Airports Commission: Consultation on Air Quality Assessment May 2015

Comments on **Module 6 Air Quality Local Assessment**

(1) Decisions regarding future airport expansion should be based on the best information available. This report on air quality presents a very detailed calculation based on numerous assumptions, the appropriateness of which a reader is unable to judge. One would expect some balance between the accuracy of the calculation and the number of assumptions. In other words more assumptions implies more uncertainty. One can accept uncertainty in decision making, but this report does not help one to make a balanced judgement. To avoid a very lengthy list, only the major assumptions are listed and comments made about them.

(2) The two pollutants of major concern are nitrogen dioxide and particulate matter. Both are secondary pollutants and therefore involve atmospheric processes over travel distances of some 10 to 100's of kilometres and travel times of some hours. Therefore regional modelling should be involved and not just local dispersion modelling. Nested meso-scale modelling would be regarded as the most advanced scientific approach to assess major pollution issues of this kind, and has previously been applied to Heathrow. The approach used in this report is not the most advanced.

(3) The assessment looks at concentrations in 2030. By this time the pollution climate of the UK, and in particular of London, may have changed considerably. It is not clear to what extent the assumed background concentrations not associated with airport sources, based on the PCM model, take into account the possible changes in the chemical interactions in the atmosphere by 2030. This is why meso-scale models taking into account meteorological and chemical interactions have been developed. The report makes no mention of these advanced approaches. The science has moved on from the conclusions of the DfT Sustainable Development of Heathrow 2006 study (page 8). The health effects of NO2 (page 12) have not as yet been formally recognised in the UK. It is the breach of the air quality limit value for NO2 (page 13) which is the major concern, although the successive UK Governments appear until now, not to have considered widespread breaches a serious matter.

(4) There is uncertainty in any air quality assessment associated with (a) the emissions, particularly future emissions, (b) local and regional meteorology, and (c) the dispersion model. Even if a model is widely used and tested, its predictions are still uncertain and this should be recognised when results are presented (page19). The distinction made in the report between local and national methods used to assess compliance with air quality limit values (page 20) is an artificial distinction, which would not exist if uncertainty in the methods was taken into account.

(5) The modelling depends on adding the annual average concentrations from the PCM model (page 22) with the hourly average concentrations in a local (airport)

model (ADMS). It would have been better to use a modelling technique which took account of chemical interactions between local airport pollution and regional pollution. For example, the change in hourly average ozone and NOx concentrations in London by 2030 is likely to have a significant effect on NO2 around Heathrow. This is not treated fully in the model, nor possible meteorological changes by 2030 in the London urban heat island, and at the very least errors should be acknowledged. This could be done by taking a worst case approximation.

(6) The key process within the chemical interactions is the treatment of NOx to NO2 conversion (page 32). The normal approach in ADMS cannot be used so another rather involved, empirical approach (Appendix D) is adopted. This approach does not take into account possible changes in regional ozone concentration by 2030 as a result of changes in emissions in London and the southeast or further afield. Changes in ozone would affect the NO2 formation (Appendix H). The approach also depends crucially on the primary NO2 fraction of NOx which must be uncertain for aircraft operations (page154), but no uncertainty is acknowledged. One could consider the effect of climate change by simply using meteorology from another year which is more representative of a projected 2030 climate change climatology.

(7) The report (page 43) appears to omit the most important result needed from the assessment, namely the incremental change, the difference between the 'do minimum' and 'scheme' concentrations in 2030. Table 4.5 gives the scheme 'Gatwick 2R' NO2 concentrations. Figs 4.6, 4.7 and 4.8 help but are impossible to read. The concentrations in the range 0 to -2 $\mu g/m^3$ and 0 to 2 $\mu g/m^3$ are indeterminate. The high changes of order 10 $\mu g/m^3$ are presumably caused by changes in road alignment, which are not relevant to judging whether an increase of 28% in NOx emissions associated with the airport is a matter of concern? One needs to know the incremental change in the pattern of total, airport, road and background NOx and NO2 around the airport. In contrast Table 4.9 (page 46) does tell us the incremental change in NOx at designated habitats. This omission starts to appear deliberate, as on page 50 the incremental change estimated by the Promoter of 0.6 $\mu g/m^3$ at the worst case location Horley is stated, but not the comparable incremental change at the same location estimated from the modelling described in the report!

(8) The results in the report for the scheme Heathrow NWR with a 26% increase in NOx emissions above 'do minimum' do not reveal readable values of the incremental change in NOx and NO2 from road, airport and background NOx emissions (page 64). Table 5.7 (page 66) does give the incremental change in NO2 at some roads in the region, which appear relatively small 3%. On page 72 the incremental change estimated by the Promoter of 0.8 $\mu g/m^3$ at the worst case location Hatton is stated (a 2.5% increase), but not the comparable incremental change at the same location estimated from modelling in the report! The report also states that the Promoter cannot compare concentrations with the EU limit value because the PCM model was not used by the Promoter. There is nothing in the EU Directive which requires the

PCM model to be applied in an assessment. No other country to which the EU Directive applies uses the PCM model.

(9) The results in the report for the scheme Heathrow ENR with a 20% increase in NOx above 'do minimum' do not reveal readable values of the incremental change in NOx and NO2 from road, airport and background NOx sources (page 89), although some values are given at specific locations. For this case the Promoter provides no air quality assessment, so no comparison with this study would be possible. Because of the limitations of the modelling the effect of an ULEZ in London cannot be assessed (page 103).

(10) The relationship between NO2 and NOx is non-linear, which makes the source apportionment between types of NOx emissions (airport, road and background) difficult to do 'in principle'. However it appears that from the slope of the lines in Figure D1 on page 155, the addition of 1 unit of NOx concentration in 2009 corresponds to the addition of about 0.4 units of NO2. Based on this relationship an approximate source apportionment could be done for 2009, but it is not clear whether the same relationship between NO2 and NOx applies in 2030.

(11) The use of a program Surfer (page 114) to interpolate from a coarser 1 km resolution grid to a finer 50m resolution grid does not produce a finer 50m resolution background air pollution field. It merely has the effect of smoothing out concentrations between adjacent 1km grid squares. The resulting concentrations are no more accurate than those in the original 1km resolution background concentration field.

(12) The evaluation of the model at just one site for each airport is not a substantial evaluation and does not justify the conclusion that the performance of the model is good (page 162). The adjustment to the estimated road NOx near Heathrow, which is not based on any scientific argument and is also used around Gatwick, does not seem the best way to deal with uncertainty (page 163). The conclusion from Table F2 should be that the background sources make the largest contribution to NOx concentrations and therefore most effort should be made to evaluate changes in the background (regional) concentration between 2009 and 2030.

(13) The report does not say how the adjustment factor affects NO2 concentrations predicted in the Heathrow and Gatwick scheme. The size of the adjustment factor should be considered a measure of the uncertainty and there is no scientific basis for applying the same correction factor to the 2030 calculations. A sentence on page 161 suggests that the it has! Incidentally there appears to be little or no relationship between modelled and measured PM10 concentrations (page 167) and therefore the model should not be used to estimate incremental changes in PM10 concentration in 2030.

(14) The final assessment appears to be based on national compliance with EU limit values, focusing on sites where NO2 is predicted to be above 32 $\mu g/m^3$ in 2030

based on the PCM model which is not part of this study and is a further assumption. On page 45 in Table 4.7, no incremental NO2 concentrations are presented for the Gatwick 2R scheme, which is no help in an assessment! On page 66, Table 5.7 shows some locations in London where the NO2 limit value will not be met in 2030 based on assuming the PCM model is correct and adding the Heathrow NWR increment. At these sites the Gatwick 2R scheme, which would lead to an increase in NOx emissions, would also cause an increase in NO2 concentrations (albeit by a smaller amount than the Heathrow schemes). Similarly on page 91, Table 6.7 which shows results for the Heathrow ENR scheme, should also show consequences for the Gatwick 2R scheme.

(15) This focus on national compliance (Tables 4.7, 5.7 and 6.7) is not the only way to compare the air quality impact of the three schemes. One also needs to know the source apportionment, available from the modelling, in order to understand why there is an exceedence and which source sector is mainly responsible (airport, road or background).

(16) Technical criticisms of the modelling in this study have been outlined in the paragraphs above. However the main general criticism is that simply not enough information from the results of the study has been made available for a reader to compare the air quality consequences of the three schemes.

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