

IAQM Meeting on Future NO₂ Concentrations – 1 July 2010

The IAQM held an afternoon discussion meeting at Arup offices in London to discuss this topic. Approximately 50 members attended and this is a brief report on the meeting based on notes made by Carl Hawkings and Jim Storey.

David Carslaw – Evidence of NO₂ and NO_x trends in the UK

David described a analysis, undertaken for Defra, of UK data to investigate why there is a difference between modelled and measured concentrations and trends, and what this may mean for air quality management and objectives in the UK. This has involved studying various monitoring sites and grouping them by type of site. He has found that NO₂ has remained generally level since 2003 in the UK after an earlier decline, except in London where since 2003 there has been a rise. David said that sometimes it is not useful or relevant to look at all data, and so he has been focusing on recent data (2004 onwards) and specifically on recent interesting changes.

One can use ozone concentrations in combination with NO_x to estimate primary NO₂ emissions (i.e. NO_x emissions emitted as NO₂). In London in 1997 primary NO₂ was about 3-4% but is now 20%. Similar trends have occurred in other EU cities. In cities in the mid 90s, tailpipe primary NO₂ was around 5% and now it is around 15%. Techniques used by David include remote sensing of NO_x (not NO₂) from actual vehicles on the road; 65000 vehicles have been sampled so far, and with registration plate recognition there are 100s of variables for each vehicle that can be cross-matched to engine size, fuel type and even colour!. Petrol and diesel vehicles have not changed in the same way over the past decade. Petrol cars produce very little (<10%) primary NO₂, but diesels produce up to 50% primary NO₂. Light duty vehicles (LDVs) produce a lot of primary NO₂.

A comparison was made with the Swiss/German Handbook on Emissions, 2010. The factors here are very different for the different EURO emission standards to those used in the UK NAEI, especially for HGVs where the NAEI shows a decline in NO_x with increasing EURO1 to EURO6, but the Handbook shows little change until EURO4. The effect of primary NO₂ and its underestimation in emission factors is most important the closer to roads one is. Central London is most affected in the UK as there is a high proportion of diesel vehicles (buses and taxis). In contrast Greece is not so affected as there are few diesel in the vehicle fleet. Primary NO₂ has declined there.

David Muir – Long Term Trends in NO₂ and NO_x in the UK

David has examined long term trends in AURN data (1992-2009) using cumulative sum analysis of the NO₂/NO_x ratio. This technique allows small changes in time series to be emphasised and to determine if the change is a step change or a creeping change. Kerbside and urban background sites have been used. At London Bloomsbury the ratio was about 0.58 NO₂/NO_x till 2000, then there was a step change (over a number of months) to 0.7 showing an increase in NO₂. Other sites showed a change in about 2003. The changes are step changes that happened over a short time (months), and

have then not be followed by other changes. Some sites (e.g. Leeds) have not changed. The step change seems to be present and more pronounced where there is congestion, i.e. it may indicate a change in emissions at low speed or stationary traffic. David questioned whether the Euro standards really address these type of traffic flows. Particle traps on buses may also be a cause.

Helen ApSimon – Modelling Future Air Quality

Helen is concerned with trying to predict trends to 2020 using the UKIAM model. Factors are taken from the NAEI which indicate for diesel vehicles and LGVs: EURO1, 11% NO₂, EURO5, 50% NO₂. The conclusion is that In 2020, NO_x is lower than today but the NO₂ proportion is higher (primary NO₂ is greater) (The NAEI estimate in 2010 is 330kt NO_x from road transport; in 2020 the estimate is 135kt). Some conflicts in estimated/modelled NO₂/NO_x and actual concentrations have been found to occur at coastal towns/cities, where shipping is having a significant effect on NO₂/NO_x. Emissions estimates for 2020 for HGVs (EURO6) could be wrong, Dutch factors are different from the NAEI.

Steve Moorcroft – LAQM, Planning Process and Trends in Future NO₂

Steve discussed whether (and if so, how) the disparity between the TG09 predicted decline in NO₂ and NO_x be amended. It is known that the TG09 1x1km maps of predicted NO₂ are not as have been measured (measurements are showing no decline over the last few years), but it is not known how to put it right? Getting this wrong means has implications for declaring AQMAs, revoking AQMAs, not spending on air quality control, overspending on air quality control, not developing action plans, where AQMAs are needed etc. If one were to, say, take the existing baseline and assume that it stays at this level, the problem was how long could this be assumed before a decline in concentration should be applied?

Steve reported that an answer to an FAQ on the LAQM Review and Assessment Helpdesk is being drafted at the moment to give local authorities' advice. Work by David Carslaw may be useful in assisting in the decision whether to adopt a flat line approach to emissions, for how long and whether to continue with the current advice. Advice from the discussion was not to present two options, i.e. flat line or decrease, but to justify the assumption in any assessment. Presenting alternatives would lead to conflict and a non-standard approach. Steve emphasised that FAQs on the local air quality management advice site have the same standing as TG09.

Question and Answer Discussion after the Presentations

A number of members gave their views on whether LAs should be advised to carry on using TG09 regardless or whether matters could be put on hold pending new vehicle emissions factors. A very valid point was that if the modelling is uncertain then monitoring will become more important, but local authorities will be under more financial pressure to shut monitors down. Also that it will be very important to build emission reductions into Section 106 or Community Infrastructure Levy agreements.

Much of the audience were concerned with what advice to give to local authority managers in relation to the absence of a decline in NO₂ (i.e. in conflict with advice in TG09). It was suggested that air quality professionals should take a precautionary approach and not use the guidance. However this approach involves uncertainty as to when a decrease will become apparent in measurements. As Steve Moorcroft is drafting an FAQ for the local air quality management web site, this may provide assistance with those faced with such issues. Steve emphasised again that an FAQ on the LA advice website has the same standing as the original guidance TG09, so if the FAQ advises to do something contravening the guidance, this is an authoritative basis for modifying the guidance. It was recognised that the FAQ/TG09 guidance was used outside the local authority context by air quality professionals.

It was also argued that air quality is not the main determinate of human health (nutrition, housing etc. are more important). Some developments may have an overall positive effect on lifestyle/environment etc. even though detrimental to human health in air quality terms. The balance between broader environmental decision was one to be made by planners not the air quality professional, who should present the uncertainty in future air quality trends.

The IAQM awaits with interest the publication of a new Frequently Answered Question to address this issue, with an answer approved by Defra, and this answer inevitably will also be used in planning assessments. Any suggestions to Steve, but watch this space!