

Was 2010 a high year for Scottish NO_x and NO₂ concentrations?

It has been recently recognised that NO₂ concentrations were generally elevated in 2010 compared to more recent years. Analysis from measurements from the UK-wide AURN undertaken on behalf of Defra by AEA, suggests that NO_x concentrations were, on average, approximately 15% higher in 2010 than other recent years. Corresponding NO₂ concentrations have been estimated to about 10% higher in 2010. Similar analysis of 2010 NO_x/NO₂ measurements from the SAQD suggested that NO_x concentrations were, on average, approximately 29% higher in Scotland than other recent years. Corresponding NO₂ concentrations have been estimated to about 15% higher in Scotland in 2010.

The latest available background maps for LAQM Review and Assessment purposes prepared for the Scottish Government by AEA and published in Spring 2012 are based and validated using 2010 air quality monitoring data from the SAQD. The effect of the higher NO_x/NO₂ concentrations in 2010 mean that projected background concentrations for NO_x/NO₂ may be higher than expected.

Background

It has been recently recognised that NO₂ concentrations were generally elevated in 2010 compared to more recent years. Analysis from measurements from the UK-wide AURN undertaken on behalf of Defra by AEA, suggest that NO_x concentrations were, on average, approximately 15% higher in 2010 than other recent years. Corresponding NO₂ concentrations have been estimated to about 10% higher in 2010. In order to address this issue, Defra have recently published guidance on the LAQM pages (see: <http://laqm.defra.gov.uk/maps/maps2010.html#removeNO2> and <http://laqm.defra.gov.uk/laqm-faqs/faq136.html>). The impact of elevated NO_x and NO₂ concentrations in 2010 on the data released for Scottish local authorities to use for LAQM Review and Assessment purposes published in Spring 2012 is examined here.

Measurements of air pollutant concentrations from the SAQD underpin the modelling of background and roadside air pollutant concentrations in Scotland. Elevated annual mean NO_x and NO₂ concentrations would lead to a corresponding increase in the modelled concentrations. The modelling output is used to prepare background and roadside maps showing current and projected air pollutant concentrations in Scotland. This work is undertaken annually by AEA on behalf of the Scottish Government. The background maps of air pollutant concentrations are published on the Air Quality in Scotland website (<http://www.scottishairquality.co.uk/maps.php>) along with background map data for Scottish local authorities to use for LAQM Review and Assessment purposes (http://www.scottishairquality.co.uk/maps.php?n_action=data).

Method

Measurements of annual mean NO_x and NO₂ concentrations from 2008-11 from the 74 current sites in operation in the SAQD were compared. In order to be considered in the analysis air quality monitoring sites required 4 years (2008-2011) of valid measurements, i.e., the annual %dc ≥ 75% for each year considered. Sites were split into two groups on the basis of site type:

- 1) All Background sites, which included Rural Background, Urban Industrial, and Urban Background sites (formerly referred to as *Rural*, *Airport*, *Urban Background*, and *Urban Centre* sites, respectively), and
- 2) Urban Traffic sites (formerly referred to as *roadside* and *kerbside* sites).

NO_x and NO₂ measurements from Dundee Union Street, which is an Urban Background site, were discounted from the analysis. This air quality monitoring station lies on a main bus corridor through the city centre and is situated between two bus stops. Consequently the annual mean NO_x and NO₂ concentrations measured during 2008-11 here were greater when compared to similar measurements from other air quality monitoring stations classified as Urban Background sites.

The final analysis for Scotland was based on NO_x and NO₂ measurements from 9 Background sites (from a total of 19, excluding Dundee Union Street), and 22 Urban Traffic sites (from a total of 54) within the SAQD in 2011. By comparison, the analysis performed for Defra was based on 58 Background sites (from a total of 83), and 17 Urban Traffic sites (from a total of 35) within the AURN in 2011. 14 SAQD air quality monitoring stations form part of the 118 air quality monitoring stations within the UK-wide AURN.

Results

The Figures 1-5 below show the general trend in the annual mean NO_x and NO₂ concentrations for the SAQD from 2008 to 2011. The results are presented for NO_x and NO₂ and are split on the basis of the two main site types: (1) All Background sites and (2) Urban Traffic sites. All plots include the predicted 2010 annual mean NO_x and NO₂ concentration (termed 2009_2011 average) which is the arithmetic mean of the 2009 and 2011 annual mean NO_x and NO₂ concentrations. For all site types and both air pollutants considered there is a clear upward trend in the annual mean NO_x and NO₂ concentrations in 2010.

Examination of the annual mean NO_x and NO₂ concentrations from the SAQN measured during 2008-11 showed that several sites showed extremely high NO_x concentrations in 2010. Since this was observed at several air quality monitoring stations it is reasonable to assume that the measurements were real and a true reflection of the ambient NO_x and NO₂ concentrations at these sites during 2010.

Conclusions

Analysis of 2010 NO_x/NO₂ measurements from the SAQD suggested that NO_x concentrations were, on average, approximately 29% higher in Scotland than other recent years. Corresponding NO₂ concentrations have been estimated to about 15% higher in Scotland in 2010. Analysis from measurements from the UK-wide AURN undertaken on behalf of Defra by AEA, suggest that NO_x concentrations were, on average, approximately 15% higher in 2010 than other recent years. Corresponding NO₂ concentrations have been estimated to about 10% higher in 2010.

Figure 1 SAQD annual mean NO_x concentration trend (2008-2011) by site type.

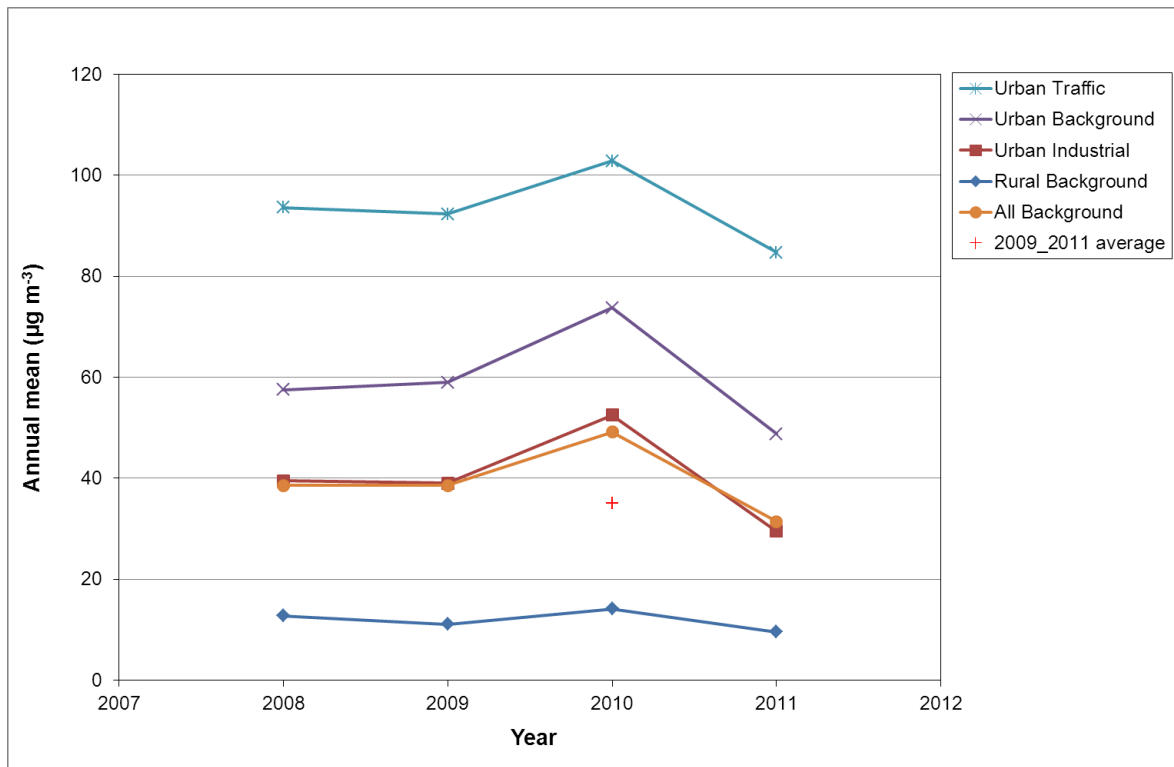


Figure 2 SAQD annual mean NO_x concentration trend (2008-2011) for Background sites.

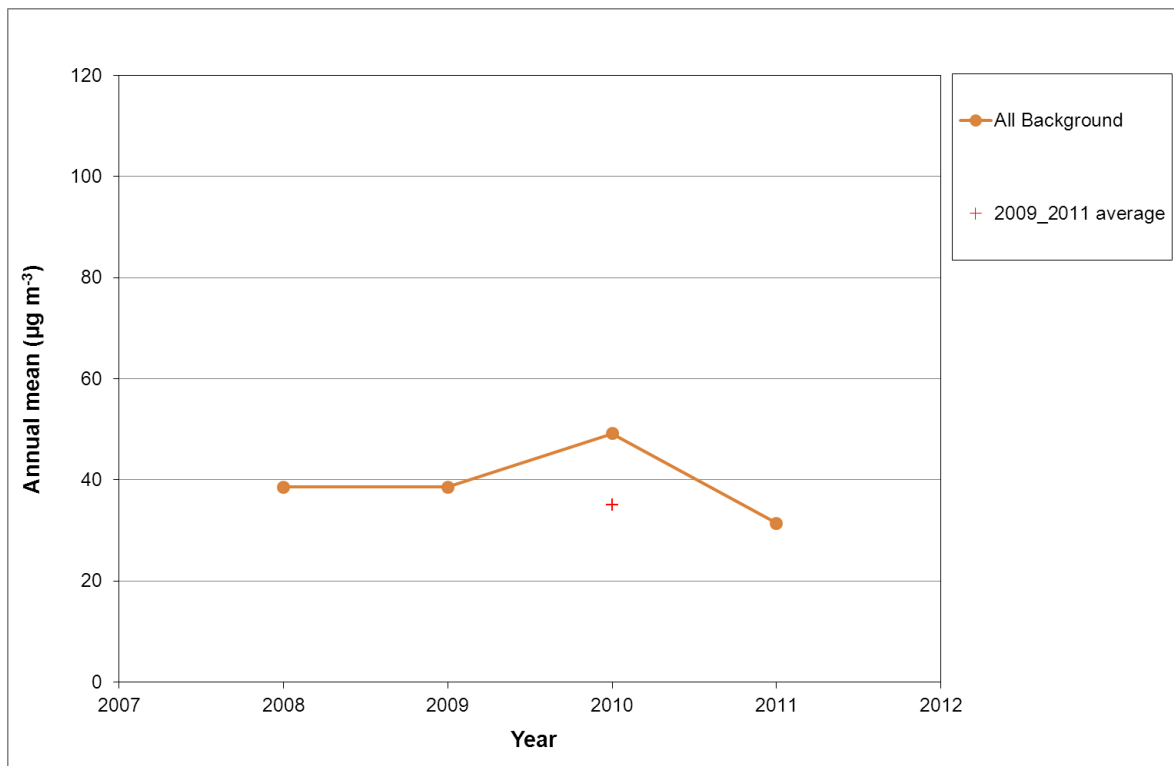


Figure 3 SAQD annual mean NO₂ concentration trend (2008-2011) by site type.

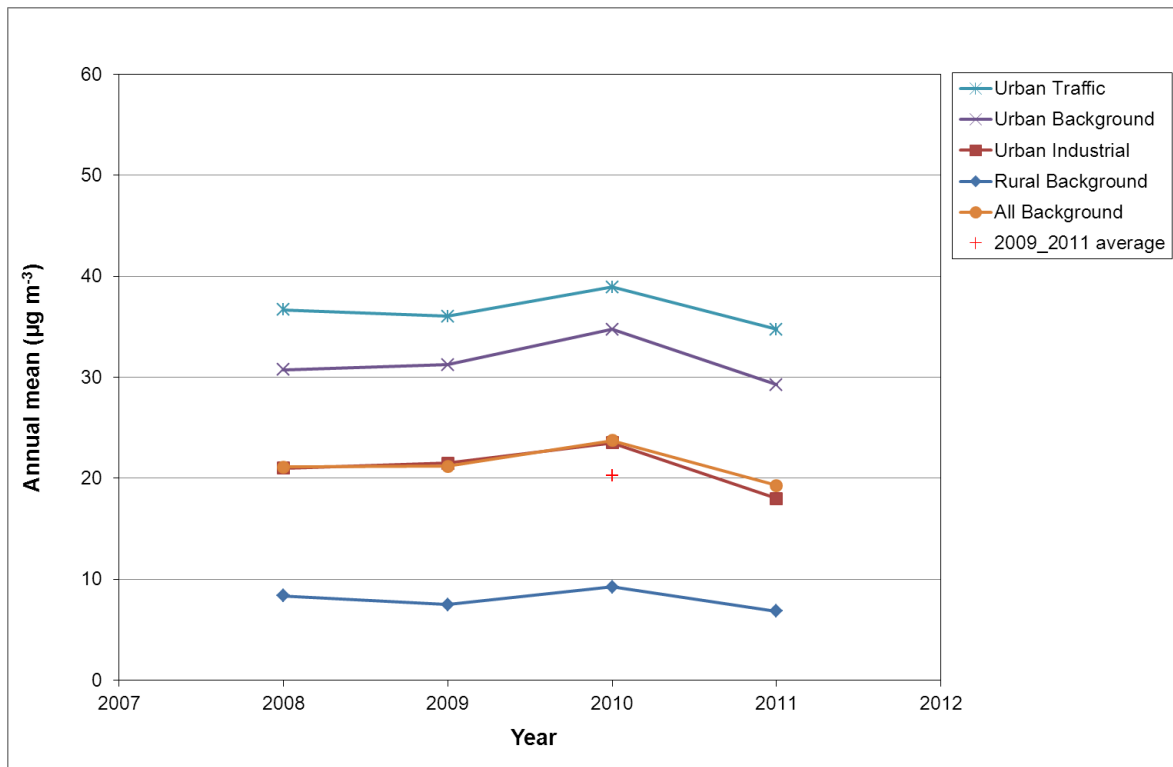


Figure 4 SAQD annual mean NO₂ concentration trend (2008-2011) for Background sites.

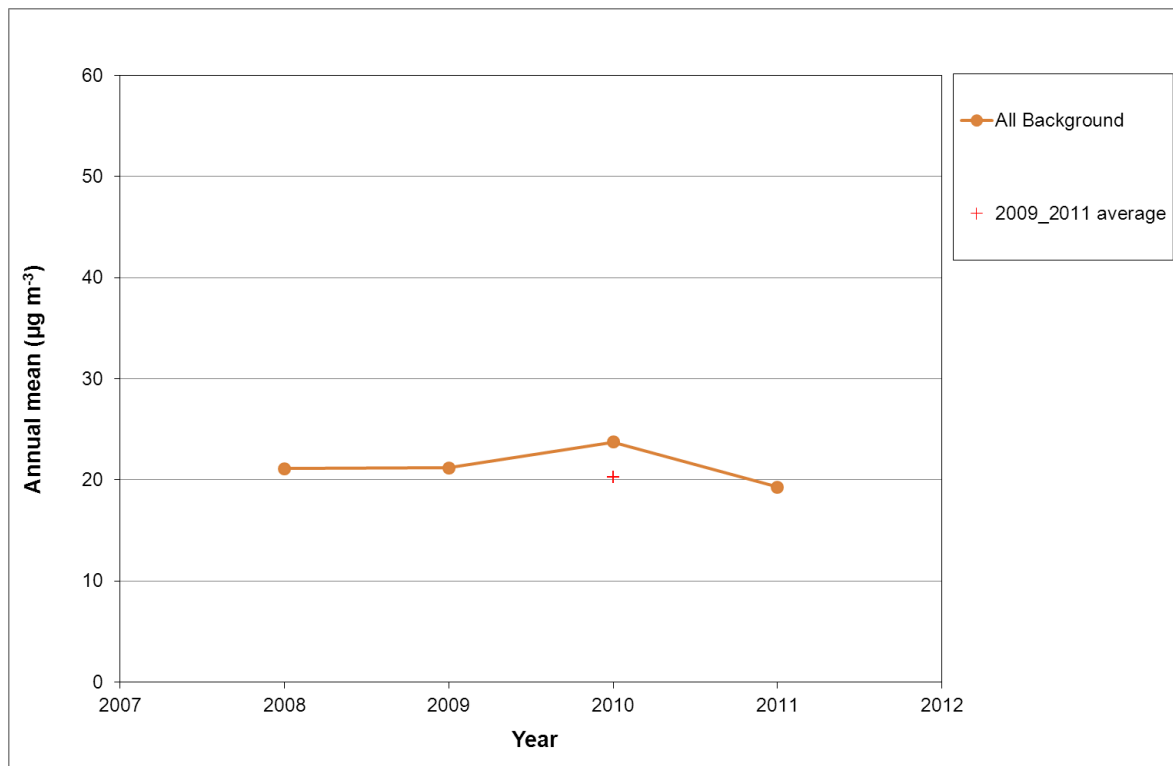


Figure 5 SAQD annual mean NO₂ concentration trend (2008-2011) for Urban Traffic sites.

