.93** | **4.56** | **3.90** | **3.72** |
| | Northern Ireland | Energy Industries | 0.18 | 0.06 | 0.05 | 0.03 | 0.04 | 0.02 | 0.02 | 0.02 |
| | Northern Ireland | Industrial Combustion | 0.48 | 0.39 | 0.38 | 0.38 | 0.16 | 0.15 | 0.24 | 0.11 |
| | Northern Ireland | Transport Sources | 1.15 | 0.88 | 0.66 | 0.42 | 0.46 | 0.48 | 0.47 | 0.47 |
| | Northern Ireland | Residential, Commercial & Public Sector Combustion | 1.07 | 1.09 | 1.17 | 1.73 | 1.43 | 1.09 | 0.77 | 0.70 |
| | Northern Ireland | Agriculture | 0.28 | 0.27 | 0.29 | 0.30 | 0.31 | 0.30 | 0.32 | 0.31 |
| | Northern Ireland | Industrial Processes | 0.36 | 0.28 | 0.25 | 0.22 | 0.26 | 0.26 | 0.23 | 0.21 |
| | Northern Ireland | Fugitive | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| | Northern Ireland | Waste | 0.38 | 0.39 | 0.40 | 0.40 | 0.39 | 0.36 | 0.34 | 0.34 |
| | Northern Ireland | Other | 0.02 | 0.02 | 0.02 | 0.01 | 0.02 | 0.01 | 0.02 | 0.01 |
| | **Northern Ireland** | **Total** | **3.96** | **3.39** | **3.22** | **3.51** | **3.07** | **2.69** | **2.40** | **2.19** |
| **B[a]P (kg)** | England | Energy Industries | 68.82 | 70.25 | 168.31 | 204.82 | 217.12 | 182.93 | 169.89 | 208.80 |
| | England | Industrial Combustion | 37.43 | 32.97 | 28.30 | 26.65 | 27.35 | 23.82 | 25.60 | 27.37 |
| | England | Transport Sources | 191.39 | 145.91 | 131.59 | 100.64 | 110.99 | 118.88 | 119.05 | 119.34 |
| | England | Residential, Commercial & Public Sector Combustion | 2,345.11 | 2,026.06 | 2,185.62 | 2,594.49 | 2,988.67 | 3,344.04 | 3,445.62 | 3,298.96 |

| Pollutant | Region | Sector | 2005 | 2010 | 2015 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|---|
| | England | Industrial Processes | 136.29 | 93.80 | 98.76 | 72.14 | 44.74 | 43.45 | 40.88 | 39.32 |
| | England | Fugitive | 63.64 | 80.50 | 52.47 | 20.72 | 18.29 | 13.04 | 6.66 | 0.99 |
| | England | Waste | 748.43 | 257.40 | 259.66 | 264.10 | 266.42 | 257.87 | 254.60 | 254.12 |
| | England | Other | 9.29 | 6.93 | 7.06 | 7.52 | 8.85 | 7.53 | 7.43 | 6.59 |
| | **England** | **Total** | **3,600.39** | **2,713.81** | **2,931.77** | **3,291.08** | **3,682.42** | **3,991.56** | **4,069.73** | **3,955.49** |
| | Scotland | Energy Industries | 5.32 | 7.25 | 4.27 | 0.41 | 0.30 | 0.29 | 0.13 | 0.08 |
| | Scotland | Industrial Combustion | 3.37 | 3.64 | 2.77 | 2.64 | 2.69 | 2.33 | 2.63 | 3.07 |
| | Scotland | Transport Sources | 19.36 | 15.31 | 13.79 | 10.48 | 11.81 | 12.77 | 12.83 | 12.88 |
| | Scotland | Residential, Commercial & Public Sector Combustion | 303.48 | 284.12 | 246.28 | 180.58 | 305.74 | 440.67 | 556.09 | 532.97 |
| | Scotland | Industrial Processes | 12.05 | 8.56 | 8.46 | 6.73 | 7.00 | 6.12 | 5.75 | 5.55 |
| | Scotland | Fugitive | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | Scotland | Waste | 133.44 | 25.56 | 25.19 | 25.21 | 29.82 | 32.83 | 36.42 | 36.51 |
| | Scotland | Other | 0.93 | 0.69 | 0.69 | 0.72 | 0.85 | 0.72 | 0.70 | 0.62 |
| | **Scotland** | **Total** | **477.95** | **345.14** | **301.45** | **226.75** | **358.20** | **495.73** | **614.56** | **591.68** |
| | Wales | Energy Industries | 10.26 | 9.10 | 11.13 | 8.00 | 8.55 | 8.20 | 8.15 | 8.80 |
| | Wales | Industrial Combustion | 7.67 | 2.25 | 2.02 | 1.98 | 1.97 | 1.74 | 1.82 | 1.93 |
| | Wales | Transport Sources | 12.07 | 9.24 | 8.47 | 6.42 | 7.12 | 7.75 | 7.75 | 7.77 |
| | Wales | Residential, Commercial & Public Sector Combustion | 313.39 | 305.28 | 315.98 | 359.08 | 350.74 | 335.71 | 289.03 | 276.48 |



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| Pollutant | Region | Sector | 2005 | 2010 | 2015 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|---|
| | Wales | Industrial Processes | 52.11 | 15.32 | 15.75 | 14.39 | 7.74 | 8.41 | 8.01 | 4.62 |
| | Wales | Fugitive | 14.16 | 25.24 | 79.28 | 70.84 | 59.16 | 43.30 | 26.92 | 4.21 |
| | Wales | Waste | 107.78 | 24.02 | 24.67 | 25.87 | 23.91 | 21.62 | 20.07 | 20.07 |
| | Wales | Other | 0.54 | 0.39 | 0.39 | 0.41 | 0.48 | 0.41 | 0.40 | 0.35 |
| | **Wales** | **Total** | **517.98** | **390.84** | **457.69** | **486.98** | **459.69** | **427.15** | **362.15** | **324.23** |
| | Northern Ireland | Energy Industries | 1.83 | 0.89 | 0.95 | 0.94 | 1.00 | 0.84 | 0.78 | 0.96 |
| | Northern Ireland | Industrial Combustion | 1.73 | 1.26 | 1.13 | 1.10 | 1.07 | 0.92 | 1.02 | 1.06 |
| | Northern Ireland | Transport Sources | 7.90 | 6.25 | 5.31 | 4.01 | 4.45 | 4.79 | 4.83 | 4.85 |
| | Northern Ireland | Residential, Commercial & Public Sector Combustion | 192.15 | 195.32 | 264.11 | 482.33 | 417.29 | 360.62 | 258.70 | 243.39 |
| | Northern Ireland | Industrial Processes | 1.17 | 0.92 | 0.89 | 0.87 | 0.93 | 0.81 | 0.74 | 0.69 |
| | Northern Ireland | Fugitive | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | Northern Ireland | Waste | 92.00 | 19.46 | 19.99 | 20.10 | 20.18 | 18.77 | 17.89 | 17.89 |
| | Northern Ireland | Other | 0.31 | 0.23 | 0.24 | 0.25 | 0.30 | 0.25 | 0.24 | 0.22 |
| | **Northern Ireland** | **Total** | **297.10** | **224.33** | **292.62** | **509.60** | **445.23** | **387.00** | **284.20** | **269.05** |
| **PCDD/Fs (g-ITEQ)** | England | Energy Industries | 5.14 | 2.63 | 10.22 | 1.60 | 1.86 | 3.04 | 2.94 | 3.52 |
| | England | Industrial Combustion | 9.27 | 15.81 | 14.46 | 13.80 | 14.88 | 13.57 | 11.73 | 11.66 |

| Pollutant | Region | Sector | 2005 | 2010 | 2015 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|---|
| | England | Transport Sources | 16.55 | 14.69 | 9.59 | 4.27 | 4.30 | 4.21 | 3.90 | 3.63 |
| | England | Residential, Commercial & Public Sector Combustion | 11.07 | 8.79 | 11.30 | 14.73 | 17.16 | 18.50 | 18.12 | 18.08 |
| | England | Industrial Processes | 29.52 | 30.92 | 13.89 | 8.16 | 6.34 | 19.84 | 7.49 | 4.54 |
| | England | Waste | 75.49 | 37.51 | 31.64 | 28.97 | 29.08 | 29.63 | 29.16 | 29.09 |
| | England | Other | 0.59 | 0.50 | 0.38 | 0.30 | 0.31 | 0.28 | 0.23 | 0.13 |
| | **England** | **Total** | **147.62** | **110.86** | **91.47** | **71.84** | **73.93** | **89.08** | **73.56** | **70.65** |
| | Scotland | Energy Industries | 0.24 | 0.18 | 0.25 | 0.15 | 0.13 | 0.22 | 0.22 | 0.24 |
| | Scotland | Industrial Combustion | 0.90 | 1.22 | 1.17 | 0.86 | 0.78 | 0.78 | 1.82 | 4.46 |
| | Scotland | Transport Sources | 1.37 | 1.47 | 0.80 | 0.44 | 0.49 | 0.50 | 0.46 | 0.44 |
| | Scotland | Residential, Commercial & Public Sector Combustion | 1.38 | 1.23 | 1.35 | 1.37 | 1.96 | 2.50 | 2.88 | 2.86 |
| | Scotland | Industrial Processes | 0.26 | 0.14 | 0.14 | 0.10 | 0.09 | 0.10 | 0.09 | 0.08 |
| | Scotland | Waste | 9.46 | 3.54 | 2.88 | 2.61 | 2.77 | 2.98 | 3.10 | 3.04 |
| | Scotland | Other | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| | **Scotland** | **Total** | **13.61** | **7.80** | **6.59** | **5.53** | **6.23** | **7.09** | **8.58** | **11.13** |
| | Wales | Energy Industries | 2.06 | 0.14 | 0.41 | 0.15 | 0.15 | 0.23 | 0.27 | 0.26 |
| | Wales | Industrial Combustion | 0.97 | 0.70 | 0.77 | 1.13 | 0.56 | 1.26 | 0.53 | 0.52 |
| | Wales | Transport Sources | 0.85 | 0.72 | 0.50 | 0.25 | 0.26 | 0.25 | 0.23 | 0.22 |
| | Wales | Residential, Commercial & Public Sector Combustion | 1.15 | 1.01 | 1.25 | 1.60 | 1.67 | 1.67 | 1.45 | 1.44 |



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| Pollutant | Region | Sector | 2005 | 2010 | 2015 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|---|
| | Wales | Industrial Processes | 9.85 | 11.73 | 19.31 | 13.88 | 3.24 | 2.61 | 1.92 | 1.80 |
| | Wales | Waste | 6.79 | 2.50 | 2.07 | 1.90 | 1.84 | 1.81 | 1.73 | 1.70 |
| | Wales | Other | 0.23 | 0.30 | 0.23 | 0.10 | 0.10 | 0.09 | 0.07 | 0.01 |
| | **Wales** | **Total** | **21.90** | **17.10** | **24.54** | **19.00** | **7.82** | **7.91** | **6.20** | **5.94** |
| | Northern Ireland | Energy Industries | 0.02 | 0.03 | 0.31 | 0.03 | 0.02 | 0.02 | 0.02 | 0.03 |
| | Northern Ireland | Industrial Combustion | 0.40 | 0.55 | 0.50 | 0.93 | 0.32 | 0.32 | 0.61 | 0.32 |
| | Northern Ireland | Transport Sources | 0.53 | 0.66 | 0.14 | 0.14 | 0.14 | 0.14 | 0.13 | 0.12 |
| | Northern Ireland | Residential, Commercial & Public Sector Combustion | 0.70 | 0.60 | 0.92 | 1.62 | 1.50 | 1.42 | 1.12 | 1.09 |
| | Northern Ireland | Industrial Processes | 0.05 | 0.03 | 0.03 | 0.03 | 0.03 | 0.02 | 0.02 | 0.02 |
| | Northern Ireland | Waste | 4.91 | 1.57 | 1.32 | 1.24 | 1.21 | 1.19 | 1.14 | 1.12 |
| | Northern Ireland | Other | 0.004 | 0.004 | 0.003 | 0.003 | 0.004 | 0.004 | 0.004 | 0.003 |
| | **Northern Ireland** | **Total** | **6.62** | **3.44** | **3.22** | **3.99** | **3.23** | **3.13** | **3.05** | **2.70** |
| **Hg (t)** | England | Energy Industries | 1.99 | 1.52 | 1.10 | 0.69 | 0.76 | 0.66 | 0.65 | 0.76 |
| | England | Industrial Combustion | 1.02 | 1.10 | 0.93 | 0.70 | 0.71 | 0.65 | 0.69 | 0.58 |
| | England | Transport Sources | 0.25 | 0.22 | 0.22 | 0.18 | 0.19 | 0.20 | 0.20 | 0.20 |
| | England | Residential, Commercial & Public Sector Combustion | 0.39 | 0.34 | 0.26 | 0.25 | 0.26 | 0.25 | 0.23 | 0.22 |

| Pollutant | Region | Sector | 2005 | 2010 | 2015 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|---|
| | England | Industrial Processes | 1.73 | 1.25 | 0.81 | 0.35 | 0.33 | 0.29 | 0.25 | 0.25 |
| | England | Waste | 1.18 | 1.22 | 0.79 | 0.69 | 0.62 | 0.71 | 0.60 | 0.60 |
| | England | Other | 0.03 | 0.02 | 0.01 | 0.007 | 0.008 | 0.007 | 0.006 | 0.005 |
| | **England** | **Total** | **6.58** | **5.68** | **4.12** | **2.85** | **2.89** | **2.78** | **2.62** | **2.62** |
| | Scotland | Energy Industries | 0.16 | 0.23 | 0.12 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 |
| | Scotland | Industrial Combustion | 0.13 | 0.11 | 0.08 | 0.05 | 0.04 | 0.04 | 0.05 | 0.06 |
| | Scotland | Transport Sources | 0.03 | 0.03 | 0.03 | 0.02 | 0.03 | 0.03 | 0.03 | 0.03 |
| | Scotland | Residential, Commercial & Public Sector Combustion | 0.05 | 0.04 | 0.03 | 0.02 | 0.03 | 0.03 | 0.03 | 0.03 |
| | Scotland | Industrial Processes | 0.14 | 0.09 | 0.05 | 0.01 | 0.01 | 0.02 | 0.01 | 0.01 |
| | Scotland | Waste | 0.11 | 0.11 | 0.08 | 0.07 | 0.06 | 0.07 | 0.06 | 0.06 |
| | Scotland | Other | 0.001 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | **Scotland** | **Total** | **0.62** | **0.61** | **0.39** | **0.20** | **0.20** | **0.21** | **0.21** | **0.21** |
| | Wales | Energy Industries | 0.18 | 0.07 | 0.07 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 |
| | Wales | Industrial Combustion | 0.08 | 0.10 | 0.09 | 0.14 | 0.13 | 0.11 | 0.11 | 0.09 |
| | Wales | Transport Sources | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| | Wales | Residential, Commercial & Public Sector Combustion | 0.04 | 0.03 | 0.03 | 0.02 | 0.02 | 0.02 | 0.02 | 0.01 |
| | Wales | Industrial Processes | 0.25 | 0.24 | 0.19 | 0.16 | 0.45 | 0.15 | 0.12 | 0.07 |
| | Wales | Waste | 0.07 | 0.07 | 0.04 | 0.04 | 0.04 | 0.04 | 0.03 | 0.03 |



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| Pollutant | Region | Sector | 2005 | 2010 | 2015 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|---|
| | Wales | Other | 0.003 | 0.005 | 0.004 | 0.004 | 0.004 | 0.003 | 0.002 | 0.001 |
| | **Wales** | **Total** | **0.63** | **0.52** | **0.44** | **0.40** | **0.68** | **0.36** | **0.33** | **0.26** |
| | Northern Ireland | Energy Industries | 0.07 | 0.005 | 0.008 | 0.01 | 0.01 | 0.01 | 0.01 | 0.006 |
| | Northern Ireland | Industrial Combustion | 0.06 | 0.06 | 0.09 | 0.05 | 0.04 | 0.05 | 0.05 | 0.04 |
| | Northern Ireland | Transport Sources | 0.01 | 0.009 | 0.009 | 0.007 | 0.008 | 0.008 | 0.008 | 0.008 |
| | Northern Ireland | Residential, Commercial & Public Sector Combustion | 0.02 | 0.02 | 0.02 | 0.03 | 0.02 | 0.02 | 0.01 | 0.01 |
| | Northern Ireland | Industrial Processes | 0.03 | 0.02 | 0.009 | 0.003 | 0.004 | 0.003 | 0.003 | 0.002 |
| | Northern Ireland | Waste | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.02 | 0.01 | 0.01 |
| | Northern Ireland | Other | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | **Northern Ireland** | **Total** | **0.20** | **0.14** | **0.14** | **0.11** | **0.10** | **0.10** | **0.09** | **0.08** |

* The uncertainties in the data may be greater than the precision indicated by the table above. Some values are shown with additional decimal places for transparency; however this does not imply greater precision.

# APPENDIX G: DEFINITION OF NFR CODES AND SECTOR CATEGORIES

The table below provides a lookup table between the Nomenclature for Reporting (NFR) codes and descriptions used to provide a high degree of detail in the inventories, and the categories used in the graphs within this report.

The Sector Category 'Other' is applied to 1A5a, 1A5b, 2B3, 5D2 and 6A across all pollutants, as shown in the table below. Additional Sector Categories are also included under 'Other' for each pollutant. If a Sector Category is insignificant for a pollutant, then it is included within the 'Other' category in the tables and graphs of the report. See **Table 32** below for further information.

Table 31: Definition of NFR Codes and Sector Categories

| NFR Code | NFR Source Description | Sector Category | Sub-sector Category |
|---|---|---|---|
| 1A1a | Public electricity and heat production | Energy Industries | Power generation |
| 1A1b | Petroleum refining | Energy Industries | Refineries |
| 1A1c | Manufacture of solid fuels and other energy industries | Energy Industries | Solid fuel manufacturing/coke ovens |
| 1A2a | Stationary combustion in manufacturing industries and construction: Iron and steel | Industrial Combustion | Iron and steel |
| 1A2b | Stationary combustion in manufacturing industries and construction: Non-ferrous metals | Industrial Combustion | Other industries |
| 1A2c | Stationary combustion in manufacturing industries and construction: Chemicals | Industrial Combustion | Other industries / Chemical industries (SO2 only) |
| 1A2d | Stationary combustion in manufacturing industries and construction: Pulp, Paper and Print | Industrial Combustion | Other industries / Pulp, paper and print industries (Hg only) |
| 1A2e | Stationary combustion in manufacturing industries and construction: Food processing, beverages and tobacco | Industrial Combustion | Food and drink |
| 1A2f | Stationary combustion in manufacturing industries and construction: Non-metallic minerals | Industrial Combustion | Other industries (for $NO_x$, $SO_2$, NMVOC and PCDD/Fs) / Non-metallic mineral industry (for CO, Pb, $PM_{10}$, $PM_{2.5}$ and Hg) / Other (for NH3 and B[a]P) |
| 1A2gvii | Mobile Combustion in manufacturing industries and construction: (please specify in the Informative Inventory Report (IIR)) | Industrial Combustion | Off-road mobile machinery |
| 1A2gviii | Stationary combustion in manufacturing industries and construction: Other (please specify in the IIR) | Industrial Combustion | Other stationary combustion |
| 1A3ai(i) | International aviation Landing and Take-Off (LTO) (civil) | Transport Sources | Rail, aviation and shipping |
| 1A3aii(i) | Domestic aviation LTO (civil) | Transport Sources | Rail, aviation, and shipping |
| 1A3bi | Road transport: Passenger cars | Transport Sources | Passenger cars / Other road transport (Pb only) |



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| NFR Code | NFR Source Description | Sector Category | Sub-sector Category |
|---|---|---|---|
| 1A3bii | Road transport: Light duty vehicles | Transport Sources | Other road transport |
| 1A3biii | Road transport: Heavy duty vehicles and buses | Transport Sources | Other road transport |
| 1A3biv | Road transport: Mopeds & motorcycles | Transport Sources | Other road transport |
| 1A3bv | Road transport: Gasoline evaporation | Transport Sources | Other road transport |
| 1A3bvi | Road transport: Automobile tyre and brake wear | Transport Sources | Other road transport / Tyre and brake wear (for Pb only) |
| 1A3bvii | Road transport: Automobile road abrasion | Transport Sources | Other road transport / Road abrasion (Pb only) |
| 1A3c | Railways | Transport Sources | Rail, aviation, and shipping |
| 1A3dii | National navigation (shipping) | Transport Sources | Rail, aviation, and shipping |
| 1A3eii | Other (please specify in the IIR) | Transport Sources | Rail, aviation, and shipping |
| 1A4ai | Commercial/institutional: Stationary | Residential, Commercial & Public Sector Combustion | Commercial & public sector |
| 1A4aii | Commercial/institutional: Mobile | Residential, Commercial & Public Sector Combustion | Commercial & public sector |
| 1A4bi | Residential: Stationary | Residential, Commercial & Public Sector Combustion | Residential |
| 1A4bii | Residential: Household and gardening (mobile) | Residential, Commercial & Public Sector Combustion | Residential |
| 1A4ci | Agriculture/Forestry/Fishing: Stationary | Residential, Commercial & Public Sector Combustion | Outdoor industries |
| 1A4cii | Agriculture/Forestry/Fishing: Off-road vehicles and other machinery | Residential, Commercial & Public Sector Combustion | Outdoor industries |
| 1A4ciii | Agriculture/Forestry/Fishing: National fishing | Residential, Commercial & Public Sector Combustion | Outdoor industries |
| 1A5a | Other stationary (including military) | Other | Other |
| 1A5b | Other, Mobile (including military, land based and recreational boats) | Other | Other |
| 1B1a | Fugitive emission from solid fuels: Coal mining and handling | Fugitive | Fugitive |
| 1B1b | Fugitive emission from solid fuels: Solid fuel transformation | Fugitive | Fugitive |
| 1B2ai | Fugitive emissions oil: Exploration, production, transport | Fugitive | Fugitive |
| 1B2aiv | Fugitive emissions oil: Refining / storage | Fugitive | Fugitive |
| 1B2av | Distribution of oil products | Fugitive | Fugitive |
| 1B2b | Fugitive emissions from natural gas (exploration, production, processing, transmission, storage, distribution and other) | Fugitive | Fugitive |
| 1B2c | Venting and flaring (oil, gas, combined oil and gas) | Fugitive | Fugitive |
| 2A1 | Cement production | Industrial Processes | Cement production |
| 2A3 | Glass production | Industrial Processes | Other industries |

| NFR Code | NFR Source Description | Sector Category | Sub-sector Category |
|---|---|---|---|
| 2A5a | Quarrying and mining of minerals other than coal | Industrial Processes | Non-coal quarrying and mining |
| 2A5b | Construction and demolition | Industrial Processes | Construction and demolition |
| 2A6 | Other mineral products (please specify in the IIR) | Industrial Processes | Other industries |
| 2B10a | Chemical industry: Other (please specify in the IIR) | Industrial Processes | Other industries |
| 2B10b | Storage, handling, and transport of chemical products (please specify in the IIR) | Industrial Processes | Other industries |
| 2B2 | Nitric acid production | Industrial Processes | Other industries |
| 2B3 | Adipic acid production | Other | Other |
| 2B6 | Titanium dioxide production | Industrial Processes | Other industries |
| 2B7 | Soda ash production | Industrial Processes | Other industries |
| 2C1 | Iron and steel production | Industrial Processes | Iron and steel |
| 2C3 | Aluminium production | Industrial Processes | Other industries |
| 2C4 | Magnesium production | Industrial Processes | Other industries |
| 2C5 | Lead production | Industrial Processes | Other industries |
| 2C6 | Zinc production | Industrial Processes | Other industries |
| 2C7a | Copper production | Industrial Processes | Other industries |
| 2C7b | Nickel production | Industrial Processes | Other industries |
| 2C7c | Other metal production (please specify in the IIR) | Industrial Processes | Other industries |
| 2D3a | Domestic solvent use including fungicides | Solvent Processes | Domestic |
| 2D3b | Road paving with asphalt | Solvent Processes | Industrial |
| 2D3d | Coating applications | Solvent Processes | Industrial |
| 2D3e | Degreasing | Solvent Processes | Industrial |
| 2D3f | Dry cleaning | Solvent Processes | Industrial |
| 2D3g | Chemical products | Solvent Processes | Industrial |
| 2D3h | Printing | Solvent Processes | Industrial |
| 2D3i | Other solvent use (please specify in the IIR) | Solvent Processes | Other solvent uses |
| 2G | Other product use (specified in the IIR) | Industrial Processes | Other industries |
| 2H1 | Pulp and paper industry | Industrial Processes | Other industries |
| 2H2 | Food and beverages industry | Industrial Processes | Food and drink |
| 2H3 | Other industrial processes (please specify in the IIR) | Industrial Processes | Other industries |
| 2I | Wood processing | Industrial Processes | Other industries |
| 2K | Consumption of Persistent Organic Pollutant (POPs) and heavy metals | Industrial Processes | Other industries |
| 3B1a | Manure management - Dairy cattle | Agriculture | Cattle manure management |



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| NFR Code | NFR Source Description | Sector Category | Sub-sector Category |
|---|---|---|---|
| 3B1b | Manure management - Non-dairy cattle | Agriculture | Cattle manure management |
| 3B2 | Manure management - Sheep | Agriculture | Other manure management |
| 3B3 | Manure management - Swine | Agriculture | Other manure management |
| 3B4d | Manure management - Goats | Agriculture | Other manure management |
| 3B4e | Manure management - Horses | Agriculture | Other manure management |
| 3B4gi | Manure management - Laying hens | Agriculture | Other manure management |
| 3B4gii | Manure management - Broilers | Agriculture | Other manure management |
| 3B4giii | Manure management - Turkeys | Agriculture | Other manure management |
| 3B4giv | Manure management - Other poultry | Agriculture | Other manure management |
| 3B4h | Manure management - Other animals (please specify in IIR) | Agriculture | Other manure management |
| 3Da1 | Inorganic N-fertilisers (includes also urea application) | Agriculture | Inorganic fertilisers |
| 3Da2a | Animal manure applied to soils | Agriculture | Organic fertilisers applied to soils (for NH3, $NO_x$, $PM_{10}$, NMVOC, B[a]P and PCDD/Fs) / Other (for CO, Pb, and $SO_2$) |
| 3Da2b | Sewage sludge applied to soils | Agriculture | Organic fertilisers applied to soils |
| 3Da2c | Other organic fertilisers applied to soils (including compost) | Agriculture | Organic fertilisers applied to soils |
| 3Da3 | Urine and dung deposited by grazing animals | Agriculture | Grazing animal excreta |
| 3Da4 | Crop residues applied to soils | Agriculture | Other agricultural practices |
| 3Dc | Farm-level agricultural operations including storage, handling, and transport of agricultural products | Agriculture | Other agricultural practices |
| 3De | Cultivated crops | Agriculture | Other agricultural practices |
| 3F | Field burning of agricultural residues | Agriculture | Other agricultural practices |
| 5A | Biological treatment of waste - Solid waste disposal on land | Waste | Landfill / Solid waste disposal on land |
| 5B1 | Biological treatment of waste - Composting | Waste | Other waste practices |
| 5B2 | Anaerobic Digestion | Waste | Other waste practices |
| 5C1a | Municipal waste incineration | Waste | Waste incineration / Other waste practices (Hg only) |
| 5C1bii | Hazardous waste incineration | Waste | Waste incineration / Other waste practices (Hg only) |

| NFR Code | NFR Source Description | Sector Category | Sub-sector Category |
|---|---|---|---|
| 5C1biii | Clinical waste incineration | Waste | Waste incineration / Other waste practices (Hg only) |
| 5C1biv | Sewage sludge incineration | Waste | Waste incineration / Other waste practices (Hg only) |
| 5C1bv | Cremation | Waste | Other waste practices / Crematoria (Hg only) |
| 5C2 | Open burning of waste | Waste | Open-burning of waste |
| 5D1 | Domestic wastewater handling | Waste | Other waste practices |
| 5D2 | Industrial wastewater handling | Other | Other |
| 5E | Anaerobic Digestion - emissions from land spreading of non-manure digestates | Waste | Other waste practices |
| 6A | Other (included in national total for entire territory) (please specify in IIR) | Other | Other |

Table 32: Summary of the sector categories included in 'Other' for each pollutant. Note that some sectors labelled 'No' have no emissions for certain pollutants.

| Sector Category | $NH_3$ | CO | $NO_x$ | VOC | $PM_{10}$ | $PM_{2.5}$ | $SO_2$ | Pb | B[a]P | PCDD/ Fs | Hg |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Agriculture | No | No | No | No | No | No | No | No | No | No | No |
| Energy Industries | **Yes** | No | No | No | No | No | No | No | No | No | No |
| Fugitive | **Yes** | No | No | No | No | No | No | No | No | **Yes** | **Yes** |
| Industrial Combustion | **Yes** | No | No | No | No | No | No | No | No | No | No |
| Residential, Commercial & Public Sector Combustion | No | No | No | No | No | No | No | No | No | No | No |
| Transport Sources | No | No | No | No | No | No | No | No | No | No | No |
| Industrial Processes | No | No | **Yes** | No | No | No | No | No | No | No | No |
| Other | **Yes** | **Yes** | **Yes** | **Yes** | **Yes** | **Yes** | **Yes** | **Yes** | **Yes** | **Yes** | **Yes** |
| Solvent Processes | **Yes** | No | No | No | **Yes** | **Yes** | No | No | **Yes** | **Yes** | No |
| Waste | No | No | **Yes** | **Yes** | No | No | **Yes** | **Yes** | No | No | No |



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