

Heathrow Air Quality

Together towards sustainability

Air quality at Heathrow Airport

Q1 2012

Headlines

Key information for air quality monitoring data is:

- Annual average NO₂ concentrations in 2011 at the Green Gates monitoring site in Longford were below the EU limit value, but concentrations measured at Oxford Avenue still exceeded it (see Fig. 1).
- In Q1 2012, the running annual mean for NO₂ fell at most monitoring sites – the principal exception being the Hillingdon M4 site (see Fig. 2).
- Annual average PM₁₀ concentrations in 2011 remained below the EU limit value (see Fig. 3).
- In Q1 2012, there were nine breaches of the daily average PM₁₀ limit value (see Fig 3) – a pattern seen across London and elsewhere in the UK.
- In 2011, annual mean PM_{2.5} concentrations were approximately half of the EU target value (see Fig 5).
- Over 90% of aircraft movements in 2011 continued to be made by more modern CAEP4 or CAEP6 models (see Fig. 7). This trend continued in Q1 2012.

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. 4 for locations of these and other air quality monitoring sites within 2km of Heathrow Airport).

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 PM₁₀ and PM_{2.5}). In addition, ozone (O₃) 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 (NO₂) and particles (measured as PM₁₀ and PM_{2.5}) - NO₂ 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 (NO₂ - annual average limit value 40µg/m³ by 2010)

The annual average EU limit value for NO₂ was met at the majority of monitoring sites close to Heathrow Airport in 2011 – 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 increased slightly again in 2011 to 43µg/m³. 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.
- Concentrations at Green Gates (light blue) have shown a gradually increasing trend since 2005. In 2010 concentrations breached the limit value but in 2011 they fell to less than 35µg/m³. Direct airport emissions are approximately 7% of measured NO_x concentrations, 5% is from airport-related road traffic, 21% from non-airport traffic and 67% 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 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. 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 NO₂ annual average concentrations measured at selected sites around Heathrow Airport since 1995

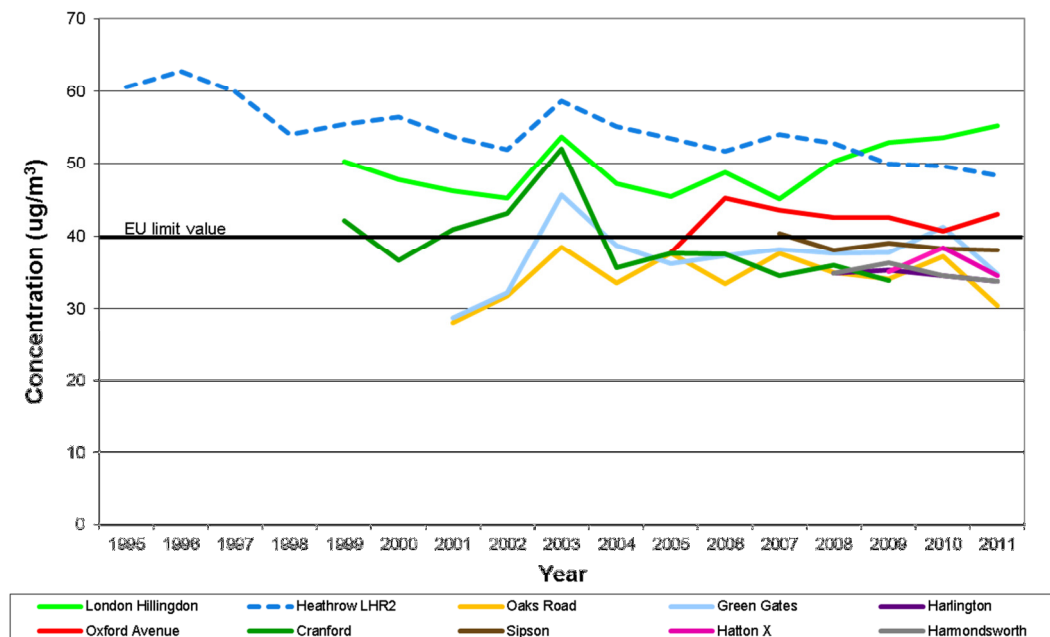


Fig. 2 NO₂ running annual average concentrations at selected sites since 1995

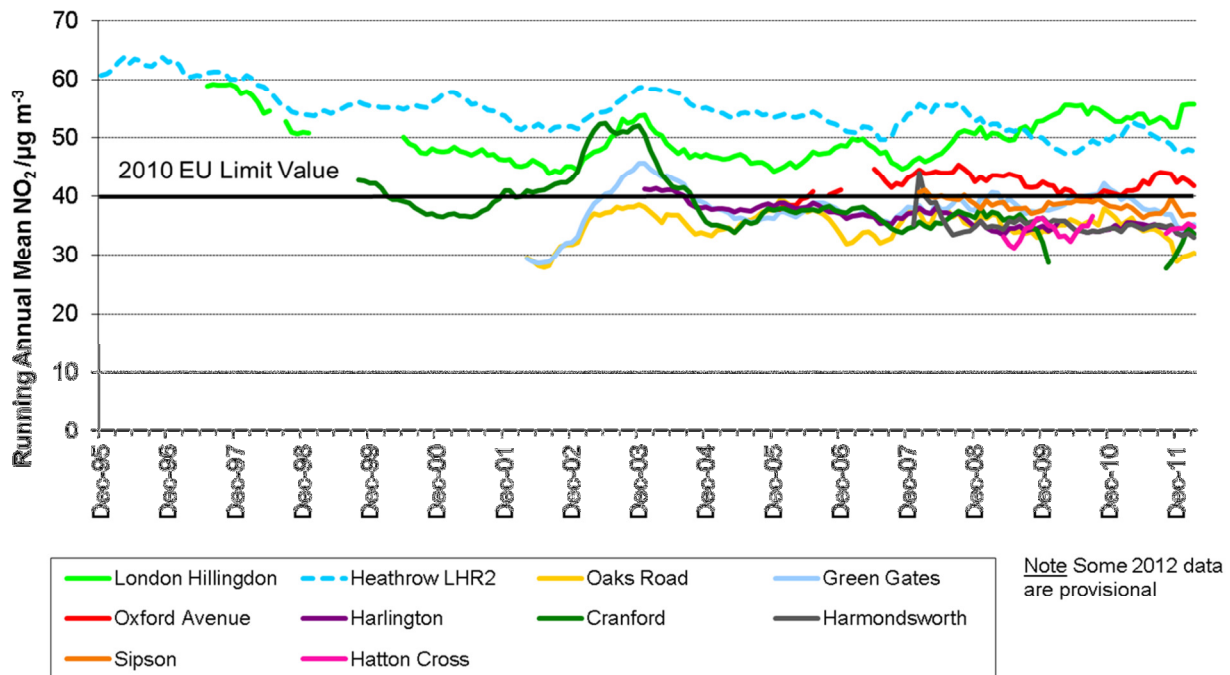


Fig. 2 shows the NO₂ monitoring data expressed as running annual means, which allows us to track changes throughout the year. In general, concentrations of NO₂ have fallen in the first quarter of 2012 compared to 2011. The principal site where an increasing trend has been recorded is the site near the M4 (London Hillingdon).

**Particles (2005 PM₁₀ EU limit value of 50µg/m³ (35 breaches allowed))
(2020 PM_{2.5} EU target of 25µg/m³)**

PM₁₀ 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.

Only 8 exceedances were recorded at LHR2 in 2011, but nine have occurred in Q1 2012. This is a higher number than usual and this pattern has been seen across London monitoring sites due to weather conditions.

The EU limit value for PM₁₀ has been met here since 2003, when unfavourable weather conditions produced 38 breaches at LHR2 and affected sites throughout the UK.

It is not unusual for daily mean PM₁₀ levels to exceed 50µg/m³, though the EU limit value allows 35 exceedances (equal to 35 days) per year before the limit value is breached.

Heathrow Air Quality

Together towards sustainability

Fig. 3 PM₁₀ at LHR2 since 1995 – Comparison with the 2005 EU limit value (number of days above 50µg/m³)

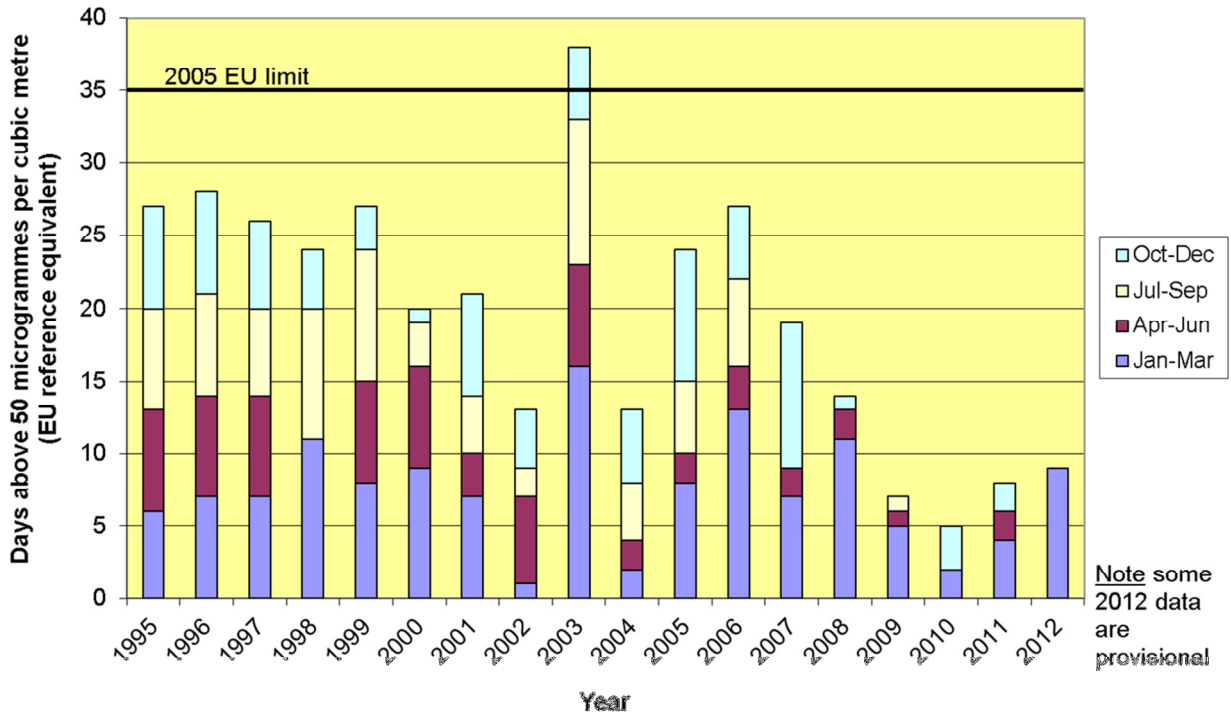
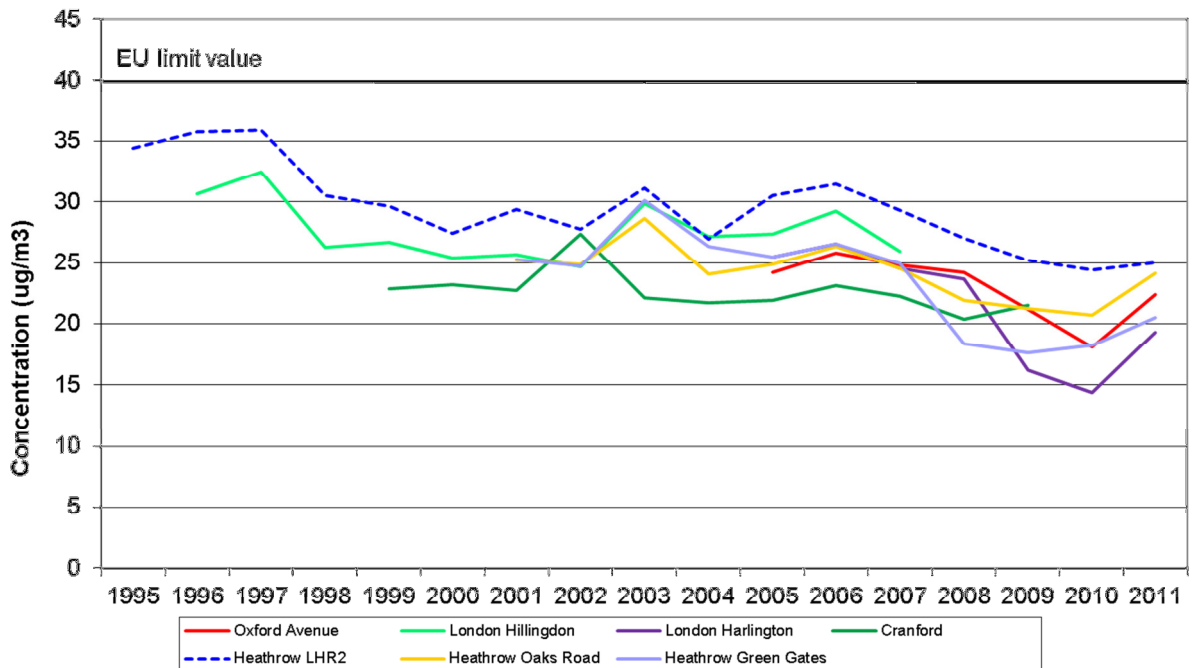


Fig. 4 Annual average gravimetric PM₁₀ measurements around Heathrow Airport since 1995

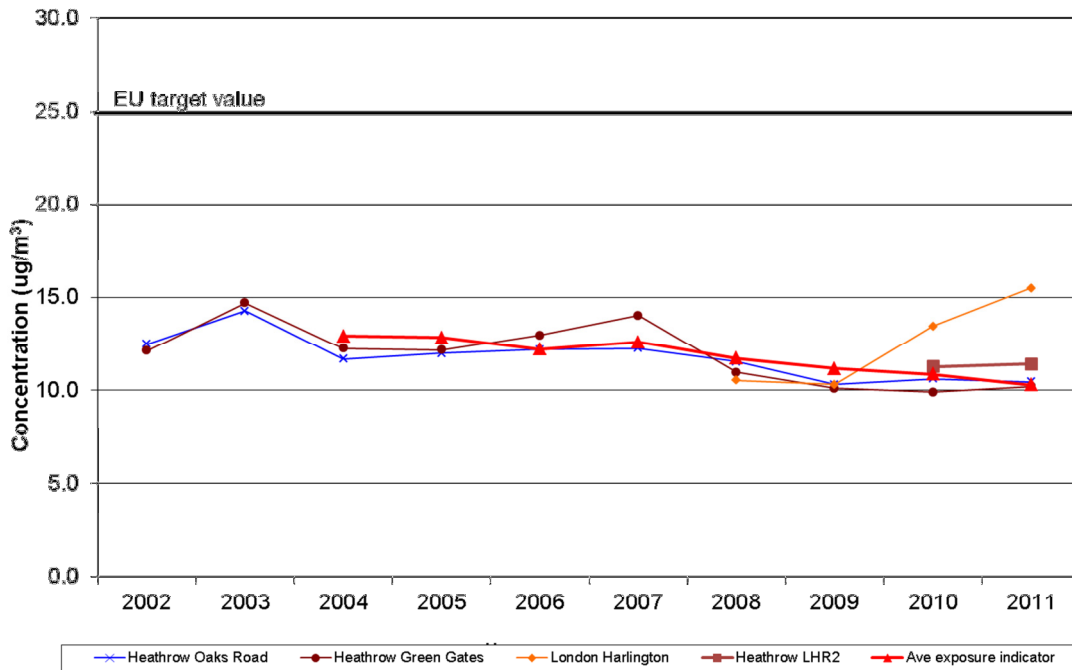


Heathrow Air Quality

Together towards sustainability

Annual average PM₁₀ concentrations were below the EU limit value in 2011 and are presented in Fig 4. A number of pollution incidents across London increased annual average concentrations last year compared to 2010.

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/m³)



Annual mean concentrations of PM_{2.5} measured at Green Gates, Oaks Road, Harlington and LHR2 for 2011 are presented in Fig 5. Concentrations measured at three of the sites were similar to 2010. Concentrations measured at Harlington appeared to increase again and is affected by data capture being below 80%. Although within the target value, HAL will investigate why concentrations have increased at this site.

Heathrow Air Quality

Together towards sustainability

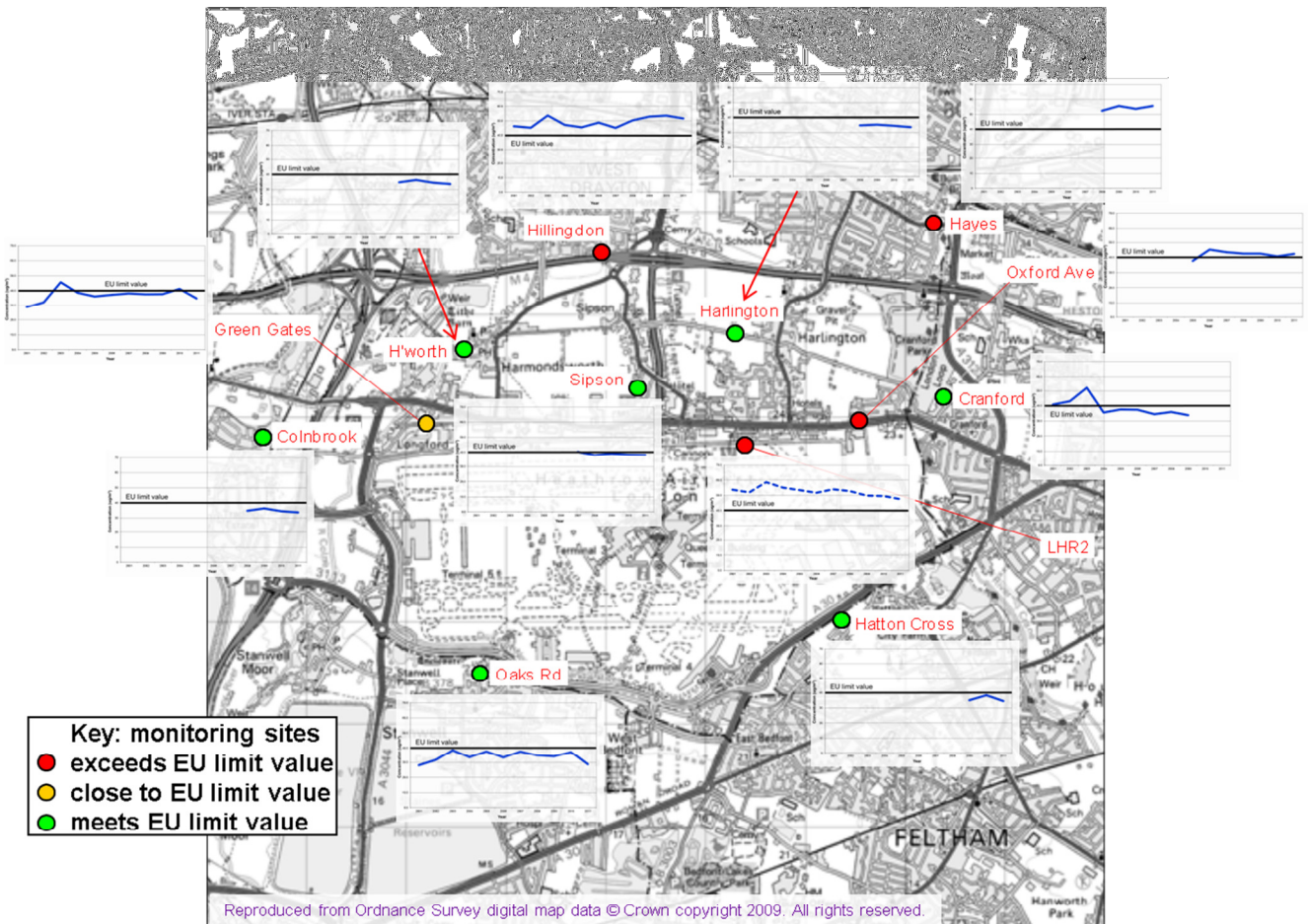
Locations of the air quality monitoring sites at Heathrow and their individual NO₂ monitoring history.

The locations of relevant air quality monitoring sites are shown in Fig. 6, which also shows the trend in NO₂ concentrations measured at each site since 2001.

The 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 NO₂ 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

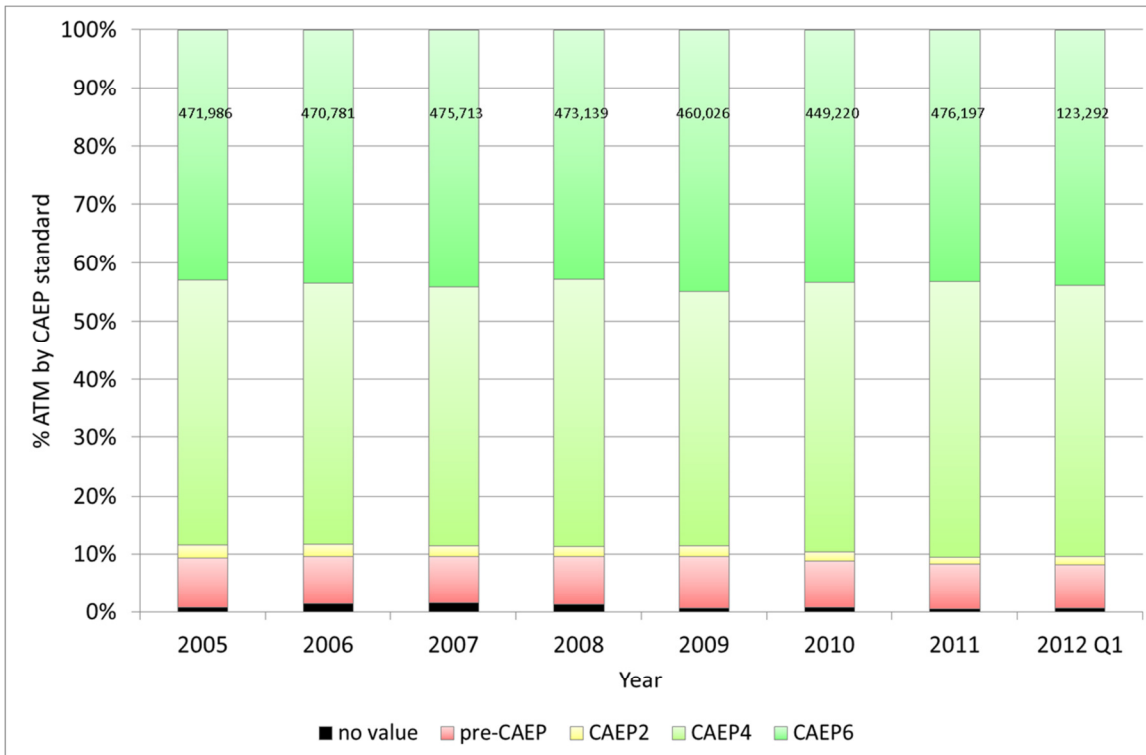


CAEP value of air traffic movements

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. 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 90% of flights were made by aircraft of CAEP4 standard or better in 2011, although ATMs were similar to those in 2007. 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 2011 aircraft emissions and report them later in 2012.