

# **Inadequate Treatment of Climate Change and Air Quality in the Environmental Statement**

## **Contents**

Summary .....	1
Greenhouse Gas Emissions.....	2
PM2.5 Air Quality Criteria and Assessment.....	3
Air Quality Standards.....	4
Significance of Air Quality Impact.....	5
Unnecessary Detail in the Environmental Statement.....	5
Alternative Health Risk Assessment for 2029.....	6
Alternative Health Risk Assessment for 2038.....	7
National Picture of Air Quality and Greenhouse Gas Emission Reductions.....	7
Errors in Table 18.8.7 and 18.8.8 .....	8
Model Verification for NO2.....	8
Conclusions.....	9
References.....	10

## **Summary**

The focus of this written representation is on Environmental Statement Chapter 13: Air Quality, Chapter 16: Greenhouse Gases and Chapter 18: Health and Wellbeing TR020005.

Aspects of the Environmental Statement dealing with climate and air quality are inadequate, and do not form a sufficient basis for a decision.

I will discuss issues in the following order:

- (1) the criterion for assessing greenhouse gas emissions and whether the emissions from the Gatwick Airport Limited project are “significant”
- (2) PM2.5 air quality criteria and assessment
- (3) health impact of air quality
- (4) assessment of nitrogen dioxide within the air quality assessment

## Greenhouse Gas Emissions

(1) The criterion for judging greenhouse gas emissions is based on the IEMA Guidance on climate change, discussed in Chapter 16 of the Environment Statement. The crucial point is the alignment of greenhouse gas emissions with the Pathway to Net Zero. Construction of the northern runway will lead to an **increase** in greenhouse gas emissions from surface access. Whether the increase is justified depends on detailed planning for meeting the Net Zero Pathway (required in statutory legislation<sup>1</sup>), which does not at present exist. (Note there is a similar lack of detailed planning to meet national targets on PM2.5<sup>2</sup>, also within statutory legislation)

(2) The Environmental Statement then goes on to justify the development, because the increase in the surface access emissions is a small fraction of the total UK carbon budget (Table 16.9.8). This approach is **not** justified. It means that any project could be judged “insignificant”, because it is a small fraction of the total UK carbon budget. It effectively implies that any local development should be approved! Instead one needs a detailed plan regarding future UK greenhouse gas emissions, which might allow an increase for some developments, because of national need, if this is balanced by mitigation, or a decrease in national emissions elsewhere, produced by greater efficiency.

(3) The Gatwick Airport Limited project appears to lead to an increase of 0.1 MtCO<sub>2e</sub> in greenhouse gas emissions between 2033-37, from surface access emissions *over the 5 year period*. The UK carbon budget over the same period is about 1000 MtCO<sub>2e</sub>, so the increase is about 0.01% (Table 16.9.8). The **increase** from surface access emissions of the proposed development is about 20,000 tCO<sub>2e</sub> *per year*. Flying will add between 3 to 4 MtCO<sub>2e</sub> *per year*. The greenhouse gas emission from aircraft is therefore much larger than the surface access related greenhouse gas emissions, but is not localised to the UK. The consequence of statutory legislation regarding the Pathway to Net Zero of these different sources of greenhouse emission is unclear to me, and is **not** made clear in the Environmental Statement.

(4) There would be a 5.555 MtCO<sub>2e</sub> increase in aviation greenhouse gas emissions because of the Gatwick Airport Limited project, in the years 2033-37, the period of the Sixth Carbon Budget (Table 16.9.10), or an increase of 1.111 MtCO<sub>2e</sub> *per year*. Total aviation emissions from Gatwick are 3% of the **total** UK airport aviation carbon budget emissions, and the increase with the project is 0.6% of the **total** UK airport aviation carbon budget emissions in the five year budget. Thus the report accepts that the northern runway development leads to an increase in airport aviation emissions and must have some adverse impact. Paragraph 16.9.76 in the Environmental Statement appears to acknowledge that aviation has an **adverse** impact, but appears to put responsibility on government policy, and not on individual airports? There is a desperate need here for clarification on how to compare and judge fairly, aviation and road transport emissions.

(5) In summary, the conclusion that the impact of aviation greenhouse gas emissions is “minor adverse, not significant effect” (16.9.84) is wishful thinking. At the present time, given the absence of policy direction, it is **not** possible to judge the significance of aviation emissions.

(6) A number of the local authorities neighbouring Gatwick have declared **climate emergencies**. If these are to be taken seriously, it is inevitable that they should constrain this development, but they should also be represented in the local development control plans produced by these local authorities. Those applying for planning permission (and residents) will then be fully informed as to the approach the local authority will take regarding climate implications of development proposals.

### **PM2.5 Air Quality Criteria and Assessment**

(7) In the air quality assessment, Chapter 13 of the Environmental Statement, the chosen criterion that PM2.5 concentrations should meet, appears to favour Gatwick Airport Limited. Gatwick Airport Limited has chosen 2038 as a year to meet a PM2.5 concentration target of  $12 \mu\text{g}/\text{m}^3$ , while the legislation requires  $10 \mu\text{g}/\text{m}^3$  PM2.5 by 2040<sup>2</sup> (13.5.4). Paragraph 13.5.34 attempts to justify this choice.

(8) There are two aspects which have been neglected in the Environmental Statement. The PM2.5 concentration target should include the natural PM2.5 contribution, such as sea salt. There is no mention of the **natural** fraction of PM2.5, equal to about  $1.4 \mu\text{g}/\text{m}^3$ . This would make a  $12 \mu\text{g}/\text{m}^3$  PM2.5 concentration target effectively equivalent to a  $10 \mu\text{g}/\text{m}^3$  PM2.5 concentration target for human made emissions.

(9) Secondly, only **primary** PM2.5 is considered in the calculation. NOx emissions will contribute to the formation of secondary PM2.5 in the atmosphere. This fraction of the PM2.5 should not be neglected. This **invalidates** the air quality calculation which should be extended to include **secondary** PM2.5.

(10) It is also rather cheeky to claim that the calculation is conservative (paragraph 13.5.34 and again in 18.8.20), because the assumed background concentration (the air pollution coming into the area) has been frozen at the predicted 2030 levels. The background concentrations are likely to decrease, because of actions to reduce emissions by others in the UK and Europe. So action by others, say on road transport and domestic emissions, which benefits Gatwick air quality, is being used as an argument by the applicant that the applicant should be subject to a less stringent standard!

(11) The basis of the air quality assessment in the Environmental Statement is to use emissions from aircraft, surface access and the doubling of the CARE (central area recycling enclosure) facility and the 2030 background PM2.5 concentrations. The study is therefore restricted to a study area defined by a 10km x 11km grid over the airport and some affected network roads. The assessment should consider effects

over a **wider area** as demonstrated later in these comments. The PM2.5 air quality target<sup>2</sup> also requires a 35% reduction in human exposure to PM2.5 by the year 2040. This statutory target is **not** mentioned in the Environmental Statement.

(12) In summary, if Gatwick Airport Limited was confident that the adverse effect was insignificant there would be no need to weight the assessment in its favour.

### **Air Quality Standards**

(13) The standards, which air quality should meet, are discussed in chapter 18 of the Environmental Statement. The World Health Organisation (WHO) guide values are much lower than the standards set in UK legislation. The government's target setting has ignored NO<sub>2</sub>. The NO<sub>2</sub> standard comes from the European Directive 2008, which is based on research conducted in years before 2008. The NO<sub>2</sub> air quality limit value was transposed into UK legislation in 2010. It should have come into force by 2010. Hence it may be considered well out of date. The introduction of the ULEZ zone in Greater London is aimed at reducing NO<sub>2</sub>. It is surprising given the enormous effort put into the air quality assessment that an update to the national NO<sub>2</sub> air quality standard has not been considered. The highest, predicted NO<sub>2</sub> concentrations in Table 18.8.2 are close to the European Directive NO<sub>2</sub> limit value of 40 µg/m<sup>3</sup>, exceed the WHO guide value of 10 µg/m<sup>3</sup> by a wide margin and exceed the WHO interim guide values (shown in Table 18.8.2 and Table 18.8.3. Both tables should be in the Air Quality Chapter 13.). It seems inevitable that over the planned lifetime of this project that the UK NO<sub>2</sub> limit value of 40 µg/m<sup>3</sup> will be lowered and this possibility should be taken into account by Gatwick Airport Limited.

(14) The incremental 0.2 µg/m<sup>3</sup> increase in PM2.5 concentrations from the Gatwick Airport Limited project may appear small (shown in Table 18.8.2 and Table 18.8.3). However, the study<sup>3</sup> leading to the setting of the PM2.5 target considered a number different emission scenarios. The study showed that it is difficult to bring about large relative changes in PM2.5 concentration, when all the contributions from primary, secondary and natural sources are included. One cannot just assume that a small fraction of a baseline concentration means a small effect. The effect of any single source is nearly always likely to be small. In a somewhat similar way to assessing the significance of greenhouse gas emissions, one should consider the cumulative effect of multiple sources, and one source should not be judged in a preferential way.

(15) Consideration of the population exposure and the formation of secondary PM2.5 mean that the receptors in a much wider zone of influence than that shown in Figs 13.1.1 to 13.1.9 should be considered.

(16) As the receptors are largely confined to a region around Gatwick, the Environmental Statement neglects secondary PM2.5 formed from NO<sub>x</sub>. Although the incremental increase in concentrations may be very low at longer distances, further away from Gatwick, this will be compensated by the greater population **exposed** at longer distances. The calculation of the population exposure should not be confined

to a small area around Gatwick. Important contributions to the air quality impact have been ignored in this air quality assessment.

(17) Adding the natural component in Table 18.8.2 and Table 18.8.3 would suggest that the PM2.5 target concentration used in the Environmental Statement would be exceeded at more locations.

### **Significance of Air Quality Impact**

(18) In paragraph 13.10.29 and Table 13.5.3 of the Environmental Statement, a case is made that the air quality impact is “insignificant”. This is based on using present air quality standards, which are much higher, and much less strict, than the standards set in the recently legislated targets for PM2.5 and the likely future limit value put on NO2. For example, applying 10 µg/m<sup>3</sup> as the NO2 standard, instead of 40 µg/m<sup>3</sup>, implies that an increment of 0.2 µg/m<sup>3</sup> would be of “moderate impact” if the same criteria were applied. [0.2 of 10 is 2% so the impact is “moderate” at some receptors.]

(19) The Environmental Statement cannot claim to be a “worst case” calculation, nor that the air quality impact is “insignificant”. Paragraph 18.8.2 effectively concedes that measures by others to address road transport will provide air quality improvements and not action taken by the project. The Gatwick Airport Limited project will not have any effect on moving towards achieving the latest WHO guide values for PM2.5 and NO2, so the assessment ignores these guide values.

### **Unnecessary Detail in the Environmental Statement**

(20) As an aside, one might remark that the Environmental Statement contains spurious detail to justify “insignificance”. If the effect was thought to be insignificant from the start, this could be easily demonstrated by taking an upper bound from a “back of envelope” calculation (by lumping all sources together, assuming a ground-level source and a “worst case” receptor location).

(21) Paragraph 18.8.27 states explicitly that the baseline PM2.5 concentration will be lower than those shown in Table 18.8.6, because of the Government’s statutory commitments to Net Zero. Yet the applicant seems to think it has no role to play and the improvement will be brought about by the action of others, on solid fuel burning, road transport and industrial combustion etc. Table 18.8.6 focuses on concentrations at receptor positions and not on the overall population exposure, including secondary PM2.5. As the government has a statutory requirement to meet Net Zero, the government should provide guidance as how to accommodate sustainably, major developments, such as this Gatwick expansion, which increase greenhouse gas emissions.

(22) In order to give some idea of the effect of secondary PM2.5 on the health impact and the treatment of limited receptor locations, I have included here in paragraphs

(23) to (27) an alternative health risk calculation. The numbers may be only approximate, but they illustrate how one may understand the possible effect on human exposure.

### Alternative Health Risk Assessment for 2029

(23) Receptors beyond the immediate Gatwick area (10km by 11 km) would be affected by the formation of secondary PM2.5. From the emissions in the air quality Chapter 13 of the Environmental Statement, Table 13.10.5, the airport related emissions appear to be 31 t/y for primary PM2.5 with an **increase** from the project of 0.6 t/y, with NOx emissions of 2124 t/y with an **increase** from the project of 99.6 t/y in the year **2029**.

(23) To illustrate how a much simpler calculation, based on a “back of envelope” estimate, can establish the approximate magnitude of the effect on human health of the proposal, I have used what I have called a series of national average Unit Health Risk Impact *UHRI* factors. These are the number of attributable deaths *per year* associated with the emission of 1000 tonnes per year of each of the precursor air pollutants, such as ammonia, nitrogen oxides or primary PM2.5 particles. These are comparable, but not the same as the damage cost values (£/t) for ammonia, nitrogen oxides and primary PM2.5 produced by DEFRA<sup>4</sup>. I have derived these myself, but the applicant, Gatwick Airport Limited, can derive their own independently, specific to Gatwick Airport if they wish. My *UHRI*'s are the national average over the UK of the number of attributable deaths *per year* associated with the emission of 1000 tonnes *per year* of each precursor air pollution emission over all distances, which would include long distances beyond the project's zone of influence. The unit health risk impact  $UHRI_{PM2.5}$  is the **regional** health impact from the emission of primary PM2.5, associated with 1000 tonnes *per year* of primary PM2.5 particle emissions (taken to be 60 lives *per year* lost per 1000 tonnes *per year* emitted). The unit health risk impact  $UHRI_{NOx}$  is the **regional** health impact from secondary PM2.5 associated with the emission of 1000 tonnes of NOx emissions (taken to be 3 lives lost per 1000 tonnes emitted). With these *UHRI* factors, the **regional health risk impact** would be  $(60 \times 0.6 + 3 \times 99.6) / 1000 = 0.336$  lives per year in the year **2029** with most coming from secondary PM2.5 associated with NOx emissions.

(24) This does not take account of the **local** primary PM2.5, nor the health effect of NO2. The local primary PM2.5 unit health risk impact  $UHRI_{locPM25}$  within the project's zone of influence (a 10km x 11km zone) is taken to be 21 lives lost per 1000 tonnes of primary PM2.5 emitted. The NO2 unit health risk impact  $UHRI_{NO2}$ , for NOx as NO2, is taken to be 12 lives lost per 1000 tonnes of NOx emitted. The additional **local health risk impact** would be  $(21 \times 0.6 + 12 \times 99.6) / 1000 = (13.6 + 1195.2) / 1000 = 1.2$  lives per year in the year 2029, again with most coming from the NOx emissions. The total attributable lives lost per annum from **regional** and **local** impacts amount to about **1.5 lives per year in 2029** according to this calculation. The Gatwick Airport Limited Environmental Statement, in Table 18.8.7, contains an estimate of **0.066**



**attributable lives per year**, which is much **lower** than our estimate. Taking account of NOx emissions from aircraft on the ground would increase our estimate further.

### Alternative Health Risk Assessment for 2038

(25) From the emissions in the air quality chapter 13 of the Environmental Statement, Table 13.10.7, airport related emissions appear to be 32 t/y for primary PM2.5 with an **increase** from the project of 4.5 t/y, with NOx emissions of 2306 t/y with an increase from the project of 370 t/y **in 2038**. Using the same unit health risk impacts *UHRI* factors as above, the **regional** health risk impact would be  $(60 \times 4.5 + 3 \times 370) / 1000 = 1.38$  lives per year in **2038** with most coming from NO2. This does not take account of the local primary PM2.5 within the project's zone of impact. The **local** unit health risk impact from PM2.5,  $UHRI_{locPM2.5}$ , within the project's zone of influence (a 10km x 11km area) is taken to be 21 lives lost per 1000 tonnes PM2.5 emitted. The NO2 unit health risk impact  $UHRI_{NO2}$ , for NOx as NO2, is taken to be 12 lives lost per 1000 tonnes NOx emitted. The additional **local health risk impact** is  $(21 \times 4.5 + 12 \times 370) / 1000 = (94.5 + 3774) / 1000 = 4$  lives *per year* in **2038**, again with most coming from NOx emissions.

(26) The total number of attributable lives lost from the **local** and **regional** health risk impact of the development equals about 5 lives *per year* in 2038 according to this calculation. Taking account of NOx emissions from aircraft on the ground would increase this estimate further. We have estimated **5 attributable lives per year in 2038** from air pollution emissions of NOx and PM2.5. The number of lives attributable to air pollution in 2038 according to this estimate is considerably **higher** than the Gatwick Airport Limited estimate of **0.6 lives per annum** in Table 18.8.9.

### National Picture of Air Quality and Greenhouse Gas Emission Reductions

(27) The increase in airport related greenhouse gas emissions between 2033 and 2038, excluding aviation, is estimated to be about 27,400 tCO2e *per year* (Table 16.9.8). Taking 3 lives *per year* as the **midway** value of our estimate and the Gatwick Airport Limited estimate in 2038 of the air quality impact of the Gatwick Airport expansion, one would estimate an increase of 1 attributable life *per year* from air pollution is associated with an increase in greenhouse gas emissions of 10,000 tCO2e emission. One can compare this with the national picture. Table 16.9.8 shows the reduction in UK CO2e emissions between 2020 and 2038. This is about 300 million CO2e *per year* if the Net Zero reduction pathway is followed. If we assume that one attributable life from air pollution emissions is associated with the emission of 10,000 tCO2e of greenhouse emissions, then the health benefit to the UK from the reduction in air pollution emissions associated with the Net Zero Pathway between 2020 and 2038 is about 30,000 attributable lives per year. The airport related emissions will have contributed nothing to this improvement. They have only made it worse by an increase of possibly **5 attributable lives per year in 2038**. The

significance of this adverse impact can only be judged in relation to an integrated plan to reduce the national exposure, and not by judging one project in isolation.

### Errors in Table 18.8.7 and 18.8.8

(28) Table 18.8.7 contains an error. The additional mortality of 0.066 lives stated in the table within a population of 300,000 in **2029** is equivalent to about the mortality of 0.022 lives in a population of 100,000, for which the baseline mortality rate would be about 1000 lives. So the change in the baseline rate is 0.000022 or 0.0022%. This is much greater than the figure 0.0000002% stated in the table. Is this another way the project is obsessed by insignificance? I have estimated in paragraph (24) that the additional mortality in **2029** from air pollution exposure to be about 1.5 lives *per year* in a much larger population.

(29) Table 18.8.8 contains an error. The additional mortality of 1.086 lives stated in the table within a population of 300,000 in 2032 is equivalent to about 0.35 lives in a population of 100,000 for which the baseline mortality rate would be about 1000. So the change in the baseline rate is 0.000035 or 0.0035% rather than 0.00000026% as stated in the table. (The percentage also depends on the size of the population exposed). I have estimated in paragraph (26) the additional mortality in **2038** from air pollution exposure to be about 5 lives *per year* in a much larger population.

### Model Verification for NO<sub>2</sub>

(30) No air quality target has been set for NO<sub>2</sub>, so the current limit is 40 µg/m<sup>3</sup>, set in a European Directive in 2008. The air quality report does not recognise the changing green agenda in a number of ways, so its analysis should be broadened to take account of recent policy recommendations. The air quality chapter of the Environmental Statement should consider extending thoughts to what would be regarded acceptable in 2050 and beyond. In 2021 the World Health Organization proposed an annual guide value for annual average NO<sub>2</sub> concentrations of 10 µg/m<sup>3</sup>. It is reasonable to expect that the UK limit value for NO<sub>2</sub> will be lowered during the lifetime of this development.

(31) The treatment of the correction to the modelled NO<sub>2</sub> calculations Appendix 13.6.1 of the Environmental Statement seems rather unscientific. If there is a systematic under prediction then some reason should be cited, possibly incorrect traffic emissions. There is discussion in the scientific community of whether emissions based on traffic cycles or real world emissions are best. Appendix 13.6.1 states that the adjustment for poor model performance is a multiplicative factor of 1.2 to 2 and a generic factor 1.3 is adopted. As NO<sub>2</sub>, or NO<sub>x</sub> derived PM<sub>2.5</sub> are the main contributions to the health risk impact (attributable lives lost *per year*) in the health risk assessment, it is important to get the NO<sub>x</sub> modelling right without incorporating correction factors. No results for NO<sub>x</sub> concentrations are presented in



the Environmental Statement, so one cannot check whether there is a problem with NOx emissions, or with the difficult step of estimating NO2 from NOx.

(32) One wonders whether it is valid to apply a poor model, with such poor performance, to future years, if one does not know the reasons for its deficiencies. The Environmental Statement recognises that background air pollution concentrations may change considerably. In paragraph 4.4.3 in Appendix 13.4.1 assumptions regarding future ozone concentrations are made without justification, which could affect future NO2 concentrations.

## Conclusions

(a) Without a detailed plan to meet Net Zero it is not possible to state that the increase in project emissions is **not** significant. The following conclusions in the Environmental Statement are **not** supported:

16.9.96 Given the overarching policy framework for the aviation sector, and the small contribution of other non-aviation emissions, it is concluded that for decision-making purposes (reflecting the guidance contained in the ANPS) the Project is **not so significant that it would have a material impact on the ability of Government to meet its carbon reduction targets, including Carbon Budgets.**

16.9.97 On this basis the overall assessment concludes that the Project has a **Minor Adverse Not Significant** impact.

ANPS = Airports National Policy Statement

(b) The Environmental Statement **neglects** some key contributions from air quality to the health risk impact and is **incomplete**. The argument that air quality is insignificant in the Environmental Statement is not supported:

13.13.1 The assessment undertaken for the ES for construction and operation concludes that no significant air quality effects are predicted.

(c) The calculated health impact from the development is an **underprediction**. One cannot be sure that the following conclusion applies.

18.12.14 The operational effects for all assessment years (2029, 2032, 2038 and 2047) are considered to be **minor adverse** (not significant). The conclusion reflects the view that exposures remain within acceptable levels for health protection, including for vulnerable groups. The minor adverse (rather than negligible) score represents a conservative assessment finding given scientific uncertainty (and emerging evidence) about non-threshold health effects of NO<sub>2</sub>, and PM<sub>2.5</sub>.

(d) The modelling of NO2 concentrations is subject to rather **large** uncertainties. One should not use a model to predict future concentrations unless the deficiencies of the approach are understood. The uncertainty is acknowledged in Appendix 13.6.1 but the reasons are unknown.

3.3.1 As described in Section 3.1, there are a number of reasons why modelling and monitoring results differ. At the majority of sites, it can be observed in that there is tendency for the model to underestimate NO<sub>2</sub> concentrations and therefore an adjustment to the modelled concentrations was considered suitable.

One cannot just adjust a model prediction without explanation. Indeed if Gatwick Airport Limited thinks that the air pollution effects are insignificant, Gatwick Airport Limited should build in safety margins and apply these to obtain an upper bound on the expected effects.

The general conclusion is that the aspects of the Environmental Statement dealing with climate and air quality are inadequate, and do not form a sufficient basis for a decision.

Bernard Fisher 11 March 2024

### References

<sup>1</sup>STATUTORY INSTRUMENTS 2019 No. 1056 CLIMATE CHANGE The Climate Change Act 2008 (2050 Target Amendment) Order 2019 Made - - - - 26th June 2019

<sup>2</sup>STATUTORY INSTRUMENTS 2023 No. 96 ENVIRONMENTAL PROTECTION, ENGLAND The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023 Made - - - - 30th January 2023

<sup>3</sup>Imperial College London, 2022. Analysis of abatement options to reduce PM2.5 concentrations. Defra contract report: SNAPCS project Support for National Air Pollution Control Strategies, February 2022

<sup>4</sup>GOV.UK, Guidance Air Quality appraisal: damage cost guidance, 2023.  
<https://www.gov.uk/government/publications/asses-impact-of-air-quality/air-quality-appraisal-damage-cost-guidance>