



**Institute for Air Quality
Management**

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Ekoere Deinne,
Atmosphere and Local Environment Programme,
Defra, Area 5F, Ergon House,
Horseferry Road, London, SW1P

Emailed to euairquality@defra.gsi.gov.uk

Dear Sir,

Consultation on Air Quality Plans for the achievement of EU air quality limit values for nitrogen dioxide (NO₂) in the UK

(1) The Institute of Air Quality Management (<http://www.iaqm.co.uk/index.html>) is the UK's professional body for those working in the field of air quality management. The Institute of Air Quality Management (IAQM) seeks to maintain, enhance and promote the highest standards of working practices in the field of air quality and for the professional development of those who undertake this work.

(2) On the 9 June 2011, Defra published a Consultation on Air Quality Plans to meet EU Limit Values for Nitrogen Dioxide (NO₂) in England, and this letter addresses the question as to whether the Government is developing an effective strategy to meet its air quality obligations under the EU Air Quality Directive. The Defra consultation consists of:

(a) a draft UK Overview Document,

(b) a draft List of UK and National Measures containing a list of air quality plans for the achievement of EU air quality limit values for nitrogen dioxide (NO₂) in the UK,

(c) draft Air Quality Plans for the 30 air quality zones and agglomerations in England where the assessment for 2010 shows that additional time will be needed to meet in full the NO₂ limit values. We will refer specifically to the Air Quality Plan for the achievement of EU air quality limit values for nitrogen dioxide (NO₂) in the Greater London Urban Area (UK0001).

(d) a draft Technical Report describing the methods used to assess the air quality plans for 2015 and other future years. This relies essentially on estimates of emissions for a zone and surrounding regions, a model (a mathematical method or procedure for doing

calculations) to estimate concentrations in the zone, and comparisons between the model and past observations to check on the model's performance i.e. that it can be used to estimate future concentrations. These are the three essential components of air quality management. This document, in its second paragraph, states that it should be read alongside the separate UK overview document, the list of UK and National Measures and the air quality plans for each of the 40 UK zones included in the notification. This is an almost impossible task for any individual, as no clear attempt has been made to explain methods and general conclusions.

(3) Because of concerns that IAQM has over this approach, IAQM is responding to this consultation.

(4) Table 3 of Defra's draft Overview report shows that compliance will not be achieved in 17 zones (under a Low Emissions Zone scenario) or 21 zones (under a baseline scenario) by the attainment date of 2015, although as stated in paragraph X of the overview document, Article 22 of the 2008 Directive allows Member States to apply to postpone the attainment date for the NO₂ limit values from 2010 up to 2015, subject to submission to the Commission of air quality plans setting out how the limits will be met by the extended deadline. It is not entirely clear why Defra is applying for a postponement when one of the conditions for applying for a postponement is that plans should be submitted to show how the limits will be met, which clearly they will not be.

Although this is a legalistic interpretation of the Directive, the implication of the Directive (Annex XV) is that an air quality problem should be diagnosed and appropriate action taken in good time. It has long been recognised that there was a problem with on-road vehicle emissions, as compared with the Euro standards, and an increasing emission of primary NO₂ from road vehicles. Additional measures not focused on the 'tail pipe' solution should have been given more urgent consideration well before now. As a minimum the overview document should explicitly reassure the reader that the limit value for NO₂ has not been exceeded by the maximum margin of tolerance in the UK, as required by the Directive under article 22, paragraph 3.

(5) The Overview report makes the point that NO_x emissions from road transport have not followed projections for various reasons, and are therefore subject to uncertainty regarding past conditions, and uncertainty when projected forward in time to 2015, and to 2020 and 2025, as discussed in the draft Overview report. Although Defra recognise the uncertainty in road transport emissions, this uncertainty is not taken into account in the projections. The uncertainty arises from problems with emission factors and assumptions in emission inventories relating to diesel vehicles, accentuated by the high fraction of diesel cars in new registrations in recent years. These problems have become apparent from trends in roadside measurements in recent years.

(6) These uncertainties undermine the basis of the modelling used to project forward to future years. It is unsatisfactory to continue to use existing road transport emission factors, just because 'nothing else is available'. Instead an attempt should be made to apply 'inverse modelling' techniques, often referred to as assimilation methods, to correct emission factors. Some so called 'tuning' is a feature of the current modelling, but no systematic attempt has been made to adjust emission trends in the projections presented and this invalidates the method used.

(7) In addition the interested reader is subject to a paper chase to understand how the assessment has been undertaken. Model projections should be readily understood by any

interested reader, if presented clearly in a plain common sense way, showing why projections behave as they do, and need not be hidden by complications. This is part of what is called a 'diagnostic' evaluation of a model. It provides a useful check and an alternative to the blind acceptance of the results of a model calculation. It is also one way to explain the reasons for differences in models. Defra can call upon experts to review the quality of their technical analysis, and given the importance of this one should have done so on this occasion.

(8) The report contains no general approach as to how national and local measures will be used to achieve NO₂ limit values. A strategic view of air quality management based on evidence from the past two decades should have been presented with Defra providing leadership. The IAQM therefore considers that Defra has failed to develop an effective strategy to meet its air quality obligations.

Further technical issues are listed below.

(9) It is stated in the Technical Report that it is **not** possible to calculate an unambiguous source apportionment for annual mean NO₂ concentrations. Source apportionment, if possible, would show how much each sector e.g. cars, buses, taxis etc., contributes to the total concentration at a specified location and is a key step in defining what is the appropriate air quality management measure. However such a source apportionment for NO₂ is undertaken for the road link with the highest concentration in Table 12 and elsewhere in the Air Quality Plan for the Greater London Urban Area (UK0001), one of the air quality plans to be read along side the overview document. This is directly contradictory. One cannot know the effect of reductions in one source sector, such as buses, on NO₂ concentrations in 2015, as shown in Table 9 of the UK001 plan, unless one takes into account reductions in other source sectors, because of the complex relation between NO_x and NO₂. There is no unique way of apportioning NO₂ to source sectors.

(10) One can undertake source apportionment for NO_x and these are shown in graphical form at many locations in Annex 1 (UK0001) to this plan. It appears from Table 9 that nearly three quarters of the NO_x is from buses at the road link in Greater London with the highest concentrations. However this does not mean that cleaning buses will remove the annual NO₂ exceedance in the whole of the UK0001 zone. In other words this site is not representative of all zones in London where the air quality limit value for NO₂ is predicted to be exceeded in 2015.

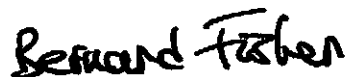
(11) An illustrative Low Emissions Zone (LEZ) Scenario has been modelled to assist in understanding the potential impacts of introducing further LEZs to reduce NO_x emissions. In this scenario all HGVs and buses would be required to meet at least Euro IV emission standards for NO_x and PM₁₀ in 2015, in order to travel on roads within selected local authorities. The reader is referred to the technical report for further information, but this does not contain any specific details, in particular the reduction in emissions likely to arise from the application of LEZs is not stated. Referring to the plan for Greater London (UK0001), one can eventually find some information on the reduction in concentration following the introduction of LEZs. The efficacy of the LEZ at the location in London with the highest NO₂ concentration is predicted to be almost entirely due to the reduction in the contribution from buses (the NO_x from this source sector in 2015 is 187.1 without the LEZ and 133 with the LEZ. The relative change in the contribution from HGVs is much smaller.) This location is not representative of all locations in London where NO₂ limit values are exceeded, so it is difficult to judge the effectiveness of the measure in quantitative terms. In addition one suspects that the effectiveness of the measure will be limited unless all

road vehicles, and not just buses and HGVs, are included in the LEZ restrictions. Given recent emission trends one needs convincing that the trends in future bus and HGV emissions used in the LEZ predictions, but not stated, will actually occur by 2015.

(13) The Air Quality Plan for Greater London is one of 40 UK air quality plans and contains information about measures which could affect NOx emissions within the Greater London zone. However no attempt is made to assess quantitatively the effectiveness of local and national measures within this Action Plan. This means that it is not possible to assess which measures are likely to be effective. With 30 Air Quality Plans contributing to reductions in NOx and NO2 within England, it is not possible for interested parties to see which measures are likely to be the most effective. Such an analysis is one of the main reasons why one undertakes modelling. (The other is to make future projections.) It allows the decision maker to consider a variety of scenarios and on this occasion is an important opportunity missed.

(14) To understand the technical report one has to go to a further technical report (UK air quality modelling for annual reporting 2008 on ambient air quality assessment under Council Directives 96/62/EC, 1999/30/EC and 2000/69/EC http://uk-air.defra.gov.uk/reports/cat09/1101250943_dd122008mapsrep_v4.pdf). In this report the relationship between NO2 and NOx is assumed to depend on an empirical relationship which may not apply in the future. Complexity is further increased because the fraction of primary NO2 emissions varies from one location to another. Thus the NO2 to NOx relationship varies at different locations. The relationship between NO2 and NOx assumes that oxidant levels will stay the same in future years out to 2025, based on a paper published in 2006, which uses observations up to 2003 and a global model to extrapolate to the future. In addition Fig 3.21 of this technical report shows clearly that the model's prediction of roadside concentrations is subject to considerable scatter possibly by as much as plus or minus 30%, suggesting that error bounds should be placed on any projections which are used for assessment. These should be presented in the draft Technical Report and Overview Report, which at present contain no indication of the accuracy of the estimates which have been made. In addition there is the unquantifiable street scale variability of traffic-related pollutants in densely populated urban areas, which may affect the reliability of routine monitoring and modelling (see the forthcoming paper by Vardoulakis *et al.* in *Atmospheric Environment*, entitled: Intra-urban and street scale variability of BTEX, NO2 and O3 in Birmingham, UK: Implications for exposure assessment.)

Yours faithfully



Prof Bernard Fisher
Chairman IAQM
On behalf of the Institute for Air Quality Management