Trends in Air Quality in London and Comparison With Other European Cities

Summary

This paper presents monitoring data aggregated by the European Environment Agency (EEA) from air quality monitoring stations in London, the rest of the UK and across Europe. In 2010 the EEA collected data from 2798 monitoring stations for nitrogen dioxide (NO_2) and 2651 for PM_{10}. This paper also quotes analysis on trends in air quality from UK and European reports.

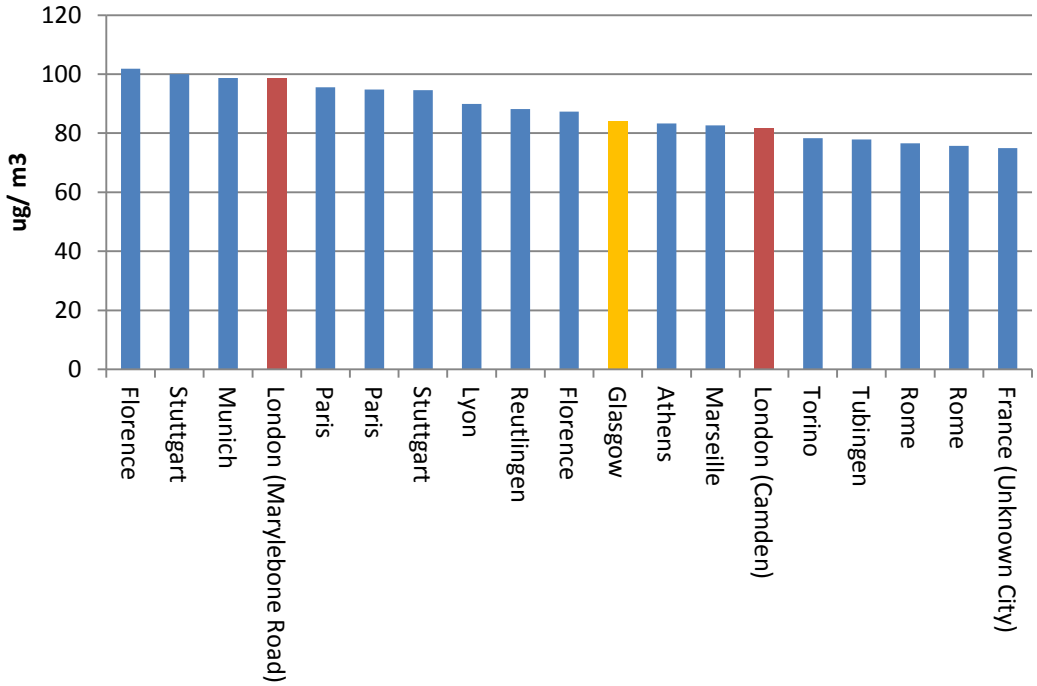
In 2010 (the most recent year EEA monitoring data is available) the Marylebone Road site in London recorded the 4th highest (or worst) annual average NO_2 concentrations of any of the EEA sites. London, taken from the Marylebone site, recorded the highest NO_2 concentrations of any European capital city. Whilst PM_{10} concentrations recorded in London are elevated, they are not amongst Europe's highest. Marylebone Road recorded the highest concentrations in London, ranking 687th worst of the 2651 EEA sites.

NO_2 concentrations taken as an average across London are understood to be stable with no increasing or declining trend. This is against a weak declining trend for NO_2 across Europe as a whole. Provisional data shows that average PM_{10} concentrations across London are now showing a weak declining trend after remaining stable for much of the last decade.

Nitrogen Dioxide

Using the latest data available (2010) data for the 2798 EEA sites, London experienced the 4th highest annual average NO_2 at the Marylebone Road site. Another London site (Camden roadside) experienced the 14th highest annual average. The worst 20 EEA sites in 2010 are shown in figure 1 below. Note that Florence (Italy), Paris (France), Rome (Italy) and Stuttgart (Germany) are the only other European cities with two monitoring sites in the 'worst 20'.

Figure 1 - Annual mean NO_2 at 'worst 20' EEA monitors (2010)[1]



[1] Source – European Environment Agency www.eea.europa.eu/data-and-maps/figures/airbase-exchange-of-information-3.

Using data taken over a longer time span London fares slightly worse. The table below is taken from an EEA report, and shows the 'worst 25' sites for NO_2 using data for 2006, 2007 and 2008. Marylebone Road is the 2nd worst, Camden roadside is 21st and Cromwell Road is 25th. Stuttgart and Paris are the only other European cities with 3 monitoring sites in the top 25.

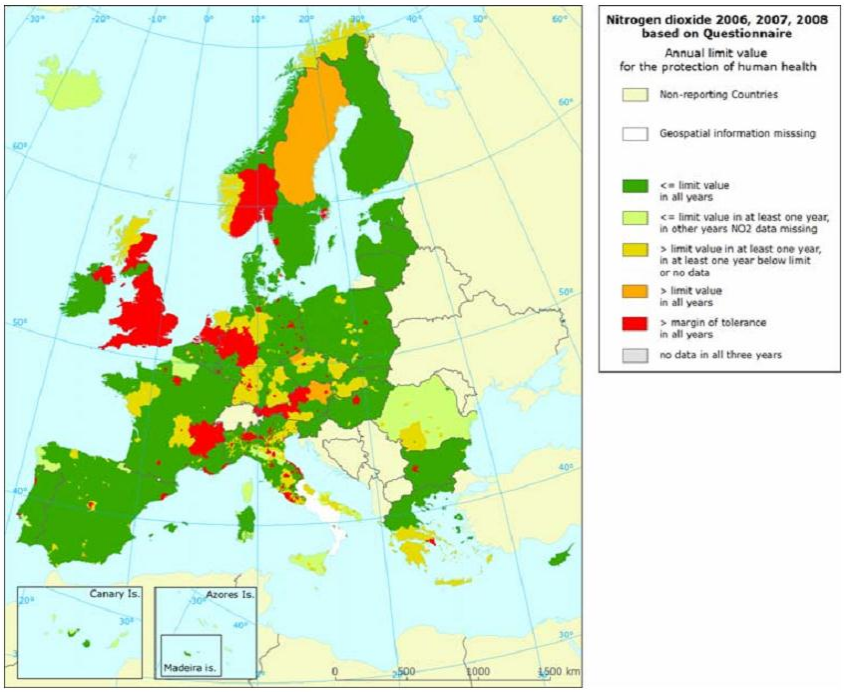
Table 1 – 25 worst European monitoring sites for NO_2 (2006 to 2008)[2]

	Annual mean (µg/m3)				Type of				
Station name	2006	2007	2008	average	station	area	city	Country	Street type
Stuttgart Am Neckartor	121	106	107	111	Traffic	urban	Stuttgart	DE	Unknown
London Marylebone road	111	102	115	109	Traffic	urban	London	UK	Unknown
Cercul Militar	126	111	79	105	Traffic	urban	Bucharest	RO	Unknown
Bd Periph Auteuil	99	104	105	103	Traffic	suburb.	Paris	FR	Unknown
Stuttgart Hohenheimer Straße (S)	104	98	98	100	Traffic	urban	Stuttgart	DE	Unknown
Place Victor Basch	94	96	91	94	Traffic	urban	Paris	FR	Unknown
Patision	85	100	92	93	Traffic	urban	Athens	GR	Canyon st.: L/H < 1.5
München/Landshuter Allee	98	89	85	91	Traffic	urban	München	DE	Unknown
Auto A1-Saint-Denis	91	91	89	90	Traffic	suburb.	Saint-Denis, Paris	FR	Unknown
Marseille_Plombieres	88	82	82	84	Traffic	suburb.	Marseille	FR	Unknown
FI-GRAMSCI 904811	72	83	93	82	Traffic	urban	Firenze	IT	Unknown
C.SO Francia 1205802	83	84	79	82	Traffic	urban	Roma	IT	Wide st.: L/H > 1.5
ES0116A-Marañón	86	80	79	81	Traffic	urban	Madrid	ES	Unknown
A7 Sud Lyonnais	81	83	79	81	Traffic	suburb.	Lyon	FR	Unknown
Fontivegge 1005402	87	83	71	80	Traffic	urban	Perugia	IT	Wide st.: L/H > 1.5
Ludwigsburg Friedrichstraße (S)	80	81	76	79	Traffic	urban	Ludwigsburg, Stuttgarc	DE	Unknown
Giardini Melis - Genova 701027	70	78	85	78	Traffic	urban	Genova	IT	Unknown
Stuttgart-Mitte-Straße	82	75	74	77	Traffic	urban	Stuttgart	DE	Wide st.: L/H > 1.5
TO_1272_TO_Rebauden 100110	94	71	66	77	Traffic	urban	Torino	IT	Wide st.: L/H > 1.5
Milano - V.Le Marche 301526	78	76	74	76	Traffic	urban	Milano	IT	Wide st.: L/H > 1.5
Milano Via Zavattari 301544	76	73	78	76	Traffic	urban	Milano	IT	Wide st.: L/H > 1.5
Camden Kerbside	72	77	76	75	Traffic	urban	London	UK	Unknown
München/Stachus	79	71	74	74	Traffic	urban	München	DE	Unknown
PE - Corso Vit. Emanuele 1306807	79	70	74	74	Traffic	urban	Pescara	IT	Canyon st.: L/H < 1.5
London Cromwell road 2	83	72	67	74	Traffic	urban	London	UK	Unknown

The UK as a whole is amongst the worst in the EU for NO_2 concentrations. Figure 2 below shows maximum NO_2 concentrations in EU monitoring 'zones' (sections of member states). Zones that have breached EU legal limits (the Limit Value plus margin of tolerance) every year between 2006-08 are shown in red.

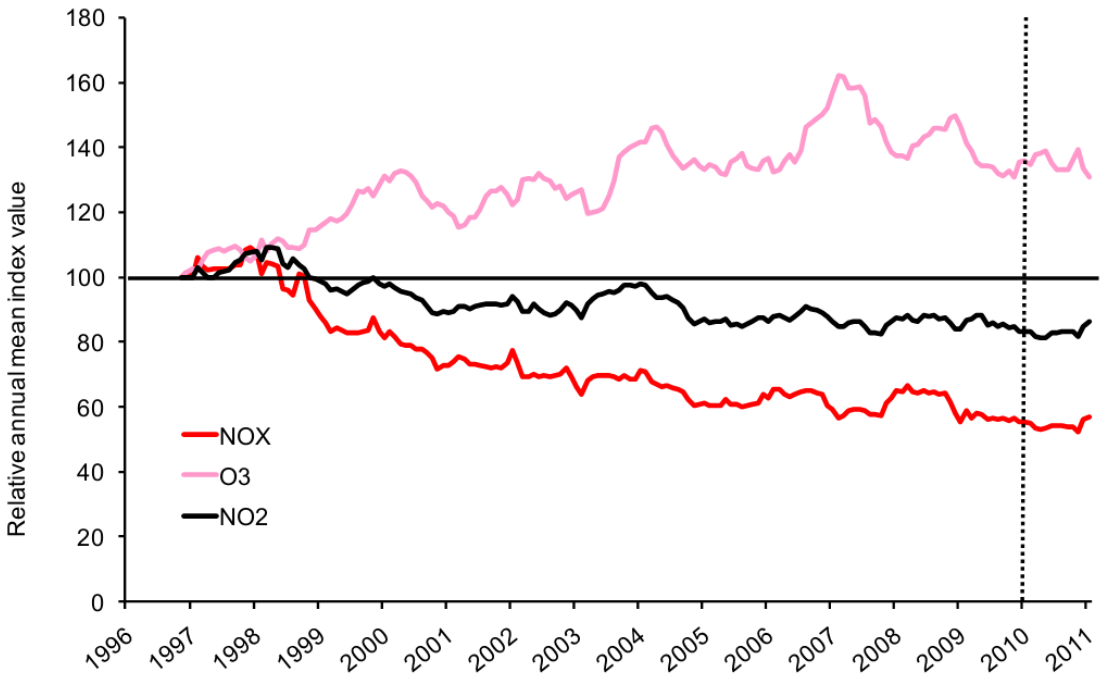
[2] Source - 'Status and trends of NO_2 ambient concentrations in Europe', European Topic Centre on Air and Climate Change 2010
http://acm.eionet.europa.eu/reports/docs/ETCACC_TP_2010_19_NO2trends.pdf

Figure 2 – Maximum NO_2 concentrations in EU Monitoring Zones (2006 to 2008)



Nitrogen dioxide concentrations in London have remained roughly stable over the past decade, as shown in Figure 3 below. Note that the data for 2010 is provisional.

Figure 3 – London Air Quality Network Index (Average) for NO_2, NO_x and O_3 [3]



[3] Source – 'London Air Quality Index: Preliminary calculation to the end of 2010' www.londonair.org.uk/london/reports/LondonAirQualityIndexnotefornewsitemFeb2011.pdf

Kings College London (who run London's air quality monitoring network) commented as follows on this data:

'there is evidence to suggest that annual mean concentrations of NO_X are moving toward stability despite the continued turn-over in the vehicle fleet with older vehicles being replaced by newer ones that emit less pollution....This is thought to be due to the fact that ... the main source of NO_X is diesel vehicles. Abatement of NO_X emissions are needed to control NO_2 concentrations. Within this context, medium term stability in NO_X concentrations, and therefore NO_X emissions give rise to concern regarding future NO_2 concentrations. However, the index value for NO_2 did decrease by 14% over the whole period of the index... the index masks considerable site to site variations with substantial increases in NO_2 at many roadside monitoring sites. The NO_2 index value increased by 3% during 2010'

Across Europe there is a weak downwards trend in NO_2 concentrations. The European Environment Agency have summarised[4] that:

'For most station types and regions there is a weak decreasing trend in the NO_2 annual means between 1999 and 2008. No significant trend is detected for: 1) the rural background stations of the Northern region; 2) the urban background stations of the Southern region; 3) the suburban background and 4) industrial stations of the Central and Eastern region.

The suburban background and industrial stations of the Northern region have no complete time series data or only have available data for one station, respectively. This single industrial station shows the increasing trend.'

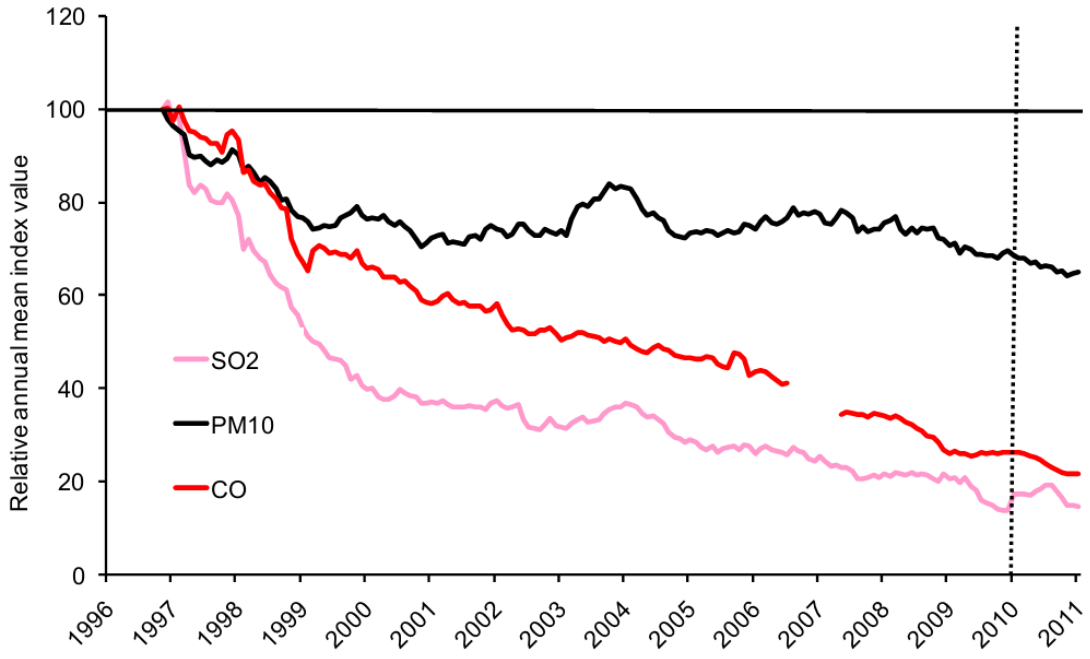
PM_{10}

PM_{10} concentrations in London are elevated, but not amongst the worst experienced in Europe. In 2010 London's worst site was Marylebone Road, which was the 687th worst of the 2651 EEA sites. The highest PM_{10} concentrations were seen in Eastern European countries.

For most of the past decade PM_{10} concentrations in London have shown no particular trend, however in more recent years a weak downwards trend has emerged as shown in Figure 4 below. Note that the data for 2010 is provisional.

[4] Source - 'Status and trends of NO_2 ambient concentrations in Europe', European Topic Centre on Air and Climate Change 2010
http://acm.eionet.europa.eu/reports/docs/ETCACC_TP_2010_19_NO2trends.pdf

Figure 3 – London Air Quality Network Index (Average) for PM_{10}, SO_2 and CO



Kings College London commented as follows on this data:

'No statistically significant trend was present for PM_{10} up to the end of 2007. Although the PM_{10} index fell by a total of 35% up to the end of 2007, the decrease was achieved in the period up to late 2000 and the index then increased at a mean rate of around 0.4 % per year until the end of 2007. Since this time there has been an indication of a decrease in annual mean PM_{10} concentrations with the index decreasing by 4% in 2010. Encouragingly, this does not appear to be solely driven by decreasing PM_{10} from distant sources originating in mainland Europe and it may also reflect emission changes from within London.'

Notes - Data Sources

Maps and data from air quality monitoring stations across Europe can be viewed and downloaded from the EEA's 'AirBase' website. Maps and complete datasets are available for:

- 2010 – www.eea.europa.eu/data-and-maps/figures/airbase-exchange-of-information-3
- 2009 - www.eea.europa.eu/data-and-maps/figures/airbase-exchange-of-information-2
- 2008 - www.eea.europa.eu/data-and-maps/figures/airbase-exchange-of-information-1
- 2007 - www.eea.europa.eu/data-and-maps/figures/airbase-exchange-of-information

AirBase can also be explored using an interactive online mapping system, see www.eea.europa.eu/themes/air/airbase/map-statistics.

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