



Department
for Environment,
Food & Rural Affairs

Accredited official statistics

Emissions of air pollutants in the UK – Particulate matter (PM10 and PM2.5)

Updated 19 February 2024

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This publication is available at <https://www.gov.uk/government/statistics/emissions-of-air-pollutants/emissions-of-air-pollutants-in-the-uk-particulate-matter-pm10-and-pm25>

1. What is particulate matter, and why are emissions of it estimated?

Particulate Matter (PM) is everything in the air that is not a gas and as such it is made up from a huge variety of chemical compounds and materials, some of which are toxic. Due to the small size of many of the particles that form PM, some of these toxins may enter the bloodstream and be transported around the body, entering the heart, brain and other organs. Therefore, exposure to PM can result in serious impacts on health, especially in vulnerable groups of people such as the young, elderly and those with respiratory problems.

PM is classified according to size. The UK currently focuses on estimating the fractions of PM emissions where particles are less than 10 micrometres in diameter (PM₁₀) and less than 2.5 micrometres in diameter (PM_{2.5}). This approach is based on scientific consensus and longstanding evidence regarding the extent to which different sizes of particles penetrate into the respiratory system, and are absorbed by the lungs.

Different emission sources can produce different proportions of coarse and fine particulate matter. For example, construction and demolition emit a higher proportion of coarse particles (PM₁₀), while in industrial combustion, the majority of PM emissions are fine particles (PM_{2.5}). In the data in this report, PM₁₀ includes all particles under 10 micrometers in diameter, including particles under 2.5 micrometers. This means that there are more tonnes of emissions of PM₁₀ than PM_{2.5}, as PM_{2.5} is included within estimates for PM₁₀.

“Primary” PM is emitted directly as particles (for example, soot or dust) and “secondary” PM is formed in the atmosphere from reactions between other pollutants (for example ammonia or NMVOCs). Both PM and the precursor pollutants that can form it can travel large distances in the atmosphere.

[Around half \(https://uk-air.defra.gov.uk/assets/documents/reports/cat09/2302091626_Analysis_of_abatement_options_to_reduce_PM2.5.pdf\)](https://uk-air.defra.gov.uk/assets/documents/reports/cat09/2302091626_Analysis_of_abatement_options_to_reduce_PM2.5.pdf) of the concentrations of PM that people in the UK are exposed to come from either naturally occurring sources, such as pollen and sea spray, or are transported to the UK from international shipping and other countries. The remaining half of UK concentrations of PM come from human activities in the UK, such as wood burning, various industrial processes and tyre and brake wear from vehicles. As such, it is in the interest of the UK to identify and reduce all these emissions where possible.

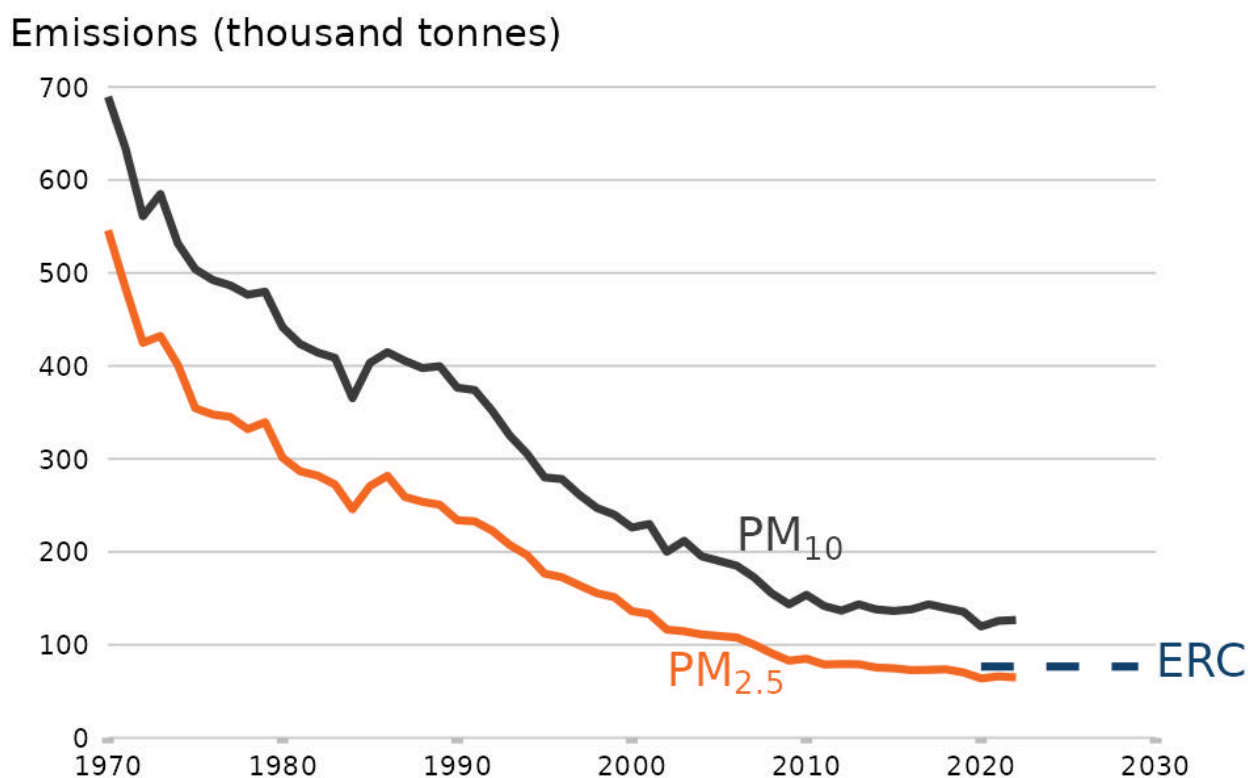
PM can be emitted both by natural processes, such as forest fires, and as a result of human activities, such as the combustion of fuels. The National Atmospheric Emissions Inventory, and the statistical tables published as part of this release, focus on emissions of “primary” PM from human activities in the UK, but there are a few exceptions included as memo items,

such as forest fires. The information presented in this document only covers “primary” PM emissions from human activities within the UK.

The Convention on Long Range Transboundary Air Pollution’s amended Gothenburg Protocol (CLRTAP) and the National Emission Ceilings Regulations (2018) (NECR) require the UK to reduce emissions of PM_{2.5} by 30 per cent compared to emissions in 2005 by 2020 and to stay below this level in each subsequent year until 2029. The NECR also requires the UK to reduce emissions by 46 per cent compared to emissions in 2005 by 2030. The UK needs to estimate emission levels to assess and report on progress made towards these commitments.

2. Trends in total annual emissions of PM₁₀ and PM_{2.5} in the UK, 1970 to 2022

Figure 3: Annual emissions of PM₁₀ and PM_{2.5} in the UK: 1970-2022



Note:

1. ‘ERC’ refers to the UK 2020-2029 emission reduction commitments, as set out in the National Emission Ceilings Regulations (2018)/Convention on Long Range Transboundary Air Pollution. These commitments apply to PM_{2.5} only.

[View the data for this chart](#)

https://assets.publishing.service.gov.uk/media/65c5f2c814b83c000ca715c2/particulate_matter_annual_emissions_2022.csv/preview

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https://assets.publishing.service.gov.uk/media/65c5f2c814b83c000ca715c2/particulate_matter_annual_emissions_2022.csv

Annual emissions of PM10 have decreased by 82 per cent since 1970, to 127 thousand tonnes in 2022. They have increased by 1 per cent between 2021 and 2022.

Annual emissions of PM2.5 have decreased by 88 per cent since 1970, to 65 thousand tonnes in 2022. They have decreased by 2 per cent between 2021 and 2022.

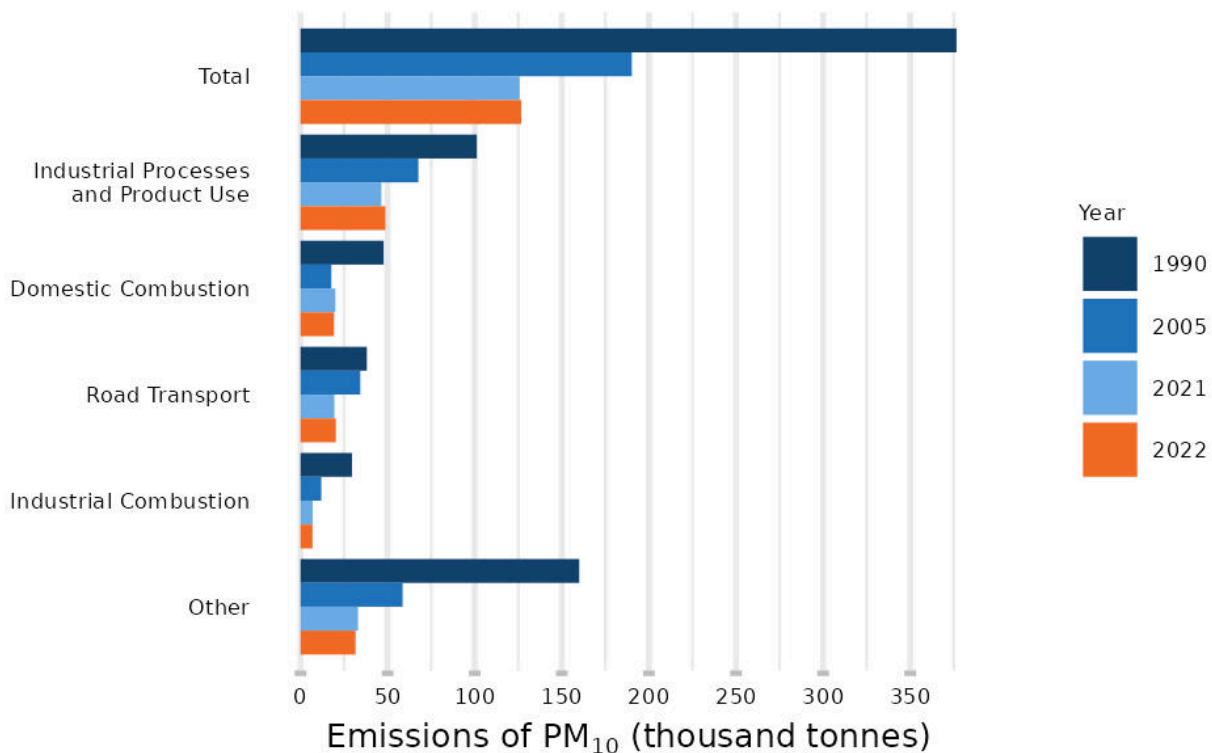
In the UK PM2.5 emissions decreased by 41 per cent between 2005 and 2022. Therefore, in 2022, the UK did meet the 30 per cent emission reduction commitment required between 2020 to 2029 as set out in the NECR.

Levels of both pollutants generally decreased between 1970 and the late-2000s. There are many reasons for this long-term decrease, which covers most emissions sources, but the reduction in the burning of coal and improved emission standards for transport and industrial processes are major drivers. Since the late 2000s annual emissions of PM have generally continued to fall, but the rate of change has reduced. Compared to earlier decades, emission levels have been relatively steady with small annual fluctuations. Considerable decreases in emissions from some sources (e.g. from road transport and energy industries) have been largely offset by increases in emissions from wood burning in domestic settings and from solid fuel burning by industry (particularly the burning of biomass based-fuels). In 2020 PM emissions reached the lowest level since estimates began due to reduced economic activity during the COVID-19 pandemic.

3. Major emission sources for PM10 and PM2.5 in the UK

Figure 4: UK annual emissions of PM10 by 2022 major emission source: 1990, 2005, 2021 and 2022

Emission source



Notes:

1. 'Industrial processes and product use' refers to specific industrial production processes, including some where fuel combustion is a necessary part of the process, such as the production of steel. This also includes the use of manufactured products, both industrial (such as the use of solvents, adhesives and lubricants) and non-industrial (such as cigarette smoking).
2. 'Industrial combustion' refers to the burning of fuels on manufacturing and construction sites, to generate energy for industrial use, for example to drive mobile machinery or to create heat or electricity for industrial processes. This does not include emissions from fuel combustion in the agricultural, forestry and fishing sectors, from the public sector, from the commercial sector, or emissions from energy industries for public heating and power.

[View the data for this chart](#)

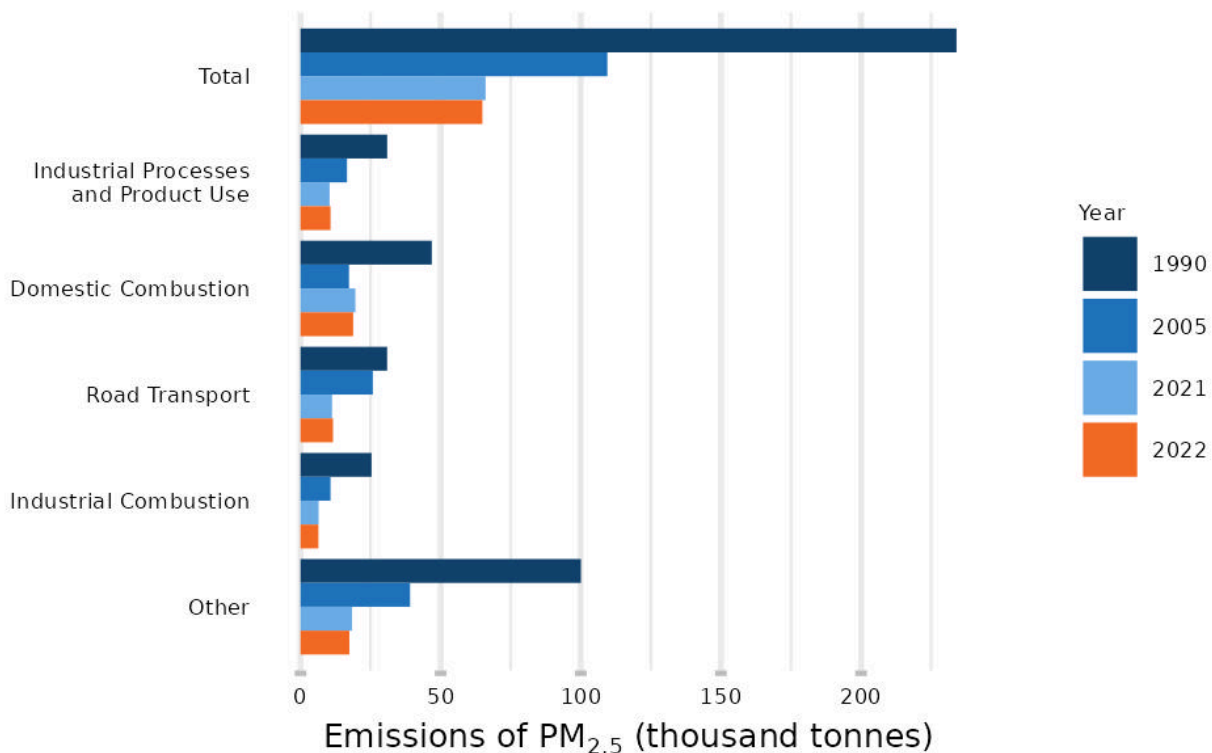
https://assets.publishing.service.gov.uk/media/65c5f351cc433b000ca90b08/pm10_key_emission_sources_2022.csv/preview

[Download the data for this chart in CSV format](#)

https://assets.publishing.service.gov.uk/media/65c5f351cc433b000ca90b08/pm10_key_emission_sources_2022.csv

Figure 5: UK annual emissions of PM_{2.5} by 2022 major emission source: 1990, 2005, 2021 and 2022

Emission source



Notes:

1. 'Industrial processes and product use' refers to specific industrial production processes, including some where fuel combustion is a necessary part of the process, such as the production of steel. This also includes the use of manufactured products, both industrial (such as the use of solvents, adhesives and lubricants) and non-industrial (such as cigarette smoking).
2. 'Industrial combustion' refers to the burning of fuels on manufacturing and construction sites, to generate energy for industrial use, for example to drive mobile machinery or to create heat or electricity for industrial processes. This does not include emissions from fuel combustion in the agricultural, forestry and fishing sectors, from the public sector, from the commercial sector, or emissions from energy industries for public heating and power.

[View the data for this chart](#)

https://assets.publishing.service.gov.uk/media/65c5f38f14b83c000ca715c4/pm2_5_key_emission_sources_2022.csv/preview

[Download the data for this chart in CSV format](#)

https://assets.publishing.service.gov.uk/media/65c5f38f14b83c000ca715c4/pm2_5_key_emission_sources_2022.csv

Industrial combustion is a major source of PM emissions. Emissions from this source contributed 10 per cent of PM_{2.5} emissions and contributed 5 per cent of PM₁₀ emissions in 2022. PM emissions from industrial

combustion have reduced in the long term as the use of coal as a fuel has fallen. However, emissions from this source have been relatively stable since 2008, with only a small drop overall, as reductions in emissions from the industrial combustion of fossil fuels have been largely offset by an increase in the industrial combustion of biomass based-fuels. Industrial combustion of biomass based-fuels contributed less than 1 per cent of total PM_{2.5} emissions in the years prior to 2009 but has since risen to represent 6 per cent of total PM_{2.5} emissions in 2022.

Emissions from industrial processes and product use, which contributed 16 per cent of total PM_{2.5} emissions and contributed 38 per cent of total PM₁₀ emissions in 2022, have also remained fairly stable in recent years. However, emissions from this source have decreased in the longer term as the manufacturing output of chemical and steel industries have reduced in the UK, alongside improvements to emission controls for these processes. In 2022 construction and demolition was the most emitting sector within this source, followed by iron and steel production and the production of other mineral products (particularly the manufacture of 'non-fletton' bricks, i.e. bricks made from clay).

Domestic combustion covers households burning a variety of fuels including wood, coal, solid smokeless fuels, and fuels derived from waste such as coffee logs. This was a major source of PM emissions in 2022, as it contributed 29 per cent of total PM_{2.5} emissions and contributed 15 per cent of total PM₁₀ emissions. Most emissions from this source come from households burning wood in stoves and open fires. The use of wood as a fuel contributed 75 per cent of both total PM_{2.5} and PM₁₀ emissions from domestic combustion in 2022. Domestic combustion of wood contributed 22 per cent of overall PM_{2.5} emissions and contributed 11 per cent of overall PM₁₀ emissions in 2022. Emissions of PM_{2.5} and PM₁₀ from domestic wood burning increased by 56 per cent between 2012 and 2022. In the 1970s, 1980s and 1990s, coal combustion was the primary source of PM emissions from households; yet the use of coal as a fuel has fallen over time (in 2022 the combustion of coal contributed 12 per cent of PM_{2.5} emissions from domestic combustion).

Road transport continues to be a major source of PM emissions, as it contributed 18 per cent of total PM_{2.5} emissions and contributed 16 per cent of total PM₁₀ emissions in 2022. Road transport emissions are made up of both exhaust emissions and non-exhaust emissions (brake, tyre and road wear). Exhaust emissions have decreased markedly from 1996 to 2022 due to stricter emissions standards (decreased by 93 per cent for both PM_{2.5} and PM₁₀). However, non-exhaust emissions (brake, tyre and road wear) have increased by 15 per cent for PM_{2.5} and increased by 14 per cent for PM₁₀ between 1996 and 2022, as the overall number of kilometres travelled by vehicles each year in the UK has increased over this period. This means that most PM emissions from road transport derive from non-exhaust emissions, which alone contributed 15 per cent of total PM_{2.5} emissions and contributed 14 per cent of total PM₁₀ emissions in 2022.

Levels and trends in emissions from specific sources are available for the period 1990 to 2022 through the [statistical tables](https://www.gov.uk/government/statistical-data-sets/env01-emissions-of-air-pollutants) (<https://www.gov.uk/government/statistical-data-sets/env01-emissions-of-air-pollutants>) that accompany this release.

4. Sections in this release

[Summary](https://www.gov.uk/government/statistics/emissions-of-air-pollutants/emissions-of-air-pollutants-in-the-uk-summary) (<https://www.gov.uk/government/statistics/emissions-of-air-pollutants/emissions-of-air-pollutants-in-the-uk-summary>)

[Background](https://www.gov.uk/government/statistics/emissions-of-air-pollutants/emissions-of-air-pollutants-in-the-uk-background) (<https://www.gov.uk/government/statistics/emissions-of-air-pollutants/emissions-of-air-pollutants-in-the-uk-background>)

[Emissions of nitrogen oxides](https://www.gov.uk/government/statistics/emissions-of-air-pollutants/emissions-of-air-pollutants-in-the-uk-nitrogen-oxides-nox) (<https://www.gov.uk/government/statistics/emissions-of-air-pollutants/emissions-of-air-pollutants-in-the-uk-nitrogen-oxides-nox>)

[Emissions of ammonia](https://www.gov.uk/government/statistics/emissions-of-air-pollutants/emissions-of-air-pollutants-in-the-uk-ammonia-nh3) (<https://www.gov.uk/government/statistics/emissions-of-air-pollutants/emissions-of-air-pollutants-in-the-uk-ammonia-nh3>)

[Emissions of non-methane volatile organic compounds](https://www.gov.uk/government/statistics/emissions-of-air-pollutants/emissions-of-air-pollutants-in-the-uk-non-methane-volatile-organic-compounds-nmvocs) (<https://www.gov.uk/government/statistics/emissions-of-air-pollutants/emissions-of-air-pollutants-in-the-uk-non-methane-volatile-organic-compounds-nmvocs>)

[Emissions of sulphur dioxide](https://www.gov.uk/government/statistics/emissions-of-air-pollutants/emissions-of-air-pollutants-in-the-uk-sulphur-dioxide-so2) (<https://www.gov.uk/government/statistics/emissions-of-air-pollutants/emissions-of-air-pollutants-in-the-uk-sulphur-dioxide-so2>)

[Compliance with the Code of Practice for Statistics and Defra group Statistics quality principles, and recent changes to the publication](https://www.gov.uk/government/statistics/emissions-of-air-pollutants/emissions-of-air-pollutants-in-the-uk-compliance-with-code-of-practice-for-statistics) (<https://www.gov.uk/government/statistics/emissions-of-air-pollutants/emissions-of-air-pollutants-in-the-uk-compliance-with-code-of-practice-for-statistics>)

[Methods and quality processes for UK air pollutant emissions statistics \(PDF\)](https://assets.publishing.service.gov.uk/media/65c6377a9c5b7f000c951c33/Methods_quality_processes_UK_air_pollutant_emissions_statistics_naei22.pdf) (https://assets.publishing.service.gov.uk/media/65c6377a9c5b7f000c951c33/Methods_quality_processes_UK_air_pollutant_emissions_statistics_naei22.pdf)

[Statistical tables \(ENV01 – Emissions of air pollutants\)](https://www.gov.uk/government/statistical-data-sets/env01-emissions-of-air-pollutants) (<https://www.gov.uk/government/statistical-data-sets/env01-emissions-of-air-pollutants>)

