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Air quality: policies, proposals and concerns

Summary

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Contents

Summary

Poor air quality is considered by the government to be "the largest environmental risk to public health in the UK". As well as human health, air pollution also has implications for the natural environment and for the economy. Due to the transboundary nature of air pollution, action to manage and improve air quality in the UK has been driven by both international agreements and EU legislation, as well as national and devolved legislation.

This briefing gives an overview of the current outdoor air quality legal framework, the changing governance and enforcement mechanisms following the UK's EU exit, forthcoming legislative changes and ongoing issues and concerns.

Information about road user charging schemes intended to reduce air pollution is set out in a separate Commons Library briefing, Clean Air Zones, Low Emission Zones and the London ULEZ.

For information about indoor air quality see Parliamentary Office of Science and Technology (POST) briefing, Indoor Air Quality.

Current law and policy

UK air quality legislation is a mesh of international commitments, retained EU law and domestic legislation.

At the international level, the Gothenburg Protocol and amendments to it set emissions ceiling levels for various pollutants. Its aim is to control long-range transboundary pollution. Its main requirements have been implemented in the UK by the National Emission Ceilings Regulations 2018.

There is also legislation relating to ambient air quality (the air that more immediately surrounds us) at EU level through Directive 2008/50/EC (PDF) (the "Air Quality Directive"). Instead of setting a ceiling for pollutants, it sets "limit values" (parameters that must not be exceeded) for concentrations of different pollutants. These limit values remain part of UK law.

The UK Government has set two further targets for fine particulate matter ($PM_{2.5}$) in England through The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023 (SI 2023/96). The targets are:

- An annual mean concentration target – a target of 10 micrograms per cubic metre (µg m^3) to be met across England by 2040.

- A population exposure reduction target – a 35% reduction in population exposure by 2040 (compared to a base year of 2018).

WHO guidelines

The World Health Organization (WHO) published updated Global Air Quality Guidelines in September 2021 covering Particulate matter ($PM_{2.5}$ and PM_{10}), ozone, nitrogen dioxide, sulphur dioxide and carbon monoxide. They provide guidance on thresholds and limits for key air pollutants that pose health risks. They are guidelines only and are not binding on any country unless that country chooses to adopt them into its own legislation. These guidelines are an update on the previous 2005 version, Air quality guidelines for particulate matter, ozone, nitrogen dioxide and sulfur dioxide (PDF), which have frequently been referenced in debates about air quality targets.

UK air quality plans and policies

In the UK, air quality limit values are devolved to the administrations in Scotland, Wales, and Northern Ireland. The Secretary of State for Environment, Food and Rural Affairs has responsibility for meeting the limit values in England and the Department for Environment, Food and Rural Affairs (Defra) co-ordinates assessment and air quality plans for the UK as a whole.

The UK Government and devolved executives published a Revised UK National Air Pollution Control Programme (NAPCP) in February 2023, to meet the national emissions ceilings legislation requirements, which must be met by the UK as a whole. The NAPCP sets out measures and analysis for meeting the emission reduction commitments. The requirement on the UK Government to produce and update this document, which originally stemmed from EU law, is set to be removed by provisions in the EU Law Revocation and Reform Act 2023.

At a national level, the UK Government and the devolved executives are required to produce a national air quality strategy. In 2007 the Air Quality Strategy for England, Scotland, Wales and Northern Ireland was published. In April 2023 the UK Government published a document, Air quality strategy: framework for local authority delivery, which supersedes the 2007 Strategy in respect of England only.

Each government within the UK can also choose to publish its own air quality strategy. See in particular:

- UK Government: Clean Air Strategy 2019, January 2019 and Environmental Improvement Plan 2023, January 2023

- Scottish Government: Cleaner Air for Scotland 2, July 2021
- Welsh Government: Clean Air Plan for Wales: Healthy Air, Healthy Wales, August 2020 and April 2023 Update Report on Progress Against Actions
- DAERA: Clean Air Strategy for Northern Ireland: A Public Discussion Document, November 2020

EU infringement proceedings

Enforcement mechanisms for failure to meet air quality limit values were previously carried out by EU institutions.

In February 2014 the European Commission began infringement proceedings against the UK (as well as other countries) for its failure to meet air quality targets for nitrogen dioxide set by the EU Air Quality Directive in certain parts of the UK.

On 4 March 2021, the found that the UK had failed to fulfil its obligations under the provisions of EU Directive 2008/50/EC and that it had failed to ensure that the period of exceedance of limit values was kept as short as possible. Media reports on the case suggested that there was some uncertainty about what would happen if the UK still failed to comply within a "reasonable" period, questioning whether the UK could be forced to pay a fine.

Judicial review and air quality plan compatibility with EU legislation

Separate to the Commission proceedings, but arising from the same EU Air Quality Directive, private judicial reviews have also been brought against the UK Government stemming from the admitted and continuing failure of the United Kingdom, since 2010, to comply (in certain zones), with the limits for nitrogen dioxide levels. These proceedings have resulted in the government being required by the courts to produce a number of different air quality plans aimed at reducing roadside nitrogen dioxide levels.

Governance and enforcement bodies

As a result of leaving the EU, environmental law and policy (including on air quality), which was derived from the EU, is no longer subject to the oversight of EU institutions, including the Court of Justice of the European Union (CJEU).

As environmental matters are generally devolved, each government/executive within the UK has now put the following in place:

- In England and Northern Ireland, the Office for Environmental Protection (OEP), has been established.
- In Scotland a public sector body called Environmental Standards Scotland (ESS) has been established.
- The Welsh Government plans to establish a permanent environmental governance oversight body, and for a temporary period has appointed an interim environmental protection assessor for Wales.

EU air quality changes

In November 2019, the European Commission published a Fitness Check of the Ambient Air Quality Directives. It concluded that these Directives have been partially effective in improving air quality, but not fully effective, and not all objectives have been met. The European Commission therefore intends to revise the Ambient Air Quality Directive, to align air quality standards more closely with the recommendations of the World Health Organization, subject to future consultation. A revised directive, Directive (EU) 2024/2881 of the European Parliament and of the Council of 23 October 2024 on ambient air quality and cleaner air for Europe was published in 2024, setting limit values to be attained by 1 January 2030.

Health concerns

Air quality has long been a high-profile issue, with specific concerns around human health. This was recently highlighted in the Chief Medical Officer's annual report 2022: air pollution, published in December 2022. Academic research has found big differences in air pollution across communities, with deprived areas often the worst affected. Children, the elderly and individuals with pre-existing cardiovascular and respiratory conditions are particularly vulnerable to the effects of poor air quality. In 2020 a coroner found that air pollution was a significant contributory factor to the death of 9-year-old child.

The Covid-19 pandemic has raised questions about whether there is a link between poor air quality and Covid-19 outcomes (PDF). Researchers are also beginning to examine the effect of lockdown measures on air quality and work out what any findings mean for future policy.

1 Sources of air pollution

Poor air quality can be caused by different pollutants from a variety of sources. The pollutants set out below are those commonly identified in UK Government air quality strategies and as being of concern and those which have legal limits places upon them.[1] They will be referred to throughout this paper and are:

- **Sulphur dioxide (SO_2)**: An acid gas formed when fuels containing sulphur impurities are burned. The main man-made sources include fossil fuel combustion and incineration of waste.[2]

- **Nitrogen oxides:** Compounds formed when nitrogen and oxygen combine. NO_x, which comprises nitric oxide (NO) and nitrogen dioxide (NO_2), is emitted from combustion processes. NO is subsequently oxidised to form NO_2, although some NO_2 is emitted directly. Main sources include road transport, power generation and industrial combustion.

- **Particulate matter (PM):** Small breathable particles classified according to size. PM is not a single compound. It is made up of a mixture of solid and liquid particles of organic and inorganic chemicals; and includes some naturally occurring substances, such as salt and dust.[3] Within this category, PM is split further into **PM_{10}** and **$PM_{2.5}$**, which reflects the size of the particles ($PM_{2.5}$ is smaller). The smaller the particle, the further it can penetrate into the lungs through inhalation.[4] Sources of PM are classified as either primary, such as particles from engine combustion or break and tyre wear; or secondary, when other substances react to form PM in the atmosphere.

- **Ozone (O_3):** A pollutant gas which is not emitted directly from any source in significant quantities, but is produced by reactions between other pollutants in the presence of sunlight.[5] Ozone acts as an irritant to the eyes, nose and lungs. It can also affect vegetation, impacting crop yields and ecosystems. [6]

1 See for example, UK Government, The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, 2007; UK Government, Clean Air Strategy 2019, January 2019 and the Air Quality Standards Regulations 2010 (SI 2010/1001)
2 WHO Fact Sheet, Ambient (outdoor) air quality and health, May 2018
3 WHO Fact Sheet, Ambient (outdoor) air quality and health, May 2018
4 Defra, Air Pollution in the UK 2019, September 2020, p22
5 Defra, Air Pollution in the UK 2019, September 2020, glossary
6 Air Quality Expert Group, Ozone in the United Kingdom, 2009

- Non-methane volatile organic compounds (NMVOCs) are organic compounds which are emitted to air as combustion products, as vapour arising from things like petrol, solvents, air fresheners, cleaning products and perfumes. NMVOCs react with other air pollutants in the presence of sunlight to produce ground level ozone. NMVOCs are released through both industrial processes and domestic use.[7]

- Lead (Pb) and heavy metals, for example, arsenic, cadmium, mercury and nickel. Anthropogenic emissions of toxic metals mainly come from fossil fuel combustion and industrial processes.[8]

- Polycyclic Aromatic Hydrocarbons **(PAHs)**. PAHs are a large group of chemical compounds that are toxic and carcinogenic. This group includes Benzo[a]pyrene (BaP). The main sources of BaP are domestic heating (in particular wood and coal burning), waste burning, coke production and steel production.[9]

- Benzene: is a chemical used as a starting material for a wide range of chemicals which feed into industrial manufacturing processes. Benzene will quickly evaporate when it is released into the environment. Major sources of benzene include vehicle exhaust, evaporation of petrol, petrol manufacturing and other industries.[10]

- 1,3-Butadiene: is an organic compound emitted into the atmosphere mainly from fuel combustion e.g. petrol and diesel vehicles.[11]

- Carbon Monoxide (CO): is a gas formed from incomplete combustion of carbon-containing fuels. The largest source is road transport, with residential and industrial combustion making significant contributions.[12]

- Ammonia (NH_3): is a gas that is emitted into the atmosphere and then either deposited back onto land or converted to secondary PM through reactions in the atmosphere. Agriculture is the dominant source of NH_3 emissions (88% in 2016). It is emitted during storage and spreading of manures, slurries and fertilisers. Other sources of NH_3 include the waste sector and industry.[13]

The sources of these pollutants are a range of natural and anthropogenic sources, including the combustion of fossil fuels for industrial and domestic processes, incineration of waste, emissions from traffic, chemical and photo-chemical reactions. For further information see the Defra publication What are the causes of Air Pollution.

7 UK Government, Clean Air Strategy 2019, January 2019, p20
8 Defra, Air Pollution in the UK 2019, September 2020, p24
9 European Environment Agency, Air quality in Europe 2017, October 2017, p16
10 Public Health England, Guidance: Benzene: general information,14 August 2019
11 Defra, Air Pollution in the UK 2019, September 2020
12 Defra, What are the causes of Air Pollution? (PDF) [accessed 10 October 2023]
13 UK Government, Clean Air Strategy 2019, January 2019, p17

1.1 Reasons for concern

Air pollution is a cause of concern for human health, the natural environment and the economy.

It is widely acknowledged that air pollution has a significant public health impact.[14] A December 2022 report on air pollution from the Chief Medical Officer (CMO) summarised that air pollution is, "associated with impacts on lung development in children, heart disease, stroke, cancer, exacerbation of asthma and increased mortality, among other health effects." In terms of numbers of deaths, the report stated that, "The mortality burden of long-term exposure to outdoor air pollution in England in 2019 was estimated to be equivalent to 26,000 to 38,000 deaths a year." The report provided more detailed information about the known health impacts of the different air pollutants.[15]

The UK Government's Clean Air Strategy 2019 raised concerns about those living in deprived communities being most likely to suffer adverse health effects from poor air quality. It noted however that this was not always the case and that more affluent communities can be affected too:

> Deprived communities are more likely to experience adverse health effects from poor air quality because they are more exposed to air pollution, for example, by being close to major roads. They are less likely to live close to well maintained green spaces associated with lower levels of air pollution, increased physical activity, and improved mental wellbeing. However, air quality can also be poor in areas that are generally considered affluent, such as central London. This is reflected by the overall national distribution of air pollution with highest average levels in South East England and lowest in the North of England, Scotland, Wales, and Northern Ireland.[16]

Research published in the Lancet Planetary Health has also identified a link between $PM_{2.5}$ pollution and clinical antibiotic resistance caused by the spread of antibiotic-resistant bacteria.[17]

In terms of environmental impact, nitrogen oxides and ammonia emissions can be deposited in soils, rivers and lakes, for example, through rain and agricultural practices. This can affect the nutrient levels and diversity of species in sensitive environments, for example, by encouraging algae growth in lakes and water courses and by producing ozone which damages crops and impacts on wildlife through enhanced nutrient levels.[18]

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14 WHO Fact Sheet, Ambient (outdoor) air quality and health, May 2018

15 Chief Medical Officer's annual report 2022: air pollution, 8 December 2022

16 HM Government, Clean Air Strategy, 2019, p24

17 The Lancet Planetary Health, Association between particulate matter (PM)2·5 air pollution and clinical antibiotic resistance: a global analysis, August 2023

18 Defra, Outcome Indicator Framework for the 25 Year Environment Plan: A1: Emissions for five key air pollutants, May 2022

The UK Government's July 2017 UK plan for tackling roadside nitrogen dioxide concentrations provides a summary of some of the implications of poor air quality on public health, the natural environment and also highlighted the impact on the economy:

> 13. Air pollution has social costs and risks the potential for economic growth. It also impacts upon people of working age which can have economic effects, for instance if they have to take days off work due to air pollution-related health problems. Poor air quality is estimated to have had a total cost of up to £2.7 billion through its impact on productivity in 2012.[19]

For a selection of further views and studies about the impacts of air pollution see:

- Reports and statements from the Committee on the Medical Effects of Air Pollutants (COMEAP);
- Section 1.3 of the European Environment Agency report, Air quality in Europe 2022, November 2022;
- Environment Agency, The state of the environment: air quality, July 2018; and
- Chief Medical Officer annual report 2017: health impacts of all pollution – what do we know? 2 March 2018.

Specific key concerns about air quality are explored further in section 8 of this paper.

[19] HM Government, UK plan for tackling roadside nitrogen dioxide concentrations, July 2017, p3

2 Air quality: key legislation, targets and policy

Due to the transboundary nature of air pollution, action to manage and improve air quality in the UK has been driven by both international agreements and EU legislation, as well as domestic legislation.

Following the UK's departure from the EU and the end of the transition period, those air quality laws (as set out below) originating from EU legislation have been retained in domestic legislation in accordance with the EU (Withdrawal) Act 2018 (as amended) and subsequent regulations.

As a former EU Member, the UK's air quality standards that set ceilings and limits have been shaped into three different strands:

- Those covering ambient air quality (the air that surrounds us). These standards cover ground level ozone, particulate matter, nitrogen oxides, dangerous heavy metals and a number of other pollutants. These air quality standards were to be attained by all Member States from 2005 or 2010 onwards, depending on the pollutant. If the set limit values were exceeded, Member States were required to adopt air quality plans detailing measures to keep the exceedance period as short as possible.

- Those covering transboundary air pollutants: sulphur oxides, nitrogen oxides, ammonia, volatile organic compounds and particulate matter. National emission reduction targets were set that need to be met in 2020 and 2030.

- Standards for key sources of pollution. These standards were originally set at EU level in legislation targeting industrial emissions, emissions from power plants, vehicles and transport fuels, as well as the energy performance of products.[20]

The following sections provide more detailed information about some of the key pieces of legislation in these three different strands.

In England long-term air quality targets have now been set under provisions in the Environment Act 2021.

Local authorities have various powers and responsibilities to control air quality in their areas. This includes the Clean Air Act 1993, which provides prohibitions on emitting dark smoke from the chimneys of any building or

[20] European Commission Communication, A Europe that protects: Clean air for all, COM(2018) 330 final, 17 May 2018

industrial or trade premises and provides local authorities with powers to designate smoke control areas, and the Environment Act 1995, which (among other things), establishes the local air quality management (LAQM) regime.

2.1 Ambient air standards

The key legislation covering ambient air quality includes stems from the EU. This includes EU Directive 2008/50/EC (the "Air Quality Directive") which covers particulate matter, NO_2 and ozone and Directive 2004/107/EC, which covers cadmium, arsenic, nickel and mercury, and polycyclic aromatic hydrocarbons (PAHs). This legislation sets limit values which have been implemented in the UK through regulations.

The Air Quality Directive

EU Directive 2008/50/EC (the "Air Quality Directive") on ambient air quality and cleaner air for Europe set legally binding standards for ambient air quality (the more immediate air that surrounds us). It did this by setting limit values for concentrations of them.

Limit values are legally binding and must not be exceeded. They are set at the same level for all EU countries for individual pollutants and comprise a concentration value, an averaging period for the concentration value, a number of exceedances allowed (per year) and a date by which it must be achieved.

The Air Quality Directive sets limit values for a number of pollutants, as follows:

Box 1: Air Quality Directive emission limits and targets for NOx, PM and Ozone for the protection of human health

- **By January 2005 for PM_{10}**: a maximum annual mean concentration of no more than 40µg/m^3 ; and a 24 hour mean concentration of 50µg/m^3 not to be exceeded more than 35 times a year.
- **By January 2010 for NO_2**: a maximum annual mean concentration of no more than 40µg/m^3; and an hourly mean concentration of 200µg/m^3 not to be exceeded more than 18 times in a year.
- **By January 2015 for $PM_{2.5}$**: a maximum annual mean concentration of 25µg/m^3.

- **By January 2020 for $PM_{2.5}$:** a maximum annual mean concentration of 20µg/m^3.
- **By January 2010 for ozone**: a target of a daily 8 hour ozone mean of 120 µg/m^3 not to be exceeded more than 25 days year (averaged over 3 years). A long-term objective of a daily 8 hour ozone mean of 120 µg/m^3, with no exceedances from January 2020.

µg = microgram

The Directive allowed for Member States to apply to the European Commission to postpone the deadline for meeting the limit values for certain pollutants in a particular area. For example, this was by three years for PM_{10} and up to five years for NO_2. Approval from the EU Commission was required to extend the deadline.

Under article 24 of the Directive, where there is a risk that the levels of pollutants will exceed one or more of the alert thresholds specified in the Directive, Member States "shall draw up action plans indicating the measures to be taken in the short term in order to reduce the risk or duration of such an exceedance".[21] The UK has produced a number of these plans. See section 4 of this paper for further information about these plans.

In the UK, the Air Quality Directive was implemented through:

- Air Quality Standards Regulations 2010 (as amended);
- Air Quality Standards (Wales) Regulations 2010 (as amended);
- Air Quality Standards Regulations (Northern Ireland) 2010 (as amended); and
- Air Quality Standards (Scotland) Regulations 2010 (as amended). Scotland has set stricter levels for PM_{10} and $PM_{2.5}$ than the EU requirements. In April 2016, the Scottish Government became the first country in Europe to adopt the 2005 World Health Organisation's recommended guideline value for $PM_{2.5}$ of 10µg/m^3 as an annual mean threshold.[22]

Fourth Daughter Directive (arsenic, cadmium, mercury, nickel and PAHs)

Directive 2004/107/EC of 15 December 2004, (referred to as "the Fourth Daughter Directive"), covers cadmium, arsenic, nickel and mercury, and polycyclic aromatic hydrocarbons (PAHs). As well as setting limit values for

[21] Article 24, Directive 2008/50/EC on ambient air quality and cleaner air for Europe

[22] The Air Quality (Scotland) Amendment Regulations 2016 (SI 2016/162)

these elements (apart from mercury), the Directive sets monitoring and reporting requirements for Member States. [23]

It is implemented in the UK through the same regulations as made in relation to the Air Quality Directive (PDF), as set out above.

2.2 Transboundary air quality standards

Transboundary air pollution is a particular problem for pollutants that are not easily destroyed or react in the atmosphere to form secondary pollutants. These are cross boundary pollutants that can be generated in one country and felt in others.[24] In the UK transboundary air quality standards stem from a mesh of international agreements, to which the UK is a contracting party, EU legislation and domestic regulations.

National Emissions Ceilings Directives 2001 and 2016

The United Nations Economic Commission for Europe (UNECE) Convention on Long-Range Transboundary Air Pollution was extended in 1999 by the Gothenburg Protocol to Abate Acidification, Eutrophication and Ground-level Ozone, (known as the Gothenburg Protocol), with the aim of reducing emissions of transboundary air pollution. The UK and the EU are both contracting parties to the Protocol.

The Gothenburg Protocol is implemented at EU level through several directives, including the National Emission Ceilings Directive 2016[25]. The 2016 Directive has been implemented in the UK by the National Emission Ceilings Regulations 2018 (SI 2018/129).

The 2018 regulations set national emissions reduction commitments in respect of nitrogen oxides (NO_x), non-methane volatile organic compounds (NMVOCs), sulphur dioxide (SO_2), ammonia (NH_3) and fine particulate matter ($PM_{2.5}$). These pollutants are to be reduced below a specified percentage of overall emissions of those which were emitted in the base year (2005). These national emission reduction commitments need to be met in two phases, from 2020, and with more stringent levels to be met from 2030 onwards. The UK Government has reported that its 2020 emission reduction commitments have been achieved.[26]

The 2030 levels are as follows:

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23 Defra, Air Pollution in the UK 2016, September 2017

24 National Atmospheric Emissions Inventory website, Transboundary Air Pollution [accessed 5 July 2022]

25 Directive (EU) 2016/2284 of the European Parliament and of the Council of 14 December 2016 on the reduction of national emissions of certain atmospheric pollutants, amending Directive 2003/35/EC and repealing Directive 2001/81/EC

26 Defra, Environmental Improvement Plan 2023, 31 January 2023, p79

- Reduce emissions of nitrogen oxides by 73%.
- Reduce emissions of sulphur dioxide by 88%.
- Reduce emission of PM2.5 by 46%.
- Reduce emissions of ammonia by 16%.
- Reduce emissions of non-methane volatile organic compounds by 39%[27]

These regulations also require the Secretary of State to produce a UK-wide National Air Pollution Control Programme (NAPCP) setting out the measures that will be taken to meet the emission reduction commitments. The most recent is the revised UK NAPCP, published in February 2023. There is currently a provision in the Retained EU Law (Revocation and Reform) Act 2023 which will automatically remove the requirements for the government to produce a NAPCP by 31 December 2023. Further information about removal of this requirement is provided in section 8 of this briefing.

Domestic regulation restricting sale of fuels for domestic burning

The UK Government has also introduced specific domestic regulations in order to help meet its international obligations on transboundary pollutants.

An example of this is the Air Quality (Domestic Solid Fuels Standards) (England) Regulations 2020 (SI 2020/1095), which apply in England. The regulations place restrictions on the sale of wet wood for domestic burning, limits on the emission of sulphur and smoke from manufactured solid fuels and phase out the sale of bituminous coal (traditional house coal). The requirements are backed by criminal sanctions, enforced by local authorities. The explanatory memorandum to the regulations states that such action is necessary since domestic burning through wood burning stoves and open fires is a major contributor to national emissions of fine particulate matter ($PM_{2.5}$).[28]

2.3 Combustion plants and industrial emissions

Controls on emissions from combustion plants and industrial emissions have been shaped by EU legislation, which in turn has been implemented by UK domestic regulations.

27 Defra, Environmental Improvement Plan 2023, 31 January 2023

28 Explanatory Memorandum to the Air Quality (Domestic Solid Fuels Standards) (England) Regulations 2020, p1

Medium Combustion Plant Directive

Medium combustion plants those that are generally used to generate heat for large buildings (e.g., offices, hotels, hospitals, prisons), industrial processes, as well as for power generation.[29] They are sources of emissions of sulphur dioxide, nitrogen oxides and dust.[30]

The EU Medium Combustion Plant Directive (MCPD) entered into force on 18 December 2015 and had to be transposed by Member States by 19 December 2017. [31] It regulates pollutant emissions from the combustion of fuels in plants with a rated thermal input equal to or greater than 1 megawatt (MWth) and less than 50 MWth.[32] The MCPD was based on a European Commission proposal, which was part of the Clean Air Policy Package adopted on 18 December 2013.

The Directive requires all plants in scope to be registered or permitted and sets limits on the levels of pollutants that these plants can emit according to their type, size, age, fuel type and annual operating hours. It also requires operators to test emissions from their plants to demonstrate compliance with emission limits.[33]

The UK and Welsh Governments published a consultation, Improving air quality: reducing emissions from Medium Combustion Plants and Generators, in November 2016 seeking views on draft plans to implement the MCPD and emission controls on generators in order to improve air quality. The Environmental Permitting (England and Wales) (Amendment) Regulations 2018 then brought these requirements into force in England and Wales. The explanatory memorandum to this SI sets out the long implementation period to meet the requirements of the directive:

> In accordance with the Directive operators of new Medium Combustion Plants will require a permit to operate plants from 20 December 2018, at which point those plants will have to comply with the emission limit values for certain pollutants (which depends on the fuel used). Operators will also need to keep a record of operations to demonstrate compliance with their permit conditions for at least 6 years. A long implementation period is provided for existing Medium Combustion Plants, in order to provide operators with sufficient time to adapt technically to the requirements. This means operators of existing medium combustion plants only come within the permitting regime from 2024 or 2029, depending upon the plant's rated thermal input.[34]

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29 Defra and Welsh Government, Consultation on reducing emissions from Medium Combustion Plants and Generators to improve air quality, November 2016, p1

30 EU Commission website, The Medium Combustion Plant Directive [accessed 10 October 2023]

31 Directive (EU) 2015/2193 of the European Parliament and the Council of 25 November 2015 on the limitation of emissions of certain pollutants into the air from medium combustion plants

32 European Commission website, The Medium Combustion Plant (MCP) Directive [accessed 10 October 2023]

33 Department for Environment, Food and Rural Affairs and Welsh Government, Improving air quality: reducing emissions from Medium Combustion Plants and Generators, November 2016, p1

34 HM Government, Explanatory memorandum to the Environmental Permitting (England and Wales) (Amendment) Regulations 2018, p3

In December 2016 the Scottish Government published its consultation, Consultation on Implementation of the Medium Combustion Plant Directive in Scotland. The Pollution Prevention and Control (Designation of Medium Combustion Plant Directive) (Scotland) Order 2017 is now in force.

The Northern Ireland Consultation on the transposition of the Medium Combustion Plant Directive (1-50 megawatts) including the regulation of thermal electricity generators, was published on 21 June 2017. The Pollution Prevention and Control (Industrial Emissions) Regulations (Northern Ireland) 2013 were amended to transpose the requirements of the Medium Combustion Plant Directive, from March 2018.[35]

Industrial Emissions Directive

The regulation of emissions from industrial installations and mobile plant is regulated primarily by the Industrial Emissions Directive 2010 (Directive 2010/75/EU), (the IED). Mobile plant may include operations such soil and groundwater remediation and landspreading of waste.[36]

The IED aims to protect human health and the environment through the use of "Best Available Techniques" (BAT). BAT sets out the available techniques which are the best for preventing or minimising emissions and impacts on the environment. "Techniques" includes both the technology used and the way the installation is designed, built, maintained, operated and decommissioned. The European Commission produces best available technique reference documents which contain the BAT for installations. Around 52,000 EU installations undertaking the industrial activities listed in Annex I of the IED are required to operate in accordance with a permit (granted by the authorities in the Member States).[37]

The Industrial Emissions Directive 2010 was implemented through the Environmental Permitting (EP) regime in England and Wales, the Pollution Prevention and Control (PPC) regime in Scotland, and in Northern Ireland through Integrated Pollution Prevention and Control. These regimes remain in operation following Brexit.

In January 2021 a joint consultation of the UK Government, the Scottish Government, the Welsh Government and the Department of Agriculture, Environment and Rural Affairs in Northern Ireland was published to seek stakeholder views on establishing a new UK BAT regime, following the UK's EU exit.[38] The consultation document summarised the approach to be taken and highlighted that there may be different aspects of BAT standards between the different UK countries:

35 Amendment made by the Pollution Prevention and Control (Industrial Emissions) (Amendment) Regulations (Northern Ireland) 2018

36 Environment Agency, Regulatory Guidance Series, No RGN 2 Understanding the meaning of regulated facility, Appendix 4 – Understanding the scope of mobile plant, May 2015

37 European Commission website, The Industrial Emissions Directive [accessed on 9 October 2023]

38 Defra, Best Available Techniques'– A future regime within the UK, January 2021

> We are proposing to develop and set future 'Best Available Techniques', based on the same principles we have followed since the concept was devised; a transparent, collaborative, data and evidence led process that safeguards and builds on the high levels of environmental protection already in place across the UK.
>
> Air quality is a devolved policy area and, following the UK's exit from the European Union, the power for defining "Best Available Techniques" conclusions is transferred to each government independently. Different countries in the UK may set different 'Best Available Techniques'. For instance, Scottish Government has committed to maintaining alignment with EU standards where possible. However, whilst some aspects of 'Best Available Techniques' may be different, a common approach to the development of 'Best Available Techniques' within the UK will be taken.[39]

The government responded to the consultation on 30 August 2022,[40] and published a new policy paper, Establishing the Best Available Techniques for the UK (UK BAT). This outlines the Government's intention to move towards a more "collaborative" approach.[41] The UK Government and devolved executives will work with industry and local councils to determine Best Available Techniques from across the UK's largest industries. This process will include agreeing and setting emissions limits within environmental permits and determining the types of technologies and methods operators should use to reduce their environmental impact.[42] A new governance structure and a new air quality governance group was also outlined:

> A new governance structure will also be established, with new independent bodies - called the Standards Council and the Regulators Group - consisting of government officials and expert regulators from all four nations of the UK. A UK Air Quality Governance Group will also be established to oversee the work of the Standards Council as also outlined: and the delivery of the requirements under this new framework. Interested parties from industry, academia and civil society will be able to engage in the running of the BAT system through an advisory group being set up by the UK BAT Team.[43]

2.4 Air quality domestic legislative controls

Environment Act 2021 targets

The Environment Act 2021 required the UK Government to make regulations setting long-term environmental targets for England in a number of areas,

39 Defra, Best Available Techniques'– A future regime within the UK, January 2021, p4-5

40 HM Government, Summary of responses to the consultation, 'Best Available Techniques': a future regime within the UK, 30 August 2022 and HM Government, Policy paper: Establishing the Best Available Techniques for the UK (UK BAT), 30 August 2022

41 HM Government, New framework announced to tackle industrial emissions across the UK, 30 August 2022

42 HM Government, New framework announced to tackle industrial emissions across the UK, 30 August 2022

43 HM Government, New framework announced to tackle industrial emissions across the UK, 30 August 2022

including one on air quality. Long-term is defined as for 15 years or more. In addition to this, the Act also required a specific target to be set in relation to fine particulate matter ($PM_{2.5}$), as this is considered to be the air pollutant of greatest harm to human health.[44]

Following a consultation process, two targets, both of which relate to $PM_{2.5}$, have now been set in secondary legislation, The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023 (SI 2023/96).[45] The targets are:

- An annual mean concentration target – a target of 10 micrograms per cubic metre (µg m^3) to be met across England by 2040.
- A population exposure reduction target – a 35% reduction in population exposure by 2040 (compared to a base year of 2018).

The targets are supported by interim targets and policy that has been set out in the government's Environmental Improvement Plan, published in January 2023. The aim of interim targets is to help track progress towards the statutory, longer term, targets. They are:

By the end of January 2028:

- The highest annual mean concentration in the most recent full calendar year must not exceed 12 µg/m3 of $PM_{2.5}$.
- Compared to 2018, the reduction in population exposure to $PM_{2.5}$ in the most recent full calendar year must be 22% or greater[46]

Clean Air Act 1993

The Clean Air Act 1993 (which contains provisions which apply to England Wales and Scotland), provides powers for local authorities to designate smoke control areas. These are areas where someone cannot emit smoke from a chimney unless they are burning an authorised fuel or using 'exempt appliances', for example burners or stoves.[47] It also contains prohibitions on emitting dark smoke from the chimneys of any building or industrial or trade premises (including from the chimney of a vessel). For further information, including on penalty levels, see GOV.UK guidance, Smoke control areas: the rules.

44 See Defra, Consultation on Environmental Targets, 16 March 2022 and the Environmental targets consultation summary of responses and government response, (PDF) 16 December 2022

45 See Defra, Consultation on Environmental Targets, 16 March 2022 and the Environmental targets consultation summary of responses and government response, (PDF) 16 December 2022

46 HM Government, Environmental Improvement Plan, January 2023, p

47 For further information see GOV.UK guidance, Smoke control areas: the rules [accessed 10 October 2023]

The Environment Act 2021 has amended the Clean Air Act 1993, so that from rom 1 May 2022, provisions have:[48]

- allowed local authorities to issue financial penalties for emitting smoke from a chimney in a smoke control area in England. It means that in England, emitting smoke from a chimney (as defined) is no longer a criminal offence, but rather subject to a civil penalty notice (a fine). The (then) Bill's Explanatory Notes state that this makes enforcement "quicker, simpler and more proportionate".[49]

- Created a new offence of selling a controlled solid fuel by retail without taking reasonable steps to notify potential customers that it is an offence to purchase the fuel for use in circumstances where a smoke control order applies. The Explanatory Notes state that "reasonable steps" could include "putting an informative sign next to the fuels and at the cash register, or including a notification during online checkout." [50]

- Removed the financial limit on penalties for the sale of controlled fuels for delivery to a building to which a smoke control order applies. The penalty is at the discretion of the Magistrates Court.

- Allowed local authorities to extend their Smoke Control Areas to include moored vessels.

Statutory nuisance for smoke emissions from private dwellings

The Environment Act 2021 has also amended the Environmental Protection Act 1990 so that smoke emitted from a private dwelling in a smoke control area in England could be defined as a statutory nuisance if it were "prejudicial to health or a nuisance".[51] Previously, smoke emitted from a chimney of a private dwelling within a smoke control area was an exemption from this statutory nuisance provision.

Environment Act 1995

At a national level, the UK Government and the devolved governments in Wales and Scotland are required under the Environment Act 1995 to produce a national air quality strategy. The requirement for Northern Ireland stems from the Environment (Northern Ireland) Order 2002. In 2007 the Air Quality Strategy for England, Scotland, Wales and Northern Ireland was published. In April 2023 the UK Government published a document, Air quality strategy: framework for local authority delivery, which supersedes the 2007 Strategy in respect of England only.

48 By virtue of the provisions of regulation 4 of the Environment Act 2021 (Commencement No 2 and Saving Provision) Regulations 2022

49 Environment Bill Explanatory Notes, para 36.

50 Environment Bill, Explanatory Notes, para 1451.

51 By virtue of the provisions of regulation 4 of the Environment Act 2021 (Commencement No 2 and Saving Provision) Regulations 2022 (SI 2022/48)

The Environment Act 1995 also establishes a local air quality management (LAQM) regime. Section 82 of the Act requires local authorities to review air quality in their respective areas and assess whether the air quality standards specified in the national air quality strategy are being achieved. For areas where specified standards and objectives are not being met, authorities are expected to declare Air Quality Management Areas (AQMAs) and then prepare action plans. The action plan must provide a timeframe for when measures will be implemented.

From 1 May 2022, schedule 11 of the Environment Act 2021 has amended the Environment Act 1995 to:[52]

- Require the Secretary of State to report annually to Parliament on an assessment of progress made in meeting air quality targets in England and steps taken to meet those targets.

- Specify factors that local Air Quality Management Areas and corresponding action plans must identify and/or include. For example, action plans must set out how local authorities will exercise functions in order to secure and maintain air quality standards, what measures they will take and the date by which they will be carried out (amongst other things).

- Impose a duty on "air quality partners" (an air quality partner can include bodies exercising public functions where they have been designated in regulations made by the Secretary of State),[53] to cooperate with the local authority, including requiring air quality partners to provide measures they would take to contribute to the action plan being developed by a local authority.

- Make provisions regarding the collaboration between district and county councils in relation to air quality action plans, with similar provisions made for London and combined authorities. District councils have the responsibility to declare LAQMs and prepare action plans.

- Introduce a requirement for local authorities to have regard to any guidance published by the Secretary of State regarding local air quality standards and the local authorities' functions in that regard.

In October 2020 the government published a consultation, Local air quality management: public authorities call for evidence, (relevant to Part 4 of the Act). It sought views on which public authorities should be considered for designation by the Environment Secretary as 'Relevant Public Authorities'. A relevant public authority may then be required to co-operate with local authorities acting as an 'Air Quality Partner' within the Local Air Quality Management Framework. On 18 August 2022 the government announced that

[52] By virtue of Environment Act 2021 (Commencement No 2 and Saving Provision) Regulations 2022 (SI 2022/48)

[53] Memorandum from the Department for the Environment, Food and Rural Affairs to the Delegated Powers and Regulatory Reform Committee, 30 Jan 2020, para 281

National Highways would become the first designated "Relevant Public Authority". The government said that this would, "see a more consistent approach to meeting local air quality objectives on road networks."[54]

Also announced on 18 August 2022, following on from the government's March 2022, Consultation on the review of the Local Air Quality Management Policy Guidance, it was confirmed that the Local Air Quality Management (LAQM) Technical Guidance, (which is designed to support local authorities in carrying out their duties under the Environment Act), has also been updated to include:

- A new requirement for local Air Quality Action Plans to include a timeline of clear actions that ensure Air Quality Objectives (pollution concentration limits) are met and air quality standards improve in local areas.
- The requirement for an Air Quality Management Area to be declared within 12 months of identifying an exceedance of the air quality objectives to ensure that local councils develop Air Quality Actions Plans more quickly.
- The requirement for local authorities to produce an Air Quality Action Plan within 18 months of declaring an Air Quality Management Area.
- A new reminder and warning alert system to increase local council compliance with reporting on actions they are taking to improve air quality.[55]

For further information on LAQM and powers available to local authorities to tackle air quality see Library briefing, Local government air quality responsibilities.

The Environment (Air Quality and Soundscapes) (Wales) Act 2024

In Wales, The Environment (Air Quality and Soundscapes) (Wales) Act 2024, received Royal Assent on 14 February 2024. This Act:

- provides a framework for setting national air quality targets (subject to further consultation)
- amends existing legislation relating to the national air quality strategy; local air quality management; smoke control; clean air zones/low emission zones and vehicle idling
- places a duty on Welsh Ministers to promote awareness of air pollution[56]

54 HM Government, Package of measures introduced to improve air quality, 18 August 2022
55 HM Government, Package of measures introduced to improve air quality, 18 August 2022
56 Welsh Parliament, The Environment (Air Quality and Soundscapes) (Wales) Act 2024 (accessed 19 February 2024)

For further information see the Senedd Cymru (Welsh Parliament) webpage, Environment (Air Quality and Soundscapes) (Wales) Act 2024.

2.5 World Health Organization guidelines

The World Health Organization (WHO) published Global Air Quality Guidelines in September 2021 covering Particulate matter ($PM_{2.5}$ and PM_{10}), ozone, nitrogen dioxide, sulphur dioxide and carbon monoxide. They provide guidance on thresholds and limits for key air pollutants that pose health risks. They are guidelines only and are not binding on any country unless that country chooses to adopt them into its own legislation.

These guidelines are an update on the previous 2005 version, WHO Air quality guidelines 2005 (PDF). In particular, the annual guideline level for fine particulate matter ($PM_{2.5}$) was lowered from 10 µg/m³ to 5 µg/m³ and the guideline level for nitrogen dioxide was reduced from 40 µg/m³ to 10 µg/m³.

µg/m³ is a microgram (one-millionth of a gram) per cubic metre of air.

The revised 2021 guidelines set the following limit values:[57]

Table 1 WHO recommended 2021 air quality guidance levels compared to 2005 air quality guideline

Pollutant	Averaging time	2005 Air Quality Guidelines	2021 Air Quality Guidelines
$PM_{2.5}$ µg/m³	Annual 24-hour	10 25	5 15
PM_{10} µg/m³	Annual 24-hour	20 50	15 45
O_3 µg/m³	Peak season 8-hour	- 100	60 100
NO_2 µg/m³	Annual 24-hour	40 -	10 25
SO_2 µg/m³	24-hour	20	40
CO mg/m³	24-hour	-	4

Source: World Health Organization, What are the WHO Air quality guidelines? 22 September 2021

[57] World Health Organization, What are the WHO Air quality guidelines? 22 September 2021

In its December 2022 Environmental targets consultation summary of responses and government response (PDF), the government expressed its view that these are guidelines only and not "ready-made targets". It stated that it would not be possible to meet the WHO's revised limit for $PM_{2.5}$ in the UK, due to the amount of this pollutant that originates from overseas sources:

> As regards the World Health Organisation's Air Quality Guidelines, they are intended to inform target setting and are not ready-made targets for adoption. The WHO itself does not expect any country to adopt its guidelines without first understanding what would be required to meet the targets. Indeed, our evidence shows that 6 – 8 µg per m^3 of the 2018 levels people experienced in parts of southeast England came not from man-made UK sources but from a combination of natural sources, emissions from other countries (such as air blown across the English Channel from Europe) and from shipping. Therefore, even if we removed all people from England, it would not be possible to meet a target level of 5 µg per m^3.[58]

[58] HM Government, Environmental targets consultation summary of responses and government response, 16 December 2022, p28

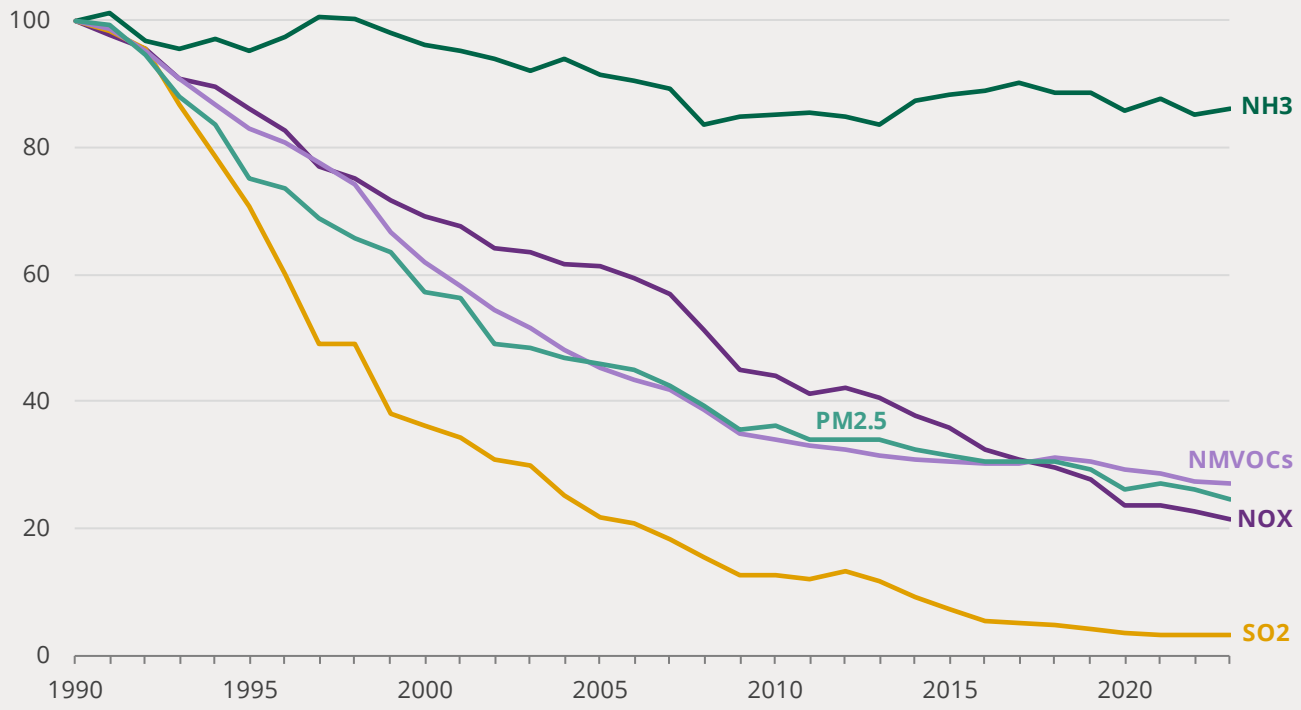
3 Trends in air pollutants

3.1 Summary

Longer term trends in estimates emissions of sulphur dioxide (SO2), fine particulate matter (PM2.5), nitrogen oxides (NOX), non-methane volatile organic compounds (NMVOC) and ammonia (NH3) are summarised in the chart below. All apart from ammonia fell by more than 70% over this time. The fall in emissions of NMVOCs and PM2.5 slowed down noticeably in the last decade. The largest reduction was in sulphur dioxide which fell by 97% between 1990 and 2023.

UK Emissions of four key pollutants down by two thirds or more since 1990

Index values 1990=100



Source: Emissions of air pollutants in the UK -Summary, Defra (March 2025)

The next chart looks at the average number of days where pollution was categorised as 'moderate' or higher[59] since 2010. The number at urban monitoring stations fell from 24 per site in 2011 to 7 in 2017. It increased in the follow two years before falling again in 2020 and 2021 to a new low of just

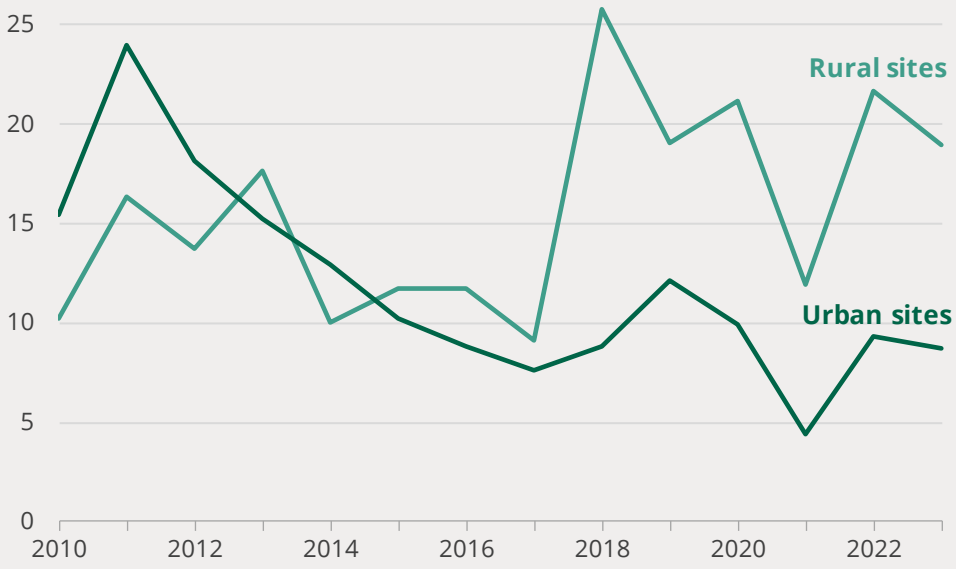
[59] Bands 'low', 'moderate', 'high', or 'very high' for a range of different pollutants.

over 4. This was reversed in 2022 and it was around 9 in 2022 and 2023. The drop in 2020 and 2021 will have been due, at least in part, to the pandemic and associated lockdowns.

In contrast the average number at rural sites where pollution was 'moderate' or higher has increased since the mid-2010s. It was between 9 and 11 in the middle of the last decade, but has been substantially higher in later years, apart from the pandemic-affected results for 2021. Pollution can be affected by weather conditions, particularly ozone which makes up most of the days of moderate of higher pollution. These trends are therefore not solely due to changes in underlying UK emissions.

Since 2015 there have been more days with moderate or higher pollution at rural sites

Mean days per monitoring site when air pollution was moderate or higher



Source: Air quality statistics, Defra (April 2024)

3.2 Individual pollutants

This section looks at national level data on emissions of the five pollutants listed above and concentrations of fine particulate matter ($PM_{2.5}$) and nitrogen dioxide (NO_2). The emissions data show estimates for 2000 to 2023 and compare these to internationally-agreed legal ceilings on emissions:

- The National Emission Ceilings Regulations 2018 (NECR)
- The Gothenburg Protocol to the UNECE Convention on Long Range Transboundary Air Pollution (CLRTAP)

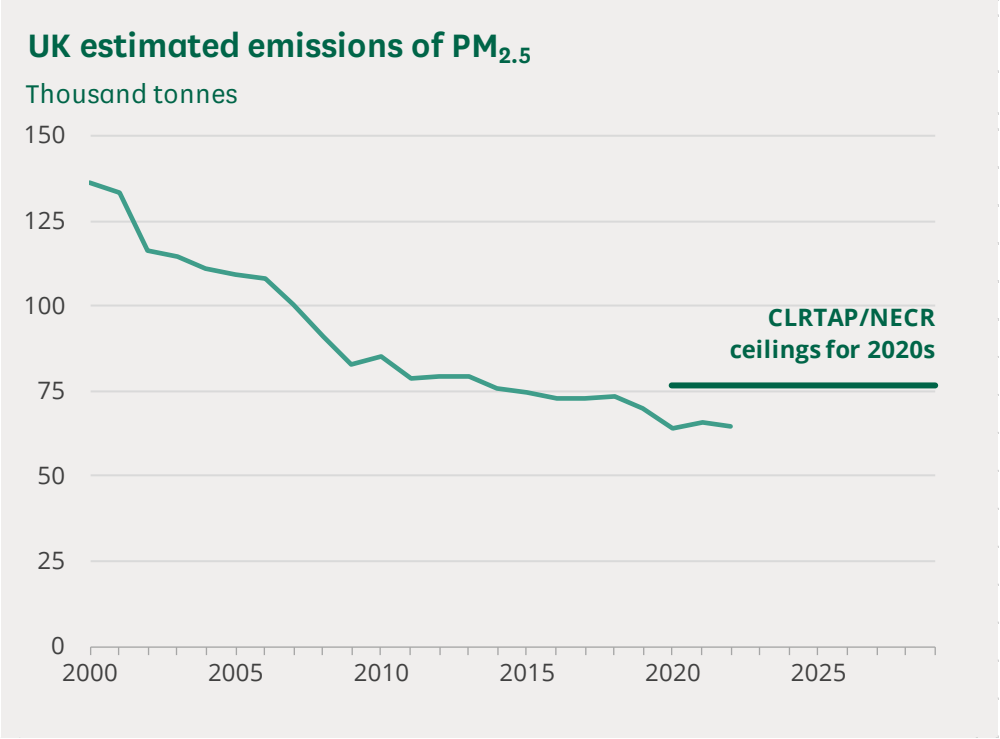
Both set limits on pollution based on an agreed percentage reduction compared to a base year. These ceilings cover 10-year periods: 2010-19 and 2020-29. The ceilings for fine particulate matter only cover 2020-29.

The data on $PM_{2.5}$ and NO_2 concentrations cover 2009 to 2023. The commentary on this data compares estimates to legal limits set out in the Air Quality Standards Regulations (2010)[60] which are based on EU and UN directives. It also compares this UK data to the recent guidelines on air quality produced by the World Health Organisation (WHO).[61] These air quality guidelines are set out alongside interim targets to meet this level.

Particulates ($PM_{2.5}$)

Emissions

Estimated emissions of $PM_{2.5}$ were around 140 thousand tonnes in 2000. They fell to 79 thousand tonnes in 2011 and remained broadly in the 75-80 thousand range up to 2018 before falling to 64 thousand tonnes in 2020. Emissions increased again in 2021, before falling to around 56 thousand tonnes in 2023 The 2022 level was 18% below the emission ceilings for the 2020s. These are set at 30% below 2005 levels.



Source: Defra, Emissions of air pollutants in the UK –Particulate matter (March 2025)

60 Air Quality Standards Regulations 2010

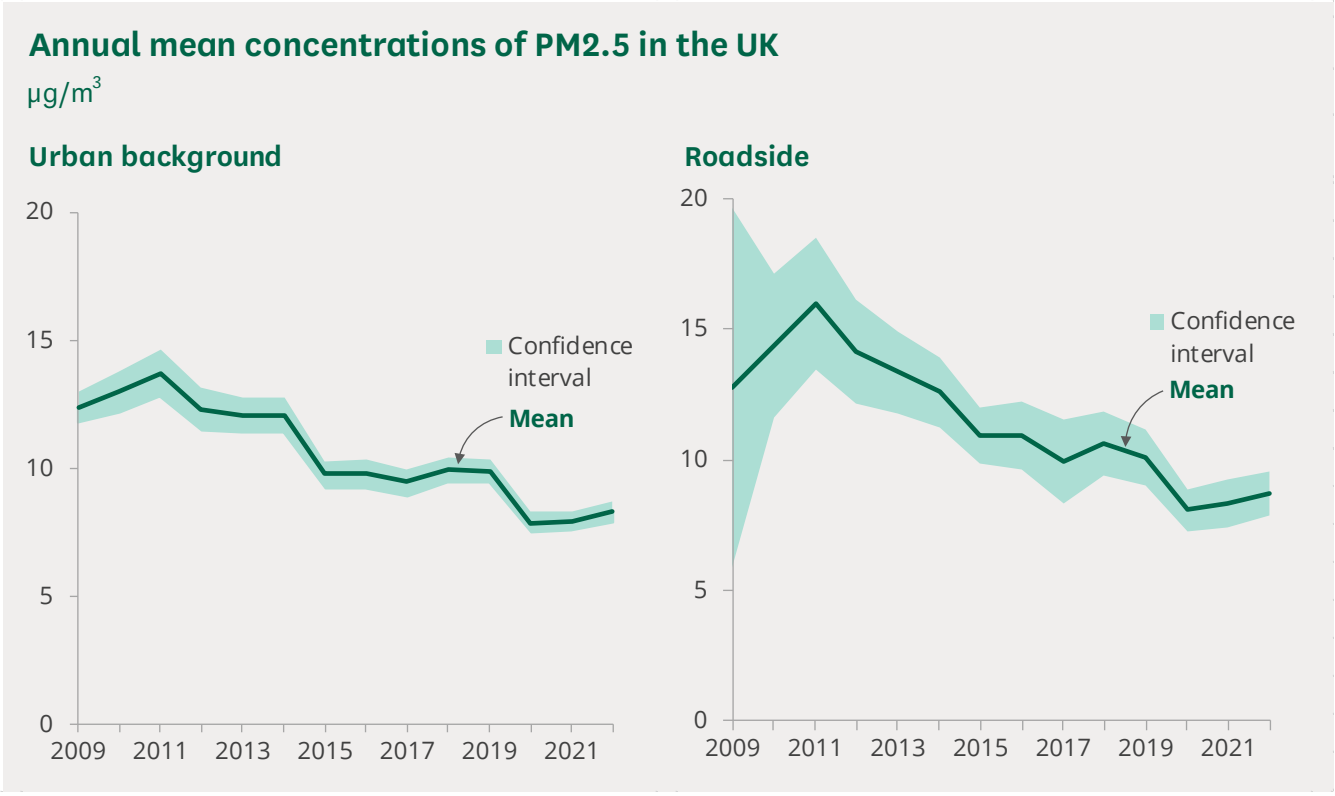
61 WHO global air quality guidelines: particulate matter (PM2.5 and PM10), ozone, nitrogen dioxide, sulphur dioxide and carbon monoxide, WHO September 2021

The largest single source of $PM_{2.5}$ was road transport s- at 21% of emissions in 2023. The next largest sources were domestic combustion (mainly burning wood for heat in home) with 18% and industrial processes and product use with 16%. Emissions from road transport exhaust emissions have fallen since the mid-1990s due to stricter emissions standards, but non-exhaust emissions, from brake, tyre and road wear, have gone up due to increases in the distanced travelled.[62]

Concentrations

Data on $PM_{2.5}$ concentrations are based on figures from roadside and urban background monitoring stations. There are a limited number of stations and in order to reflect the uncertainty in going from this data to national estimates they presented alongside confidence intervals. These intervals narrow over time due to the increased number of monitoring stations and the reduction in variation between sites.

Mean hourly concentrations of $PM_{2.5}$ fell between 2011 and 2017 at urban background and roadside sites by 38% and 31% respectively. There was little change in the following two years. Concentrations fell in 2020 and remained at this level in 2021 as the pandemic and related lockdowns led to a dramatic fall in road traffic. There was an increase in both measures in 2022 and 2023, but they were still below pre-pandemic levels.



Source: Defra, Air quality statistics (April 2024)

[62] Defra, Emissions of air pollutants in the UK –Particulate matter (PM10 and PM2.5), (March 2025)

The Air Quality Standards Regulations 2010 require that from 2015 annual average concentrations of $PM_{2.5}$ must not exceed 25 µg/m³ and from 2020 they must not exceed 20 µg/m³. The charts above show that concentrations were well below these levels. The UK is divided into 43 zones for the purpose of assessment of compliance with these regulations. In 2023 all met the 20 µg/m³ limit.[63]

$PM_{2.5}$ targets
UK limit: **20 µg/m³**
WHO guidelines:
2005: **10 µg/m³**
2021: **5 µg/m³**

In 2021 the WHO has recommended an annual guideline concentration level of 5 µg/m³.[64] Its earlier target, published in 2005 was 10 µg/m³.

The Government has said the following on its progress to meeting the earlier guideline level:[65]

> The UK's current objectives on PM2.5 stem from EU legislation. We already meet the EU limit value of 25 µg/m3 and are on track to meet the second stage limit of 20 µg/m3 by 2020.
>
> The WHO guidelines recommend an ultimate goal for concentrations of PM2.5 of 10 µg/m3. This is half of the 2020 EU limit and the WHO recognises that this represents a significant challenge … **We will reduce PM2.5 levels in order to halve the number of people living in locations where concentrations of particulate matter are above 10 µg/m3 by 2025.**

Nitrogen oxides (NOx)

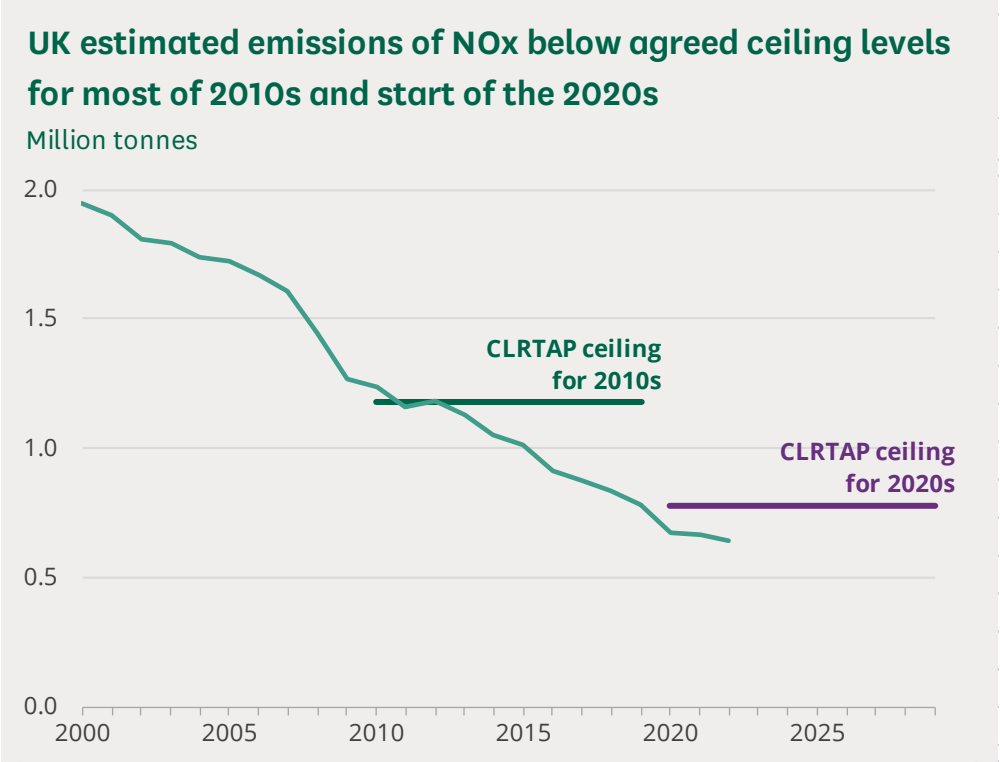
Emissions

NO_2 targets
UK limit: **40 µg/m³**
WHO guidelines:
2005: **40 µg/m³**
2021: **10 µg/m³**

Emissions of NOx have fallen consistently from just under 2 million tonnes in 2000 to below 1.5 million tonnes from 2008 and less than 1 million tonnes from 2016. The pandemic and associated lockdowns were partly responsible for the relatively large drop in 2020. The overall cut between 2000 and 2022 was 69%.

The following chart shows that emissions were below the CLRTAP ceiling for the 2010s in all years other than 2010. Estimated emissions in the 2020s have so far been the annual cap for this decade which is set at 55% below the 2005 level. The NECR applies to NOx excluding agriculture and emissions on this basis were below this the relevant level ceiling in all years other than 2010. [66]

63 Air Pollution in the UK 2023, Defra
64 WHO global air quality guidelines: particulate matter (PM2.5 and PM10), ozone, nitrogen dioxide, sulphur dioxide and carbon monoxide, WHO September 2021
65 Defra, Air Quality: National Air Pollution Control Programme (March 2019)
66 Defra, Emissions of air pollutants in the UK – Nitrogen oxides (NOx) (March 2025



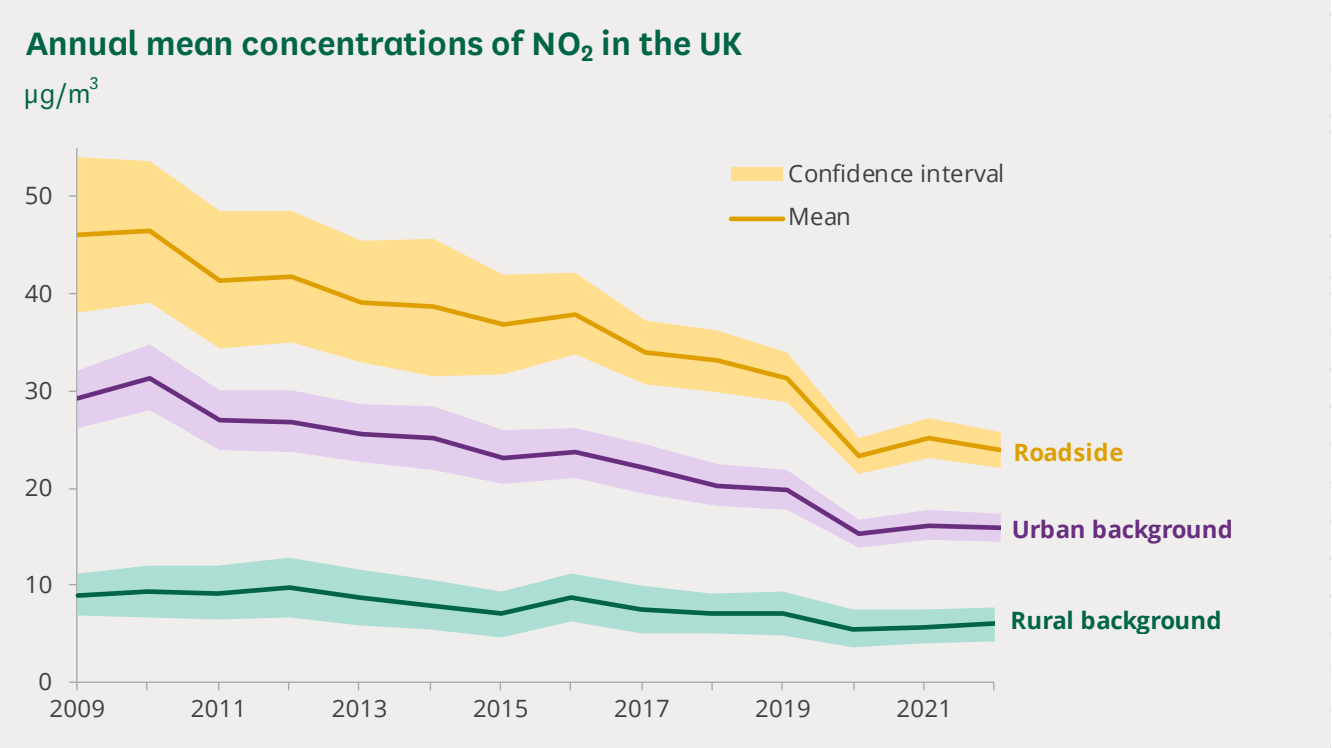
Source: Defra, Emissions of air pollutants in the UK – Nitrogen oxides (NOx) (March 2025)

Emissions of NOx from road transport have fallen faster than other sources, but they were still the largest single source in 2023 with 30% of the total. Combustion in energy industries and the non-road transport sector were the next most important sectors with 19% and 16% respectively.[67]

Concentrations of Nitrogen Dioxide (NO_2)

Data on concentrations of NO_2, are, as with other pollutants, estimated from monitoring stations of different types. They are presented with confidence intervals to take account of the uncertainty of this method. The following chart shows trends for the three different types of charts since 2009. Average concentrations at all types of sites fell over the 2010s, with somewhat larger percentage reductions at roadside and urban background sites. There was a more dramatic fall in 2020 as the lockdowns led to a large cut in road traffic. While concentrations increased after 2020, their latest levels were below pre-pandemic concentrations for all three different types of site.

[67] Defra, Emissions of air pollutants in the UK – Nitrogen oxides (NOx) (March 2025)



Source: Defra, Air quality statistics, (April 2024)

The Air Quality Standards Regulations 2010 require that annual concentrations must not exceed 40 µg/m^3. The average at all types of site has been below this level for some years. In 2023 there were 34 of the 43 air quality zones in the UK which met this annual limit, down from 38 in 2020, but up from 10 in 2019.[68]

The latest WHO guideline concentration is 10 µg/m^3.[69] The chart above shows that average concentrations were well above this level at urban background and roadside sites, even during pandemic-affected 2020 and 2021.

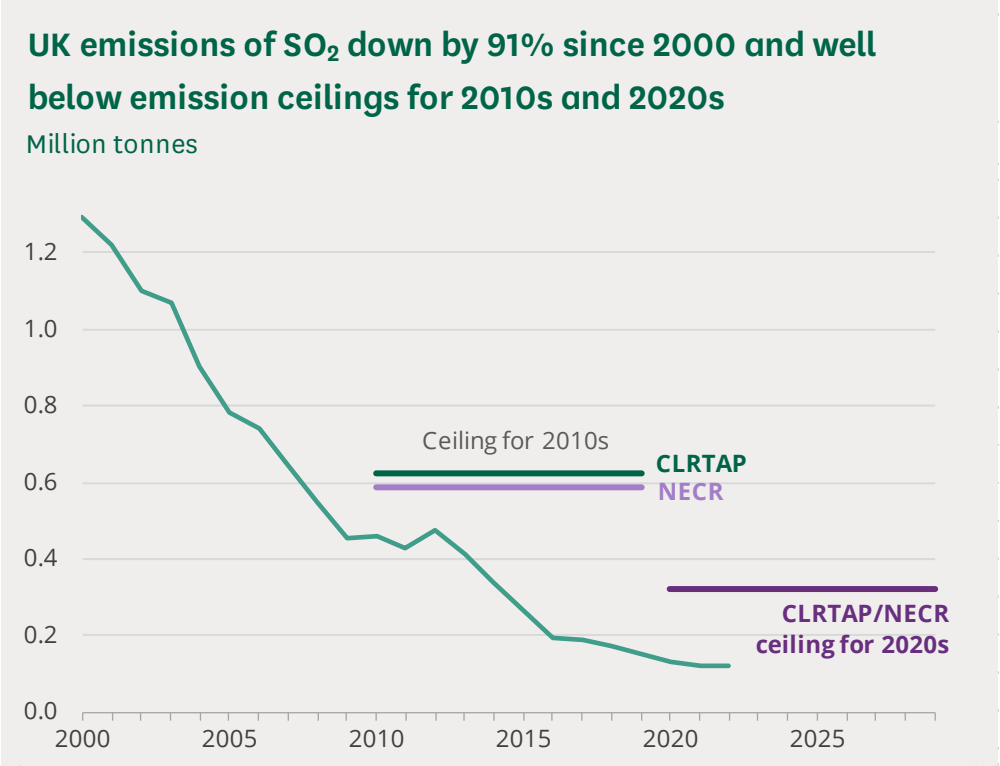
Sulphur Dioxide (SO_2)

Emissions

Estimated emissions of SO_2 have been falling for many decades. The following chart looks at the period since 2000 during which they fell by 91% from 1.3 million tonnes to just over than 0.1 million tonnes. Levels were below the NECR and CLRTAP ceilings for the 2010s at the start of the decade and well below at the end. Recent levels have also been below the commitments for the 2020s which require a reduction of 59% compared to 2005 levels.

[68] Air Pollution in the UK 2023, Defra

[69] WHO global air quality guidelines: particulate matter (PM2.5 and PM10), ozone, nitrogen dioxide, sulfur dioxide and carbon monoxide, WHO September 2021



Source: Defra, Emissions of air pollutants in the UK – Sulphur dioxide (SO2), (March 2025)

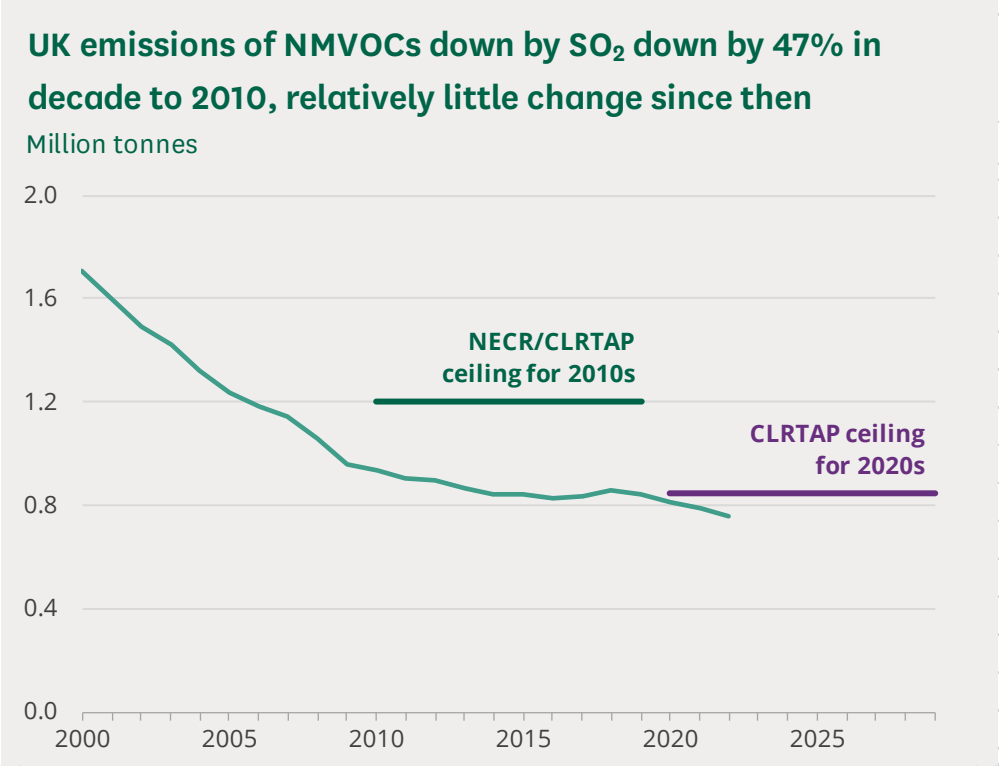
The switch away from coal-fired power has been the main cause of the long-term cut in SO_2 emissions. In 2023 domestic combustion, combustion in the manufacturing/construction sector the energy sector were all responsible for 26% of total emissions of SO_2.[70]

Non-methane volatile organic compounds (NMVOCs)

Emissions

Estimated emissions of NMVOCs fell by 47% between 2000 and 2010 to just over 0.9 million tonnes. They fell gradually in the early 2010s and were well below the emission ceilings for the decade. They were stable during most of the 2010s and fell gradually in the early 2020s. Estimated emissions in the 2020s have so far been below the CLRTAP ceiling for the decade. The NECR commitment for the 2020s excludes NMVOCs from agriculture, and emissions on this basis (not shown in the following chart) were 19% below this ceiling in 2023.

[70] Defra, Emissions of air pollutants in the UK – Sulphur dioxide (SO2), (March 2025)



Source: Defra, Emissions of air pollutants in the UK – Non-methane volatile organic compounds (NMVOCs) (March 2025)

23% of NMVOC emissions in 2023 were from domestic solvent use, mainly in cosmetics and toiletries. The next largest source was the agriculture with 17%. NMVOC emissions from agriculture have increased since 1990 due to greater use of manure-based fertilisers and an increase in the number of chickens and dairy cows reared.[71]

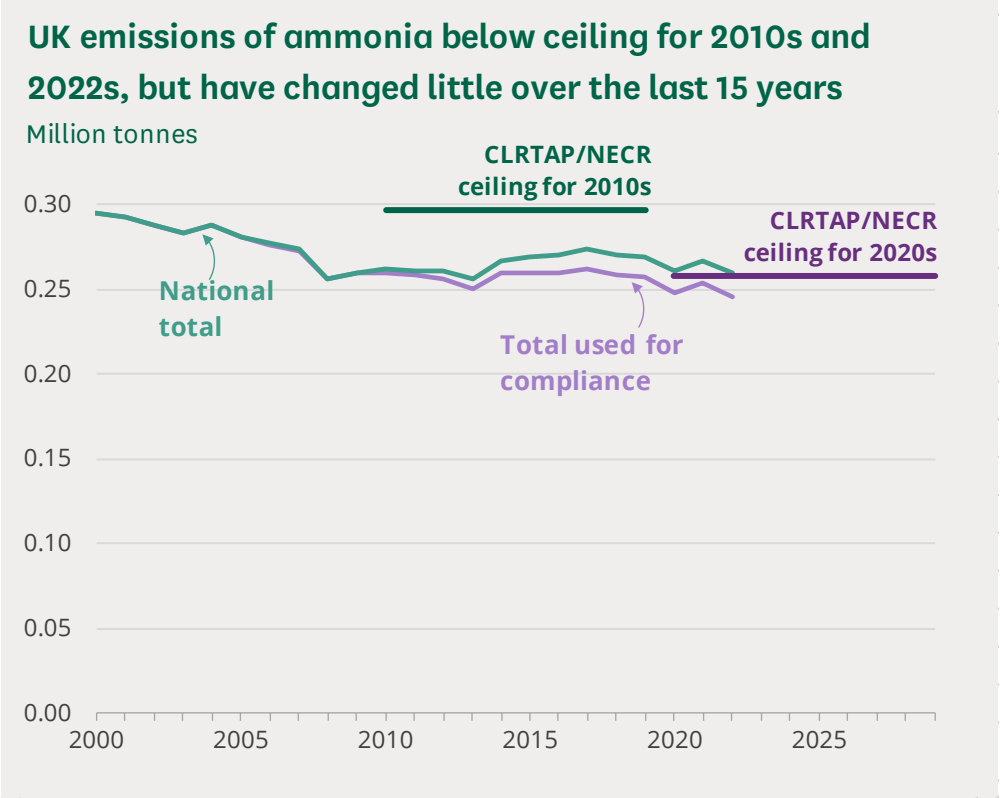
Ammonia

Emissions

Estimated UK emissions of ammonia fell from almost 300 thousand tonnes in 2000 to just over 255,000 in 208. The following chart shows that emissions remained around this level for six years before increasing during the late 2010s. This level of emissions was below the ceiling levels during the whole of the 2010s. Emissions fell by 3% in 2020 to their lowest level since 2013, and were just above this level between 2021 and 2023. The ceiling level for the 2020s required an 8% reduction on 2005 levels, smaller than the reductions requited for other pollutants. In 2023 adjusted total emissions[72] were 4% below the ceiling level for the 2020s of 258 thousand tonnes.

[71] Defra, Emissions of air pollutants in the UK – Non-methane volatile organic compounds (NMVOCs) (March 2025)

[72] Annual total emissions of ammonia are adjusted for compliance purposes by removing the contribution of emissions from non-manure digestate spreading. This source was not included in the inventory when the emission reduction commitments were set.



Source: Defra, Emissions of air pollutants in the UK – Ammonia (NH3) (March 2025)

The majority of ammonia emissions come from agriculture; 85% in 2023. Half of the emissions from agriculture come from cattle. Trends in total emissions are closely connected to changings in farming practice, such as fertiliser use and the number of farm animals.[73]

3.3 Local data on air quality

Air quality assessment zones

The annual Air pollution in the UK report gives a high level summary of the UK's compliance with legal limits on air pollution alongside background information on the UK's legal and policy framework and how pollution is measured and modelled. The UK is divided into 43 zones for air quality assessment. 28 are agglomerations zones (large urban areas) and 15 non agglomeration zones (larger regions outside urban areas). The report presents compliance with each pollution limit for all zones. This is based on a mixture of measured concentrations and modelling.

In 2021 all zones were compliant with the limit values for SO_2, $PM_{2.5}$, lead, benzene and CO. The UK has been compliant with these limits for more than a decade. No zones exceeded the NO_2 hourly mean limit (for the second time ever) and ten exceeded the annual mean (up from five in 2020, but down from

[73] Defra, Emissions of air pollutants in the UK – Ammonia (NH3) (March 2025)

33 in 2019). No zones exceeded the annual or daily mean limits for PM_{10} and all were compliant with the stage 1 and stage 2 limits on $PM_{2.5}$. All zones were compliant with the 8 hour target value on ozone protection of human health, but only four were compliant with the long term objective for human health. The target value on a separate measure of ozone for protection of vegetation was met in all zones and only one exceeded the long-term objective on this measure.

Current and forecast levels of pollution

The following websites give current data on air pollution levels (Daily Air Quality Index bands) and forecasts:

- Air Quality in England
- Air Quality in Scotland
- Air Quality in Wales
- Northern Ireland Air

Detailed local level modelling of pollution

The UK Air website from Defra contains forecast and latest pollution summary bands, but also includes data on pollution levels from the monitoring network and exceedances of pollution limits. The ambient air quality map on this site is an interactive tool which allows users to explore modelled annual data on background and roadside pollution concentrations from Defra's national Pollution Climate Mapping modelling. It covers all the pollutants included in the UK's limits for each year from 2001 to 2020. These give detailed local patterns and the roadside figures show modelled pollution levels along the length of specific roads.

Local authority reports and data

Local authorities are required to produce annual reports on their air quality: Annual Status Reports in England and Annual Progress Reports in Wales and Scotland. These include a summary of local pollution in the year, data on pollution levels at their monitoring sites, exceedances of pollution limits and descriptions of actions they have taken to cut pollution.

The Greater London Authority compiles a Borough Air Quality Compendium from the reports for individual London boroughs. The London Air Quality Network website includes current pollution levels, local authority summaries which give pollution data and exceedances for individual sites and annual summary maps of modelled concentrations of NO_2, ozone, PM_{10} and $PM_{2.5}$.

4 UK air quality policies, plans and strategies

In the UK, responsibility for meeting air quality limit values is devolved. The Secretary of State for Environment, Food and Rural Affairs has responsibility for meeting the limit values in England and the Department for Environment, Food and Rural Affairs (Defra) co-ordinates assessment and air quality plans for the UK as a whole.[74]

The UK Government and devolved executives published a Revised UK National Air Pollution Control Programme (NAPCP) in February 2023, to meet requirements set by the revised 2016 National Emission Ceilings Directive (2016/2284). This document replaced the April 2019 National Air Pollution Control Programme. The revised NAPCP sets out the existing and proposed measures relating to how emission reduction commitments have been and will be met across the UK.

At a national level, the UK, Scottish and Welsh Governments are required under the Environment Act 1995 to produce a national air quality strategy. A similar requirement for Northern Ireland stems from the Environment (Northern Ireland) Order 2002. In 2007, the Air Quality Strategy for England, Scotland, Wales and Northern Ireland was published. In April 2023 the UK Government published a document, Air quality strategy: framework for local authority delivery, which supersedes the 2007 Strategy in respect of England only.

Each government within the UK can also choose to publish its own air quality strategy. These strategies are highlighted below.

4.1 A UK-wide air quality common framework

Following EU exit, the four parts of the UK are no longer bound together by the common framework on air quality provided by the EU. As a result, the UK government and devolved executives have agreed that a number of common frameworks will be needed to avoid significant policy divergence between the nations of the UK where that would be undesirable. As part of this work, air quality was identified as a policy area, "where we think that common rules of

[74] Defra website, UK Air Quality Policy Context [accessed 10 October 2023]

ways of working will be needed and we expect to implement this through a non-legislative common framework agreement."[75]

An Air quality: provisional common framework was published on 3 February 2022. It sets out how the UK and devolved executives propose to work together on policies that aim to reduce harmful emissions and concentrations of air pollutants. For example, it would commit the executives to continue to collaborate on the reporting of data at a UK level and to work collaboratively on emission reductions to meet national and international ceilings. This includes delivering future National Air Pollution Control Programmes, as required under the National Emission Ceilings Regulations 2018. The document states that no primary legislation is deemed necessary for the implementation of this framework.[76]

4.2 England

On 14 January 2019 the UK Government published a Clean Air Strategy 2019 for England. It sets out the government's plans for dealing with all sources of air pollution and reducing emissions from sectors including transport, farming and industry.[77]

The UK Government's 25 Year Environment Plan, January 2018, and the January 2023 revision to it, the Environmental Improvement Plan 2023, also contain ambitions on air quality, and commitments to meet targets.

The 25 Year Environment Plan is accompanied by an indicator framework that is used to check progress against the ambitions and targets in the Plan, Outcome Indicator Framework for the 25 Year Environment Plan, 25 May 2023 update. A series of update reports on the plan and the indicator framework have also been published.

4.3 Scotland

The Scottish Government's policies on air quality are currently set out in a July 2021 document called Cleaner Air for Scotland 2 - Towards a Better Place for Everyone (CAFS2). CAFS2 sets out the Scottish Government's policies on air quality improvements over the next five years. It sets a vision of, "Scotland having the best air quality in Europe – a quality of air that aims to protect and enhance health, wellbeing and the environment." A further review of progress

75 HM Government, Frameworks Analysis 2020 Breakdown of areas of EU law that intersect with devolved competence in Scotland, Wales and Northern Ireland, September 2020

76 HM Government, Air quality: provisional common framework, 3 February 2022, p15

77 HM Government, Clean Air Strategy 2019, January 2019, p63

on air quality improvements will commence during 2024, "in order to track progress on delivering the actions in the new strategy."[78]

Prior to this the policies were contained in the November 2015 (now superseded) Cleaner Air for Scotland – The Road to a Healthier Future (CAFS).[79] Since publication, annual progress reports were published, up to 2018-19. In November 2018 the Scottish Government commissioned an independently led review of CAFS, led by Professor Campbell Gemmell.[80] A final report following the independent review, Cleaner Air for Scotland strategy: independent review, was published in August 2019. The review concluded CAFS provided for an "overly complex" structure which lacked effective accountability.[81]

Alignment with EU law

In Scotland, section 1 of the UK Withdrawal from the European Union (Continuity) (Scotland) Act 2021 (the "Continuity Act"), provides Scottish Ministers with the discretionary power to continue to keep devolved law in line with EU law. It establishes a broad power for the Scottish Government to make regulations that match or implement new EU measures.

In its Cleaner Air for Scotland 2 strategy, the Scottish Government stated that it will, "ensure that EU standards and principles relating to emissions of air pollutants continue to apply in Scotland following the UK's exit from the EU, in line with the duties introduced by the Continuity Act 2021."[82] The Strategy also set out the Scottish Government's intention to apply EU laws:

> The Scottish Government has made clear its commitment to maintain or exceed EU standards, following the UK's departure from the European Union (EU). The Scottish Government is committed to ensuring that EU environmental principles continue to sit at the heart of environmental policy and law in Scotland. The UK Withdrawal from the European Union (Continuity) (Scotland) Act 20213 will bring the guiding European principles on the environment into force in Scots law, including the precautionary principle, polluter pays principle, prevention principle, rectification at source principle and the integration principle. In relation to current regulation, retained EU law will continue to apply, as will domestic regulations made to transpose EU Directives.[83]

78 Scottish Government, Cleaner Air for Scotland 2 - Towards a Better Place for Everyone, July 2021, p9-10

79 Scottish Government, Cleaner Air for Scotland – The Road to a Healthier Future, November 2015, executive summary

80 Scottish Government, Tackling Air Pollution, 6 November 2018

81 Cleaner Air for Scotland strategy: independent review, August 2019, para 1.5

82 Scottish Government, Cleaner Air for Scotland 2, July 2021, p52

83 Scottish Government, Cleaner Air for Scotland 2, July 2021, p9

4.4 Wales

In August 2020 the Welsh Government published a Clean Air Plan for Wales: Healthy Air, Healthy Wales and it is now accompanied by an April 2023 Update Report on Progress Against Actions. The update report provides information about whether the policies in the Clean Air Plan are on track or delayed, alongside further commentary and explanation.

The aim of the clean air plan is set out as being to "improve air quality and reduce the impacts of air pollution on human health, biodiversity, the natural environment and our economy." It sets a ten-year pathway to achieving cleaner air, based on its four key themes:

> We have structured the Plan around four core themes, with actions to enable collaborative approaches to reducing air pollution.
>
> - People: Protecting the health and well-being of current and future generations
> - Environment: Taking action to support our natural environment, ecosystems and biodiversity
> - Prosperity: Working with industry to reduce emissions, supporting a cleaner and more prosperous Wales
> - Place: Creating sustainable places through better planning, infrastructure and transport.
>
> The themes were designed through the lens of the Well-being of Future Generations Act to enable collaborative and integrated approaches to improving air quality, across a range of policy areas and sectors.
>
> The timescales for delivering actions are framed within three Senedd periods, short term: 2020 to 2021, medium term: 2021-26 and longer term: 2026-2031.[84]

On leaving the EU, the Plan states that Wales will, "maintain or enhance air quality standards."[85]

The plan also sets out legislative proposals to develop what is now The Environment (Air Quality and Soundscapes) (Wales) Act 2024, which received Royal Assent on 14 February 2024.

In October 2020 Ricardo Energy & Environment (on behalf of the Welsh Government and Welsh Air Quality Forum), published an updated version of its publication, Air Quality in Wales 2019. This provides a summary of information on local air quality monitoring, and pollution levels and their impacts throughout Wales during 2019, along with a 2020 update.

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84 Welsh Government, Clean Air Plan for Wales: Healthy Air, Healthy Wales, August 2020, p5

85 Welsh Government, Clean Air Plan for Wales: Healthy Air, Healthy Wales, August 2020, p9

4.5 Northern Ireland

In November 2020 the Northern Ireland Department of Agriculture, Environment and Rural Affairs (DAERA) launched a Discussion Document in advance of developing the first Clean Air Strategy for Northern Ireland. It presented evidence and research on a range of ambient air pollutants, as well as outlining existing policy and legislation. The consultation on the discussion document closed on 15 February 2021 and a synopsis of consultee responses was published in June 2022.

The DAERA website stated that the responses to the discussion document will be considered and used to shape future policies; that these policies will be included within the final Clean Air Strategy, which will "undergo a further public consultation later in 2021."[86] At the time of writing this further public consultation has not taken place. An update on the work was provided in the in the July 2022 draft UK National Air Pollution Control Programme:

> Preliminary analysis, recommendations and actions have been presented to the Minister. Once they have considered the options and decided on a policy direction, officials will engage with other Departments to develop preferred options and policy positions more fully. Officials will then begin to draft the first Clean Air Strategy for Northern Ireland. This will be a more focused and shorter document than the Discussion Document and will contain proposals relating to policy and other measures which can improve air quality. This draft Clean Air Strategy will be subject to an additional public consultation and due to the cross-cutting nature of the policy area, Executive approval will also be sought at that time.[87]

DAERA also produces a series of annual reports on air quality in Northern Ireland. The latest is the Air Pollution in Northern Ireland 2022 Report, published 9 November 2023. It summarises the air quality monitoring results for Northern Ireland in 2022.

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86 Department of Agriculture, Environment and Rural Affairs website, A Clean Air Strategy for Northern Ireland – Public Discussion Document, November 2020

87 UK government, Scottish Government, Welsh Government and the Northern Ireland Executive, Draft UK National Air Pollution Control Programme (PDF), July 2022

5 Enforcement of air quality legislation

This section provides information about some of the more recent enforcement proceedings against the UK Government in respect of non-compliance with air quality limit values. This has stemmed both from European Commission infringement proceedings and judicial review proceedings in UK courts. Judicial review is a type of court proceeding in which a judge reviews the lawfulness of a decision or action made by a public body. European Commission infringement proceedings are where a possible infringement of EU law has been identified and is a matter which can ultimately be referred to the Court of Justice. Having now left the EU, the UK Government and the devolved executives have/ are now putting in place new bodies and procedures to govern enforcement action against breaches of air quality laws.

5.1 Monitoring, enforcement and governance bodies

As a result of leaving the EU, environmental law and policy (including on air quality), which was derived from the EU, will no longer be subject to the oversight of EU institutions and the Court of Justice of the European Union (CJEU). Environmental campaigners had raised concerns following the Brexit referendum that this would leave a "governance gap".[88] As environmental matters are generally devolved policy areas, each executive within the UK has now undertaken work to establish new environmental governance bodies to replace (either in part or more fully) the role played by the EU institutions.

England and Northern Ireland

The Environment Act 2021 provided the legal basis for the establishment of a new environmental enforcement body in England and Northern Ireland called the Office for Environmental Protection (OEP). It has been fully operational in England as a non-departmental public body sponsored by Defra from January 2022. Following the passing of the Environment (2021 Act) (Commencement and Saving Provision) Order (Northern Ireland) 2022 the OEP became functional in Northern Ireland from 28 February 2022.[89]

88 See for example, Greener UK, The governance gap: why Brexit could weaken environmental protections, August 2017

89 DAERA, Assembly approves new environmental provisions for Northern Ireland, 7 March 2022

The OEP has a range of monitoring and governance duties and holds enforcement powers in respect of environmental law. These are similar functions those that were held by European institutions until the end of the EU withdrawal transition period.

Monitoring

In respect of monitoring, environmental consultants Ricardo were commissioned by the OEP to undertake a comprehensive review of air quality issues in England and Northern Ireland. The assessment included identifying the causes of air pollution and the impacts on the natural environment and people. The Ricardo report, Air quality stocktake, technical report, was published in May 2023. The report assessed $PM_{2.5}$ and ultrafine particles (particles with one dimension less than 100 nanometres) to be of "very high risk overall" to both human health and the environment.[90]

The OEP's remit also covers the scrutiny of the government's progress against Environmental Improvement Plan (the 2018 25 Year Environment Plan and its subsequent revision, the Environmental Improvement Plan 2023) and targets; and monitoring the implementation of environmental law. Related to this, in January 2024 the OEP published its latest monitoring report, Progress in improving the natural environment in England 2022/2023 (PDF). In it the OEP noted that progress has been made in improving air quality over the long term, but cautioned that for this progress to continue, "more entrenched sources of pollution will need to be addressed."[91]

Progress in improving the natural environment in England, 2021/2022. The OEP called progress towards meeting clean air goals "encouraging".[92]

Enforcement powers

The OEP is able to investigate and enforce potential breaches of environmental law in England and Northern Ireland, and of reserved areas of environmental law across the United Kingdom.

The OEP has powers in the form of being able to issue "information notices" and "decision notices". An information notice describes the alleged failure of compliance with environmental law and is a means by which the OEP can formally request information from the relevant Minister or authority concerned in relation to a suspected failure. A decision notice describes a failure of a public authority to comply with environmental law, and sets out the steps the OEP considers the authority should take in relation to the failure.

The OEP can also bring legal proceedings in the High Court against a public authority regarding an alleged breach of environmental law in accordance using a procedure called "environmental review". The remedies available to the Court are set out in the (then) Bill's explanatory notes, as follows:

90 Ricardo, Air quality stocktake, technical report, May 2023, p3
91 OEP, Progress in improving the natural environment in England 2022/2023 (PDF), January 2024, p54
92 OEP, Progress in improving the natural environment in England, 2021/2022, January 2023

> ...it will have the full suite of remedies, other than damages, available to it as on a judicial review, but only if it is satisfied that granting such a remedy would have neither of the effects described in paragraphs (a) and (b). These remedies include a declaration, quashing, prohibiting and mandatory orders, and injunctions. Damages are not available in environmental reviews because the OEP, as the only applicant, would have no cause to seek compensation for damages personally suffered where the claimant in a traditional judicial review might. As such, this remedy is unnecessary.[93]

Although damages are ruled out as a remedy, if a public authority then failed to comply with one of the above remedies ordered by the High Court, they could be held in contempt of court, which may then result in fines or other sanctions.

Further information about the OEP and how to submit a complaint about a failure of a public authority to comply with environmental law, is available from the Office for Environmental Protection website.

When the then Environment Bill went through its Parliamentary stages concern was expressed about whether the OEP would have comparable powers, to hold the government to account, to those held by the EU institutions it replaces. For further information about these concerns, and the government's response to them, see Library briefing, Commons Library analysis of the Environment Bill 2019-20.

Scotland

In Scotland the UK Withdrawal from the European Union (Continuity) (Scotland) Act 2021 (the "Continuity Act"), made provision for a new independent body called Environmental Standards Scotland (ESS) to be established.[94] It has been established as a non-Ministerial office and is directly accountable to the Scottish Parliament for the delivery of its functions.

The Continuity Act 2021 provides for a range of functions and powers for ESS. It has the power to require information and may issue a written 'information notice' to a public authority requiring it to provide such information as ESS reasonably requires. It also has three specific enforcement powers:

- Power to prepare an "improvement report" if ESS considers that a public authority has failed to comply with environmental law, make effective environmental law or implement or apply environmental law effectively when carrying out its functions. It is a report that sets out the details of the alleged failure and recommends measures that the public authority should take to comply with environmental law, or to improve the effectiveness of environmental law, or how it is applied.[95]

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93 Explanatory Notes to the Environment Bill 2019-21, para 294

94 Scottish Government website, Environmental Standards Scotland [downloaded on 19 May 2021]

95 Explanatory Notes to the UK Withdrawal from the European Union (Continuity) (Scotland) Act 2021, section 26

- Power to issue a "compliance notice", if ESS considers that a public authority is failing to comply with environmental law, or has failed to comply with environmental law and it is likely that the failure will be repeated or be continued. Another requirement is that the failure has caused, is causing or is at risk of causing environmental harm. A compliance notice is a notice requiring the public authority to whom it is issued to take the steps set out in the notice in order to address its failure to comply with environmental law.[96]

- Power to apply for judicial review of a public authority's conduct or intervene in an existing case.[97]

Further information about ESS, its board, chair, mission statement and vision and how to raise a complaint is available from the Environmental Standards Scotland website. Further information is also provided by the Scottish Parliament Information Centre briefing, UK Withdrawal from the European Union (Continuity) (Scotland) Bill - Part 2 -Environmental Principles and Governance, August 2020.

ESS investigation into air quality

In 2022, ESS completed an investigation into the Scottish Government's plans and approach to ensuring future compliance with legal limits on nitrogen dioxide levels.

The ESS found a number of areas where it believed the system of management of local air quality could be improved. These included the timeframes over which local air quality objectives should be met and the rules surrounding them. ESS also considered that existing governance and oversight arrangements were overly complex and opaque. ESS published an improvement report[98] in relation to this investigation in September 2022. It recommended a set of measures to strengthen air quality systems. These measures are:

> 1.6 In summary, the recommended measures will require local authorities to:
>
> - complete and publish air quality action plans within a specified target date after an air quality management area has been declared;
>
> - achieve air quality action plan objectives within a specified target date; and
>
> - review air quality action plans and update, where necessary.

[96] Explanatory Notes to the UK Withdrawal from the European Union (Continuity) (Scotland) Act 2021, section 31

[97] Explanatory Notes to the UK Withdrawal from the European Union (Continuity) (Scotland) Act 2021, section 38

[98] An improvement report is a report which ESS can issue recommending measures that the Scottish Ministers, or any other public authority, should take in order to comply with environmental law, or improve the effectiveness of environmental law or of how it is implemented or applied. The report is issued to the Scottish Ministers and laid before the Scottish Parliament.

1.7 Further recommendations require the Scottish Government to:

- identify or introduce an appropriate monitoring body;
- critically analyse the protocols surrounding the siting of monitoring stations and data provision; and
- revise its most recent air quality strategy to include specific and measurable timescales for reaching compliance.[99]

In March 2023 the Scottish Government published a response to this investigation.[100] It accepted all of the recommendations and committed to delivering action on them. The response document provides more detailed information about the measures to be taken.

Wales

The Welsh Government has not yet established a new environmental governance body for Wales but has put forward proposals to do so in its January 2024 consultation on an Environmental principles, governance and biodiversity targets: White Paper. The white paper sets out proposals to introduce a Bill into the Senedd that will (among other things) "strengthen environmental governance in Wales by establishing a new body to oversee compliance with environmental law by Welsh public authorities."[101] Following this, the Welsh Government confirmed, in July 2024, that an Environmental Principles and Biodiversity Bill would be introduced.[102]

As temporary measure, for two years from February 2021 (with the option to extend for a further year), the Welsh Government has appointed environmental lawyer, Dr Nerys Llewelyn Jones as an Interim Environmental Protection Assessor for Wales (IEPAW).[103] Concerns about the functioning of environmental laws in Wales can be sent to the IEPAW. The Welsh Government has provided information about what this means in practice:

What do we mean by 'functioning'?

Concerns about the functioning of environmental law fall into three broad categories.

- No longer delivers intended objectives and outcomes. Either because it is outdated or requires updating or it no longer functions in a way which

99 ESS, Air Quality Investigation Improvement Report, Case Reference IESS.21.013 (PDF), September 2022

100 Scottish Government, Environmental Standards Scotland air quality investigation - Scottish Government improvement plan, 27 March 2023

101 Welsh Government, Environmental principles, governance and biodiversity targets: White Paper, 30 January 2024

102 Welsh Government, First Minister says the Welsh Government is focussed on 'what matters most in people's daily lives' as he announces legislative programme, 9 July 2024

103 Welsh Government, Welsh Government appoints new environmental protection assessor, 24 February 2021

protects the environment or enables us to deliver our ambitious environmental outcomes.

- Guidance or information about the law is not accessible. The quality and availability of information or guidance impedes deliverability or operability by intended users.

- Practical delivery of the law is impeded. Where there are improvements which could be incorporated as a result of advances in science or technology or where barriers exist which frustrate or prevent practical delivery of law.[104]

The guidance from the Welsh Government is that a challenge, in relation to compliance with environmental law, should be made by pursing existing means of redress (for example judicial review) following appropriate independent legal advice. For further information see Welsh Government, Raising a concern about the functioning of environmental law, updated 2 September 2022.

For analysis about the debate about the interim arrangements see Senedd Research article, The environmental governance gap: how robust are the interim measures?, November 2022.

5.2 Examples of previous proceedings

EU infringement proceedings

As an EU Member State, the UK was required to report air quality data on an annual basis to the European Commission under the Directive on ambient air quality and cleaner air for Europe (2008/50/EC), the "Air Quality Directive".

The Air Quality Directive contained certain flexibility with regard to the deadline for returning air pollution to safe levels. For example, although the original deadline for meeting the NO_2 limit values was 1 January 2010, extensions were agreed by the Commission with some Member States who had notified it of a credible and workable plan for meeting the air quality standards within five years of the original deadline, i.e. to January 2015.[105] Notifications by Member States and Commission decisions on notification are available Commission webpage, Air Quality - Time extensions.

The United Kingdom submitted a notification to the Commission in September 2011 of a postponement (under Article 22(1) of the Air Quality Directive) of the 2010 deadline for attaining the annual limit value and hourly limit value for NO_2 in a number of air quality zones. The Commission accepted the notification for some, but not all of the zones. This was on the grounds that

[104] Welsh Government, Raising a concern about the functioning of environmental law, 5 May 2021 update version

[105] European Commission, Press release Brussels, Environment: Commission takes action against UK for persistent air pollution problems, 20 February 2014

the United Kingdom had not demonstrated that compliance with the limit value could be achieved by 1 January 2015 or earlier. For further information see "Commission decision of 25 June 2012 (C(2012) 4155 final).[106]

In May 2013 the UK Supreme Court declared that EU Air Quality Directive limits on nitrogen dioxide had been regularly exceeded in 16 zones across the UK.[107] The areas affected were: Greater London, the West Midlands, Greater Manchester, West Yorkshire, Teesside, the Potteries, Hull, Southampton, Glasgow, the East, the South East, the East Midlands, Merseyside, Yorkshire & Humberside, the West Midlands, and the North East.

The Court also noted that air quality improvement plans had estimated that in London compliance with the Directive's standards would only be achieved by 2025 and by 2020 for the other 15 zones.[108] The original deadline in the Directive was for compliance by 2010.

In February 2014 the European Commission began infringement proceedings against the UK for its failure to meet Air Quality Directive targets for NO_2 in the 16 air quality zones (listed above).[109] This action was followed in February 2017 by final warnings to Germany, France, Spain, Italy and the United Kingdom for failing to address repeated breaches of NO_2 limits.[110]

On 17 May 2018 the Commission referred the UK (along with France, Germany, Hungary, Italy and Romania) to the Court of Justice of the EU (CJEU) for "for failure to respect limit values for nitrogen dioxide (NO_2), and for failing to take appropriate measures to keep exceedance periods as short as possible."[111] Further information is available from the Commission press release, "Air quality: Commission takes action to protect citizens from air pollution" 17 May 2018.

On 4 March 2021, the CJEU issued its decision on this case (European Commission v. United Kingdom of Great Britain and Northern Ireland, c-664/18). The CJEU court had continued to oversee the case because proceedings started before the UK's EU exit. The CJEU found that the UK had failed to fulfil its obligations under the provisions of EU Directive 2008/50/EC and that it had failed to ensure that the period of exceedance of limit values was kept as short as possible.

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106 Commission decision of 25 June 2012 (C(2012) 4155 final) on the notification by the United Kingdom of Great Britain and Northern Ireland of a postponement of the deadline for attaining the limit values for NO_2 in 24 air quality zones.

107 R (on the application of ClientEarth) (Appellant) v The Secretary of State for the Environment, Food and Rural Affairs (Respondent), [2013] UKSC 25

108 European Commission, Press release Brussels, Environment: Commission takes action against UK for persistent air pollution problems, 20 February 2014

109 European Commission, Press release, Environment: Commission takes action against UK for persistent air pollution problems, Brussels, 20 February 2014

110 European Commission - Press release, Commission warns Germany, France, Spain, Italy and the United Kingdom of continued air pollution breaches, Brussels, 15 February 2017

111 European Commission press release, "Air quality: Commission takes action to protect citizens from air pollution" 17 May 2018

Reporting on the case, the BBC set out what could happen next and highlighted uncertainty about whether fines could be imposed:

> Following today's ruling, if the UK still fails to comply within a "reasonable" period, the European Commission could issue formal notice requiring the UK to remedy the situation.
>
> If the UK fails again, the Commission could bring the matter before the court a second time.
>
> If that happens, fines may be imposed – although it's not clear legally whether the UK could be forced to pay, following Brexit.
>
> In any future cases where the government has breached legal limits, the case would be dealt with by a new UK Office for Environmental Protection.[112]

Judicial Review

Separate to European Commission infringement proceedings, EU legislation on air quality has also provided the legal framework for the government's actions to be challenged by private organisations in the UK courts by judicial review.

Proceedings brought by the environmental advocacy charity, ClientEarth, arose out of the admitted and continuing failure of the United Kingdom since 2010 to secure compliance in certain zones with the limits for nitrogen dioxide levels set by European Union law, under the Air Quality Directive (2008/50/EC).[113] Article 13 of this Directive sets limit values "for the protection of human health". In respect of NO_2, certain limits "may not be exceeded" from the relevant date, (1 January 2010).

Following judicial review challenges in 2015, 2016 and 2017 the UK Government has been directed by the courts to produce and amend a series of plans to reduce nitrogen dioxide (see Box 2 below). For further information about the judicial review challenges see Library briefing paper, Brexit and Air Quality, 21 May 2019.

Box 2: Government plans on NO_2 air quality

A number of different plans to reduce nitrogen dioxide (NO_2) have been published by the UK Government. The plans were formulated following recognition that a number of zones in the UK had not met EU limits on NO_2. The air quality plans were initially submitted to the European Commission with a view to postponement of the 2010 compliance date for meeting the NO_2 limits to 2015. The plans are as follows:

[112] BBC News, "UK found guilty of dirty air breach by EU court" 4 March 2021

[113] R (on the application of ClientEarth) (Appellant) v The Secretary of State for the Environment, Food and Rural Affairs (Respondent), [2013] UKSC 25

- Air Quality Plans for the achievement of EU air quality limit values for nitrogen dioxide (NO2) in the UK: UK Overview Document, **September 2011**. This was subsequently replaced by:
- Improving air quality in the UK, Tackling nitrogen dioxide in our towns and cities: UK overview document, **December 2015**. This in turn was replaced by:
- UK plan for tackling roadside nitrogen dioxide concentrations: Detailed plan, **July 2017**. This is the government's current approach to setting out how the UK will be reducing roadside nitrogen dioxide concentrations.

Following judicial review proceedings in relation to the July 2017 Plan, the High Court ruled, on 21 February 2018, that a supplement to the 2017 Plan should be produced by the government by 5 October 2018. This was published on 5 October 2018: Supplement to the UK plan for tackling roadside nitrogen dioxide concentrations.

Since publication of the October 2018 Supplement to the UK plan for tackling roadside nitrogen dioxide concentrations the government has issued directions, Air quality plan for nitrogen dioxide (NO2) in UK (2017): air quality directions, requiring specific local authorities to take specified actions to plan for and take actions aimed at delivering compliance with nitrogen dioxide limit values in the shortest possible time.

The government's Joint Air Quality Unit (JAQU) commissioned Ipsos MORI, working in partnership with the Institute for Transport Studies (ITS) at the University of Leeds, to deliver an annual Central Evaluation of the impact of Local NO2 Plans. These evaluations are published on the government's website: Evaluation of Local NO2 Plans - AQ0851.

Information about road user charging schemes intended to reduce air pollution is set out in a separate Commons Library briefing, Clean Air Zones, Low Emission Zones and the London ULEZ.

6 Proposals for change

The UK Government is currently undertaking a review of the Environmental Improvement Plan (EIP), which includes provisions on air quality. A revised EIP will be published following the review. Further information is provided in the Interim statement on the EIP rapid review, 30 January 2025.

In response to a PQ in September 2024 (UIN 5227), the government said that domestic wood-burning stoves make a "significant contribution to fine particulate matter ($PM_{2.5}$) emissions nationally, with implications for the health of everyone exposed to smoke." It set out that Defra is currently considering options for action to reduce the impact of wood burning stoves on people's health.

In a further PQ the government has said that it is currently evaluating "a number of options to reduce emissions of air pollutants, in particular fine particulate matter, from domestic burning." (Wood-burning stoves, UIN 20994, answered on 8 January 2025). This work is expected to be complete in "spring" 2025.

6.1 Private members' bills: Clean Air (Human Rights)

The Clean Air (Human Rights) Bill 2023-24 was a private members' bill introduced by Green Party MP Caroline Lucas under the ten-minute rule procedure. The text of the bill was not printed, but it was introduced by Caroline Lucas on 17 January 2024 where she established the aims of the bill:

> That leave be given to bring in a Bill to establish the right to breathe clean air; to require the Secretary of State to achieve and maintain clean air in England; to involve the UK Health Security Agency in setting and reviewing pollutants and their limits; to enhance the powers, duties and functions of various agencies and authorities in relation to air pollution; to establish the Citizens' Commission for Clean Air with powers to institute or intervene in legal proceedings; to require the Secretary of State and the relevant national authorities to apply environmental principles in carrying out their duties under this Act and the clean air enactments; and for connected purposes.[114]

The bill did not complete all of its stages before the 2024 general election and so was not passed.

[114] HC Deb 24 January 2024 c832

The bill followed a series of bills with similar titles which were introduced in the House of Lords by Baroness Jones of Moulsecoomb (Green Party) in previous sessions (2022-23, 2019-21, 2019-19 and 2017-19), but which did not complete all of their stages.

The previous version of the bill, the Clean Air (Human Rights) Bill [HL] 2022-23 had very similar aims to Caroline Lucas's bill;

- establishing the right to breathe clean air, as defined in Clause 1;
- introducing new obligations on the Secretary of State to achieve and maintain clean air in England and Wales;
- enhancing the powers, duties and functions of the relevant national authorities, including the Environment Agency ("EA"), the Committee on Climate Change, local authorities (including port authorities), the Office for Environmental Protection ("OEP"), the Civil Aviation Authority (the "CAA"), Highways England-National Highways, Historic England and Natural England, in relation to establishing and maintaining clean air;
- involving the UK Health Security Agency in setting and reviewing pollutants and their limits; and
- establishing a new independent body, the Citizens' Commission for Clean Air (the "CCCA") with powers to institute or intervene in legal proceedings, including judicial review, in relation to enforcing the right to breathe clean air. [115]

Baroness Jones called her bill "Ella's law".[116] A Coroner's inquest, which concluded in December 2020, found that air pollution was a significant contributory factor to the death of 9-year-old Ella Roberta Adoo-Kissi-Debrah in Lewisham in 2013. This was the first time that a Coroner had found that air pollution was a contributory cause of illness and death (see section 8.2 below for further information). The bill had been called Ella's law with permission of Ella's mother, Rosamund Adoo-Kissi-Debrah.[117]

115 Explanatory Notes to the Clean Air (Human Rights) Bill [HL] (HL Bill 5), 21 June 2022, p2
116 Green World, "Clean Air Act needs your support" 17 May 2022
117 Blackstone Chambers, Inquest into the Death of Ella Adoo-Kissi-Debrah, 17 December 2020

7 Future EU air quality policy

7.1 Revision of the Ambient Air Quality Directives

In November 2019, the EU Commission published a Fitness Check of the Ambient Air Quality Directives.[118] It concluded that these Directives have been partially effective in improving air quality, but not fully effective, and not all their objectives have been met. It concluded that the remaining gap to achieve air quality standards is too wide in certain cases.[119] The European Commission therefore intends to revise the Ambient Air Quality Directive, to align air quality standards more closely with the recommendations of the World Health Organization, subject to future consultation.

A Proposal for revision of the Ambient Air Quality Directives was published in October 2022. Further information is available on the European Commission webpage, Revision of the Ambient Air Quality Directives and from the European Parliamentary Research Service, Revision of EU air quality legislation: Setting a zero pollution objective for air [EU Legislation in Progress], updated 8 September 2023.

A revised directive, Directive (EU) 2024/2881 of the European Parliament and of the Council of 23 October 2024 on ambient air quality and cleaner air for Europe was published in 2024, setting revised limit values to be attained by 1 January 2030. The revised directive also aims to ensure that people suffering from health damages due to air pollution have the right to be compensated, in the case of a violation of EU air quality rules. Further information is available in the European Commission press release, Zero Pollution: New EU rules enter into force for cleaner air by 2030, 10 December 2024 and European Council webpage, air quality.

In January 2025 the government was asked if it would "take steps to amend clean air targets to bring the UK in line with the European Union's Ambient Air Quality Directive." The government replied as follows:

> "The Government is committed to cleaning up our air and protecting the public from the harm of pollution. We recognise the importance of ambitious yet achievable air quality targets, supported by robust delivery plans, which is why the Government has launched a rapid review of the Environmental

[118] European Commission, Fitness check of the ambient air quality directives, SWD(2019) 427 final, 28 November 2019

[119] European Commission, inception impact assessment - Ares(2020)7689281, 2020, p1

> Improvement Plan to revise our plan for significantly improving the environment including for air quality."[120]

7.2 The EU Green Deal

In December 2019 the European Commission published a communication called The European Green Deal.[121] It is described as resetting "the Commission's commitment to tackling climate and environmental-related challenges that is this generation's defining task."[122] It presents an initial roadmap of the key policies and measures needed to achieve a number of goals. Commentators have stated that they expect the European Green Deal to "significantly alter EU environmental law over the next five years".[123]

On air quality the Green Deal specifically noted the plans to revise air quality standards:

> The Commission will draw on the lessons learnt from the evaluation of the current air quality legislation. It will also propose to strengthen provisions on monitoring, modelling and air quality plans to help local authorities achieve cleaner air. The Commission will notably propose to revise air quality standards to align them more closely with the World Health Organization recommendations.[124]

As part of its Green Deal work, on 12 May 2021, the European Commission adopted an EU Action Plan: "Towards Zero Pollution for Air, Water and Soil". This Action Plan provides more detailed information on proposals for specific policy areas. On outdoor air quality, it again proposed changes to the EU's air quality standards, to align them more closely with 2005 WHO recommendations:

> ...in 2022 the Commission will propose that the EU's air quality standards be aligned more closely with the upcoming WHO recommendations and that provisions on monitoring, modelling and air quality plans be strengthened to help local authorities, while improving the overall enforceability of the regulatory framework. In parallel, the Commission will introduce stricter requirements to tackle air pollution at source, such as from agriculture, industry, transport, buildings and energy, including through a number of European Green Deal measures and strategies (such as sustainable and smart mobility, renovation wave, and farm to fork).[125]

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120 Air pollution, UIN 23100, answered 16 January 2025

121 European Commission website, A European Green Deal [downloaded on 30 June 2021]

122 European Commission, Communication from the Commission, The European Green Deal, COM(2019) 640 final, 11 December 2019

123 "Q&A: What's at stake for the environment in post-Brexit talks" ENDSReport, 21 February 2020 [subscription required]

124 European Commission, Communication from the Commission, The European Green Deal, COM(2019) 640 final, 11 December 2019, section 2.1.8

125 European Commission, Pathway to a Healthy Planet for All EU Action Plan: 'Towards Zero Pollution for Air, Water and Soil', COM(2021) 400 final, 12 May 2021, section 2.2

The EU Action Plan also set out plans to assess whether further legislation is needed to cap ammonia emissions and to consider the need to limit $PM_{2.5}$ emissions from road vehicles.[126]

[126] European Commission, Pathway to a Healthy Planet for All EU Action Plan: 'Towards Zero Pollution for Air, Water and Soil', COM(2021) 400 final, 12 May 2021, section 2.2

8 Health, inequality and environmental concerns

Academic research has found big differences in air pollution across communities in England, with deprived areas often being the worst affected. Children, the elderly and individuals with pre-existing cardiovascular and respiratory conditions are particularly vulnerable to the effects of poor air quality.[127] In 2020 a coroner found that air pollution was a significant contributory factor to the death of 9-year-old child.[128]

The Covid-19 pandemic has highlighted this concern further in relation to whether there is a link between poor air quality and Covid-19 outcomes.[129] Researchers are also beginning to examine the effect of lockdown measures on air quality and work out what any findings mean for future policy formation.[130]

The context of Brexit has also led commentators to question what the future for UK air quality standards and enforcement looks like and whether any new domestic legislation will be as robust as that provided for by the EU.[131]

The following sections set the above issues and responses to them out in further detail.

8.1 The Covid-19 pandemic

Investigating the correlation between air quality and Covid-19 mortality

It is widely accepted that children, the elderly and individuals with pre-existing cardiovascular and respiratory conditions are particularly vulnerable to the effects of poor air quality.[132] In turn, the NHS has warned that those

127 See for example, HM Government, Clean Air Strategy 2019, p27
128 London Inner South Coroner's Court, Inquest touching the death of Ella Roberta Adoo-Kissi Debrah, December 2020
129 COMEAP, COMEAP's on-going work on air pollution and COVID-19, undated
130 Air Quality Expert Group, Report: Estimation of changes in air pollution emissions, concentrations and exposure during the COVID-19 outbreak in the UK, July 2020
131 Greener UK, Final Risk Tracker June 2016-March 2021: air pollution tab, March 2021
132 See for example, HM Government, Clean Air Strategy 2019, p27

people with certain pre-existing conditions, such as respiratory illnesses, may have an increased vulnerability to Covid-19.[133]

To investigate this possible link further, the UK Health Security Agency and other government departments are undertaking reviews, which include "assessing whether there is any evidence of an association between exposure to gaseous pollutants or particulates and COVID-19 mortality in the United Kingdom."[134] In January 2021 Defra Minister Rebecca Pow set out further how the government was examining this issue:

> Defra continues to work with the Department of Health and Social Care (DHSC) regarding the relationship between air quality and health, recently considering the specific relationship between Covid-19 deaths and air quality. I met with Jo Churchill, Parliamentary Under Secretary of State at DHSC, to discuss this important issue on 13 November 2020. We will continue working closely on this issue, as our understanding of the role air quality has to play in the Covid-19 pandemic continues to evolve, taking into account the many other factors influencing health inequalities.[135]

The independent advisory body to government on how air pollution impacts health, the Committee on the Medical Effects of Air Pollution (COMEAP), published a statement on 6 September 2023, on the science linking long-term air pollution exposure with SARS-CoV-2 infection and adverse COVID-19 outcomes. In it, COMEAP concluded that there was evidence to suggest that air pollution may be a contributory factor in worsening symptoms of Covid-19, but that there was not enough evidence to suggest that air pollution increases the risk of infection with Covid-19:

> We conclude that, in the context of evidence for the effect of air pollution on lung infections more generally, long-term air pollution may be a contributory factor in worsening the symptoms of COVID-19. Currently, there are a limited number of good quality studies on COVID-19 and these studies are often inconsistent in their findings. Based on evidence reviewed, published up to the end August 2022, there is not enough epidemiological evidence to suggest that long-term exposure to air pollution increases the risk of infection with the SARS-CoV-2 virus that causes COVID-19 disease. There is more evidence that long-term exposure to PM2.5 air pollution can increase the severity of COVID-19 disease once someone is infected with SARS-CoV-2, with an increased risk of hospitalisation following infection. The evidence for an increased risk of death from COVID-19 is less clear, with few studies available. A small number of studies are available relating to possible mechanisms and these suggest ways air pollution can alter the body's immune function and, consequently, increase risk of infection with the SARS-CoV-2 virus and disease severity. We did not find convincing evidence to support air pollution particles having an important role in transporting viable SARS-CoV-2 virus in the environment.[136]

133 NHS, Who is at high risk from coronavirus (clinically extremely vulnerable) [downloaded on 7 July 2021] Webpage since removed

134 PQ Coronavirus: Nitrogen Oxides, UIN HL4694, tabled on 19 May 2020

135 PQ Air pollution: Coronavirus, UIN 133171, tabled on 30 December 2020

136 COMEAP, Statement on the state of the science linking long-term air pollution exposure with SARS-CoV-2 infection and adverse COVID-19 outcomes, 6 September 2023

A paper by the Office for National Statistics (ONS) examining the potential relationship between long term air pollution exposure and Covid-19 mortality rates was published in August 2020, based on the available evidence at that time, Air pollution and COVID-19 mortality rates. The paper highlighted the possibility of a changing correlation between air quality and mortality over the course of the pandemic. The ONS concluded that ultimately, its analysis was inconclusive, and that further work would need to be done to control for other factors (including ethnicity) that may impact on the correlation:

> To disentangle factors such as pollution and ethnicity, and their contribution to COVID-19 mortality, we would need to identify detailed characteristics of the individuals who have died from COVID-19. While we hope to publish this kind of analysis in future, the data and modelling required take much longer to put together.[137]

The ONS published further findings in January 2023, Coronavirus (COVID-19) mortality and long-term outdoor air pollution in London: September 2020 to January 2022. The analysis found that "air pollution exposure has little impact on the risk of dying from COVID-19 among people who lived in London and tested positive for SARS-CoV-2."[138] The main points were summarised as follows:

- Exposure levels to four long-term air pollutants among people living in London who tested positive for SARS-CoV-2 between 1 September 2020 and 12 December 2021 were associated with an increase in risk of death involving coronavirus (COVID-19) in initial analyses that adjusted for sex and age, but did not take account of all risk factors.
- The positive association between air pollution exposure and risk of death involving COVID-19 disappeared when further adjusting for factors related to area characteristics, ethnicity and deprivation.
- The association between air pollution exposure and risk of death involving COVID-19 did not change when further adjusting for factors relating to virus variant and pre-existing health conditions.
- The results suggest that the positive association between death involving COVID-19 and long-term air pollution exposure is because of other risk factors such as deprivation and ethnicity, or that the contribution of effect of air pollution exposure to the risk of death involving COVID-19 after a positive test is small.[139]

Air pollution during lockdown

Questions have been raised about whether the reduced economic activity and use of road transport during lockdowns over the course of the Covid-19 pandemic has affected concentrations of air pollution. A number of studies

137 ONS, Air pollution and Covid-19 mortality rates, 13 August 2020

138 ONS, Coronavirus (COVID-19) mortality and long-term outdoor air pollution in London: September 2020 to January 2022, 30 January 2023

139 ONS, Coronavirus (COVID-19) mortality and long-term outdoor air pollution in London: September 2020 to January 2022, 30 January 2023

and report have since examined the issue. Some of the key ones are set out below.

Air Quality Expert Group

In April 2020 the Air Quality Expert group (an expert committee that provides independent scientific advice to government), acting on a request from Defra, called for evidence from the research and air quality management user communities to examine seven areas of scientific uncertainty related to the potential interactions between Covid-19 and UK air pollution.[140]

The Air Quality Expert Group published its report in July 2020, Report: Estimation of changes in air pollution emissions, concentrations and exposure during the COVID-19 outbreak in the UK. These findings, based on non-peer reviewed observational data, showed evidence there was a drop in the emissions and concentrations of some pollutants. The measured drop in emissions varied by pollutant. Nitrogen dioxide levels showed a consistent drop while $PM_{2.5}$ exhibited a more variable pattern:

> The most pronounced changes in UK air quality during lockdown have been in the urban environment, notably for nitrogen oxides (NOx). Once weather effects are accounted for, mean reductions in urban NOx averaged over the lockdown period considered have been typically 30-40%, with mean NO2 reductions of 20- 30%. In general, NOx and NO2 reductions have been greater at roadside than at urban background sites. These reductions would typically correspond to decreases in concentrations of 10-20 μg m-3 if expressed relative to annual averages.
>
> Meteorological conditions have led to higher PM2.5 during lockdown than the average experienced in equivalent calendar periods from previous years. Analysis combining observations and models indicates however that PM2.5 concentrations were of the order 2 - 5 μg m-3 lower in Southern England than would have been expected under a business-as-usual emissions scenario. The changes to UK PM2.5 in terms of contributing sources and transboundary influences have yet to be determined.[141]

National Centre for Atmospheric Science

Scientists from the National Centre for Atmospheric Science – based at the Wolfson Atmospheric Chemistry Laboratory and supported by the Natural Environment Research Council (NERC) – compared air pollution level in ten UK cities from spring 2020 to previous averages for that time from the past five years. Their analysis found that levels of nitrogen dioxide and fine particulate matter were "significantly lower than the levels normally seen at this time of year in most of the UK's largest cities."[142]

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140 Air Quality Expert Group, Estimation of changes in air pollution emissions, concentrations and exposure during the COVID-19 outbreak in the UK, 7 April 2020

141 Air Quality Expert Group, Report: Estimation of changes in air pollution emissions, concentrations and exposure during the COVID-19 outbreak in the UK, July 2020, p8

142 National Centre for Atmospheric Science, Air pollution falling across UK cities, latest data shows, 31 March 2020

A later article set out their analysis of air pollution during the winter lockdown in early 2021.[143] This research concluded that air pollution levels fell across the UK during the winter lockdown, but they did not fall as far as during the first lockdown in spring 2020:

> Research led by the National Centre for Atmospheric Science and University of York shows that nitrogen dioxide levels dropped by around 28% between January and March this year.
>
> By comparison, nitrogen dioxide fell by around 52% between March and May last year.
>
> Nitrogen dioxide is a pollutant that, in urban areas, is primarily caused by vehicles. It may be surprising then, that despite both lockdowns having a similar impact on transport, levels of nitrogen dioxide remained higher throughout the winter period.
>
> Scientists believe that the disparity is likely caused by increasing household heating emissions in winter as people continue to work from home, and higher exhaust emissions from cars running in colder conditions.
>
> Dr Will Drysdale, part of the research team at the Wolfson Atmospheric Chemistry Laboratory, says the key difference between each lockdown is the change in weather.
>
> "Colder temperatures influence our activities, which in turn lead to higher emissions. This seems to have muted the reduction in air pollution over the winter lockdown."[144]

European Environment Agency

The European Environment Agency (EEA) has also examined air pollution in the context of Covid-19 related lockdowns. An article by the EEA updated in May 2021 found that concentrations of nitrogen dioxide had decreased in many European cities with lockdown measures in place, but that a decrease in fine particulate matter was not consistent. It sets out how other factors, such as weather conditions may also affect results:

> Data from EEA member countries show how concentrations of nitrogen dioxide (NO2) — a pollutant mainly emitted by road transport — have decreased in many European cities where lockdown measures have been implemented.
>
> Although a decrease in concentrations of fine particulate matter (PM2.5) may also be expected, a consistent reduction cannot yet be seen across European cities. This is likely due to the fact that the main sources of this pollutant are more varied, including at European level the combustion of fuel for the heating of residential, commercial and institutional buildings, industrial activities and road traffic. A significant fraction of particulate matter is also formed in the atmosphere from reactions of other air pollutants, including ammonia — a

[143] National Centre for Atmospheric Science, Winter lockdown had less impact on UK air pollution than first lockdown, 26 April 2021

[144] National Centre for Atmospheric Science, Winter lockdown had less impact on UK air pollution than first lockdown, 26 April 2021

> pollutant typically emitted from the application of agricultural fertilisers at this time of year.
>
> Other factors, such as weather conditions, may also significantly contribute to the reductions seen in pollutant concentrations. Conversely, changes in meteorology can also lead to increased air pollution, and coupled with the often non-linear relationships between changes in emissions and changes in concentrations, also explain why lower air pollution may not occur at all locations.[145]

Welsh Government

The Welsh Government and Ricardo published a report Provisional Analysis of Welsh Air Quality Monitoring Data – Impacts of Covid-19, July 2020. The report outlines key findings from air quality data during the first lockdown period, including that from 16 March to 31 May 2020. The report estimated that nitrogen oxide and nitrogen dioxide concentrations had decreased on average by 49% and 36% respectively, compared with previous business-as-usual levels at roadside sites.

8.2 Air pollution: coroner's ruling and prevention of future deaths

A Coroner's inquest, which concluded in December 2020, found that air pollution was a significant contributory factor to the death of 9-year-old Ella Roberta Adoo-Kissi-Debrah in Lewisham in 2013. This was the first time that a Coroner had found that air pollution was a contributory cause of illness and death.[146] The Coroner's Record of Inquest stated:

> Air Pollution was a significant contributory factor to both the induction and exacerbations of her asthma. During the course of her illness between 2010 and 2013 she was exposed to levels of Nitrogen Dioxide and Particulate Matter in excess of World Health Organization Guidelines. The principal source of her exposure was traffic emissions. During this period there was a recognized failure to reduce the level of NO2 to within the limits set by the EU and domestic law which possibly contributed to her death.
>
> Ella's mother was not given information about the health risks of air pollution and its potential to exacerbate asthma. If she had been given this information she would have taken steps which might have prevented Ella's death.[147]

In relation to this case, in April 2021, the Coroner also produced a Report to prevent future deaths. In it he set out three matters of concern for appropriate authorities to respond to, including that:

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145 European Environment Agency, Air quality and COVID-19, 11 May 2021 update

146 Blackstone Chambers, Inquest into the Death of Ella Adoo-Kissi-Debrah, 17 December 2020

147 London Inner South Coroner's Court, Inquest touching the death of Ella Roberta Adoo-Kissi Debrah, December 2020

> (1) The national limits for Particulate Matter are set at a level far higher than the WHO guidelines. The evidence at the inquest was that there is no safe level for Particulate Matter and that the WHO guidelines should be seen as minimum requirements. Legally binding targets based on WHO guidelines would reduce the number of deaths from air pollution in the UK.
>
> (2) There is a low public awareness of the sources of information (such as UK-Air website) about national and local pollution levels. Greater awareness would help individuals reduce their personal exposure to air pollution. It was clear from the evidence at the inquest that publicising this information is an issue that needs to be addressed by national as well as local government. The information must be sufficiently detailed and this is likely to require enlargement of the capacity to monitor air quality, for example by increasing the number of air quality sensors.[148]

The government responded to the Coroner's Prevention of Future Deaths Report in June 2021.[149] The response set out some of the actions that the government intended to take to improve air quality in both the short and long term:

- Immediate action will be taken to increase public awareness about air pollution. This will include a comprehensive review of existing sources of information – including UK Air and the Daily Air Quality Index (DAQI) – to include more specific messaging for different population groups. This will help health professionals in advising patients when poor air quality is forecast. The Government will also look at working with relevant health charities on longer-term campaigns aimed specifically at vulnerable groups.

- An additional £6 million will be added to the annual funding pot for local authorities as part of the Air Quality Grant scheme. Part of this fund will be dedicated to improving public awareness in local communities about the risks of air pollution. It will also encourage collaboration with local public health bodies to, for example, provide guidance to vulnerable groups about the health impacts from air pollution and the steps they can take to minimise their exposure. This funding sits alongside the £880 million that has already been pledged for local authorities to develop and implement local air quality plans, including Clean Air Zones.

- Several media organisations already provide air quality information online alongside their weather forecasts to warn people when air pollution levels are likely to be elevated. There are also a number of alert systems – including in Manchester and London – that people can sign up to. The Government will have further discussions with broadcasters, social media companies and app providers to identify ways to spread this information more widely with clear advice that people can act on. It will also consider the scope and effectiveness of establishing a new national SMS alert system.

- NHS England and Improvement (NHSEI) will continue work on a more systematic approach to asthma management. This will include

[148] Philip Barlow, assistant coroner for the coroner area of Inner South London, Regulation 28: Report to prevent future deaths, April 2021

[149] HM Government, Government responds to Coroner after Ella Kissi-Debrah inquest, 17 June 2021

identifying environmental triggers and promoting more personalised care for individual patients. In addition, the NHSEI Children and Young People's (CYP) Transformation Programme will set out evidence-based interventions to help children, young people, families and carers, to control and reduce the risk of asthma attacks.

- On particulate matter limits, a public consultation on new legal targets for PM2.5 and other pollutants will launch early next year, with the aim of setting new targets in legislation by October 2022. The Government has used the World Health Organisation guidelines on PM2.5 to inform its ambitions in shaping these targets. Further to this, the new Office for Health Promotion will consider as a priority how public health benefits can be achieved through reductions in population exposure to PM2.5, taking into account the particular circumstances experienced in London and the South East.

- As well as a simple concentration target on PM2.5, the Government is developing a more sophisticated population exposure reduction target. This aims to drive reductions not just in pollution "hotspots", but in all areas. In setting these new targets, there will also be a commitment to significantly increase the monitoring network to capture more detailed air quality information across the country.[150]

8.3 Air quality and inequality

A Public Health England blog piece, from 2018, set out that while air pollution is an international problem that affects everyone, "almost always the most socioeconomically disadvantaged suffer most from the health effects of pollution."[151] Other groups disproportionately affected include older people, children, pregnant women, individuals with existing medical conditions, and communities in areas of higher pollution.[152]

In relation to concerns such as these, the UK Government said, in 2020, that when its Air Quality Strategy is reviewed, it would consider measures focussed on protecting those most vulnerable to air pollution.[153] The Air Quality Strategy was updated in April 2023 and it highlights measures (for example using anti-idling powers), that local authorities can take to help those that are vulnerable to poor air quality. The updated strategy goes on to state that there is more to do:

> "we know there is more to do, and are undertaking a review of how we communicate air quality information to ensure that members of the public,

150 HM Government, Government responds to Coroner after Ella Kissi-Debrah inquest, 17 June 2021
151 UK Health Security Agency, Public Health Matters Blog, Health Matters: Air pollution – sources, impacts and actions, 14 November 2018
152 UK Health Security Agency, Public Health Matters Blog, Health Matters: Air pollution – sources, impacts and actions, 14 November 2018
153 HM Government, Environment Bill Policy paper 10 March 2020: Air quality factsheet (part 4), Updated 21 October 2020

> and vulnerable groups, have the information they need protect themselves and understand their impact."[154]

In 2015 a study by Imperial College London and published in the journal Environmental Pollution found big differences in air pollution across communities in England:

> In England, the most deprived 20 per cent of neighbourhoods had higher air pollution levels than the least deprived neighbourhoods - 1.5 µg/m3 higher PM10 and 4.4 µg/m3 NO2 after adjusting for other factors – but this was not the case in the Netherlands. The biggest differences in air pollution levels according to socioeconomic status were in London.
>
> The worst air pollution levels were seen in ethnically diverse neighbourhoods, defined as those where more than 20 per cent of the population are non-white. Even after allowing for the fact that some of these neighbourhoods are more deprived, in England, this difference was 3.0 µg/m3 for PM10 and 10.1 µg/m3 for NO2. In the Netherlands, differences were lower, with 1.1 µg/m3 higher PM10 and 4.5 µg/m3 NO2.[155]

Research from the University of York and the National Centre for Atmospheric Science published in August 2023 also highlighted a link between the most deprived areas in England (in both cities and countryside) and the highest levels of air pollution, from all emission sources:

> Deprivation-based inequality was found across all major NOx [nitrogen oxide] emission sources, such as transport, domestic and commercial heating, factories and power plants. This shows that sources of NOx, beyond road transport, are also important drivers of air pollution inequality.
>
> Nathan Gray, the PhD researcher at the Wolfson Atmospheric Chemistry Laboratories at the University of York who carried out this research, said: "It is often assumed that people living in cities will be exposed to the highest levels of air pollution.
>
> "Our research shows that while the difference in air pollution between the city and the countryside does drive inequalities, those in more deprived areas will likely have worse air quality regardless of whether they live in the city or more rural areas."[156]

In June 2023 the Mayor of London published an Air Pollution and Inequalities in London - update 2023. The findings showed that while progress had been made, the more deprived communities in London still more commonly live in the most polluted areas:

> Deprivation

[154] HM Government, Air quality strategy: framework for local authority delivery, 28 April 2023

[155] Imperial College London, Ethnic minorities and deprived communities hardest hit by air pollution, 26 January 2015

[156] University of York, Deprived communities in England experience higher emissions of air pollution, 22 August 2023

> The most deprived communities of London still more commonly live in the most polluted areas, however concentrations have declined faster in areas of deprivation and more markedly since 2016.
>
> Again, unless further significant action is taken, the differential of pollution experienced between the least and most deprived will remain.
>
> Ethnicity
>
> The areas in London with the lowest NO_2 and $PM_{2.5}$ concentrations have a disproportionately white population. The inequalities in exposure to air pollution experienced between ethnic groups are much more pronounced in Outer London than Inner London. Despite progress towards meeting the WHO targets, the disparity in exposure by ethnicity is not expected to change over time without further significant action.
>
> Diaspora communities
>
> Diaspora communities tend to reside in areas where there are higher concentrations of pollutants than the London average.
>
> Vulnerable receptor sites
>
> For all years analysed between 2013 and 2030, all schools, hospitals and care homes will remain exposed to concentrations of NO_2 and $PM_{2.5}$ above the WHO guideline annual mean, unless further action is taken.[157]

The WHO ambient air quality database, 2022 update: status report, reported that globally, people living in lower and middle-income countries are the most exposed to air pollution:

> In the 117 countries monitoring air quality, the air in 17% of cities in high-income countries fall below the WHO's Air Quality Guidelines for PM2.5 or PM10. In low- and middle-income countries, air quality in less than 1% of the cities complies with WHO recommended thresholds.
>
> Globally, low- and middle-income countries still experience greater exposure to unhealthy levels of PM compared to the global average, but NO2 patterns are different, showing less difference between the high- and low- and middle-income countries.[158]

[157] Mayor of London, Air Pollution and Inequalities in London - update 2023 June 2023

[158] WHO, Billions of people still breathe unhealthy air: new WHO data, 4 April 2022

8.4 Divergence from EU standards and enforcement

The European Union (Withdrawal) Act 2018, (the "Withdrawal Act"), and related statutory instruments have retained the EU air quality regulations in UK law after exit day (31 January 2020) and completion of the implementation period (31 December 2020). Now that the UK has left the EU, the UK Government has the discretion to amend air quality standards.

Following the referendum result in June 2016 some environment and health organisations expressed concern that policies on air pollution could be weakened following the UK exit from the EU. ClientEarth challenged the government to affirm its commitment to environmental laws, including on air pollution.[159]

In 2016 the then Chair of the Environmental Audit Committee, Mary Creagh MP, expressed the view that EU membership had been key for air quality, and had allowed campaigners to hold the government to account.[160] She also said there were "question marks about what will happen to air pollution standards in the brave new Brexit world."[161] There has also been concern from environmental groups, including the coalition group Greener UK, that new standards on air quality will not be as ambitious as those set and proposed in future by the EU.[162]

The government under Prime Minister May sought to allay concerns about changes to air quality standards following Brexit by stating that there were no plans to change air quality limit values and targets.[163] The government's 25 Year Environment Plan, published in January 2018 set a commitment to meet targets:

> The UK's determination to improve air quality is reinforced by our commitment to meeting ambitious, legally-binding targets to cut emissions of five pollutants – ammonia, nitrogen oxides, non-methane volatile organic compounds, fine particulate matter and sulphur dioxide – by 2020 initially, and by 2030 for a deeper cut. Our commitment to meeting these legally binding targets is not affected by the UK's departure from the EU.[164]

In October 2020, in the context of air quality provision in the then Environment Bill, the current government stated that leaving the EU provided it with "the opportunity to take a more tailored approach to UK action on air quality".[165]

159 ClientEarth, Brexit "challenge" to politicians over UK environmental laws, 24 June 2016
160 HC Deb 12 July 2016, c193
161 HC Deb 12 July 2016, c193
162 Greener UK, Final Risk Tracker June 2016-March 2021: air pollution tab, March 2021
163 HC Written Question 66372 Air Pollution: EU Law, 8 March 2017
164 HM Government, A Green Future: Our 25 Year Plan to Improve the Environment, February 2018, p97
165 HM Government, Policy paper 10 March 2020: Air quality factsheet (part 4), updated 21 October 2020

A December 2017 report by the Environmental Industries Commission, an environmental business membership organisation, on Improving Air Quality after Brexit suggested that a change to air quality limit values post Brexit could be desirable on the basis that they could be more refined for the UK's specific circumstances, rather than aligned with a more generic EU approach:

> These are concentration values for pollutants in ambient air, applying to locations where the public is routinely exposed and averaged over a given time period. While they have been a useful tool to help drive air quality improvements, they also imply that concentrations above the limit value are harmful and those below are not. Health evidence has demonstrated that this is not the case for pollutants such as fine particulate matter or ozone, and may not be so for other pollutants.
>
> However, Limit Values are an accepted concept in Europe and are written into, for example, land use planning processes and tend to be strongly supported by both Member States and NGOs. Moreover, the UK's geographic position in Europe, with weather systems dominated by Atlantic south westerly winds, means that annual average concentrations for particulate matter (PM10 and PM2.5) tend to be lower than more central European states. Compliance with the limit values for PM10 is universal across the UK and thus measures to reduce PM, probably the most harmful of the standard suite of air pollutants, are de-prioritised despite evidence that health impacts continue below the Limit Value concentrations.
>
> Brexit could offer the opportunity to seek examples of policy making in countries and regions outside the EU and to draw on examples more suited to the UK context. [166]

Ambient air quality divergence

As set out in section 7 above, the European Commission published its Proposal for a revision of the Ambient Air Quality Directives in October 2022. This would set more ambitious air quality targets than under the previous Ambient Air Quality Directive from which targets remain in UK law. The UK Government was asked about whether this had implications for its own policies in a December 2022 PQ. The government replied to say that it was focussing on domestic action and targets:

> We have noted the proposals set out by the EU Commission, with whom we work closely through the UNECE Convention on Long-Range Transboundary Air Pollution. These proposals will be subject to negotiation between Member States in EU Council.
>
> The UK remains firmly committed to reducing air pollution on a national scale and we are legally required to set domestic targets that we can achieve. We have worked with internationally recognised experts to deliver the evidence to inform our target setting, and we are now setting targets for PM2.5 that are stretching but specific to our national circumstances.[167]

[166] Environmental Industries Commission, Improving Air Quality after Brexit, 14 December 2017, p18

[167] Air Pollution: EU Law, UIN 110549, tabled on 14 December 2022

Air quality measures removed by the Retained EU Law (Revocation and Reform) Act 2023

The Retained EU Law (Revocation and Reform) Act 2023 has removed specified provisions in the National Emission Ceilings Regulations 2018 (NECR) from UK law from 31 December 2023. These provisions related to obligations for the UK Government to produce a National Air Pollution Control Programme (NAPCP).

A NAPCP set out the government's policies and analysis relating to how its statutory commitments to reduce emissions of various air pollutants could be met across the UK. These pollutants were: nitrogen oxides, fine particulate matter ($PM_{2.5}$); sulphur oxides (SO_x); ammonia (NH_3); and volatile organic compounds (VOCs).

The NAPCP was originally a requirement stemming from EU legislation (Directive (EU) 2016/2284 on the reduction of national emissions of certain atmospheric pollutants) and all EU member states must produce one. The UK Government last published a revised NAPCP in February 2023.

The removed provisions are regulations 9 and 10 of the National Emission Ceilings Regulations 2018 (SI 2018/129) (NECR) and the whole of Commission Implementing Decision (EU) 2018/1522.

Regulation 9 of the NECR included various requirements relating to the NAPCP, such as: an obligation for the UK government to prepare and implement it; the obligation to review it under certain circumstances (e.g. if emissions actually exceed or are projected to exceed the emission reduction commitments); and minimum content requirements. Public authorities needed to have regard to the NAPCP when exercising any functions which, "significantly affect the level of emissions of a relevant pollutant within the United Kingdom."

Regulation 10 of the NECR required the government to conduct a public consultation when a NAPCP was prepared or revised.

Commission Implementing Decision (EU) 2018/1522 set a common format for NAPCPs to follow, to ensure consistency across EU member states.

The Retained EU Law (Revocation and Reform) Act 2023 only revoked the NECR requirements relating to NAPCP. Other parts of the NECR, including the statutory emission reduction commitments for the air pollutants (as set out in section 2.2 of this briefing), remain.

Rationale for removing the NAPCP provisions

The government said that removing the above provisions would reduce duplication and administrative burdens:

> "We remain committed to reducing emissions of the 5 key air pollutants and achieving the emission reduction targets set out in the National Emission Ceilings Regulations (NECR). The targets in the NECR remain unchanged and

there is no reduction in the level of environmental protection. Our intent in removing regulations 9 and 10 of the NECR is to reduce administrative burdens and aid transparency regarding air quality emissions policy.

The NAPCP set out policies and measures which will be considered further to reduce emissions in line with the emissions ceilings. It does not set out a detailed delivery plan for ensuring the emissions ceilings are met. In England the emissions targets and the delivery plan of policies and measures to achieve those targets are set out in the Environmental Improvement Plan."[168]

Concern about removal of the NAPCP provisions

The environmental enforcement and governance body for England and Northern Ireland, the Office for Environmental Protection (OEP) wrote to the government to express concern that removal of these provisions will be detrimental in several areas, including a weakening of accountability on emissions reduction targets and a reduction in transparency:

- Duplication – we do not consider there to be any statutory duplicative requirements akin to the requirements of regulations 9 and 10 of the NECR in either England or Northern Ireland, or more broadly across the UK. Whilst there may be some policy duplication, we do not consider it directly comparable, and no legally binding equivalent requirements exist.

- Northern Ireland – we have particular concerns over the legislative gap that would be left in NI.

- UK-wide – we have concerns that revocation will create disparity between the countries of the UK in relation to an important transboundary environmental issue, where the NAPCP currently provides important UK-wide oversight and coordination.

- Accountability – removal of regulations 9 and 10 of the NECR would result in a weakening of accountability as regards meeting emissions reduction targets in the UK.

- Transparency - removal of regulations 9 and 10 of the NECR would result in a weakening of transparency regarding Government's plans to meet reduction targets in the UK, and reduced scrutiny of those plans.

- Environmental protection – there is no publicly available assessment as to the potential impacts to environmental protections, including consideration of the Environmental Principles Policy Statement (EPPS).[169]

Some environmental campaign groups have also expressed concern about the removal of the provisions relating to the NAPCP from UK law.[170] For example, the campaign organisation Client Earth has said that "These

[168] Letter from The Rt Hon Thérèse Coffey MP, Secretary of State Environment, Food & Rural Affairs to the Office for Environmental Protection, 25 July 2023

[169] Letter from the Office for Environmental Protection to The Rt Hon Thérèse Coffey MP, Secretary of State Environment, Food & Rural Affairs, 30 August 2023

[170] See Client Earth, The importance of retaining the National Emission Ceilings Regulations 2018, September 2023

regulations are vital for reducing air pollution in the UK and, despite the government's assurances, are not duplicated by any other domestic law."

On 5 September 2023 Client Earth sent a letter (PDF) on behalf of itself and 47 academics, NGOs and other environmental organisations to the Defra Secretary of State asking her take steps to retain the NECR provisions. Alongside the letter Client Earth published a Comparison of the legal requirements that apply to the National Air Pollution Control Programme (NAPCP) vs the Environmental Improvement Plan (EIP), in an effort to demonstrate how the NECR provisions have a "much higher level of accountability and transparency" than other provisions that the government has argued duplicate the NECR.

8.5 Ammonia and emissions from agriculture

Ammonia (NH_3) is a gas that is emitted into the atmosphere and then either deposited back onto land or converted to secondary Particulate Matter (PM) through reactions in the atmosphere. Agriculture is the dominant source of NH_3 emissions (88% in 2016). It is emitted during storage and spreading of manures, slurries and fertilisers.[171]

The Air Quality Expert Group published a report on Air Pollution from Agriculture, 2018. In this it summarises the impacts of ammonia on human health and the environment:

> The main impacts of ammonia arise through its contribution to (1) formation of particulate matter (PM) and the consequent effects on human mortality and morbidity throughout the UK, and (2) the eutrophication of the semi-natural landscape of the UK leading to marked reductions in plant biodiversity. Ammonium in particle form (NH4+) is a transboundary pollutant, exchanged between European countries. Therefore, UK ammonia emissions contribute to human health effects and biodiversity changes in the UK and elsewhere in Europe, while the UK is impacted by emissions from elsewhere in Europe.[172]

The UK Government has published a guidance document in July 2018, Code of Good Agricultural Practice (COGAP) for reducing ammonia emissions produced by Defra in collaboration with the farming industry. It explains the practical steps farmers, growers, land managers, advisors and contractors in England can take to minimise ammonia emissions, including from the storage and application of organic manures, the application of manufactured fertiliser, and through modifications to livestock diet and housing.

In the UK the National Emission Ceilings Regulations 2018 sets targets (among other things) to require the UK to reduce ammonia (NH_3) emissions by 8 per cent compared to 2005 emissions by 2020 and by 16% by 2030.[173] The 2005

171 HM Government, Clean Air Strategy, January 2019, p11

172 Air Quality Expert Group, Air Pollution from Agriculture, 2018

173 Defra National Statistics Release: Emissions of air pollutants in the UK, 1970 to 2016, February 2018, p10

baseline for ammonia was 288kt (kilotonnes).[174] The 2020 ceiling is therefore 265kt and in 2030 it is 242kt.[175] The UK Government has acknowledged that without further policy intervention, the UK may not meet these targets. To this end the UK Government has set out actions that it intends to take to reduce ammonia emissions in its Clean Air Strategy 2019 and the February 2023 revised National Air Pollution Control Plan.

In November 2020 the government also published a consultation on Reducing ammonia emissions from urea fertilisers. It sought views on three policy options that give the greatest ammonia emission reductions from regulating the use or sale of sold urea fertilisers. The government's response was published in March 2022.[176] The response explained that the government had had to change its approach in response to a global fertiliser shortage and that instead it would take a non-regulatory approach:

> Global fertiliser shortages and price increases have led to significant concerns over the cost of food and, in turn, on the cost of living. We therefore consider a ban on solid urea fertilisers (Option 1) to be unfeasible. Furthermore, evidence submitted through the consultation indicated that the costs to farmers of banning solid urea would be substantially greater and ammonia emissions reduction less than previously expected. The timelines to implement a ban would be longer than previously estimated due to the changes needed to infrastructure to handle and store greater volumes of ammonium nitrate (AN). An industry consortium including farming unions, research and advice bodies, accreditation/assurance schemes, and the fertiliser supply industry offered to set up and run a non-regulatory approach, which they have termed as "Option 4". This would utilise farm assurance schemes such as Red Tractor, to reduce ammonia emissions from the use of fertilisers containing urea (both solid and liquid), in England from April 2023.
>
> (...)
>
> In view of the results of the revised analysis and taking into account global supply and pricing of fertilisers, Defra is supportive of the industry consortium's proposed approach to be delivered from 2023, a year later than initially proposed. This approach is expected to deliver around 11kt of ammonia emissions reductions by 2024/25. The assurance scheme standard, coupled with advice and guidance on effective use of all fertilisers, have the potential to deliver greater protection for the environment in the longer term if they lead to improved crop nutrient management practices, such as increased nitrogen use efficiency. Defra will monitor the global supply of fertilisers and any impacts on food prices to determine whether any further postponement may be required. Once implemented, Defra will monitor the industry's scheme and its success in reducing ammonia emissions. Should the scheme not achieve sufficient ammonia emissions reductions and the global supply and pricing of fertilisers be more stable, government will consult on draft regulations from 2025/26.[177]

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174 HM Government, Clean Air Strategy Consultation, May 2018, p87

175 HM Government, Clean Air Strategy Consultation, May 2018, p87

176 HM Government, Consultation on reducing ammonia emissions from solid urea fertilisers: Government response, March 2022

177 HM Government, Consultation on reducing ammonia emissions from solid urea fertilisers: Government response, March 2022, p4-5

Information about policies in Scotland, Wales and Northern to tackle ammonia emissions is provided in February 2023 revised National Air Pollution Control Plan.

8.6 Decarbonisation and net zero

In June 2019, the Climate Change Act 2008 (2050 Target Amendment) Order 2019, set a new target requiring the government to reduce the UK's net emissions of greenhouse gases by 100% relative to 1990 levels by 2050. This is widely known as the "net zero target".

In October 2021 the government published a Net Zero Strategy: Build Back Greener which sets out the government's policies and proposals for a decarbonised economy in 2050. It covered a range of sectors including transport, international shipping and aviation, heat and buildings, industry, waste, agriculture and land use, fuel supply, power and greenhouse gas removal. On air quality, it highlighted that further work would be done to assess the impacts of some of the proposed policy measures which may affect air quality. It recognised that some policies could have a negative impact on air quality:

> However, some policies and proposals could result in significant negative air quality impacts at both regional and local scales, for example emissions of fine particulate matter from biomass combustion, ammonia from the use of anaerobic digestion, and NOx emissions from hydrogen combustion in domestic or industrial settings. These are likely to impact our ability to reach statutory national emissions ceilings, increase exposure to harmful pollutants and cause some uneven health burdens. Furthermore, the impacts of air pollution can also impact the delivery of net zero. For example, all of England's forests and peatlands continue to be damaged by harmful emissions – particularly ammonia – which impact their ability to provide the ecosystem services required to meet net zero, including carbon sequestration and flood mitigation. Historic pollution loading across all habitats may also need to be ameliorated to maximise the potential of restoring them to meet the biodiversity targets in the Environment Bill. Further work will be undertaken to assess this and provide advice on tailoring our pathway to minimise these impacts. Continuous improvements in emission requirements and innovation in abatement technologies will also be necessary to deliver a pathway to net zero that maximises environmental benefits.[178]

For air quality, the potential for low carbon policies to contribute to better air quality, depends on the technology chosen to achieve it and the pollutant being considered. This was set out in a 2020 report to government by the Air Quality Expert Group (AQEG):

> Since air pollution is a complex mixture of different chemical entities, the potential for low carbon strategies to generate cleaner air depends on which pollutant is being considered and the low carbon pathway and/or technology chosen. For some regulated air pollutants that are co-emitted with carbon

[178] HM Government, Net Zero Strategy: Build Back Greener, October 2021, p334-335

> dioxide (CO2) during fossil fuel combustion, such as nitrogen oxides NOx (defined as the sum of NO and NO2), black carbon, polycyclic aromatic compounds and carbon monoxide, significant reductions in ambient concentrations might be anticipated as fossil fuel use decreases. Other pollutants such as secondary particulate matter (PM), ammonia (NH3), non-methane Volatile Organic Compounds (VOCs), persistent organic pollutants and airborne metals have complex non-combustion sources and have less direct connections to national carbon budgets. For example, fine particles are generated by vehicles through the friction and abrasion of surfaces, irrespective of the propulsion system. In some cases, the future air quality effects of Net Zero will depend critically on how a replacement technology is used; hydrogen consumed in a fuel cell releases no air pollution, whereas hydrogen combusted in a boiler or engine potentially does.
>
> For air pollutants, in contrast to greenhouse gas emissions, it matters if air pollutant emissions shift closer to areas of population (even if total national emissions decrease). For example, air pollutants from district heating biomass boilers can have disproportionate impacts on people close by compared with large power-generation facilities remotely located and with tall chimneys. The effects of poor air quality are felt immediately and are costly, so transitory pollution generated on the pathway to 2050 requires consideration and careful management, for example the localised impacts of major infrastructure projects or the use of intermediate fuels.[179]

The AQEG examined the proposed policies Climate Change Committee's (CCC) 2019 report Net Zero – The UK's contribution to stopping global warming. The CCC is an independent, statutory body, established to advise the UK and devolved governments on emissions. AQEG's report stated that, "encouragingly, for virtually all of the changes proposed on the CCC Net Zero pathway, positive, improved and better air quality outcomes can be envisaged."[180] Among its key conclusions, AQEG cautioned that care needed to be taken to assess local air quality impacts of any development work undertaken to transition to net zero:

> Air pollution has immediate adverse health effects on the communities where it is experienced, and care is needed to ensure that during the transition to 2050, air quality impacts are considered and minimised. For example, major low-carbon infrastructure projects have the potential to create localised air quality problems during their development, whilst the use of transitionary fuels may cause pollution to rise temporarily in some locations.[181]

[179] Air Quality Expert Group, Impacts of Net Zero pathways on future air quality in the UK, 2020
[180] Air Quality Expert Group, Impacts of Net Zero pathways on future air quality in the UK, 2020
[181] Air Quality Expert Group, Impacts of Net Zero pathways on future air quality in the UK, 2020

9 Funding

Funding for air quality improvements can be both direct and indirect and have more than one purpose. For example, funding aimed at encouraging a switch to cycling and walking might have the aim of reducing congestion on the roads, but may also bring improvements for air quality. The following sections set out the sources of funding that have been explicitly linked to air quality improvements.

9.1 UK Government funding

As set out by the National Audit Office (NAO) in its 2022 report, Tackling local breaches of air quality, there are three main tranches of funding available to local authorities to help deliver compliance with nitrogen dioxide limits:

- The Implementation Fund, which provides funding to assist local authorities in developing and implementing clean air plans.
- The Clean Air Fund, which is to assist local authorities to support those affected by the plans and help to improve the local acceptability of clean air measures by making it easier, more attractive or more affordable for individuals and businesses to change to cleaner modes of transport, by enabling a local authority to implement plans that collectively impact on fewer people; or by reducing transport costs for people.
- Feasibility funding to support local authorities that were directed to conduct targeted feasibility studies to identify measures that could bring forward compliance. [182]

The NAO's report summarises the funding levels awarded as follows:

> 2.17 As at February 2020 JAQU had awarded £522 million to local authorities through to 2021-22 with more than half (54%) to support individuals and business affected by the plans (through the Clean Air Fund), around one third of this (35%) going towards the implementation of measures (through the Implementation Fund) and 10% towards funding for feasibility studies. Government has also budgeted a further £180 million in 2022-23. HM Treasury told us that it has not set a firm limit for the budget for local authorities' implementation of measures to tackle breaches, in order to meet a legal requirement that cost cannot be a limiting factor to achieving compliance in the shortest possible time. It has set a budget in the usual way for the Clean Air Fund.[183]

[182] National Audit Office, Tackling local breaches of air quality, June 2022, p33
[183] National Audit Office, Tackling local breaches of air quality, June 2022, p33

Air Quality Grant Scheme

Until 2023 Defra had previously run an Air Quality Grant Scheme, which local authorities in England could apply to, to help improve air quality. A series of press releases on the air quality grant scheme set out the funding awarded each year.

In May 2024 the previous government said that it had decided not to fund the scheme for the 2023-24 financial year and would seek to redesign it:

> The Minister used his discretion not to fund the Local Air Quality Grant Scheme for the 2023-2024 financial year. He has asked Defra officials to consider the future of the scheme and how it might be redesigned to better deliver positive outcomes for local air quality and public health and therefore enhanced value for money for taxpayers.[184]

On 7 August 2024 the current government said that, "No decisions have been made yet on the future of the Air Quality Grant."[185]

Clean Air Fund

In 2018 the government launched a Clean Air Fund, as follows:

> Fulfilling a commitment to support local authorities to deliver these plans, the government has today launched a £220 million Clean Air Fund to minimise the impact of local plans on individuals and businesses. A range of options local authorities could consider to utilise this money such as new park and ride services, freight consolidation centres, concessionary travel schemes and improvements to bus fleets have been set out.
>
> At the same time, more than £40 million from the £255 million Implementation Fund has been awarded to support local authorities take action as soon as possible to improve air quality.
>
> This includes:
>
> - £11.7 million to the 28 local authorities with the biggest air quality challenges to help carry out the work needed to develop air quality plans, including securing resource and expertise
> - £24.5 million to the same 28 local areas to support a range of measures to take action locally. Examples include installing electric charge point hubs in car parks; junction improvements; bus priority measures; building cycle routes; incentivising ultra-low emission taxis through licensing schemes and leasing electric vehicles; and traffic management and monitoring systems
> - £2.4 million from the 2017/18 Air Quality Grant for local community projects to tackle air quality at a grass roots level. This comes in addition to £3.7 million already awarded in last year's Air Quality Grant, which included an award winning project taken forward by Westminster City Council to provide advice and toolkits for small and medium businesses to

184 Air Pollution: Pollution Control, UIN 24733, answered 24 May 2024

185 Air Quality Grant Scheme: Finance, UIN HL530, answered 7 August 2024

reduce transport emissions from deliveries associated with their operations

- £1.65 million to support the 33 local authorities that have been asked to conduct targeted feasibility studies to identify measures that could bring forward compliance dates within the shortest possible time[186]

Clean Air Strategy 2019

The government's Clean Air Strategy 2019 included some additional funding:

- UK Research Innovation (UKRI) has recently launched a new £19.6 million research programme to predict future air quality challenges, identify the most vulnerable groups in society, and improve new technologies and policies for reducing air pollution. The programme will be led by the Natural Environment Research Council (NERC) with the Met Office.

- We are investing £10 million in improving our modelling, data and analytical tools to give a more precise picture of current and future air quality and the impact of policies to improve it. We will continue to collaborate closely with UKRI and the wider science and engineering community to deliver cost-effective and innovative solutions to reducing air pollution.[187]

Active travel

In an April 2021 PQ response the then Environment Minister, Rebecca Pow, set out funding for an "active travel" scheme that would bring air quality improvements:

> A £2 billion package of funding for active travel, which is the largest amount of funding ever committed to increasing cycling and walking in this country, was announced by the Secretary of State for Transport on 9 May 2020. The first £250 million of the £2 billion was allocated in 2020/21 to "quick wins" including the Active Travel Fund and the Fix your Bike voucher scheme.[188]

UK plan for tackling roadside nitrogen dioxide concentrations

In July 2017, the then government published its plan for tackling nitrogen dioxide emissions from road traffic. The plan was supported by government investment in clean air policies. In a PQ response in January 2019, the then Environment Minister Dr Thérèse Coffey set out the components of this investment and how much of it had been disbursed at the time:

> The UK Plan for Tackling Roadside Nitrogen Dioxide Concentrations (NO2), setting out how we will achieve compliance in the shortest possible time, is

[186] HM Government, £260 million of clean air funding launched by government, 23 March 2018
[187] HM Government, Clean Air Strategy 2019, January 2019, p22-23
[188] Air Pollution UIN 188162, tabled on 27 April 2021

supported by a £3.5 billion investment into air quality and cleaner transport over 2010 to 2021. This investment includes:

- £1.5 billion to support the uptake of ultra low emission vehicles to 2021 (including elements funded from the National Productivity Investment Fund). As of December 2017 £862.8m had been disbursed.
- £1.2 billion – for the Cycling and Walking Investment Strategy. As of December 2017 £555m had been disbursed.
- £495 million Implementation Fund and Clean Air Fund to support councils in the 2017 Plan of which £40m was disbursed as of March 2018 (including the Air Quality Grant for 16/17 and 17/18).
- £100 million disbursed to Highways England for air quality as part of the Road Investment Strategy.
- £89 million disbursed for the Green Bus Fund from 2010 to 2013 for low emission buses.
- £40 million allocated through the Clean Bus Technology Fund 2017-19.
- £27 million allocated through the Clean Bus Technology Fund 2013 & 2015 and Clean Vehicle Fund 2014 and other bus retrofitting.
- An additional £7 million disbursed through the Air Quality Grant to local authorities to support air quality from 2011 to 2015.[189]

9.2 Scottish Government

When asked about funding given to local authorities to support clean air initiatives, the Scottish Government has highlighted that this is part of the overall financial support given to local authorities:

> It is the responsibility of individual local authorities to manage their own budgets and to allocate the total financial resources available to them, including on reducing vehicle emissions, on the basis of local needs and priorities, having first fulfilled their statutory obligations and the jointly agreed set of national and local priorities.[190]

In the Cleaner Air for Scotland 2 Strategy the Scottish Government set out that it provided funding for walking and cycling infrastructure:

> The Scottish Government has invested significant resources in improving walking and cycling infrastructure. In 2018, it doubled the funding for active travel from £39.2 million to £80 million, and increased this to over £100 million in 2020-21, as part of an overall £500 million commitment over the next five years. The figure for 2021-22 is £115.5 million. This funding supports various active travel schemes such as Places for Everyone and Smarter Places, Smarter

[189] Air Pollution, UIN 206817, tabled on 9 January 2019

[190] Scottish Parliament Question reference: S6W-10764, answered 31 October 2022

> Choices. In 2020, we delivered the 'Spaces for People' fund in response to the COVID-19 emergency, providing £39 million of funding and guidance to local authorities to quickly design and deliver the temporary walking and cycling infrastructure that was needed to enable people to physically distance.[191]

It also set out funding to improve emissions from busses:

> The Scottish Government also provides substantial financial support via the Bus Service Operators Grant (BSOG) and concessionary fares, and established the Bus Decarbonisation Taskforce to co-design a pathway to a fully zero emission bus fleet. The Taskforce is comprised of leaders from the bus, energy and finance sectors and will set out the pathway to zero emissions by November 2021. The Scottish Government provided over £50 million to support the shift to zero emission buses in 2020-21 and has committed a further £120 million for the next five years. The Scottish Bus Emissions Abatement Retrofit programme also provides funding to licensed bus and coach operators, local authorities and community transport operators to retrofit existing mid-life buses to the Euro VI diesel standard (and thus make them LEZ-compliant).[192]

The document also highlighted Scottish Government funding to support adaptation to new low emissions zones (LEZ):

> The Scottish Government introduced the LEZ Support Fund in 2019 as a form of vehicle disposal scheme to help those who will have the most difficulty in making the transition to the introduction of a LEZ. Rather than a conventional scrappage scheme, it provides targeted mobility grant funding for households (who currently use an LEZ-non-compliant private car) and micro-businesses using non-compliant light commercial vehicles. This approach seeks to encourage lower emission mobility options such as, but not limited to, e-bikes, bikes, public transport season ticket contributions and other incentives which reduce car ownership.[193]

9.3 Welsh Government

The Welsh Government has announced a Local air quality management support fund 2023-24. The fund is £1 million and local authorities can bid for support for the following types of project:

- Prevention – action that seeks to improve air quality and prevent worsening of concentrations and/or an exceedance of air quality objectives.
- Mitigation – action that seeks to improve air quality in an Air Quality Management Area (AQMA).

[191] Scottish Government, Cleaner Air for Scotland 2, July 2021, p70
[192] Scottish Government, Cleaner Air for Scotland 2, July 2021, p71
[193] Scottish Government, Cleaner Air for Scotland 2, July 2021, p79

- Innovation – action using innovative methods or technologies to improve air quality and/or reduce exposure.[194]

Projects must be delivered within the 2023-24 financial year.

Prior to this, in 2018, the Welsh Government established a £20m fund to reduce emissions and improve the environment in Wales. The Air Quality Fund, which ran until 2021, supported local authorities to comply with nitrogen dioxide limits and improve air quality in their areas.[195]

In the Welsh Government's Clean Air Plan for Wales, 2020, it said that it had allocated over £69 million to Local Authorities to develop new walking and cycling routes and facilities, and make improvements to their existing infrastructure.[196] In Air Quality in Wales 2019, October 2020 update version, the Government summarised further funding for active travel:

> In July 2020, the Welsh Government announced the allocation of £38m in grants to local authorities across Wales for active travel and road safety schemes. During the lockdown period, many more people walked and cycled to make everyday journeys. This investment will create routes and connections in towns and cities across Wales to give people the confidence to continue walking and cycling.[197]

9.4 Northern Ireland

An overview of specific schemes funded by the Northern Ireland Department for Agriculture, Environment and Rural Affairs (DAERA) is provided in the November 2020, A Clean Air Strategy for Northern Ireland – Public Discussion Document. The document sets out that DAERA has a Local Air Quality Management (LAQM) grants scheme which draws down from its Environment Fund. Councils apply annually for funding from the Department to carry out air quality monitoring and assessment, and to prepare and implement action plans.[198]

194 Welsh Government, Local air quality management support fund 2023-24 (accessed 16 May 2023)
195 Welsh Government press release, £20m Air Quality Fund among new measures to improve air quality in Wales, 24 April 2018
196 Welsh Government, The Clean Air Plan for Wales, 2020, p61
197 Welsh Government Air Quality in Wales 2019, October 2020 update version, p5
198 Northern Ireland Department for Agriculture, Environment and Rural Affairs, A Clean Air Strategy for Northern Ireland – Public Discussion Document, November 2020, p118

10 Debate and scrutiny

Air quality issues have been scrutinised by the National Audit Office and also raised frequently in Parliament, in debates, parliamentary questions and in the work of select committees. Recent references to this work are set out in the sections below.

10.1 National Audit Office

In June 2022 the National Audit Office (NAO) published a report which examined the UK Government's NO_2 Programme and its progress in tackling local breaches of NO_2 limits.[199] The NAO's report concluded that existing measures will not be sufficient to achieve "most" of government's 2030 air quality targets and that the NO_2 programme was progressing more slowly than had been expected. For this reason, the NAO said that it could not yet be confident that the programme was on track to deliver value for money.[200]

The NAO's work was used to inform a House of Commons Committee of Public Accounts report, Tackling local air quality breaches (PDF), 17 October 2022. The committee was also critical of progress towards meeting targets:

> Government does not know how much public money is spent on addressing air quality across all departments, reducing transparency and potentially hindering the integrated approach necessary to tackle air quality risks in a cost-effective manner. Current policy measures are insufficient to meet 4 out of 5 of the 2030 emissions ceiling targets set for the UK as a whole; it is vital that the additional measures set out in the coming months are both sufficient to address this shortfall, and realistic in terms of deliverability.[201]

The government responded to both reports (PDF) to highlight, (among other things), its work in the updating the National Air Pollution Control Programme (now completed), which it said, "includes robust actionable measures for further consideration to deliver compliance with the 2030 targets for all air pollutants."[202]

199 NAO, Tackling local breaches of air quality, 27 June 2022
200 NAO, Tackling local breaches of air quality, 27 June 2022
201 House of Commons Committee of Public Accounts report, Tackling local air quality breaches (PDF), 17 October 2022, p3
202 Treasury Minutes, Twenty-second Report of Session 2022-23 Department for Environment, Food & Rural Affairs and Department for Transport (Joint Air Quality Unit) Tackling local air quality breaches, 14 December 2022

10.2 Select Committee work

- Environmental Audit Committee, Outdoor and indoor air quality targets. The committee is currently undertaking a short inquiry to establish the adequacy of current measures to promote indoor and outdoor air quality, and assess whether air quality targets are sufficient for protecting public health and the environment.
- Public Accounts Committee, Tackling local air quality breaches (PDF), Twenty-Second Report of Session 2022–23, 26 October 2022. Treasury Minutes, Twenty-second Report of Session 2022-23 Department for Environment, Food & Rural Affairs and Department for Transport (Joint Air Quality Unit) Tackling local air quality breaches, 14 December 2022, and follow-up response letter from government (PDF), 28 February 2023.
- Environment, Food and Rural Affairs Committee, Oral evidence: Air quality: follow-up, 6 July 2021
- Environment, Food and Rural Affairs Committee, Fifth report: Air Quality and coronavirus: a glimpse of a different future or business as usual, 11 February 2021; and associated government response, Seventh Special Report - Air Quality and Coronavirus: A Glimpse of a Different Future or Business as Usual: Government Response to the Committee's Fifth Report, 24 April 2021.
- First Joint Report from the Environment, Food and Rural Affairs, Environmental Audit, Health and Social Care and Transport Committees, Improving air quality, 15 March 2018 and associated Government response, Improving air quality: Government Response, 20 June 2018. See also background National Audit Office Report prepared for the Committees, Air Quality, 16 November 2017.
- Environment, Food and Rural Affairs Committee, Air Quality, 27 April 2016 and associated government response, Air quality: Government response to the Committee's Fourth Report of Session 2015–16, 13 September 2016.

10.3 Parliamentary debates and oral questions

- Clean Air (Human Rights) 2023-24 ten-minute rule bill, 17 January 2024.
- Air Pollution, topical questions, 7 December 2023.
- Clean Air ten-minute rule bill, 31 January 2023.
- Clean Air (Human Rights) Bill, HL Bill 5 2022-23.
- Environment Bill 2021-22 and 2019-21. Debates at various stages in the proceedings have touched on air quality issues. See for example,

Commons public bill committee debates: sixth sitting, 17 March 2020, fifteenth sitting, 12 November 2020, and twenty-second sitting, 26 November 2020; Commons Report Stage, 26 January 2021; and Lords committee stage (second day) 23 June 2021.

- Air Quality (Legislative Functions) (Amendment) Regulations 2021, House of Lords Grand Committee, 19 May 2021 and Draft Air Quality (Legislative Functions) (Amendment) Regulations 2021, House of Commons delegated legislation committee, 27 April 2021.
- Air Pollution: London, Westminster Hall debate, 27 April 2021.
- Air Quality, House of Commons ten-minute rule motion, 3 February 2021.
- Local Clean Air Targets, Westminster Hall debate, 20 October 2020.
- Air Quality (Domestic Solid Fuels Standards) (England) Regulations 2020, House of Lords, 29 September 2020 and Draft Air Quality (Domestic Solid Fuels Standards) (England) Regulations 2020, House of Commons delegated legislation committee, 16 September 2020
- Air Quality, House of Commons oral questions, 10 September 2020.
- Air Quality and Emissions, House of Lords oral questions, 19 May 2020.
- Air Quality, House of Commons oral questions, 31 October 2019.
- Clean Air, House of Commons ten-minute rule motion, 3 September 2019.

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