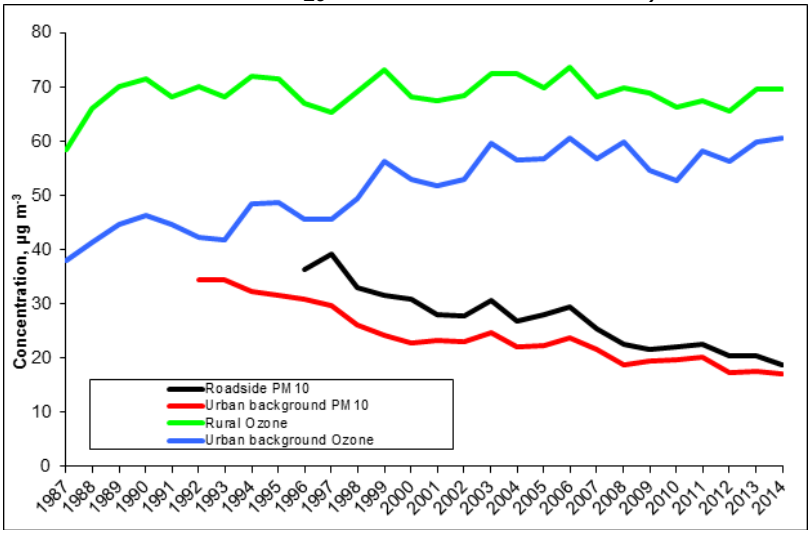
Department for Environment Food & Rural Affairs

Department for Environment, Food and Rural Affairs

STATISTICAL RELEASE: 23 April 2015

- **Urban background and roadside particulate pollution has shown long-term improvement with small decreases in concentration shown from 2013 to 2014.**
- **There were on average fewer days of Moderate or higher pollution at urban pollution monitoring sites in 2014 compared with 2013. There is a long-term decline in days of Moderate or higher pollution at urban sites.**
- **There were on average fewer days of Moderate or higher pollution at rural pollution monitoring sites in 2014 compared with 2013, reversing the small increase in the previous year. However, there is a great deal of year-on-year variability and there is no clear long-term trend.**
- **Urban background ozone pollution has remained fairly stable between 2003 and 2014, although concentrations have shown a long-term increase since monitoring began. Rural background ozone pollution has shown no clear long-term trend and stayed level at 66 µg m^{-3} in 2014.**
- **The main drivers of the average number of days when air pollution is Moderate or higher are particulate matter and ozone, for urban and rural pollution monitoring sites in the UK respectively.**

Annual levels of PM_{10} and Ozone in the UK, 1987 to 2014



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AIR QUALITY STATISTICS IN THE UK, 1987 TO 2014

Background

Why measure air quality?

Air pollution is a local, regional and international problem caused by the emission of pollutants, which either directly or through chemical reactions in the atmosphere lead to negative impacts on human health and ecosystems. There are many sources of air pollution, including power stations, traffic, household heating, agriculture and industrial processes.

There have been significant reductions in recent decades of emissions of air pollutants from the above mentioned sources. However, the relationship between emissions and ambient air quality is not straightforward. It is strongly affected by weather; for example, the gas ozone (O_3) is not emitted directly in significant quantities, but is created in the air through chemical reactions between other pollutants in sunlight, with more being created on hot, still, sunny days.

Day-to-day changes in weather also have a great influence on air quality. Levels of pollutants that are relatively high on a still day when dispersion is limited can be much lower the next day or even the next hour if a wind starts to blow. In addition UK air quality can be affected by pollutants blown across from mainland Europe. For example, emissions of the pollutants that lead to ozone formation have reduced substantially, but this is not reflected in the long-term trend in ozone concentrations. This is partly explained by a proportion of the ozone experienced in the UK originating from air pollutant emissions from mainland Europe and beyond.[i] It follows that air pollutant emissions reductions do not always produce a corresponding drop in atmospheric concentrations in the UK. Therefore it is important to measure ambient air quality as well as emissions. The statistics presented in this release provide an important overview of air quality in the UK.

In order to monitor air quality and help assess the risks to people's health and to the environment, the concentrations of key pollutants are measured via a national network of monitoring sites, the Automatic Urban and Rural Network (AURN), which continuously captures ambient concentrations of selected pollutants throughout the UK. The UK-AIR website provides further information and provides the most up-to-date data for all air pollutants measured by Defra.

In the UK, actions taken to improve air quality are driven by the objectives set out in the 2007 Air Quality Strategy[ii] and by EU standards for air quality which are set into English law through the Air Quality Standards Regulations (England) 2010[iii] and equivalent regulations in Scotland, Wales and Northern Ireland. UK actions are informed by the statistics derived

[i] UNECE, 2010, Hemispheric Transport of Air Pollution 2010m Part D: Answers to Policy-Relevant Science Questions, Air Pollution Studies No. 20. ECE/EB.AIR/103, United Nations Economic Commission for Europe, Geneva.

[ii] https://www.gov.uk/government/publications/the-air-quality-strategy-for-england-scotland-wales-and-northern-ireland-volume-1

[iii] http://www.legislation.gov.uk/uksi/2010/1001/contents/made

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from air quality monitoring. See Defra's air quality website for more information on air quality policy.

This statistical release covers **annual average concentrations** in the UK of two pollutants thought to have the greatest health impacts[iv]:

- Chronic exposure to **particulate matter** contributes to the risk of developing cardiovascular and respiratory diseases, and there is increasing evidence suggesting that long-term exposure to even low levels of Particulate matter may have a significant effect on health. The annual average concentrations for Particulate matter are considered a useful measure of overall exposure to Particulate matter at all concentrations.

- The gas **ozone** (O_3) can affect people's health and can damage, for example, wild plants, crops and forests. Higher levels of ground level ozone can cause breathing problems, trigger symptoms of asthma, reduce lung function and cause lung diseases. Several European studies have reported that current ozone concentrations in Europe have health effects, especially in the summer, and that daily mortality rises with increases in ozone exposure[v]. The ozone concentration reported in this release is the annual average of the maximum daily eight-hour running mean.

The statistical release also covers **the number of days when air pollution was Moderate or higher.** The indicator is intended to provide a summary measure of air pollutants that affect health. It should be noted that a change in methodology for this indicator was introduced in 2013, as described in the Pre-Release Announcement on Methodological Changes issued in February 2013[vi]. The five pollutants included in the indicator from the 1st January 2012 are as follows:

- Particulate matter ($PM_{2.5}$)
- nitrogen dioxide (NO_2)
- ozone (O_3)
- Particulate matter (PM_{10})
- sulphur dioxide (SO_2)

These five pollutants included in the indicator have known harmful effects on human health and the environment[vii]. These pollutants are principally the products of combustion from space heating, power generation or from motor vehicle traffic. Fine particles ($PM_{2.5}$) can be carried deep into the lungs where they can cause inflammation and a worsening of heart and lung diseases. The gases irritate the airways of the lungs, increasing the symptoms of those suffering from lung diseases.

Defra's air pollution information service uses an index and banding system recommended by the Committee on Medical Effects of Air Pollutants (COMEAP). This system was subject to major change when it was updated in January 2012, as described in the Pre-Release

[iv] http://www.comeap.org.uk/air
[v] WHO, 2008, Air quality and health, Fact sheet no 313 (http://www.who.int/mediacentre/factsheets/fs313/en/).
[vi] http://webarchive.nationalarchives.gov.uk/20130123162956/http:/www.defra.gov.uk/statistics/files/AQS-pre-release-statement-feb13.pdf
[vii] http://www.comeap.org.uk/air

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Announcement of February 2013[viii]. Some minor adjustments have been made to the thresholds in the index in April 2013 to ensure statistical alignment with calculation methods for EU Limit Values, as recommended by COMEAP. This statistical release has been undertaken using the updated April 2013 version which is set out in Table 6. These changes, together with an update on implementation of the index are provided in more detail on UK-AIR [ix].

The system uses an index numbered 1-10, divided into four bands, "low" to "very high", to provide more detail about air pollution levels in a simple way, similar to the sun index or pollen index. At the Moderate level, the effects of pollution may start to be noticeable to people with respiratory and other health problems, with greater risks to health at higher levels.

The definition of "Moderate or higher" for each of the above pollutants is according to the air pollution bandings used in the Daily Air Quality Index (Low, Moderate, High and Very High) for the purpose of air quality forecasting. Information on the bandings and thresholds used is contained in the Annex to this release.

Important changes to methodology

Changes have been made in recent years to the calculation methodology for the indicator "Annual levels of PM_{10} and Ozone in the UK". The data are now extracted from UK-AIR, which automatically applies a minimum annual data capture requirement of 75% for these annual statistics. From a scientific point of view this is a better approach: it has therefore been adopted for the annual PM_{10} and ozone indicator statistics as of 2013. For previous years, comparing the statistics produced with and without the 75% minimum data capture requirement showed that its use had minimal effect on the indicator statistics. Typically the difference was within 1 µg m^{-3} except in some cases for earlier years when there were fewer sites. For this reason, the statistics for years up to 2012 inclusive have not been changed. This change only affects the annual PM_{10} and ozone indicator statistics (Figure 1 and Annex Table 1): for the other statistics, those based on days with Moderate or higher pollution, a 75% minimum data capture requirement has been in use since 1998 (see footnotes to data tables).

As previously explained in the February 2013 Pre-Release Announcement, the following changes have been made to the calculation methodology for the indicator *'the number of days when air pollution was Moderate or higher*':

1. The pollutants included; and
2. The thresholds and in some cases, time periods used for the air pollution bandings.

The change to the pollutants is the replacement of carbon monoxide (CO) by fine particulate matter ($PM_{2.5}$), all other pollutants are still included. The changes to the thresholds have in most cases made the index more stringent. For nitrogen dioxide and PM_{10} the lower threshold of the Moderate band has been reduced, with the new threshold now consistent with the limit values set by the European Union Directive 2008/50/EC on Ambient Air Quality

[viii] http://webarchive.nationalarchives.gov.uk/20130123162956/http:/www.defra.gov.uk/statistics/files/AQS-pre-release-statement-feb13.pdf
[ix] http://uk-air.defra.gov.uk/library/reports?report_id=750

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and Cleaner Air for Europe. The April 2013 update additionally increases the Moderate band for sulphur dioxide by 1µg m^{-3} to align it with the UK 15 minute objective set out in the 2007 Air Quality Strategy.

For some pollutants (PM_{10} and ozone), the statistic on which the air quality banding is based has also changed. The air quality bandings for PM_{10} (and $PM_{2.5}$) now refer to the daily mean, while those for ozone now refer to the maximum daily eight-hour running mean instead of being based on either the maximum daily eight-hour or one-hour mean.

This change to the pollutants and the thresholds has had a significant effect on the indicator statistics. Results from 2010 onwards have been presented using the new methodology in bold fonts, with back calculations undertaken for 2011 and 2010 (Figures 2 and 3). Results using the old methodology for all years have been presented in lighter fonts for comparison. The bold results use the new selection of pollutants and the lighter font results use the old selection of pollutants. $PM_{2.5}$ data are not available prior to 2010 so back calculations have not been done for years previous to this.

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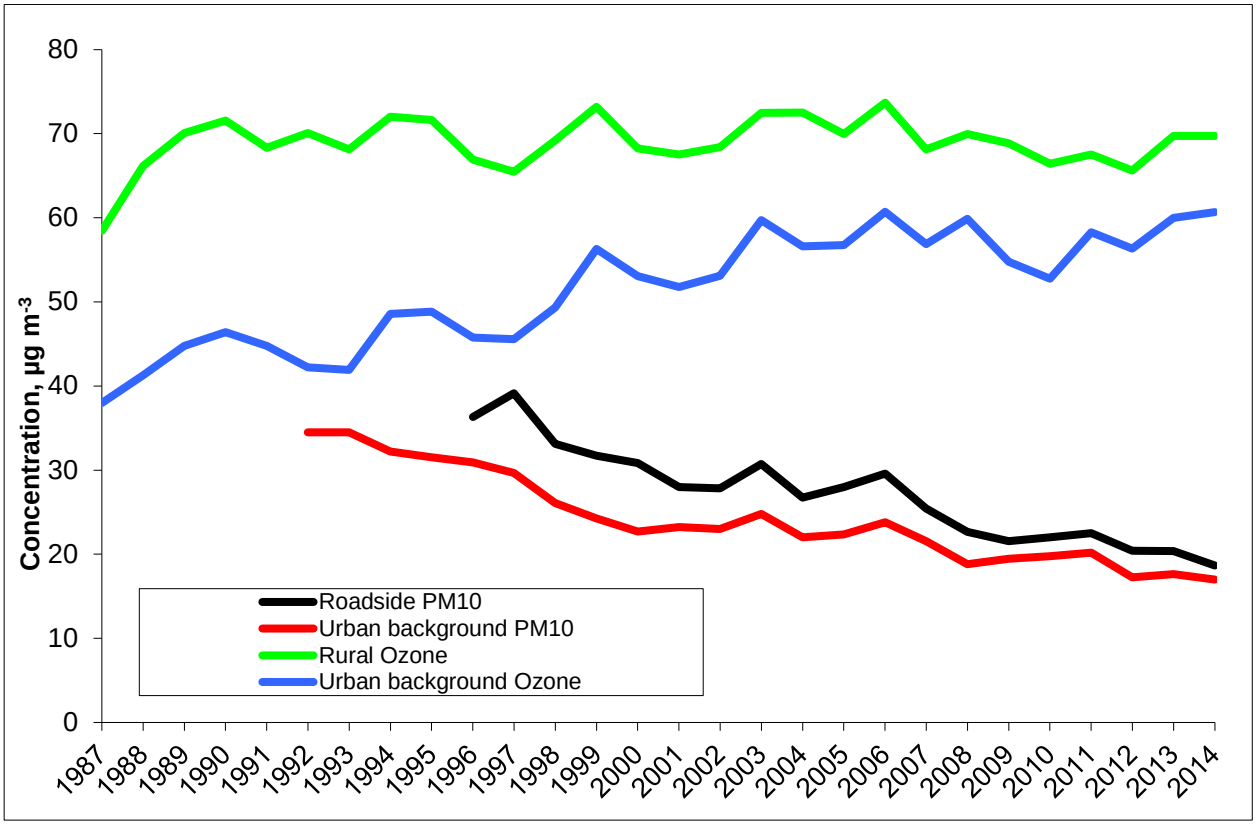
Particulate (PM_{10}) and Ozone concentrations

Figure 1: Annual concentrations of PM_{10} and Ozone in the UK, 1987 to 2014 (No data capture threshold pre-2013, 75% in 2013 onwards)



Notes:

The ozone index shows the annual average of the maximum daily eight-hour running mean, averaged over all included sites. The PM_{10} index shows the annual mean, averaged over all included sites.

Figure 1 illustrates that:

- **Urban background particulate pollution has shown long-term improvement but remained stable recently:** average concentrations have gone down fairly consistently throughout the time series to 17 µg m^{-3} in 2014, a new low since monitoring began in 1992. Concentrations changed little in the past seven years but in the past three years have remained consistently below the level in 2008.

- **Roadside particulate pollution has shown long-term improvement but changed little recently:** average concentrations have steadily declined to 19 µg m^{-3} in 2014, a new low since monitoring began in 1996. Concentrations changed little in the past seven years but in the past three years have remained consistently below the level in 2009.

- **Urban background ozone pollution has shown a long-term increase:** the average maximum daily eight hour mean concentration has increased since 1987 and was 61 µg

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m^{-3} in 2014. The recent upward trend between 2010 and 2014 reverses the short term decline between 2006 and 2010.

- **Rural background ozone pollution has shown no clear long-term trend and changed little recently:** average concentrations increased since 1987 to 70 µg m^{-3} in 2014. The average maximum daily eight hour mean concentration showed no change in 2014, remaining at similar levels to 2008.

The data are presented in Table 1 of the Annex at the end of this statistical release. Statistics for the previous year (2013) have been re-calculated as there were some minor changes to the dataset since last year's Statistical Release was produced.

Considering the causes of the trends in particulate matter concentrations, emissions of PM_{10} steadily declined until around a decade ago[x], since when the rate of decline decreased, and slight reductions have been seen in recent years. This is reflected in the measured urban background concentrations. The steady decline was attributable to a move away from coal to gas in both electricity generation and domestic and commercial combustion; and also the introduction of emission standards for road vehicles.

Both particulate and ozone concentrations are strongly influenced by weather, which contributes to the high variability over time and peaks such as in the hot summers of 2003 and 2006. This means that long time series are required to distinguish between weather effects and the effect of changes in pollutant emissions.

Emissions of the pollutants that are the main precursors to ozone (including nitrogen oxides (NO_x) and volatile organic compounds (VOCs)) have reduced substantially, but this is not reflected in the long-term trend in ozone concentrations. This may be partly explained by a proportion of the ozone experienced in the UK originating from releases of precursor pollutants that are blown over from mainland Europe.

However, a similar lack of an apparent link between emissions and measured concentrations of ozone in the air is observed Europe wide. The European Environment Agency provides further analysis of European air quality.

[x] See Statistical release: Emissions of air pollutants in the UK, 1970-2013

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Days with Moderate or higher air pollution

Figure 2: Average number of days per site when air pollution is Moderate or higher in the UK, 1987-2014

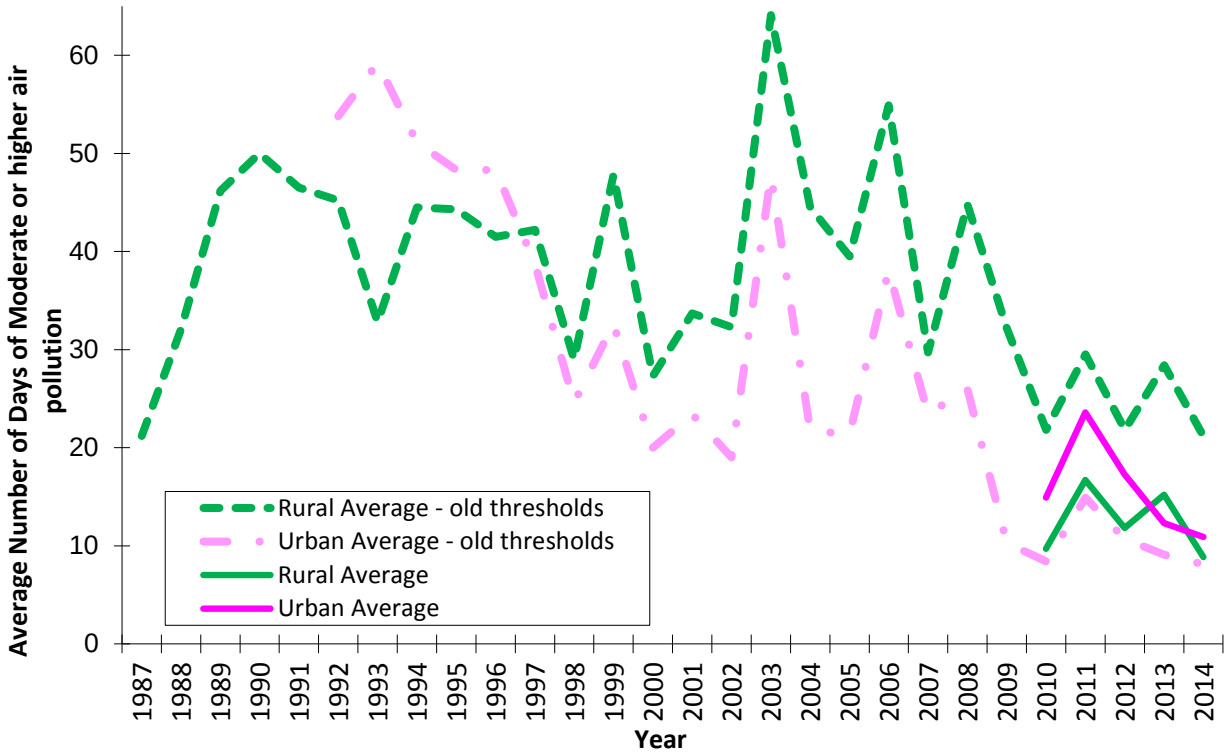

Figure 2 illustrates that:

- **There is a long-term decline in days of Moderate or higher pollution at urban sites:** using the old methodology it can be seen that the average number of days of Moderate or higher pollution has decreased since 1992 with notable peaks in 1999, 2003 and 2006.

- **There were on average fewer days of Moderate or higher pollution at urban pollution monitoring sites in 2014 compared with any other year since 2010**: using the new methodology, the average number of pollution days declined in 2014 from 24 days in 2011 to 11 days in 2014, which is below the previous lowest point of 12 days of Moderate or higher air pollution days in 2013.

- **There is no clear trend in the number of days of Moderate or higher air pollution at rural sites:** the new methodology shows that average number of days decreased from 15 days in 2013 to 9 days in 2014, returning to a similar level to 2010.

The data are presented in Table 2 of the Annex at the end of this statistical release

Data are presented using both the new and old index methodologies to allow a long term interpretation of trends. It should be noted that the new methodology has increased the number of days of Moderate or higher air pollution in urban areas. This reflects the lowering of the Low to Moderate threshold for NO_2 and PM_{10}, and the introduction of bandings for $PM_{2.5}$ in place of CO. Conversely, the number of days of Moderate or higher air pollution in

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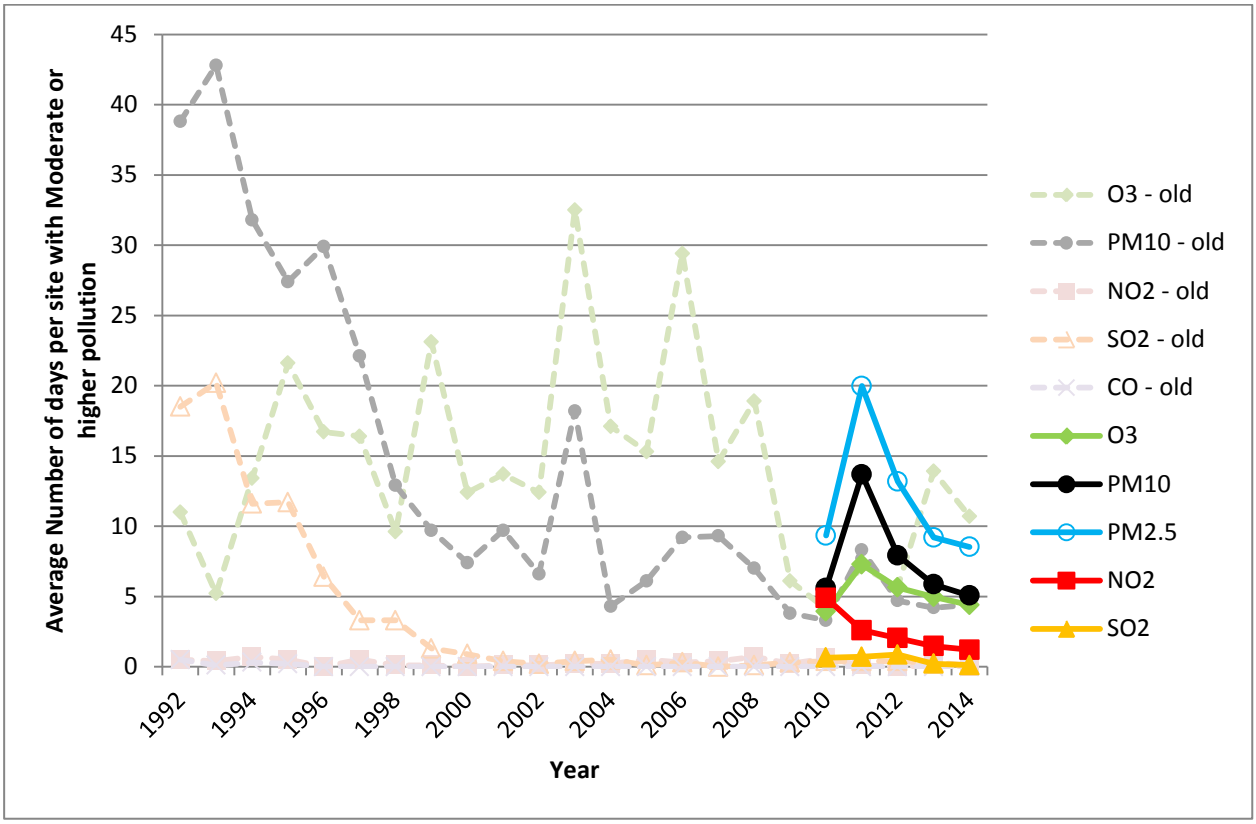
rural areas is lower compared to the old methodology. This is because the majority of Moderate or higher pollution days at rural sites are attributable to ozone, for which the calculation of the bandings has been changed to only be based on a daily maximum 8-hour mean rather than the higher of the daily maximum hourly or eight hourly means, and for which the lower threshold of the Moderate banding has not been tightened.

Figure 3: Average number of days when levels of ozone, particulate matter, nitrogen dioxide and sulphur dioxide were Moderate or higher at urban sites in the UK, 1992-2014 [xi]



Note: for the purposes of this chart, where more than one pollutant exceeds the Moderate threshold on any given day, it is counted for each pollutant i.e. there is double counting.

The data are presented in Table 3 of the Annex at the end of this statistical release

Figure 3 illustrates that:

- The new methodology shows that at urban sites in 2014 the average number of days above the Moderate threshold declined for each of the five pollutants. particulate matter was the main cause of Moderate or higher pollution days. The nitrogen dioxide contribution continued its steady decline to just over 1 day on average. The ozone contribution has remained just under that of PM_{10}.

[xi] The dotted lines on the graph refer to the old suite of pollutants and their bandings which have been in use since 1992. They are presented with the new suite of pollutants and the new banding for average number of days when concentrations of these pollutants were Moderate or higher at urban sites in the UK.

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- Using the new methodology PM_{10}, $PM_{2.5}$ and ozone caused the vast majority of the Moderate or higher pollution days in 2014, either separately or in combination with each other. These pollutants are influenced by weather, which contributes to the variability over time.

- The average number of days per site with Moderate or higher PM_{10} and nitrogen dioxide calculated with the new methodology has increased compared with the results from the old methodology, because of the more stringent banding thresholds.

The change in methodology has not significantly affected the average number of days per site with Moderate or higher ozone at urban sites. However, it should be noted that the new bandings are based on only the maximum daily 8-hour running mean, rather than the highest of the maximum daily 1-hour mean and 8-hour running mean and that this has led to a reduction in the number of pollution days in urban locations for 2014.

The new methodology shows that nitrogen dioxide has caused on average 1.2 days per site of Moderate or higher pollution in urban areas during 2014, showing a decline since 2010 which had five days per site of Moderate or higher nitrogen dioxide pollution. The new methodology increased the average number of days per site with Moderate or higher nitrogen dioxide because of the more stringent banding.

Sulphur dioxide continues to cause less than one pollution day per site on average, either solely or in combination with other pollutants. This low number of pollution days still reflects the large reductions in emissions from the early 1990s.

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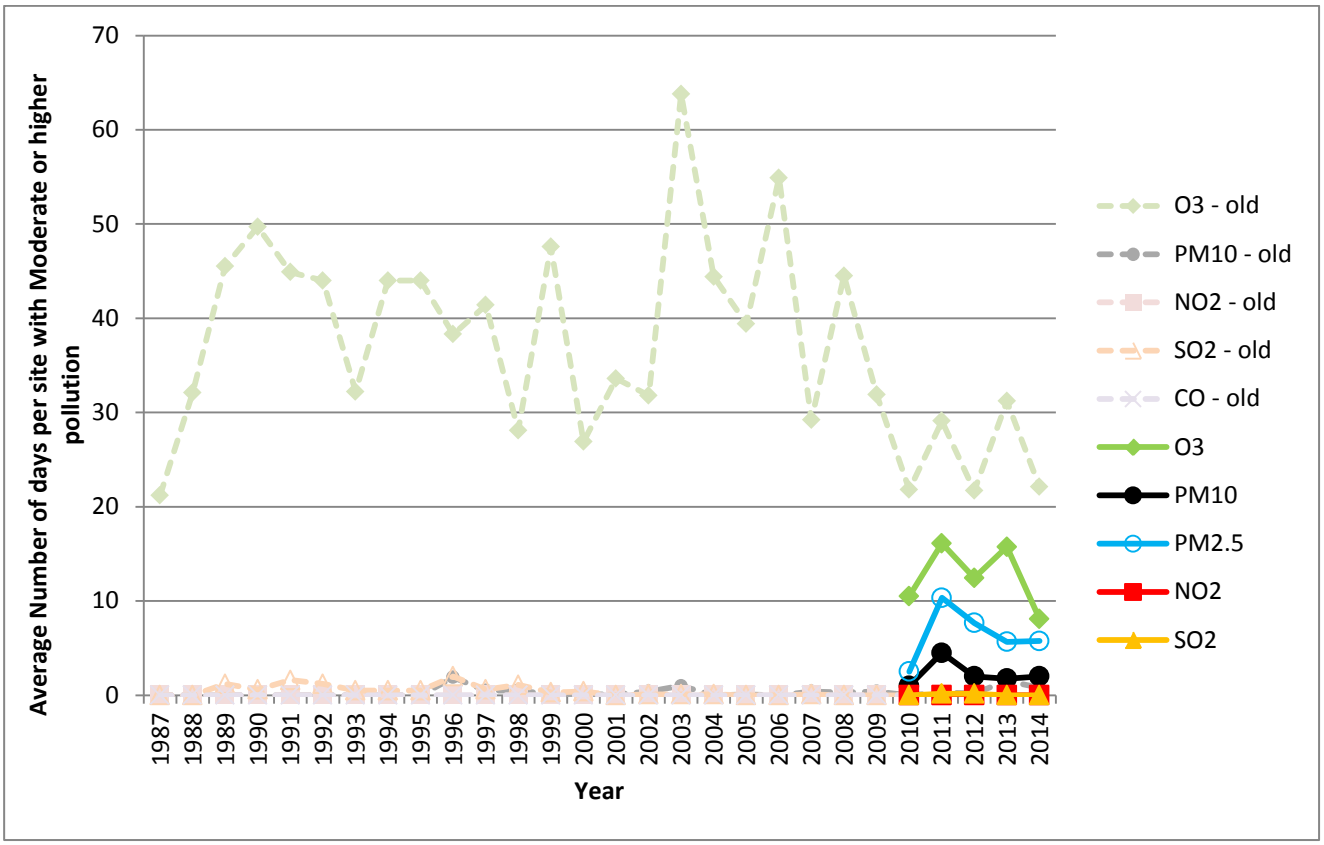
Figure 4: Average number of days when levels of ozone, particulate matter, nitrogen dioxide and sulphur dioxide were Moderate or higher at rural sites in the UK, 1992-2014 [xii]



Note: for the purposes of this chart, where more than one pollutant exceeds the Moderate threshold on any given day, it is counted for each pollutant i.e. there is double counting.

The data are presented in Table 4 of the Annex at the end of this statistical release

Figure 4 illustrates that:

For rural areas, ozone is the cause of the majority of pollution days, followed by particulate matter.

- The new methodology shows that at rural sites in 2014 ozone was the main cause of Moderate or higher pollution days, although the average number fell sharply from 16 to 8. Sulphur dioxide and nitrogen dioxide do not directly contribute to the pollution days at rural sites, with no days of medium or higher pollution attributed to these sources at any of the rural monitoring sites.

- Using the new methodology PM_{10}, $PM_{2.5}$ and ozone caused the vast majority of the Moderate or higher pollution days in 2014, either separately or in combination with each

[xii] The dotted lines on the graph refer to the old suite of pollutants and their bandings which have been in use since 1992. They are presented with the new suite of pollutants and the new banding for average number of days when concentrations of these pollutants were Moderate or higher at urban sites in the UK.

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other. These pollutants are influenced by weather, which contributes to the variability over time.

The change in methodology has significantly affected the average number of days per site with Moderate or higher ozone at rural sites. The new bandings are based on only the maximum daily 8-hour running mean, rather than the highest of the maximum daily 1-hour mean and 8-hour running mean and this has led to a reduction in the number of pollution days in rural locations for 2014, driven by Ozone pollution.

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Main notes

1. The banding system used to determine Moderate or higher air pollution is that of UK Daily Air Quality Index. The UK air quality index system underwent a major update on 1st January 2012. Additional minor amendments have been made to the index thresholds in April 2013. The revised version which has been used for this statistical release is displayed in Table 6 of the Annex.
2. More detailed data, site metadata and information are published on the UK-AIR website.
3. Further information on air quality policy is available from the Defra website.
4. Further details and data relating to UK air quality are available on Defra's Environment Statistics website.

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Annex

Table 1: Annual average levels of PM_{10} and Ozone ($\mu g\ m^{-3}$), 1987-2014, UK

Year	PM_{10}		Ozone	
	Roadside	Urban Background	Rural	Urban Background
1987	..	..	58	38
1988	..	..	66	41
1989	..	..	70	45
1990	..	..	72	46
1991	..	..	68	45
1992	..	35	70	42
1993	..	35	68	42
1994	..	32	72	49
1995	..	32	72	49
1996	36	31	67	46
1997	39	30	65	46
1998	33	26	69	49
1999	32	24	73	56
2000	31	23	68	53
2001	28	23	68	52
2002	28	23	68	53
2003	31	25	72	60
2004	27	22	73	57
2005	28	22	70	57
2006	30	24	74	61
2007	25	22	68	57
2008	23	19	70	60
2009	22 (19)[1]	19 (22)[1]	69	55
2010	22 (22)[1]	20	66	53
2011	23	20	68	58
2012	20	17	66	56
2013	20	18	70	60
2014	19	17	70	61

Notes:

1.Since 2008, upgrade of numerous PM_{10} monitoring instruments has enabled correction of measurements taken from sites using older equipment, by using the Volatile Correction Model (VCM). These results are shown in parentheses. Non-VCM corrected data for 2008 and 2009 are retained here for the purpose of year-on-year comparison. From 2011 all monitoring instruments had been upgraded so no correction is necessary.

PM_{10}: annual mean, averaged across all included sites.

Ozone: annual mean of the daily maximum 8 hour running mean: average across all included sites

.. not available because of insufficient data

Not every site in the automatic monitoring network is included. Sites must also meet certain data capture targets to be used in the index. For both ozone and PM_{10}, from 1987-97 data capture should be more than or equal to 50% of the year and from 1998 onwards it should be more than or equal to 75% of the year. For ozone this applies to both the full year and the summer period in isolation.

Cardiff Centre and Manchester Piccadilly were excluded in 1994 and 2001 respectively, because stone cutting adjacent to sites caused unrepresentative results. Narberth was excluded in 2004 and 2007 due to incorrect measurements. Great Dun Fell was excluded until 2001 due to sample lines being frozen. Reading New Town was excluded in 2008 due to low data capture for PM_{10} caused by faulty new measuring instruments.

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Table 2: Average number of days of Moderate or higher air pollution per site, 1987-2014, UK

	Rural Average		Urban Average	
Year	Old Thresholds	New Thresholds	Old Thresholds	New Thresholds
1987	*21.2*		...	
1988	*32.1*		...	
1989	*46.2*		...	
1990	*50*		...	
1991	*46.5*		...	
1992	*45.2*		*53.8*	
1993	*32.8*		*59.2*	
1994	*44.5*		*51.1*	
1995	*44.3*		*48.3*	
1996	*41.5*		*48.3*	
1997	*42.2*		*38.7*	
1998	*29*		*24.6*	
1999	*47.8*		*32.6*	
2000	*27.3*		*20*	
2001	*33.7*		*23.4*	
2002	*32.3*		*19*	
2003	*64.1*		*47.8*	
2004	*44.5*		*21.7*	
2005	*39.5*		*21.4*	
2006	*54.9*		*38.1*	
2007	*29.7*		*23.4*	
2008	*44.8*		*26*	
2009	*32.2*		*10.3*	
2010	*21.8*	9.7	*8.4*	14.9
2011	*29.5*	16.7	*14.9*	23.6
2012	*21.8*	11.8	*10.7*	17.3
2013	*28.4*	15.2	*9.1*	12.3
2014	*21.2*	8.9	*8.1*	10.9

Notes:

... Not available because of insufficient data

Not every site in the automatic monitoring network is included. Sites must also meet certain data capture targets to be used in the index. Urban sites are required to monitor PM_{10} and rural sites are required to monitor ozone. For the required pollutants, 1987-97 data capture should be more than or equal to 50% of the year, and from 1998 onwards it should be more than or equal to 75% of the year. For ozone this applies to both the full year and the summer period in isolation.

Cardiff Centre and Manchester Piccadilly were excluded in 1994 and 2001 respectively, because stone cutting adjacent to sites caused unrepresentative results. Narberth was excluded in 2004 and 2007 due to incorrect measurements. Great Dun Fell was excluded until 2001 due to sample lines being frozen. Reading New Town was excluded in 2008 due to initial problems with new measuring instruments.

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Table 3: Average number of days of Moderate or higher air pollution at urban sites caused by the each of the basket of 5 pollutants, 1992 to 2014, UK

Year	O3		NO2		CO	SO2		PM10		PM2.5
	Old	New	Old	New	Old	Old	New	Old	New	New
1992	*11*		*0.5*		*0.5*	*18.5*		*38.8*		
1993	*5.2*		*0.4*		*0.1*	*20.2*		*42.8*		
1994	*13.4*		*0.7*		*0.3*	*11.6*		*31.8*		
1995	*21.6*		*0.5*		*0.2*	*11.7*		*27.4*		
1996	*16.7*		*0*		*0*	*6.4*		*29.9*		
1997	*16.4*		*0.5*		*0*	*3.3*		*22.1*		
1998	*9.6*		*0.1*		*0*	*3.3*		*12.9*		
1999	*23.1*		*0.1*		*0*	*1.3*		*9.7*		
2000	*12.4*		*0*		*0*	*0.9*		*7.4*		
2001	*13.7*		*0.1*		*0*	*0.4*		*9.7*		
2002	*12.4*		*0.1*		*0*	*0.2*		*6.6*		
2003	*32.5*		*0.2*		*0*	*0.4*		*18.2*		
2004	*17.1*		*0.2*		*0*	*0.5*		*4.3*		
2005	*15.3*		*0.5*		*0*	*0.1*		*6.1*		
2006	*29.4*		*0.3*		*0*	*0.3*		*9.2*		
2007	*14.6*		*0.4*		*0*	*0*		*9.3*		
2008	*18.9*		*0.7*		*0*	*0.1*		*7*		
2009	*6.1*		*0.2*		*0*	*0.3*		*3.8*		
2010	*4.1*	3.9	*0.6*	4.9	*0*	*0.4*	0.6	*3.3*	5.6	9.3
2011	*7.1*	7.3	*0.1*	2.6	*0*	*0.4*	0.7	*8.3*	13.7	20.0
2012	*5.7*	5.6	*0*	2.0	*0*	*0.4*	0.9	*4.7*	7.9	13.2
2013	*13.9*	5.0	*0.1*	1.5	*0*	*0.3*	0.2	*4.2*	5.9	9.2
2014	*10.7*	4.4	*0*	1.2	*0*	*0.1*	0.1	*4.4*	5.1	8.5

Notes:

Not every site in the automatic monitoring network is included. Sites must also meet certain data capture targets to be used in the index. Urban sites are required to monitor PM_{10} and rural sites are required to monitor ozone. For the required pollutants, 1987-97 data capture should be more than or equal to 50% of the year, and from 1998 onwards it should be more than or equal to 75% of the year. For ozone this applies to both the full year and the summer period in isolation.

Cardiff Centre and Manchester Piccadilly were excluded in 1994 and 2001 respectively, because stone cutting adjacent to sites caused unrepresentative results. Narberth was excluded in 2004 and 2007 due to incorrect measurements. Great Dun Fell was excluded until 2001 due to sample lines being frozen. Reading New Town has been excluded in 2008 due to initial problems with new measuring instruments.

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Table 4: Average number of days of Moderate or higher air pollution at rural sites caused by the each of the basket of 5 pollutants, 1987 to 2014, UK

Year	O3		NO2		CO	SO2		PM10		PM2.5
	Old	New	Old	New	Old	Old	New	Old	New	New
1987	*21.2*		*0*		…	…		…		
1988	*32.1*		*0*		…	…		…		
1989	*45.5*		*0*		…	*0*		…		
1990	*49.7*		*0*		…	*1.2*		…		
1991	*44.9*		*0*		…	*0.6*		…		
1992	*44*		*0*		…	*1.6*		…		
1993	*32.2*		*0*		…	*1.2*		…		
1994	*44*		*0*		…	*0.5*		…		
1995	*44*		*0*		…	*0.5*		…		
1996	*38.3*		*0*		…	*0.5*		*0*		
1997	*41.4*		*0*		…	*2*		*1.9*		
1998	*28.1*		*0*		…	*0.6*		*0.5*		
1999	*47.6*		*0*		…	*1.1*		*0.5*		
2000	*26.9*		*0*		…	*0.3*		*0.1*		
2001	*33.6*		*0*		…	*0.4*		*0.1*		
2002	*31.8*		*0*		*0*	*0*		*0.1*		
2003	*63.8*		*0*		*0*	*0.1*		*0.4*		
2004	*44.4*		*0*		*0*	*0.1*		*1*		
2005	*39.4*		*0*		*0*	*0.1*		*0*		
2006	*54.9*		*0*		*0*	*0*		*0.1*		
2007	*29.2*		*0*		*0*	*0*		*0*		
2008	*44.5*		*0*		*0*	*0.1*		*0.4*		
2009	*31.9*		*0*		*0*	*0*		*0.3*		
2010	*21.8*	10.5	*0*	0.0	*0*	*0*	0.0	*0.4*	1.0	2.5
2011	*29.1*	16.1	*0*	0.0	*0*	*0*	0.2	*0*	4.5	10.3
2012	*21.7*	12.4	*0*	0.0	*0*	*0*	0.2	*0.3*	2.0	7.7
2013	*31.2*	15.7	*0*	0.0	*0*	*0.1*	0.0	*0.2*	1.8	5.7
2014	*22.1*	8.1	*0*	0.0	*0*	*0*	0.0	*1.5*	2.0	5.8

Notes:

... not available because of insufficient data

Not every site in the automatic monitoring network is included. Sites must also meet certain data capture targets to be used in the index. Urban sites are required to monitor PM_{10} and rural sites are required to monitor ozone. For the required pollutants, 1987-97 data capture should be more than or equal to 50% of the year, and from 1998 onwards it should be more than or equal to 75% of the year. For ozone this applies to both the full year and the summer period in isolation.

Cardiff Centre and Manchester Piccadilly were excluded in 1994 and 2001 respectively, because stone cutting adjacent to sites caused unrepresentative results. Narberth was excluded in 2004 and 2007 due to incorrect measurements. Great Dun Fell was excluded until 2001 due to sample lines being frozen. Reading New Town has been excluded in 2008 due to initial problems with new measuring instruments.

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Table 5: UK Air quality bandings applicable until 31st December 2011

Band	Index	Ozone		Nitrogen Dioxide		Sulphur Dioxide		Carbon Monoxide		PM10 Particles	
		Running 8 hourly or hourly mean*		hourly mean		15 minute mean		Running 8 hourly mean		Running 24 hour mean	
		µg m^{-3}	ppb	µg m^{-3}	ppb	µg m^{-3}	ppb	mg m^{-3}	ppm	µg m^{-3} (Grav. Equiv.)	µg m^{-3} (Ref. Equiv.)
Low											
	1	0-33	0-16	0-95	0-49	0-88	0-32	0-3.8	0.0-3.2	0-21	0-19
	2	34-65	17-32	96-190	50-99	89-176	33-66	3.9-7.6	3.3-6.6	22-42	20-40
	3	66-99	33-49	191-286	100-149	177-265	67-99	7.7-11.5	6.7-9.9	43-64	41-62
Moderate											
	4	100-125	50-62	287-381	150-199	266-354	100-132	11.6-13.4	10.0-11.5	65-74	63-72
	5	126-153	63-76	382-477	200-249	355-442	133-166	13.5-15.4	11.6-13.2	75-86	73-84
	6	154-179	77-89	478-572	250-299	443-531	167-199	15.5-17.3	13.3-14.9	87-96	85-94
High											
	7	180-239	90-119	573-635	300-332	532-708	200-266	17.4-19.2	15.0-16.5	97-107	95-105
	8	240-299	120-149	636-700	333-366	709-886	267-332	19.3-21.2	16.6-18.2	108-118	106-116
	9	300-359	150-179	701-763	367-399	887-1063	333-399	21.3-23.1	18.3-19.9	119-129	117-127
Very High											
	10	360 or more	180 or more	764 or more	400 or more	1064 or more	400 or more	23.2 or more	20 or more	130 or more	128 or more

* For ozone, the maximum of the 8 hourly and hourly mean was used to calculate the index value.

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Table 6: Revised Daily Air Quality Index, updated April 2013

Band	Index	Ozone Running 8 hourly mean µgm^{-3}	Nitrogen Dioxide hourly mean µgm^{-3}	Sulphur Dioxide 15 minute mean µgm^{-3}	$PM_{2.5}$ Particles 24 hour mean µgm^{-3}	PM_{10} Particles 24 hour mean µgm^{-3}
LOW						
	1	0-33	0-67	0-88	0-11	0-16
	2	34-66	68-134	89-177	12-23	17-33
	3	67-100	135-200	178-266	24-35	34-50
MODERATE						
	4	101-120	201-267	267-354	36-41	51-58
	5	121-140	268-334	355-443	42-47	59-66
	6	141-160	335-400	444-532	48-53	67-75
HIGH						
	7	161-187	401-467	533-710	54-58	76-83
	8	188-213	468-534	711-887	59-64	84-91
	9	214-240	535-600	888-1064	65-70	92-100
VERY HIGH						
	10	241 or more	601 or more	1065 or more	71 or more	101 or more

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