



Department
for Environment
Food & Rural Affairs

Air Pollution in the UK 2019

Compliance Assessment Summary

September 2020



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Executive Summary

The UK is currently required to report air quality data on an annual basis under the following European Directives:

- The Council Directive on ambient air quality and cleaner air for Europe (2008/50/EC).
- The Fourth Daughter Directive (2004/107/EC) under the Air Quality Framework Directive (1996/62/EC).

This document has been prepared to accompany and summarise the UK's 2019 submission on air quality to the European Commission. It presents a summary of the UK's compliance with the above Directives, based upon measurements from national air pollution monitoring networks and air pollution modelling. This includes details of the exceedances reported in 2019.

This document is an extract from a larger report, '*Air Pollution in the UK 2019*', which, in addition to the compliance summary, also provides background information on the pollutants covered by these Directives and the UK's own Air Quality Strategy; their sources, effects, how they are measured and modelled in the UK, and details of their spatial distribution and changes over time.

These data are reported on behalf of Defra (the Department for Environment, Food and Rural Affairs) and the Devolved Administrations of Scotland, Wales and Northern Ireland.

For the purposes of air quality monitoring and assessment of compliance with the above Directives, the UK is divided into 43 zones. The 2019 results are detailed in section 3 of this report and summarised below:

- The UK met the limit value for hourly mean nitrogen dioxide (NO₂) in 42 out of 43 zones.
- Ten zones were compliant with the limit value for annual mean NO₂. The remaining 33 zones exceeded this limit value. Implementation of measures as a result of the 2017 UK Plan for Tackling Roadside Nitrogen Dioxide Concentrations is in progress, with the effect on compliance expected to be demonstrated in subsequent years.
- All non-agglomeration zones complied with the critical level for annual mean NO_x concentration, set for protection of vegetation.
- Three zones exceeded the target value for benzo[a]pyrene.
- Four zones exceeded the target value for nickel.
- All zones met the target values for arsenic and cadmium.
- All zones met both the target values for ozone; the target value based on the maximum daily eight-hour mean, and the target value based on the AOT40 statistic.

- No zones were compliant with the long-term objective for ozone, set for the protection of human health. This is based on the maximum daily eight-hour mean.
- 37 zones met the long-term objective for ozone, set for the protection of vegetation. This is based on the AOT40 statistic.
- All zones met the limit value for daily mean concentration of PM₁₀ particulate matter, without the need for subtraction of the contribution from natural sources.
- All zones met the limit value for annual mean concentration of PM₁₀ particulate matter, without the need for subtraction of the contribution from natural sources.
- All zones met both limit values for annual mean concentration of PM_{2.5} particulate matter: the Stage 1 limit value, which came into force on 1st January 2015, and the indicative Stage 2 limit value which must be met by 2020.
- The running year Average Exposure Indicator (AEI) for 2019 was within the 2020 exposure reduction target.
- All zones met the EU limit values for sulphur dioxide, carbon monoxide, lead and benzene.

A summary of the air quality assessment for 2019 with a comparison of the submissions carried out in the previous years (since 2008 when the Air Quality Directive came into force) can be found in Section 4 of this report. Copies of those previous annual submissions can be found on the Commission website:

<http://cdr.eionet.europa.eu/gb/eu/annualair> and <http://cdr.eionet.europa.eu/gb/eu/aqd/>.

For more information on air quality in the UK visit the Defra website at www.gov.uk/defra and the UK Air Quality websites at <http://uk-air.defra.gov.uk/>, <http://www.scottishairquality.scot/>, <https://airquality.gov.wales> and www.airqualityni.co.uk.

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1 Introduction

A cleaner, healthier environment benefits people and the economy. Clean air is vital for people's health and the environment, essential for making sure our cities are welcoming places for people to live and work now and in the future, and to our prosperity. It is therefore important to monitor levels of air pollution.

Air quality standards are set in European Union (EU) Directive 2008/50/EC on Ambient Air Quality and Cleaner Air for Europe¹ and the Fourth Daughter Directive² (2004/107/EC). These Directives require all Member States to undertake air quality assessment, and to report the findings to the European Commission on an annual basis.

As a Member State of the EU during 2019, these Directives applied to the UK during the period covered by this report. The provisions of these Directives also form part of the UK's own legislation, having previously been incorporated or 'transposed' into our national law. Under the European Union (Withdrawal) Act, the Government has laid in Parliament Statutory Instruments which ensure the continuity of air quality regulation, standards and transparency. These will ensure that the whole body of existing EU environmental law continues to have effect in UK law, after the UK has left the EU.

The UK has statutory monitoring networks in place to meet the requirements of these Directives, with air quality modelling used to supplement the monitored data. While the UK remains in the EU, the results must be submitted to the European Commission each year. From 2013 onwards, the air quality compliance assessment has been submitted to the Commission via e-Reporting (a process developed by the European Commission, for reporting of compliance and provision of data). The UK's annual submission for 2019 can be found on the Commission website at <http://cdr.eionet.europa.eu/gb/eu/aqd>. All the compliance results are reported under 'Information on the Attainment of Environmental Objectives' in e-Reporting Data Flow G. Submissions for years up to and including 2012 (which were in the form of a standard questionnaire) can be found at <http://cdr.eionet.europa.eu/gb/eu/annualair>.

This document presents an assessment of the UK's compliance with the limit values, target values and long-term objectives set out in the Air Quality Directive and the fourth Daughter Directive. It then provides a comparison with previous recent years. This is based upon the data submitted to the European Commission.

Links to the EU Directives on ambient air quality are provided on Defra's web pages at www.defra.gov.uk/environment/quality/air/air-quality/eu/. The Air Quality Directive itself can also be found at <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:152:0001:0044:EN:PDF>, and the fourth Daughter Directive can be found at <http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32004L0107>.

Further information on air quality in the UK can be found on Defra's online UK Air Information Resource (UK-AIR), at <https://uk-air.defra.gov.uk/>.

2 Definition of Zones

The UK is divided into 43 zones for air quality assessment. There are 28 agglomeration zones (large urban areas) and 15 non-agglomeration zones. Each zone has an identification code (**Table 2-1**). Zones are shown in **Figure 2-1**.

Table 2-1 UK Zones for Ambient Air Quality Reporting 2019

Zone	Zone code	Zone type
Greater London Urban Area	UK0001	Agglomeration
West Midlands Urban Area	UK0002	Agglomeration
Greater Manchester Urban Area	UK0003	Agglomeration
West Yorkshire Urban Area	UK0004	Agglomeration
Tyneside	UK0005	Agglomeration
Liverpool Urban Area	UK0006	Agglomeration
Sheffield Urban Area	UK0007	Agglomeration
Nottingham Urban Area	UK0008	Agglomeration
Bristol Urban Area	UK0009	Agglomeration
Brighton/Worthing/Littlehampton	UK0010	Agglomeration
Leicester Urban Area	UK0011	Agglomeration
Portsmouth Urban Area	UK0012	Agglomeration
Teesside Urban Area	UK0013	Agglomeration
The Potteries	UK0014	Agglomeration
Bournemouth Urban Area	UK0015	Agglomeration
Reading/Wokingham Urban Area	UK0016	Agglomeration
Coventry/Bedworth	UK0017	Agglomeration
Kingston upon Hull	UK0018	Agglomeration
Southampton Urban Area	UK0019	Agglomeration
Birkenhead Urban Area	UK0020	Agglomeration
Southend Urban Area	UK0021	Agglomeration
Blackpool Urban Area	UK0022	Agglomeration
Preston Urban Area	UK0023	Agglomeration
Glasgow Urban Area	UK0024	Agglomeration
Edinburgh Urban Area	UK0025	Agglomeration
Cardiff Urban Area	UK0026	Agglomeration
Swansea Urban Area	UK0027	Agglomeration
Belfast Metropolitan Urban Area	UK0028	Agglomeration
Eastern	UK0029	Non-agglomeration
South West	UK0030	Non-agglomeration
South East	UK0031	Non-agglomeration
East Midlands	UK0032	Non-agglomeration
North West & Merseyside	UK0033	Non-agglomeration
Yorkshire & Humberside	UK0034	Non-agglomeration
West Midlands	UK0035	Non-agglomeration
North East	UK0036	Non-agglomeration
Central Scotland	UK0037	Non-agglomeration
North East Scotland	UK0038	Non-agglomeration
Highland	UK0039	Non-agglomeration
Scottish Borders	UK0040	Non-agglomeration
South Wales	UK0041	Non-agglomeration
North Wales	UK0042	Non-agglomeration
Northern Ireland	UK0043	Non-agglomeration

Figure 2-1 UK Zones for Ambient Air Quality Reporting 2019



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3 Air Quality Assessment for 2019

The air quality assessment for each pollutant is derived from a combination of measured and modelled concentrations. Where both measurements and model results are available the assessment of compliance for each zone is based on the higher concentration of the two.

The air quality compliance assessment is submitted to the European Commission via an e-Reporting system. All the compliance results come under 'Information on the Attainment of Environmental Objectives' in e-Reporting Data Flow G.

The results of the air quality assessment submitted to the European Commission for 2019 are summarised in the tables below. The tables have been completed as follows:

- Where all measurements were within the relevant limit values in 2019, the table shows this as 'OK'.
- In the above cases, where compliance was determined by modelling or supplementary assessment, this is indicated by '(m)' – i.e. 'OK (m)'.
- Where locations were identified as exceeding a limit value, target value or long-term objective, this is identified as '>LV', '>TV' or '>LTO' as applicable.
- Where a non-compliance was determined by modelling or supplementary assessment, this is indicated by (m), as above.
- The abbreviation 'n/a' (not applicable) means that an assessment is not relevant for this zone, such as for the NO_x vegetation critical level in agglomeration zones.
- Zones that complied with the relevant limit values, targets or long-term objectives are shaded blue, while those that did not are shaded red. For ozone, zones that met the relevant target value but not the long-term objective are shaded purple.

There are no longer any zones where margins of tolerance apply.

3.1 Directive 2008/50/EC on Ambient Air Quality and Cleaner Air for Europe

Sulphur dioxide (SO₂): in 2019, all zones and agglomerations within the UK complied with the limit values for 1-hour mean and 24-hour mean SO₂ concentration, set for protection of human health.

All non-agglomeration zones within the UK also complied with the critical levels for annual mean and winter mean SO₂ concentration, set for protection of ecosystems (these are not applicable to built-up areas).

Carbon monoxide (CO), benzene and lead: all zones and agglomerations were compliant with the limit values for these three pollutants in 2019.

The 2019 compliance assessment for CO has been based on objective estimation (explained in Defra's technical report on UK air quality assessment³), underpinned by NAEI emission trends, AURN measurement trends and historical modelling assessments.

Nitrogen dioxide (NO₂): in 2019 not all zones and agglomerations were compliant with the limit values. The results of the air quality assessment for nitrogen dioxide for each zone are summarised in **Table 3-1**.

One zone had locations where the 1-hour limit value (200 µg m⁻³) was exceeded on more than the permitted 18 occasions during 2019: this was South Wales (UK0041). The remaining 42 zones and agglomerations complied with the 1-hour mean NO₂ limit value.

Ten zones *met* the annual mean limit value for NO₂ in 2019:

- Brighton, Worthing and Littlehampton
- Leicester Urban Area
- Kingston upon Hull
- Birkenhead Urban Area
- Blackpool Urban Area
- Preston Urban Area
- Swansea Urban Area
- Highland
- Scottish Borders
- Northern Ireland.

The remaining 33 zones had locations with measured or modelled annual mean NO₂ concentrations higher than the annual mean limit value (40 µg m⁻³).

All non-agglomeration zones within the UK complied with the critical level for annual mean NO_x concentration, set for protection of vegetation.

As part of the 2017 UK plan for tackling roadside nitrogen dioxide concentrations⁴, local authorities with exceedances of the annual mean nitrogen dioxide limit value have been required to develop local plans or studies to consider measures to achieve the statutory limit value within the shortest possible time. These studies or plans may include local scale modelling and/or monitoring data, and in some cases the local data and the national Pollution Climate Mapping (PCM) modelling present different results. These local data are not reflected within this assessment; however, we are working to develop our approach to assessing national NO₂ compliance with a view to better reflecting local level NO₂ concentrations.

Table 3-1 Results of Air Quality Assessment for Nitrogen Dioxide in 2019

Zone	Zone code	NO ₂ LV for health (1hr mean)	NO ₂ LV for health (annual mean)	NO _x critical level for vegetation (ann. mean)
Greater London Urban Area	UK0001	OK	> LV	n/a
West Midlands Urban Area	UK0002	OK	> LV (m)	n/a
Greater Manchester Urban Area	UK0003	OK	> LV (m)	n/a
West Yorkshire Urban Area	UK0004	OK	> LV	n/a
Tyneside	UK0005	OK	> LV (m)	n/a
Liverpool Urban Area	UK0006	OK	> LV (m)	n/a
Sheffield Urban Area	UK0007	OK	> LV (m)	n/a
Nottingham Urban Area	UK0008	OK	> LV (m)	n/a
Bristol Urban Area	UK0009	OK	> LV (m)	n/a
Brighton/Worthing/Littlehampton	UK0010	OK	OK	n/a
Leicester Urban Area	UK0011	OK	OK	n/a
Portsmouth Urban Area	UK0012	OK	> LV (m)	n/a
Teesside Urban Area	UK0013	OK	> LV (m)	n/a
The Potteries	UK0014	OK	> LV	n/a
Bournemouth Urban Area	UK0015	OK	> LV (m)	n/a
Reading/Wokingham Urban Area	UK0016	OK	> LV (m)	n/a
Coventry/Bedworth	UK0017	OK	> LV (m)	n/a
Kingston upon Hull	UK0018	OK	OK	n/a
Southampton Urban Area	UK0019	OK	> LV (m)	n/a
Birkenhead Urban Area	UK0020	OK	OK	n/a
Southend Urban Area	UK0021	OK	> LV (m)	n/a
Blackpool Urban Area	UK0022	OK	OK	n/a
Preston Urban Area	UK0023	OK	OK	n/a
Glasgow Urban Area	UK0024	OK	> LV	n/a
Edinburgh Urban Area	UK0025	OK	> LV	n/a
Cardiff Urban Area	UK0026	OK	> LV (m)	n/a
Swansea Urban Area	UK0027	OK	OK	n/a
Belfast Urban Area	UK0028	OK	> LV	n/a
Eastern	UK0029	OK	> LV (m)	OK
South West	UK0030	OK	> LV (m)	OK
South East	UK0031	OK	> LV	OK
East Midlands	UK0032	OK	> LV (m)	OK
North West & Merseyside	UK0033	OK	> LV (m)	OK (m)
Yorkshire & Humberside	UK0034	OK	> LV (m)	OK
West Midlands	UK0035	OK	> LV (m)	OK (m)
North East	UK0036	OK	> LV (m)	OK (m)
Central Scotland	UK0037	OK	> LV (m)	OK (m)
North East Scotland	UK0038	OK	> LV (m)	OK (m)
Highland	UK0039	OK	OK	OK (m)
Scottish Borders	UK0040	OK	OK	OK
South Wales	UK0041	> LV	> LV	OK
North Wales	UK0042	OK (m)	> LV (m)	OK
Northern Ireland	UK0043	OK	OK	OK (m)

LV = limit value, (m) indicates that the compliance or exceedance was determined by modelling.

Particulate Matter as PM₁₀: all zones and agglomerations were compliant with the annual mean limit value of 40 µg m⁻³ for PM₁₀. All zones and agglomerations were compliant with the daily mean limit value. The results of the air quality assessment for PM₁₀ for each zone, with respect to the daily mean and annual mean limit values, are summarised in **Table 3-2**.

Under Section 20 of the Air Quality Directive, Member States are required to inform the Commission where exceedances of PM₁₀ limit values are due to natural sources (for example sea salt), and where this is the case, the exceedance does not count as non-compliance. Particulate matter from sea salt is modelled and has been used in the past to determine whether compliance with the limit values has been achieved after contribution from natural sources has been subtracted. However, in 2019 there were no modelled exceedances of either the 24-hr or annual mean limit values, so no subtraction of contribution from natural sources has been carried out.

Particulate Matter as PM_{2.5}: all zones met the Stage 1 limit value (25 µg m⁻³ to be achieved by 1st Jan 2015) which came into force on 1st January 2015, and the Stage 2 indicative limit value (20 µg m⁻³ to be achieved by 1st Jan 2020). Both limit values apply to the annual mean, based on the calendar year.

The results of the air quality assessment for PM_{2.5} for each zone are summarised in **Table 3-3**. Subtraction of PM_{2.5} contributions due to natural sources was not necessary for any zone.

Under the Air Quality Directive, Member States will be required to achieve a national exposure reduction target for PM_{2.5}, over the period 2010 to 2020. This is based on the Average Exposure Indicator (AEI) statistic. The AEI for the UK is calculated as follows: the arithmetic mean PM_{2.5} concentration at appropriate UK urban background sites only is calculated for three consecutive calendar years, and the mean of these values taken as the AEI.

The AEI for the reference year (2010) was used to determine the National Exposure Reduction Target (NERT), to be achieved by 2020 (see Annex XIV of the Air Quality Directive). The UK's reference year AEI was 13 µg m⁻³; on this basis, the Air Quality Directive sets an exposure reduction target of 15%. This equates to reducing the AEI to 11 µg m⁻³ by 2020. (The detailed methodology and results of this calculation are presented in Defra's technical report on UK air quality assessment³.)

Table 3-2 Results of Air Quality Assessment for PM₁₀ in 2019

Zone	Zone code	PM ₁₀ LV (daily mean)	PM ₁₀ LV (annual mean)
Greater London Urban Area	UK0001	OK	OK
West Midlands Urban Area	UK0002	OK	OK
Greater Manchester Urban Area	UK0003	OK	OK
West Yorkshire Urban Area	UK0004	OK	OK
Tyneside	UK0005	OK	OK
Liverpool Urban Area	UK0006	OK	OK
Sheffield Urban Area	UK0007	OK	OK
Nottingham Urban Area	UK0008	OK	OK
Bristol Urban Area	UK0009	OK	OK
Brighton/Worthing/Littlehampton	UK0010	OK (m)	OK (m)
Leicester Urban Area	UK0011	OK	OK
Portsmouth Urban Area	UK0012	OK	OK
Teesside Urban Area	UK0013	OK	OK
The Potteries	UK0014	OK	OK
Bournemouth Urban Area	UK0015	OK (m)	OK (m)
Reading/Wokingham Urban Area	UK0016	OK	OK
Coventry/Bedworth	UK0017	OK	OK
Kingston upon Hull	UK0018	OK	OK
Southampton Urban Area	UK0019	OK	OK
Birkenhead Urban Area	UK0020	OK (m)	OK (m)
Southend Urban Area	UK0021	OK (m)	OK (m)
Blackpool Urban Area	UK0022	OK (m)	OK (m)
Preston Urban Area	UK0023	OK (m)	OK (m)
Glasgow Urban Area	UK0024	OK	OK
Edinburgh Urban Area	UK0025	OK	OK
Cardiff Urban Area	UK0026	OK	OK
Swansea Urban Area	UK0027	OK	OK
Belfast Metropolitan Urban Area	UK0028	OK	OK
Eastern	UK0029	OK	OK
South West	UK0030	OK	OK
South East	UK0031	OK	OK
East Midlands	UK0032	OK	OK
North West & Merseyside	UK0033	OK	OK
Yorkshire & Humberside	UK0034	OK	OK
West Midlands	UK0035	OK	OK
North East	UK0036	OK	OK
Central Scotland	UK0037	OK	OK
North East Scotland	UK0038	OK	OK
Highland	UK0039	OK	OK
Scottish Borders	UK0040	OK (m)	OK (m)
South Wales	UK0041	OK	OK
North Wales	UK0042	OK	OK
Northern Ireland	UK0043	OK	OK

LV = limit value, (m) indicates that the compliance or exceedance was determined by modelling.

Table 3-3 Results of Air Quality Assessment for PM_{2.5} in 2019

Zone	Zone code	PM _{2.5} Stage 1 limit value (annual mean, for 1 st Jan 2015)	PM _{2.5} Stage 2 limit value (annual mean, for 1 st Jan 2020)
Greater London Urban Area	UK0001	OK	OK
West Midlands Urban Area	UK0002	OK	OK
Greater Manchester Urban Area	UK0003	OK	OK
West Yorkshire Urban Area	UK0004	OK	OK
Tyneside	UK0005	OK	OK
Liverpool Urban Area	UK0006	OK	OK
Sheffield Urban Area	UK0007	OK	OK
Nottingham Urban Area	UK0008	OK	OK
Bristol Urban Area	UK0009	OK	OK
Brighton/Worthing/Littlehampton	UK0010	OK	OK
Leicester Urban Area	UK0011	OK	OK
Portsmouth Urban Area	UK0012	OK	OK
Teesside Urban Area	UK0013	OK	OK
The Potteries	UK0014	OK	OK
Bournemouth Urban Area	UK0015	OK	OK
Reading/Wokingham Urban Area	UK0016	OK (m)	OK (m)
Coventry/Bedworth	UK0017	OK	OK
Kingston upon Hull	UK0018	OK	OK
Southampton Urban Area	UK0019	OK	OK
Birkenhead Urban Area	UK0020	OK	OK
Southend Urban Area	UK0021	OK	OK
Blackpool Urban Area	UK0022	OK	OK
Preston Urban Area	UK0023	OK	OK
Glasgow Urban Area	UK0024	OK	OK
Edinburgh Urban Area	UK0025	OK	OK
Cardiff Urban Area	UK0026	OK (m)	OK (m)
Swansea Urban Area	UK0027	OK	OK
Belfast Metropolitan Urban Area	UK0028	OK	OK
Eastern	UK0029	OK	OK
South West	UK0030	OK	OK
South East	UK0031	OK	OK
East Midlands	UK0032	OK	OK
North West & Merseyside	UK0033	OK	OK
Yorkshire & Humberside	UK0034	OK	OK
West Midlands	UK0035	OK	OK
North East	UK0036	OK	OK
Central Scotland	UK0037	OK	OK
North East Scotland	UK0038	OK	OK
Highland	UK0039	OK	OK
Scottish Borders	UK0040	OK (m)	OK (m)
South Wales	UK0041	OK	OK
North Wales	UK0042	OK	OK
Northern Ireland	UK0043	OK	OK

Subtraction of natural source contribution was not carried out for any zones in 2019.

LV = limit value, (m) indicates that the compliance or exceedance was determined by modelling.

The AEI for the reference year 2015 is set at $20 \mu\text{g m}^{-3}$ as an Exposure Concentration Obligation (ECO) in the Air Quality Directive. The UK already meets this obligation. There are no obligations or target values for the years *between* 2010, 2015 and 2020, but the running AEIs for these intervening years give an indication of progress towards the 2020 target. The running year AEI for 2019 was calculated as follows:

- 2017: $10 \mu\text{g m}^{-3}$
- 2018: $10 \mu\text{g m}^{-3}$
- 2019: $10 \mu\text{g m}^{-3}$

The mean of these three values (to the nearest integer) is $10 \mu\text{g m}^{-3}$. Thus, the running AEI for 2019 is below the 2020 exposure reduction target.

Ozone: all zones and agglomerations met the target values for health and for protection of vegetation. The results of the air quality assessment for ozone are summarised in **Table 3-4**.

For ozone, there is a target value based on the maximum daily 8-hour mean. All 43 zones and agglomerations were compliant with this target value. There is also a long-term objective for protection of human health, based on the maximum daily 8-hour mean. None of the 43 zones and agglomerations were compliant with the long-term objective (LTO) for health in 2019.

There is also a target value based on the AOT40 statistic. The AOT40 statistic (expressed in $\mu\text{g m}^{-3}\cdot\text{hours}$) is the sum of the difference between hourly concentrations greater than $80 \mu\text{g m}^{-3}$ (= 40 ppb) and $80 \mu\text{g m}^{-3}$ over a given period using only the hourly mean values measured between 08:00 and 20:00 Central European Time each day. All 43 zones and agglomerations met the target value based on the AOT40 statistic. There is also a long-term objective, for protection of vegetation, based on this statistic; six zones and agglomerations exceeded this long-term objective for vegetation in 2019. These were: Southend Urban Area, Eastern, South West, South East, Yorkshire and Humberside, and the North East.

Ozone concentrations – and hence the number of zones exceeding the LTOs - fluctuate from year to year as ozone is a transboundary pollutant and its formation is influenced by meteorological factors.

Table 3-4 Results of Air Quality Assessment for Ozone in 2019

Zone	Zone code	O ₃ TV and LTO for health (8hr mean)	O ₃ TV and LTO for vegetation (AOT40)
Greater London Urban Area	UK0001	Met TV, > LTO	OK
West Midlands Urban Area	UK0002	Met TV, > LTO	OK
Greater Manchester Urban Area	UK0003	Met TV, > LTO	OK
West Yorkshire Urban Area	UK0004	Met TV, > LTO	OK
Tyneside	UK0005	Met TV, > LTO	OK
Liverpool Urban Area	UK0006	Met TV, > LTO	OK
Sheffield Urban Area	UK0007	Met TV, > LTO	OK (m)
Nottingham Urban Area	UK0008	Met TV, > LTO	OK
Bristol Urban Area	UK0009	Met TV, > LTO	OK
Brighton/Worthing/Littlehampton	UK0010	Met TV, > LTO	OK
Leicester Urban Area	UK0011	Met TV, > LTO	OK
Portsmouth Urban Area	UK0012	Met TV, > LTO	OK
Teesside Urban Area	UK0013	Met TV, > LTO	OK
The Potteries	UK0014	Met TV, > LTO	OK
Bournemouth Urban Area	UK0015	Met TV, > LTO	OK
Reading/Wokingham Urban Area	UK0016	Met TV, > LTO (m)	OK (m)
Coventry/Bedworth	UK0017	Met TV, > LTO	OK
Kingston upon Hull	UK0018	Met TV, > LTO	OK
Southampton Urban Area	UK0019	Met TV, > LTO (m)	OK
Birkenhead Urban Area	UK0020	Met TV, > LTO	OK
Southend Urban Area	UK0021	Met TV, > LTO	Met TV, > LTO (m)
Blackpool Urban Area	UK0022	Met TV, > LTO	OK
Preston Urban Area	UK0023	Met TV, > LTO	OK
Glasgow Urban Area	UK0024	Met TV, > LTO	OK
Edinburgh Urban Area	UK0025	Met TV, > LTO	OK
Cardiff Urban Area	UK0026	Met TV, > LTO (m)	OK
Swansea Urban Area	UK0027	Met TV, > LTO	OK
Belfast Metropolitan Urban Area	UK0028	Met TV, > LTO	OK (m)
Eastern	UK0029	Met TV, > LTO	Met TV, > LTO
South West	UK0030	Met TV, > LTO	Met TV, > LTO
South East	UK0031	Met TV, > LTO	Met TV, > LTO
East Midlands	UK0032	Met TV, > LTO	OK
North West & Merseyside	UK0033	Met TV, > LTO	OK
Yorkshire & Humberside	UK0034	Met TV, > LTO	Met TV, > LTO
West Midlands	UK0035	Met TV, > LTO	OK
North East	UK0036	Met TV, > LTO	Met TV, > LTO (m)
Central Scotland	UK0037	Met TV, > LTO	OK
North East Scotland	UK0038	Met TV, > LTO	OK
Highland	UK0039	Met TV, > LTO	OK
Scottish Borders	UK0040	Met TV, > LTO	OK
South Wales	UK0041	Met TV, > LTO	OK
North Wales	UK0042	Met TV, > LTO	OK
Northern Ireland	UK0043	Met TV, > LTO	OK

TV = target value, LTO = long-term objective, (m) indicates that the compliance or exceedance was determined by modelling.

In 2019 there were 96 measured exceedances of the ozone population information threshold of 180 $\mu\text{g m}^{-3}$ (at 13 sites), but no exceedances of the population warning threshold of 240 $\mu\text{g m}^{-3}$. The population information threshold exceedances are detailed in **Table 3-5**. All occurred on the following dates: 24th - 27th Aug 2019 (afternoon and early evening), 25th Jul 2019 (14:00-23:00) and 29th Jun 2019 (early evening). Also, there was one 1-hour mean of 180 $\mu\text{g m}^{-3}$ measured at Bournemouth at 17:00 on 21st Apr 2019: this equalled, but did not exceed, the threshold.

Table 3-5 Measured Exceedances of the Ozone Information Threshold Value in 2019

Site name	Zone code	Number of 1-hour exceedances of information threshold	Maximum 1-hour concentration ($\mu\text{g m}^{-3}$)
Northampton Spring Park	UK0032	17	227
Hull Freetown	UK0018	14	226
St Osyth	UK0029	14	233
Sibton	UK0029	9	238
Wicken Fen	UK0029	9	212
Norwich Lakenfields	UK0029	8	198
Canterbury	UK0031	5	187
High Muffles	UK0034	5	204
Rochester Stoke	UK0031	5	205
Weybourne	UK0029	5	222
Southend-on-Sea	UK0021	3	189
Middlesbrough	UK0013	1	190
Thurrock	UK0029	1	181

Table 3-5 shows the exceedances of the ozone information threshold in the verified dataset.

3.2 Fourth Daughter Directive 2004/107/EC

All zones met target values for arsenic and cadmium, but some zones exceeded the target value for nickel or benzo[a]pyrene. The results of the air quality assessment for arsenic (As), cadmium (Cd), nickel (Ni) and benzo[a]pyrene (B[a]P) for each zone are summarised in **Table 3-6**.

Concentrations of nickel were above the target value in four zones; Sheffield Urban Area, Swansea Urban Area, Yorkshire and Humberside, and South Wales. These Ni exceedances are attributed to emissions from industrial sources. The remaining 39 zones were compliant with the target values for nickel, as shown in **Table 3-6**. Concentrations of benzo[a]pyrene were above the target value in three zones; Swansea Urban Area, Yorkshire and Humberside, and South Wales.

Table 3-6 Results of Air Quality Assessment for As, Cd, Ni and B[a]P in 2019

Zone	Zone code	As TV	Cd TV	Ni TV	B[a]P TV
Greater London Urban Area	UK0001	OK	OK	OK	OK
West Midlands Urban Area	UK0002	OK (m)	OK (m)	OK (m)	OK
Greater Manchester Urban Area	UK0003	OK (m)	OK (m)	OK (m)	OK
West Yorkshire Urban Area	UK0004	OK (m)	OK (m)	OK (m)	OK
Tyneside	UK0005	OK (m)	OK (m)	OK (m)	OK
Liverpool Urban Area	UK0006	OK (m)	OK (m)	OK (m)	OK
Sheffield Urban Area	UK0007	OK	OK	> TV (m)	OK
Nottingham Urban Area	UK0008	OK (m)	OK (m)	OK (m)	OK
Bristol Urban Area	UK0009	OK (m)	OK (m)	OK (m)	OK (m)
Brighton/Worthing/Littlehampton	UK0010	OK (m)	OK (m)	OK (m)	OK (m)
Leicester Urban Area	UK0011	OK (m)	OK (m)	OK (m)	OK (m)
Portsmouth Urban Area	UK0012	OK (m)	OK (m)	OK (m)	OK (m)
Teesside Urban Area	UK0013	OK (m)	OK (m)	OK (m)	OK
The Potteries	UK0014	OK (m)	OK (m)	OK (m)	OK (m)
Bournemouth Urban Area	UK0015	OK (m)	OK (m)	OK (m)	OK (m)
Reading/Wokingham Urban Area	UK0016	OK (m)	OK (m)	OK (m)	OK (m)
Coventry/Bedworth	UK0017	OK (m)	OK (m)	OK (m)	OK (m)
Kingston upon Hull	UK0018	OK (m)	OK (m)	OK (m)	OK (m)
Southampton Urban Area	UK0019	OK (m)	OK (m)	OK (m)	OK (m)
Birkenhead Urban Area	UK0020	OK (m)	OK (m)	OK (m)	OK (m)
Southend Urban Area	UK0021	OK (m)	OK (m)	OK (m)	OK (m)
Blackpool Urban Area	UK0022	OK (m)	OK (m)	OK (m)	OK (m)
Preston Urban Area	UK0023	OK (m)	OK (m)	OK (m)	OK (m)
Glasgow Urban Area	UK0024	OK (m)	OK (m)	OK (m)	OK
Edinburgh Urban Area	UK0025	OK (m)	OK (m)	OK (m)	OK
Cardiff Urban Area	UK0026	OK (m)	OK (m)	OK (m)	OK
Swansea Urban Area	UK0027	OK	OK	> TV	> TV (m)
Belfast Urban Area	UK0028	OK	OK	OK	OK
Eastern	UK0029	OK	OK	OK	OK
South West	UK0030	OK	OK	OK	OK
South East	UK0031	OK	OK	OK	OK
East Midlands	UK0032	OK	OK	OK	OK
North West & Merseyside	UK0033	OK (m)	OK (m)	OK (m)	OK
Yorkshire & Humberside	UK0034	OK	OK	> TV (m)	> TV
West Midlands	UK0035	OK	OK	OK	OK (m)
North East	UK0036	OK (m)	OK (m)	OK (m)	OK
Central Scotland	UK0037	OK	OK	OK	OK
North East Scotland	UK0038	OK (m)	OK (m)	OK (m)	OK (m)
Highland	UK0039	OK (m)	OK (m)	OK (m)	OK
Scottish Borders	UK0040	OK	OK	OK	OK (m)
South Wales	UK0041	OK	OK	> TV (m)	> TV (m)
North Wales	UK0042	OK (m)	OK (m)	OK (m)	OK (m)
Northern Ireland	UK0043	OK (m)	OK (m)	OK (m)	OK

TV = target value, (m) indicates that the compliance or exceedance was determined by modelling.

4 Comparison with Previous Years

This section provides information on non-compliances in previous years from 2008 onwards.

For **SO₂**, **PM_{2.5}**, **lead**, **benzene** and **CO**, the UK has been compliant with Air Quality Directive limit values (apart from the PM_{2.5} Stage 2 indicative limit value) in all years since 2008 (the year the Air Quality Directive came into force). For information on compliance with the 1st and 2nd Daughter Directives for all pollutants in earlier years, please see the 2012 or earlier reports in this series, which can be found here: <https://uk-air.defra.gov.uk/library/annualreport/>.

The UK has been compliant with the limit values for both **lead** and **CO** since 2003, and for **benzene** since 2007: these limit values are the same as those contained in the 1st and 2nd Daughter Directives, which the Air Quality Directive superseded.

For oxides of nitrogen, **Table 4-1** summarises the results of the air quality assessment in years from 2008 to 2019. This table shows the numbers of zones exceeding the limit value (plus any agreed margin of tolerance, in cases where a time extension had been granted). The right-hand column contains notes on the effects of any time extensions. As of 1st January 2015, there have been no margins of tolerance in force for any pollutant.

All non-agglomeration zones within the UK have complied with the critical level for annual mean NO_x concentration, set for protection of vegetation, in years 2008 onwards.

For PM₁₀, **Table 4-2** summarises the results of the air quality assessment in years from 2008 to 2019. Again, there are notes in the right-hand column explaining the effects of the time extensions which were in place up to the end of 2011 for some zones.

For ozone, **Table 4-3** summarises annual exceedances of the limit value for human health (based on the maximum daily 8-hour mean), the limit value for protection of vegetation (based on the AOT40 statistic), and the two long-term objectives (LTOs) based on these two metrics.

Finally, for the pollutants covered by the Fourth Daughter Directive - arsenic (As), cadmium (Cd), nickel (Ni) and benzo[a]pyrene (B[a]P), **Table 4-4** summarises the numbers of zones with exceedances of target values in previous years.

Table 4-1 Non-Compliances with the Limit Values of the Air Quality Directive for Nitrogen Dioxide, 2008-2019

Year	Zones Exceeding NO ₂ LV for health (1hr mean)	Zones Exceeding NO ₂ LV for health (annual mean)	Notes on Time Extensions
2008	3 zones (London, Glasgow, N.E. Scotland)	40 zones	-
2009	2 zones (London, Glasgow)	40 zones	-
2010	3 zones (London, Teesside, Glasgow)	40 zones	-
2011	3 zones (London, Glasgow, South East)	35 zones	<i>A further 5 zones exceeded the annual mean NO₂ LV in 2011 but were covered by time extensions and within the LV+ Margin of Tolerance (MOT), therefore compliant.</i>
2012	2 zones (London, South East)	34 zones	<i>A further 4 zones exceeded the annual mean NO₂ LV in 2012 but were covered by time extensions and within the LV+ MOT, therefore compliant.</i>
2013	1 zone (London)	31 zones	<i>A further 7 zones exceeded the annual mean NO₂ LV in 2013 but were covered by time extensions and within the LV+ MOT, therefore compliant.</i>
2014	2 zones (London, South Wales)	30 zones	<i>A further 8 zones exceeded the annual mean NO₂ LV in 2014 but were covered by time extensions and within the LV+ MOT, therefore compliant.</i>
2015	2 zones (London, South Wales)	37 zones	<i>2015 was the first year with no time extensions for NO₂: this is the reason for the apparent increase in zones exceeding between 2014 and 2015.</i>
2016	2 zones (London, South Wales)	37 zones	<i>No time extensions in place.</i>
2017	2 zones (London, South Wales)	37 zones	<i>No time extensions in place.</i>
2018	2 zones (London, South Wales)	36 zones	<i>No time extensions in place.</i>
2019	1 zone (South Wales)	33 zones	<i>No time extensions in place.</i>

Table 4-2 Non-Compliances with the Limit Values of the Air Quality Directive for PM₁₀, 2008-2019

Year	PM ₁₀ LV (annual mean)	PM ₁₀ LV (daily mean)	Notes on Time Extensions and Subtraction of Natural contribution
2008	None	2 zones (1 zone after subtraction of natural contribution)	-
2009	None	3 zones (1 zone after subtraction of natural contribution)	-
2010	None	None (after subtraction of natural contribution)	<i>One zone exceeded the daily mean PM₁₀ limit value more than the permitted 35 times in 2010, after subtraction of natural contribution. This zone was covered by a time extension and was within the LV+MOT so was therefore compliant.</i>
2011	None	None (after subtraction of natural contribution)	<i>One zone exceeded the daily mean PM₁₀ limit value more than the permitted 35 times in 2011, after subtraction of natural contribution. This zone was covered by a time extension and was within the LV+MOT so was therefore compliant.</i>
2012	None	None (after subtraction of natural contribution. No time extension.)	-
2013	None	None (after subtraction of natural contribution. No time extension.)	-
2014	None	None (after subtraction of natural contribution. No time extension.)	-
2015	None	None (after subtraction of natural contribution. No time extension.)	-
2016	None	None	-
2017	None	None	-
2018	None	None	-
2019	None	None	-

Table 4-3 Exceedances of Air Quality Directive Target Values for Ozone (Health) and Long-Term Objectives, 2008-2019

Year	8-Hour Mean Target Value	AOT40 Target Value	8-Hour Mean LTO	AOT40 LTO
2008	1 zone measured (Eastern)	None	43 zones	41 zones
2009	None	None	39 zones	10 zones
2010	None	None	41 zones	6 zones
2011	None	None	43 zones	3 zones
2012	None	None	41 zones	3 zones
2013	None	None	33 zones	8 zones
2014	None	None	32 zones	3 zones
2015	None	None	43 zones	1 zone
2016	None	None	42 zones	5 zones
2017	None	None	34 zones	None
2018	None	None	43 zones	38 zones
2019	None	None	43 zones	6 zones

Table 4-4 Number of Zones Exceeding 4th Daughter Directive Target Values for As, Cd, Ni and B[a]P, 2008-2019

Year	As	Cd	Ni	B[a]P
2008	None	None	2 (Swansea, South Wales)	6 (Yorkshire & Humberside, Teesside, Northern Ireland, Swansea, South Wales, Belfast)
2009	None	None	2 (Swansea, South Wales)	6 (Yorkshire & Humberside, Northern Ireland, Teesside, Swansea, North East, South Wales)
2010	None	None	2 (Swansea, South Wales)	8 zones, (Yorkshire & Humberside, Northern Ireland, Teesside, Belfast, W Midlands, North East, South Wales, North Wales.)
2011	None	None	2 (Swansea, South Wales)	7 (Yorkshire & Humberside, Northern Ireland, Teesside, Swansea, Belfast, North East, South Wales)
2012	None	None	2 (Swansea, South Wales)	8 (Yorkshire & Humberside, Teesside, Swansea, Belfast, the North East, South Wales, North Wales, Northern Ireland.)
2013	None	None	2 (Swansea, South Wales)	6 (Yorkshire & Humberside, Teesside, Swansea, the East Midlands, the North East, South Wales.)
2014	None	None	3 (Sheffield, Swansea, South Wales)	6 (Yorkshire & Humberside, Teesside, Swansea, the East Midlands, the North East and South Wales).
2015	None	None	2 (Swansea, South Wales)	5 (Yorks. & Humberside, Teesside, Swansea, the North East and South Wales).
2016	None	None	3 (Sheffield, Swansea, South Wales)	4 (Yorks. & Humberside, Swansea, South Wales and Northern Ireland).
2017	None	None	None	3 (Yorks. & Humberside, Swansea and South Wales)
2018	None	None	4 (Sheffield, Yorks. & Humberside, Swansea and South Wales)	3 (Yorks. & Humberside, Swansea and South Wales)
2019	None	None	4 (Sheffield, Yorks. & Humberside, Swansea and South Wales)	3 (Yorks. & Humberside, Swansea and South Wales)

References

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- ² European Parliament and Council of the European Union (2004) '*Directive 2004/107/EC of the European Parliament and of the Council of 15 December 2004 relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air*'. [online]. Available at <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32004L0107:EN:NOT>, (Accessed 28 Jul 2020).
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- ⁴ Department for Environment, Food and Rural Affairs and Department for Transport (2017) '*UK plan for tackling roadside nitrogen dioxide concentrations*' [online]. Available at <https://www.gov.uk/government/publications/air-quality-plan-for-nitrogen-dioxide-no2-in-uk-2017> . (Accessed 15 Sep 2020).