Heathrow Air Quality

Together towards sustainability

Air quality at Heathrow Airport

Q1 2013

Headlines

Key information for air quality monitoring data is:

- All 2012 data has now been ratified
- Annual average NO_2 concentrations in 2012 were below the EU limit value except for Oxford Avenue and the Hillingdon M4 sites (see Fig. 1).
- Running annual mean for NO_2 fell at most monitoring sites in Q1 2013 (see Fig. 2).
- There were four breaches of the daily average PM_{10} limit value in Q1 2013 (see Fig 3).
- Annual average PM_{10} concentrations in 2011 were below the EU limit value (see Fig. 4).
- Annual mean $PM_{2.5}$ concentrations were approximately half of the EU target value in 2012 (see Fig 5).
- Over 91% of aircraft movements were made by more modern CAEP4 or CAEP6 models in 2012 (see Fig. 7). This trend continued in Q1 2013.
- Heathrow aims to replace all of its air quality monitors in 2013.
- Heathrow is updating the AirWatch website (www.heathrowairwatch.org.uk) in 2013.

Background

Heathrow Airport Ltd (HAL) has monitored air quality since the 1990s at its site located near the northern runway (LHR2). It now monitors air quality at three other sites around the airport – Harlington, Green Gates and Oaks Road (see Fig. 6 for locations of these and other air quality monitoring sites within 2km of Heathrow Airport). We are aiming to replace all thirteen air quality monitors in 2013.

Large areas of London exceed the health-based air quality limit values set by the EU, due primarily to emissions from road traffic and from buildings. Every London borough has declared at least one Air Quality Management Area (AQMA).

Air quality management is a key priority for HAL and we will continue to work in partnership with our key stakeholders – especially local authorities and national government - to reduce emissions from all sources in the area in order to meet the EU limit values. The main pollutants of concern at Heathrow are measured at all these sites – oxides of nitrogen (NO_X – made up of nitrogen dioxide and nitrous oxide) and particles (measured as PM_{10} and $PM_{2.5}$). In addition, ozone (O_3) is measured at Harlington.

Measured concentrations

Local air quality

Located on the western edge of London and close to two busy motorways, the Great Western mainline and local industries, Heathrow Airport is within an area of high air pollution.

Of the two pollutants of concern - nitrogen dioxide (NO_2) and particles (measured as PM_{10} and $PM_{2.5}$) - NO_2 has the greatest extent of exceedence and large areas of London (and the rest of the UK) exceed the annual average EU limit value, due mainly to emissions from road traffic and from buildings. This pattern is repeated locally, where the activities that take place at Heathrow Airport are just one source of air emissions in the local area.

Nitrogen dioxide (NO_2 - annual average limit value 40µg/m^3 by 2010)

The annual average EU limit value for NO_2 was met at the majority of monitoring sites close to Heathrow Airport in 2012 – presented in Fig. 1. Key information is:

- Oxford Avenue (red) is approximately 200m northeast of the airport boundary. Concentrations have exceeded the limit value since installation in 2005. Although concentrations fell to their lowest value in 2010, they remained at 43µg/m^3 in 2012. Direct airport emissions are approximately 19% of measured NO_X concentrations, 6% is from airport-related road traffic, 18% from non-airport traffic and 57% from background sources.
- Two other sites exceeded the limit value:

  - London Hillingdon (light green) is mainly affected by emissions from traffic on the M4. Concentrations increased slightly in 2012 to 57µg/m^3 (from 55µg/m^3 in 2011). Direct airport emissions are approximately 4% of measured NO_X concentrations, 13% is from airport-related road traffic, 38% from non-airport traffic and 45% from background sources.

  - LHR2 (blue dotted line), located near the northern runway, has shown a gradual decreasing trend in concentrations, though it is in an area of high emissions. Concentrations were 48µg/m^3 in 2012 (from 50µg/m^3 in 2011). Direct airport emissions are approximately 30% of measured NO_X concentrations, 19% is from airport-related road traffic, 14% from non-airport traffic and 37% from background sources.

Fig. 1. NO_2 annual average concentrations measured at selected sites around Heathrow Airport since 1995

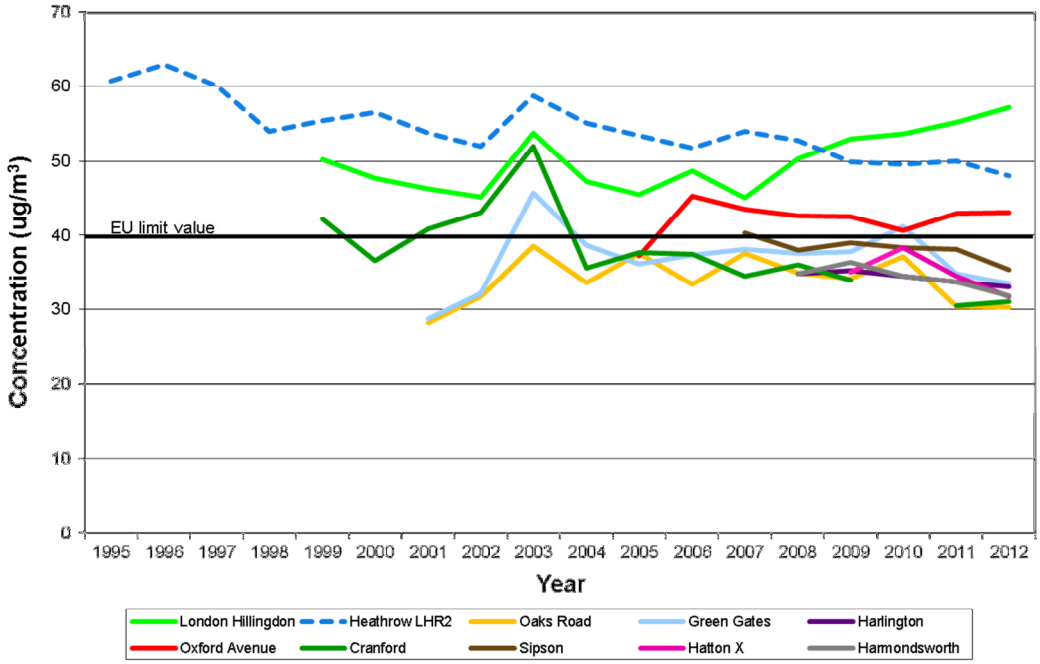


Fig. 2. NO_2 running annual average concentrations at selected sites since 1995

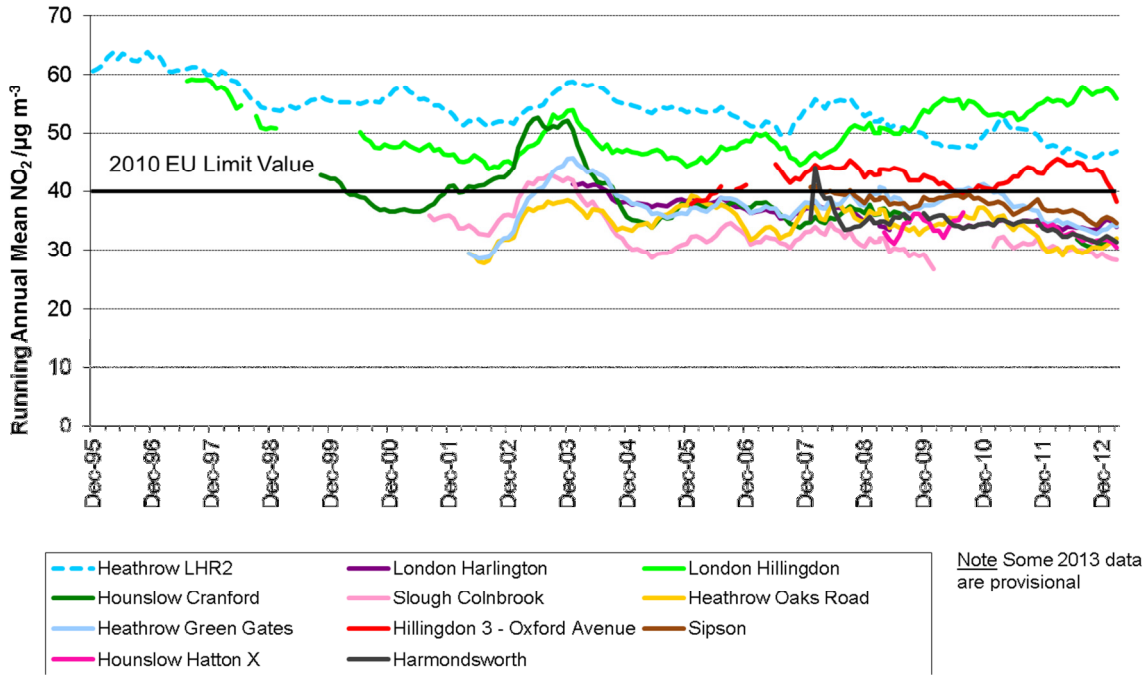


Fig. 2 shows the NO_2 monitoring data expressed as running annual means, which allows us to track changes throughout the year. In general, concentrations of NO_2 have fallen in the first quarter of 2013. The principal site where an increasing trend has been recorded is the site near the M4 (London Hillingdon).

Particles (2005 PM_{10} EU limit value of 50µg/m^3 (35 breaches allowed))

(2020 $PM_{2.5}$ EU target of 25µg/m^3)

PM_{10} is measured at all four of HAL's monitoring sites and concentrations measured at LHR2 are generally the highest. Results are presented in Fig. 3.

Fourteen exceedances were recorded at LHR2 in 2011, and four have occurred in Q1 2013.

The EU limit value for PM_{10} has been met at the LHR2 site since 2003, when unfavourable weather conditions produced 38 breaches at LHR2 and affected sites throughout the UK.

It is not unusual for daily mean PM_{10} levels to exceed 50µg/m^3, though the EU limit value allows 35 exceedances (equal to 35 days) per year before the limit value is breached.

Fig. 3. PM_{10} at LHR2 since 1995 – Comparison with the 2005 EU limit value (number of days above 50µg/m^3)

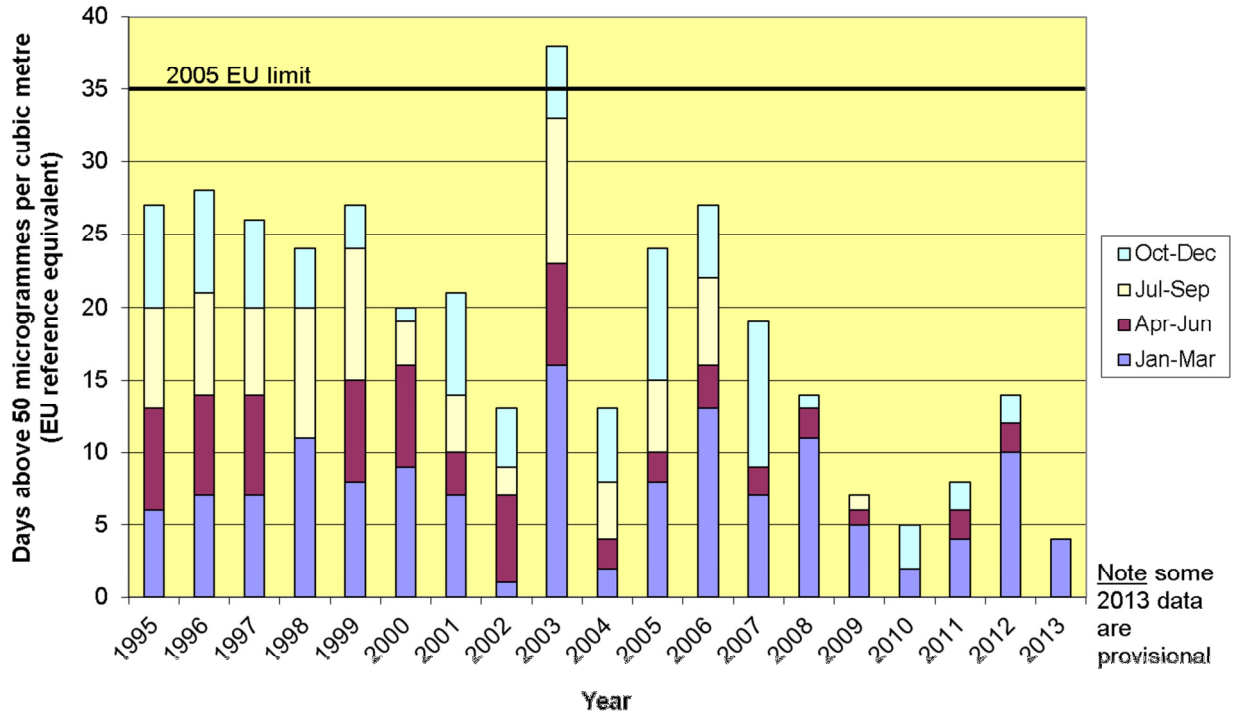
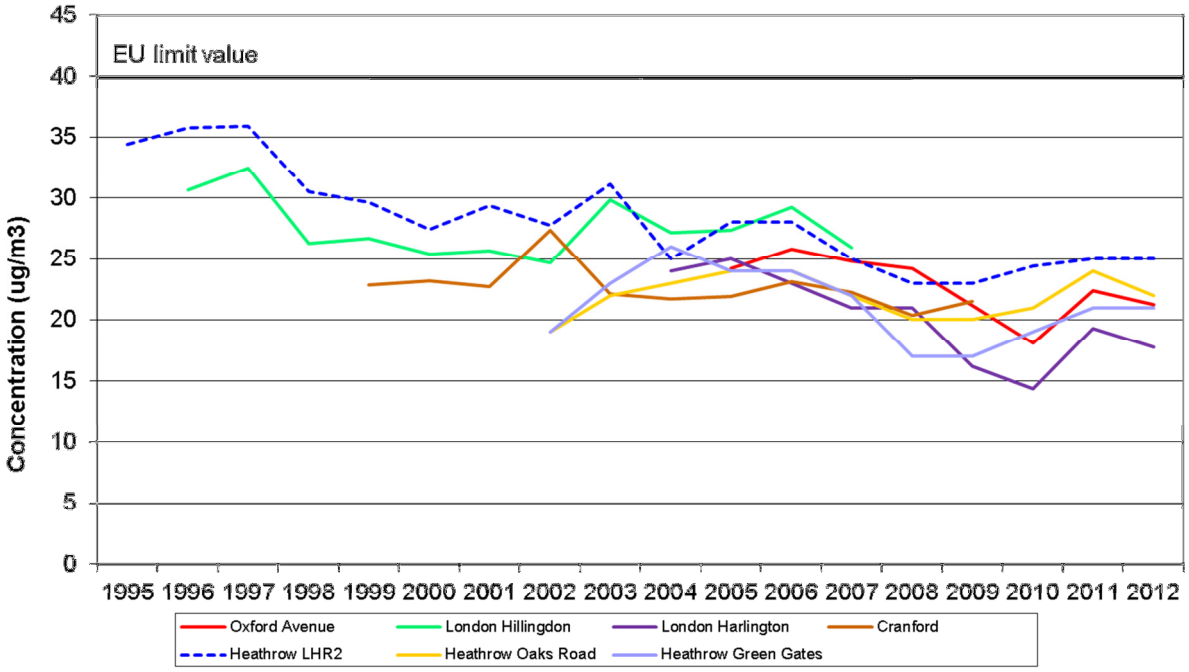
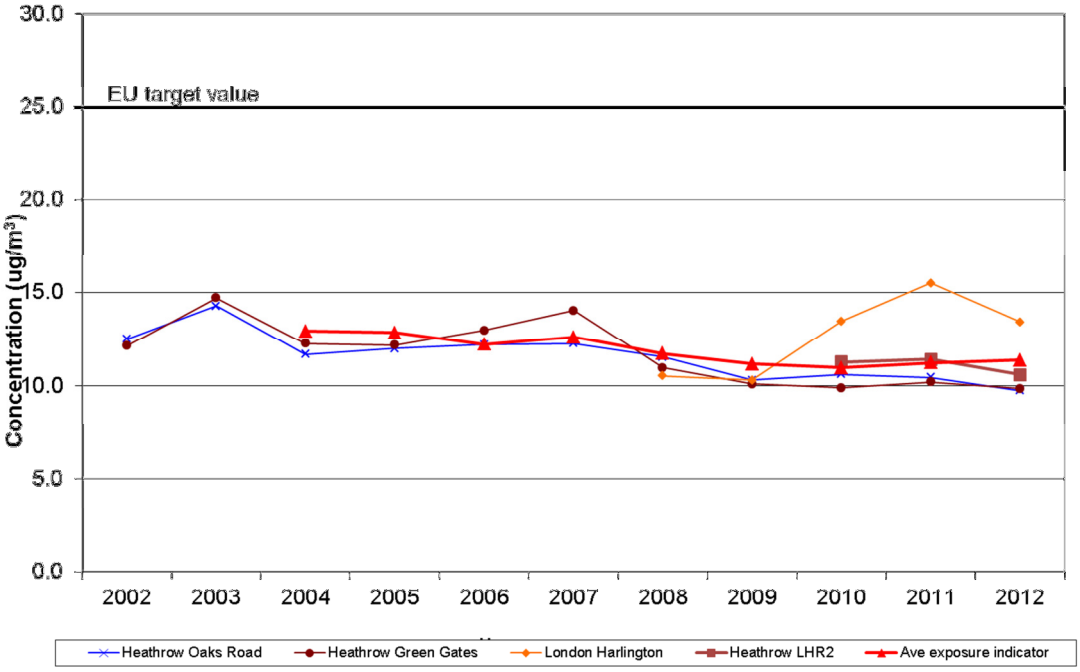


Fig. 4. Annual average gravimetric PM_{10} measurements around Heathrow Airport since 1995



Annual average PM_{10} concentrations were below the EU limit value in 2012 and are presented in Fig 4.

Fig. 5. Annual average gravimetric $PM_{2.5}$ measurements around Heathrow Airport since 2005 – Comparison with the EU limit value (2020 $PM_{2.5}$ EU target of 25µg/m^3)



Annual mean concentrations of $PM_{2.5}$ measured at Green Gates, Oaks Road, Harlington and LHR2 for 2012 are presented in Fig 5. It also includes the average exposure indicator, which is a three year average for all monitoring sites.

Concentrations measured at three of the sites were similar to 2010, whereas those measured at Harlington have been higher since 2009. We have a slightly different monitor at Harlington which captures a greater proportion of the volatile fraction of particles – it uses a TEOM FDMS, as opposed to TEOM instruments at the other three sites. Unfortunately the TEOM FDMS is more prone to breakdown and the data capture at Harlington has been below the minimum EU requirement (90%) since the instrument was installed. This situation has improved, but we achieved data capture of only 84% in 2012.

HAL is investigating replacement of all its particle monitors in 2013 with an alternative to the TEOM and TEOM FDMS. These alternative monitors collect the volatile fraction – giving a truer reading of particle concentration – as well as having much more reliable data capture.

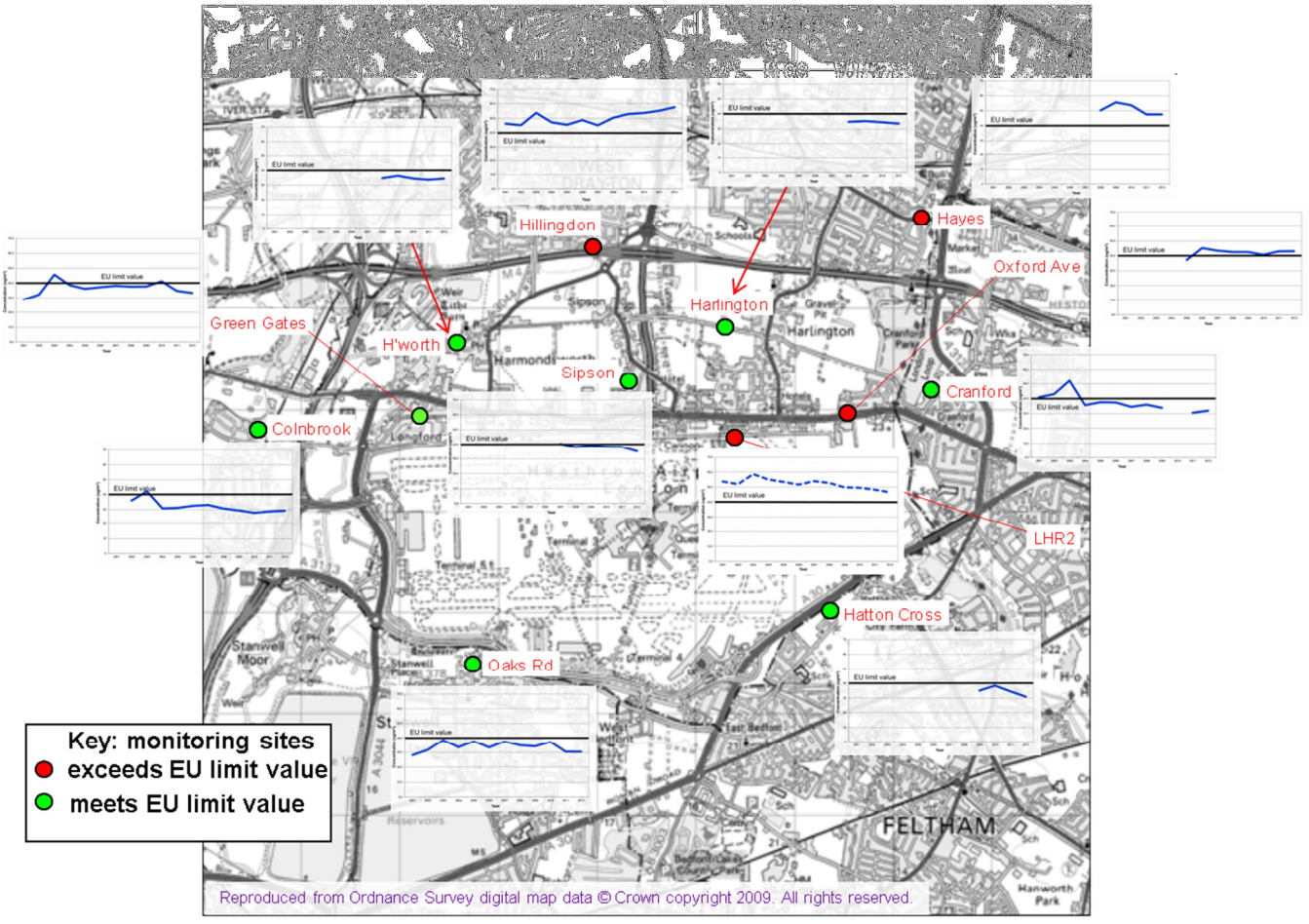
Locations of the air quality monitoring sites at Heathrow and their individual NO_2 monitoring history.

The locations of relevant air quality monitoring sites are shown in Fig. 6, which also shows the trend in NO_2 concentrations measured at each site since 2001.

Previous Air Quality Briefings described the proportions of emissions calculated for each monitoring site when the HAL Emissions Inventory 2008/9 was compiled. Fig. 6 shows the trend in measured NO_2 concentration at each site as well as providing the geographical context for the data presented in Fig.1.

- The only site not previously mentioned is Hayes, to the northeast of Heathrow. Direct airport emissions are approximately 4% of measured NO_X concentrations, 2% is from airport-related road traffic, 33% from non-airport traffic and 61% from background sources.

Fig. 6. Nitrogen dioxide monitoring sites and annual mean measurements since 2001

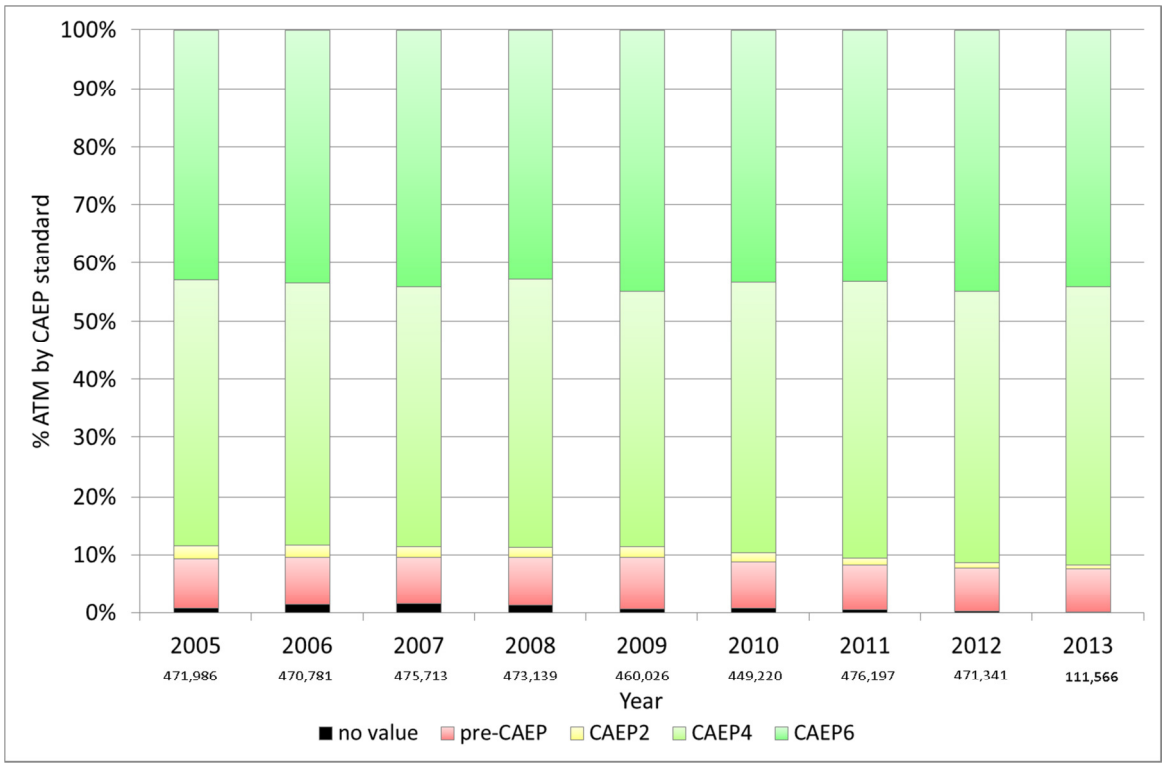


CAEP value of air traffic movements

Through its Committee on Aviation Environmental Protection (CAEP), the International Civil Aviation Organization (ICAO) sets new emissions standards for aircraft engines – including for NO_X. CAEP6 is the latest standard and came into force in 2008.

Fig. 7 shows the proportion air traffic movements (ATMs) based on their relationship to the CAEP NO_X emissions standards. The number of ATMs each year is also presented below each bar.. It shows the relative proportion of flights made by newer, cleaner aircraft (those defined as CAEP4 or better) has risen to its highest ever point. Over 91% of flights were made by aircraft of CAEP4 standard or better in 2012 – a 0.9% increase over 2011. This pattern has continued into the first quarter of 2012.

Fig. 7. - CAEP4 compliance of ATMs (air traffic movements) since 2005



We will investigate the 2012 aircraft emissions and report them later in 2013.

AirWatch website

We have contracted Ricardo-AEA to give the website a new fresh, modern graphical design. It will be built using the most modern techniques; ensuring best practice is adhered to at all times for accessibility and usability.

In addition, its design will meet all modern web standards and will be tested in all major browsers during the development period – by comparison, the current site comes across as clunky.

As the gateway to the website that most visitors will see, the homepage will continue to provide introduction information as currently used on the website, and will also show a summary of the latest levels to help make the latest automatic data more visible, and engage with more visitors.

All the partners involved in Heathrow Airwatch (LB Hillingdon, LB Hounslow, Slough BC and Spelthorne BC and BA) will also be visible, each with clickable links to their respective websites.

We expect the changes to the website to be finished in summer 2013.