



Department
for Environment
Food & Rural Affairs

Air Pollution in the UK 2016

Compliance Assessment Summary

September 2017



© Crown copyright 2017

You may re-use this information (excluding logos) free of charge in any format or medium, under the terms of the Open Government Licence v.3. To view this licence visit www.nationalarchives.gov.uk/doc/open-government-licence/version/3/ or email PSI@nationalarchives.gsi.gov.uk

This publication is available at <https://uk-air.defra.gov.uk/library/annualreport/index>

Any enquiries regarding this publication should be sent to us at

air.quality@defra.gsi.gov.uk

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 2016 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 2016.

This document is an extract from a larger report, '*Air Pollution in the UK 2016*', 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 2016 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 all but two zones.
- Six zones were compliant with the limit value for annual mean NO₂. The remaining 37 exceeded this limit value.
- Four zones exceeded the target value for benzo[a]pyrene.
- Three zones exceeded the target value for nickel.
- 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.
- All zones except one exceeded the long-term objective for ozone, set for the protection of human health. This is based on the maximum daily eight-hour mean.
- Five zones exceeded 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 the target value 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 Stage 2 limit value which must be met by 2020.
- All zones met the EU limit values for sulphur dioxide, carbon monoxide, lead and benzene.

A summary of the air quality assessment for 2016 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>.

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/>, www.scottishairquality.co.uk, www.welshairquality.co.uk and www.airqualityni.co.uk.

This page is intentionally blank.

Contents

1	Introduction	1
2	Definition of Zones	2
3	Air Quality Assessment for 2016	4
3.1	Directive 2008/50/EC on Ambient Air Quality and Cleaner Air for Europe	4
3.2	Fourth Daughter Directive 2004/107/EC	12
4	Comparison with Previous Years	14
	References	19

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. The UK has domestic, EU and international elements to our legal framework for tackling air pollution. As part of the EU legislation on air quality, all Member States of the European Union (EU) must comply with Directive 2008/50/EC on Ambient Air Quality and Cleaner Air for Europe¹ (referred to as 'the Air Quality Directive') and the Fourth Air Quality Daughter Directive² (2004/107/EC). These Directives require all Member States, including the UK, to undertake air quality assessment, and to report the findings to the European Commission on an annual basis.

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. 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 2016 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 <http://uk-air.defra.gov.uk/>.

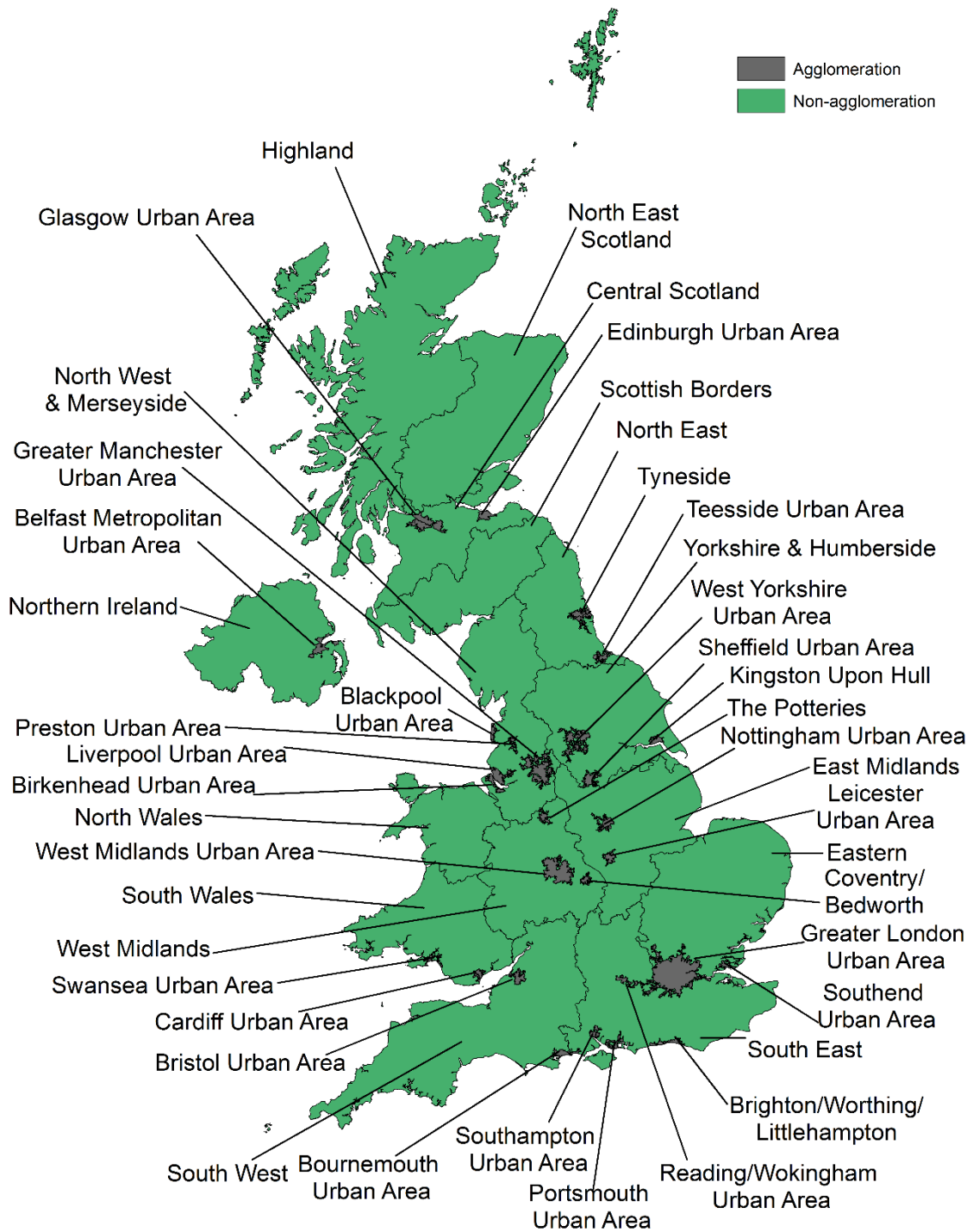
2 Definition of Zones

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 Zones for Ambient Air Quality Reporting 2016

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 2016



© Crown copyright. All rights reserved Defra, Licence number 100022861 [2017]

3 Air Quality Assessment for 2016

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 e-Reporting. 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 2016 are summarised in **Table 3-1** to **Table 3-6**. The tables have been completed as follows:

- Where all measurements were within the relevant limit values in 2016, 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 2016, 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 2016. The 2016 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 2016 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**.

Two zones had locations where the 1-hour limit value (200 µg m⁻³) was exceeded on more than the permitted 18 occasions during 2016: Greater London Urban Area (UK0001) and South Wales (UK0041). The remaining 41 zones and agglomerations complied with the 1-hour mean NO₂ limit value.

Six zones *met* the annual mean limit value for NO₂ in 2016:

- Brighton/Worthing/Littlehampton (UK0010)
- Blackpool Urban Area (UK0022)
- Preston Urban Area (UK0023)
- Highland (UK0039)
- Scottish Borders (UK0040)
- Northern Ireland (UK0043).

The remaining 37 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.

PM₁₀ Particulate Matter: 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 2016 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.

Table 3-1 Results of Air Quality Assessment for Nitrogen Dioxide in 2016

Zone	Zone code	NO ₂ LV for health (1hr mean)	NO ₂ LV for health (annual mean)	NO _x critical level for vegetation (annual mean)
Greater London Urban Area	UK0001	> LV	> 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	> LV	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	> LV (m)	n/a
Southampton Urban Area	UK0019	OK	> LV	n/a
Birkenhead Urban Area	UK0020	OK	> LV (m)	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 (m)	> LV (m)	n/a
Cardiff Urban Area	UK0026	OK	> LV (m)	n/a
Swansea Urban Area	UK0027	OK	> LV (m)	n/a
Belfast Urban Area	UK0028	OK	> LV	n/a
Eastern	UK0029	OK	> LV	OK
South West	UK0030	OK	> LV	OK
South East	UK0031	OK	> LV	OK
East Midlands	UK0032	OK	> LV (m)	OK
North West & Merseyside	UK0033	OK	> LV	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	OK (m)
Highland	UK0039	OK	OK	OK (m)
Scottish Borders	UK0040	OK	OK	OK
South Wales	UK0041	> LV	> LV	OK (m)
North Wales	UK0042	OK	> LV (m)	OK
Northern Ireland	UK0043	OK	OK	OK (m)

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

Table 3-2 Results of Air Quality Assessment for PM₁₀ in 2016

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 (m)	OK (m)
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 (m)	OK (m)
Kingston upon Hull	UK0018	OK	OK
Southampton Urban Area	UK0019	OK (m)	OK (m)
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 (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 (m)	OK (m)
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

In Table 4-3, LV = limit value, (m) indicates that the compliance or exceedance was determined by modelling.

PM_{2.5} Particulate Matter: all zones met the target value for annual mean concentration of PM_{2.5} particulate matter (25 µg m⁻³ to be achieved by 1st Jan 2010), 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 limit value (20 µg m⁻³ to be achieved by 1st Jan 2020). All three apply to the calendar year mean.

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 events (1999/30/EC Article 5(4)) or natural contributions (2008/50/EC Article 20) 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.)

The AEI for the reference year 2015 is set at 20 µg 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 2016 was calculated as follows:

- 2014: 12 µg m⁻³
- 2015: 10 µg m⁻³
- 2016: 10 µg m⁻³

The mean of these three values (to the nearest integer) is 11 µg m⁻³. The exposure reduction target has therefore been met before 2020.

Table 3-3 Results of Air Quality Assessment for PM_{2.5} in 2016.

Zone	Zone code	PM _{2.5} target value (annual mean, for 1 st Jan 2010)	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	OK
West Midlands Urban Area	UK0002	OK	OK	OK
Greater Manchester Urban Area	UK0003	OK	OK	OK
West Yorkshire Urban Area	UK0004	OK	OK	OK
Tyneside	UK0005	OK	OK	OK
Liverpool Urban Area	UK0006	OK	OK	OK
Sheffield Urban Area	UK0007	OK	OK	OK
Nottingham Urban Area	UK0008	OK	OK	OK
Bristol Urban Area	UK0009	OK	OK	OK
Brighton/Worthing/Littlehampton	UK0010	OK	OK	OK
Leicester Urban Area	UK0011	OK	OK	OK
Portsmouth Urban Area	UK0012	OK	OK	OK
Teesside Urban Area	UK0013	OK	OK	OK
The Potteries	UK0014	OK	OK	OK
Bournemouth Urban Area	UK0015	OK	OK	OK
Reading/Wokingham Urban Area	UK0016	OK	OK	OK
Coventry/Bedworth	UK0017	OK	OK	OK
Kingston upon Hull	UK0018	OK	OK	OK
Southampton Urban Area	UK0019	OK (m)	OK (m)	OK (m)
Birkenhead Urban Area	UK0020	OK	OK	OK
Southend Urban Area	UK0021	OK	OK	OK
Blackpool Urban Area	UK0022	OK	OK	OK
Preston Urban Area	UK0023	OK	OK	OK
Glasgow Urban Area	UK0024	OK	OK	OK
Edinburgh Urban Area	UK0025	OK	OK	OK
Cardiff Urban Area	UK0026	OK	OK	OK
Swansea Urban Area	UK0027	OK	OK	OK
Belfast Metropolitan Urban Area	UK0028	OK	OK	OK
Eastern	UK0029	OK	OK	OK
South West	UK0030	OK	OK	OK
South East	UK0031	OK	OK	OK
East Midlands	UK0032	OK	OK	OK
North West & Merseyside	UK0033	OK	OK	OK
Yorkshire & Humberside	UK0034	OK	OK	OK
West Midlands	UK0035	OK	OK	OK
North East	UK0036	OK	OK	OK
Central Scotland	UK0037	OK	OK	OK
North East Scotland	UK0038	OK	OK	OK
Highland	UK0039	OK	OK	OK
Scottish Borders	UK0040	OK (m)	OK (m)	OK (m)
South Wales	UK0041	OK	OK	OK
North Wales	UK0042	OK	OK	OK
Northern Ireland	UK0043	OK (m)	OK (m)	OK (m)

Subtraction of natural source contribution was not carried out for any zones in 2016.

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

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. All but one of the 43 zones and agglomerations were *above* the long-term objective (LTO) for health in 2016, the exception being Edinburgh Urban Area (UK0025).

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. Five zones (Yorkshire and Humberside, the West Midlands, the North East, South Wales and North Wales) were above the long-term objective for vegetation in 2016.

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 2016

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 (m)	OK
Liverpool Urban Area	UK0006	Met TV, > LTO	OK
Sheffield Urban Area	UK0007	Met TV, > LTO	OK
Nottingham Urban Area	UK0008	Met TV, > LTO	OK
Bristol Urban Area	UK0009	Met TV, > LTO (m)	OK
Brighton/Worthing/Littlehampton	UK0010	Met TV, > LTO (m)	OK
Leicester Urban Area	UK0011	Met TV, > LTO	OK
Portsmouth Urban Area	UK0012	Met TV, > LTO (m)	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	OK
Coventry/Bedworth	UK0017	Met TV, > LTO	OK
Kingston upon Hull	UK0018	Met TV, > LTO	OK
Southampton Urban Area	UK0019	Met TV, > LTO (m)	OK (m)
Birkenhead Urban Area	UK0020	Met TV, > LTO	OK
Southend Urban Area	UK0021	Met TV, > LTO	OK
Blackpool Urban Area	UK0022	Met TV, > LTO	OK
Preston Urban Area	UK0023	Met TV, > LTO	OK
Glasgow Urban Area	UK0024	Met TV, > LTO (m)	OK
Edinburgh Urban Area	UK0025	OK	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 (m)	OK
Eastern	UK0029	Met TV, > LTO	OK
South West	UK0030	Met TV, > LTO (m)	OK
South East	UK0031	Met TV, > LTO	OK
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	Met TV, > LTO (m)
North East	UK0036	Met TV, > LTO (m)	Met TV, > LTO (m)
Central Scotland	UK0037	Met TV, > LTO (m)	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	Met TV, > LTO (m)
North Wales	UK0042	Met TV, > LTO	Met TV, > LTO
Northern Ireland	UK0043	Met TV, > LTO	OK

Footnote to Table 4-5: TV = target value, LTO = long-term objective, (m) indicates that the compliance or exceedance was determined by modelling.

In 2016 there were five measured exceedances of the ozone population information threshold (at four sites), but no exceedances of the population warning threshold. The information threshold exceedances are detailed in **Table 3-5**. All exceedances occurred between 19:00 and 20:00 on 19th July 2016.

Table 3-5 Measured Exceedances of the Ozone Information Threshold Value in 2016

Site name	Zone code	Number of 1-hour exceedances of information threshold	Maximum 1-hour concentration ($\mu\text{g m}^{-3}$)
Canterbury	UK0031	1	186
Sibton	UK0029	2	181
Southend-on-Sea	UK0021	1	181
St Osyth	UK0029	1	194

3.2 Fourth Daughter Directive 2004/107/EC

All zones met target values for arsenic and cadmium but some zones exceeded target values for nickel and 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**.

All zones and agglomerations met the target values for arsenic and cadmium. Three zones (Sheffield Urban Area, Swansea Urban Area and South Wales) exceeded the target value for nickel. In these zones, the exceedance has been attributed to industrial sources.

Concentrations of B[a]P were above the target value in four zones; Swansea Urban Area, Yorkshire and Humberside, South Wales and Northern Ireland. In the Swansea Urban Area, South Wales, and Yorkshire and Humberside zones, exceedances are attributed to emissions from industrial sources. In Northern Ireland, domestic combustion is the main source of B[a]P.

The remaining 39 zones were compliant with the target value for B[a]P, as shown in **Table 3-6**.

Table 3-6 Results of Air Quality Assessment for As, Cd, Ni and B[a]P in 2016

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	OK	OK	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	OK (m)
Nottingham Urban Area	UK0008	OK (m)	OK (m)	OK (m)	OK (m)
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 (m)
South East	UK0031	OK	OK	OK	OK
East Midlands	UK0032	OK	OK	OK	OK
North West & Merseyside	UK0033	OK	OK	OK	OK
Yorkshire & Humberside	UK0034	OK	OK	OK	> 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)	> TV

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

4 Comparison with Previous Years

Table 4-1 to Table 4-5 summarise the results of the air quality assessment for 2016 and provide a comparison with the results of the assessments carried out in previous years since 2008 (the year in which the Air Quality Directive came into force). For information on compliance with the 1st and 2nd Daughter Directives in earlier years, please see the 2012 or earlier reports in this series. **Table 4-1** shows the number of zones exceeding the limit value plus any agreed margin of tolerance applicable in the relevant year (i.e. the numbers of zones that were non-compliant). If any additional zones were within the limit value plus an agreed MOT (and therefore compliant), for example for NO₂, this is shown in the footnotes. As of 1st January 2015, there are no longer any margins of tolerance (MOT) in force for any pollutants.

Table 4-1 Non-Compliances with the Limit Values of the Air Quality Directive

Pollutant	Avg. time	2008	2009	2010	2011	2012	2013	2014	2015	2016
SO ₂	1-hour	None	None	None	None	None	None	None	None	None
SO ₂	24-hour	None	None	None	None	None	None	None	None	None
SO ₂	Annual ⁱ	None	None	None	None	None	None	None	None	None
SO ₂	Winter ⁱ	None	None	None	None	None	None	None	None	None
NO ₂	1-hour ⁱⁱ	3 zones (London, Glasgow, NE Scotland)	2 zones (London, Glasgow)	3 zones (London, Teesside, Glasgow)	3 zones (London, Glasgow, South East)	2 zones (London, South East)	1 zone (London)	2 zones (London, South Wales)	2 zones (London, South Wales)	2 zones (London, South Wales)
NO ₂	Annual	40 zones	40 zones	40 zones	35 zones ⁱⁱⁱ	34 zones ^{iv}	31 zones ^v	30 zones ^{vi}	37 zones ^{vii}	37 zones
NO _x	Annual ⁱ	None	None	None	None	None	None	None	None	None

Pollutant	Avg. time	2008	2009	2010	2011	2012	2013	2014	2015	2016
PM ₁₀	Daily	2 zones (1 zone after subtraction of natural contribution)	3 zones (1 zone after subtraction of natural contribution)	None (after subtraction of natural contribution) ^{viii}	None (after subtraction of natural contribution) ^{ix}	None (after subtraction of natural contribution. No time extension.)	None (after subtraction of natural contribution. No time extension.)	None (after subtraction of natural contribution. No time extension.)	None (after subtraction of natural contribution. No time extension.)	None
PM ₁₀	Annual	None	None	None	None	None	None	None	None	None
Lead	Annual	None	None	None	None	None	None	None	None	None
Benzene	Annual	None	None	None	None	None	None	None	None	None
CO	8-hour	None	None	None	None	None	None	None	None	None

Footnotes to Table 4-1:

ⁱ Applies to vegetation and ecosystem areas only. Critical Levels are already in force, no MOT.

ⁱⁱ No modelling for 1-hour LV.

ⁱⁱⁱ A further five zones exceeded the annual mean NO₂ LV in 2011 but were covered by time extensions and within the LV+ MOT, therefore compliant.

^{iv} A further four zones exceeded the annual mean NO₂ LV in 2012 but were covered by time extensions and within the LV+ MOT, therefore compliant.

^v A further seven zones exceeded the annual mean NO₂ LV in 2013 but were covered by time extensions and within the LV+ MOT, therefore compliant.

^{vi} A further eight zones exceeded the annual mean NO₂ LV in 2014 but were covered by time extensions and within the LV+ MOT, therefore compliant.

^{vii} 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. In 2014, 5 zones met the limit value and a further 8 zones were legally compliant due to the time extension. The time extensions ended on 1st January 2015. In 2015, 6 zones met the limit value, but the remaining zones were no longer covered by the time extension, bringing the total number of non-compliant zones from 30 in 2014 to 37 in 2015

^{viii} 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.

^{ix} 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.

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.

Table 4-2 Exceedances of Air Quality Directive Target Values for Ozone (Health)

Pollutant	Averaging time	2008	2009	2010	2011	2012	2013	2014	2015	2016
O ₃	8-hour	1 zone measured (Eastern)	None	None	None	None	None	None	None	None
O ₃	AOT40	None	None	None	None	None	None	None	None	None

Table 4-3 Exceedances of Air Quality Directive Long Term Objectives for Ozone

Pollutant	Averaging time	2008	2009	2010	2011	2012	2013	2014	2015	2016
O ₃	8-hour	43 zones	39 zones	41 zones	43 zones	41 zones	33 zones	32 zones	43 zones	42 zones
O ₃	AOT40	41 zones	10 zones	6 zones	3 zones	3 zones	8 zones	3 zones	1 zone	5 zones

Table 4-4 Exceedances of 4th Daughter Directive Target Values

Pollutant	Averaging time	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
As	Annual	None	None	None	None	None	None	None	None	None	None
Cd	Annual	None	None	None	None	None	None	None	None	None	None
Ni	Annual	1 zone (Swansea)	2 zones (Swansea, S Wales)	2 zones (Swansea, S Wales)	2 zones (Swansea, S Wales)	2 zones, (Swansea, S Wales)	2 zones, (Swansea, S Wales)	2 zones, (Swansea, S Wales)	3 zones, (Sheffield, Swansea, S Wales)	2 zones, (Swansea and S Wales)	3 zones, (Sheffield, Swansea, S Wales)
B[a]P	Annual	1 zone (Yorkshire & Humberside)	6 zones (Yorkshire & Humberside, Teesside, N Ireland, Swansea, S Wales, Belfast)	6 zones (Yorkshire & Humberside, N Ireland, Teesside, Swansea, North East, S Wales)	8 zones, (Yorkshire & Humberside, N Ireland, Teesside, Belfast, W Midlands, North East, S Wales.)	7 zones (Yorkshire & Humberside, N Ireland, Teesside, Swansea, Belfast, North East, South Wales)	8 zones (Yorkshire & Humberside, Teesside, Swansea, Belfast, the North East, South Wales, North Wales, Northern Ireland.)	6 zones (Yorkshire & Humberside, Teesside, Swansea, the East Midlands, the North East, South Wales.)	6 zones (Yorkshire & Humberside, Teesside, Swansea, the East Midlands, the North East and South Wales).	5 zones (Yorks. & Humberside, Teesside, Swansea, the North East and South Wales).	4 zones (Yorks. & Humberside, Swansea, South Wales and Northern Ireland).

Table 4-5 Exceedances of Ambient Air Quality Directive Target Value for PM_{2.5}

Pollutant	Ave. time	2009	2010	2011	2012	2013	2014	2015	2016
PM _{2.5}	Annual	None	None	None	None	None	None	None	None

References

¹ European Parliament and Council of the European Union (2008) '*Council Directive on ambient air quality and cleaner air for Europe (2008/50/EC)*'. [online]. Available at <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32008L0050:EN:NOT> (Accessed 01 Aug 2017).

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 01 Aug 2017).

³ Brookes, D. M. et al. (2015) '*Technical report on UK supplementary assessment under the Air Quality Directive (2008/50/EC), the Air Quality Framework Directive (96/62/EC) and Fourth Daughter Directive (2004/107/EC) for 2014*'. Ricardo Energy & Environment report number R/3459 [online]. Available at https://uk-air.defra.gov.uk/assets/documents/reports/cat09/1611011538_AQ0650_2014_MAAQ_technical_report.pdf (Accessed 27 Jul 2017).