



HILLINGDON

LONDON

Airports Commission
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20 Great Smith Street
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Air.quality@airports.gsi.gov.uk

Our Ref JP/PW/10115

26th May 2015

Dear Sir Howard

Airports Commission's Consultation on Air Quality Assessment

We would like to thank you for the opportunity to respond to your consultation on the 'Airports Commission: Air Quality Assessment'.

Whilst we welcome the opportunity, we would point out that we find the short three week consultation period to be totally unacceptable for such an important, highly technical consultation which seeks views on an issue that impacts adversely on substantial numbers of people. It is our view that three weeks, one of which is a school half term holiday, is an ill considered and inadequate timescale in which to properly engage and consult with our local affected communities in the surrounding villages who need to attempt to read and try to work out the likely impacts of these proposals on their health and local environment. Notwithstanding the above, we have, as a council, strived to provide as robust a response as possible given the tight time constraints. I would therefore be pleased if you could accept the comments, in the attached Appendix 1 to this letter, as Hillingdon Council's response. This response has been agreed by the Leader of Hillingdon Council. Please note that Hillingdon's response, for obvious reasons, is focused on the appraisal of the two options for expansion at Heathrow.

As part of Hillingdon's response, I would also be pleased if you could accept the attached report 'Equity Focused Review Report of the Airports Commission's Air Quality Local Assessment' dated May 2015, which has been submitted by Public Health by Design and is referred to in our response.



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 www.hillingdon.gov.uk

London Borough of Hillingdon,
Location, Civic Centre, High Street, Uxbridge, UB8 1UW

We would be happy to discuss our response documents with you, if you feel that would be helpful. Should you have any queries on this, please do contact me.

Yours sincerely



Enclosed:

Appendix 1 - Airports Commissions Consultation - Air Quality Assessment, Response from London Borough of Hillingdon;
'Equity Focused Review Report of the Airports Commission's Air Quality Local Assessment' dated May 2015 by Public Health by Design.

Appendix 1

AIRPORTS COMMISSION CONSULTATION - AIR QUALITY ASSESSMENT, MAY 2015

Airports Commission

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RESPONSE FROM THE LONDON BOROUGH OF HILLINGDON

General comment

1 The Council finds the short three week consultation period to be totally unacceptable for such an important, highly technical consultation which seeks views on an issue that impacts adversely on substantial numbers of people. Three weeks, one of which is a school half term holiday, is an ill considered, inappropriate and inadequate timescale in which to properly engage and consult with our local affected communities in the surrounding villages who need to attempt to read and try to work out the likely impacts of these proposals on their health and local environment.

2 As a Council we have tried to work within your tight time constraints and have outlined below our initial concerns with the air quality assessment and highlighted what we regard as substantially adverse impacts which will be inflicted upon our local communities.

3 The Council hopes that this consultation is a genuine attempt to gain views and, despite the press speculation that the final report is expected by the end of June/early July, that the Commission has afforded enough time within its process for consultees views on this issue to be taken into account.

Question 5

Do you have any comments on how the Commission has carried out its appraisal of specific topics (as defined by the Commission's 16 appraisal modules), including methodology and results?

Question 6

Do you have any comments on the Commission's sustainability assessment, including methodology and results?

Local assessment

1 The assessment has provided a snapshot of the expansion position in 2030 under the Carbon Traded, Global Growth scenario for Heathrow. This does not provide the full impacts of the expansion, which for 2030 is predicted to accommodate 125mppa and yet by 2040 is predicted to increase to 138 mppa and in 2050 to 148mppa.

2 By not appraising the air quality impacts of the scheme in full operation, i.e. worst case, this appraisal has not afforded any degree of confidence that the air quality impacts of expansion at Heathrow have been properly assessed.

3 The use of this partial approach also means there has been no full assessment, either environmental or economic, of any additional mitigation measures needed to deal with the increased passenger numbers from 2030 onwards.

4 This inadequate approach is a concurrent theme through other Airports Commission's appraisals including surface access which has also only been assessed to 2030. (Surface Access: Process Overview, Nov 2014). This approach leads to an unrealistic, over-optimistic account of the impacts that the full expansion of Heathrow would bring to this area.

5 Whilst the compilation of independent emissions inventories and the use of accepted dispersion models such as ADMS Airports is supported, the continued lack of provision of important data on issues such as a local roads assessment and a freight impact assessment still leaves considerable doubt in terms of the final results and whether they even represent the full impact of this partial 2030 snapshot.

6 As an example, in the NWR option, the re-routing of the Bath Road has not been fully assessed. Properties are identified as potentially present but no pollution concentration estimates have been given. Due to the lack of any detailed information the appraisal is therefore considered to be incomplete which has hampered the ability to produce a robust air quality assessment in terms of identifying all the properties at risk from an expanded Heathrow airport in this area.

7 Due to incompatibility between model outputs for the specific airport related traffic and the total road traffic, the air quality assessment has not been able to apportion surface access emissions into Heathrow airport and non-airport related categories. This casts doubt on the accuracy of any assessment relating to airport-related surface access mitigation measures.

8 The Council considers that the lack of this important detailed information cast doubt on the ability to properly assess the efficacy of specific airport-related surface access measures in terms of improvements to air quality.

9. We consider that the Commission's assessment methodology is flawed because there has been no assessment of the impacts during construction, even though there is every prospect that, for the Heathrow schemes, traffic disruption and re-routing will cause Limit Value breaches and delays to achievement of Limit Values in parts of west London.

10. The Consultation documents clearly state that there are insufficient details to undertake any quantitative assessment of impacts. The scale of the construction is emphasised by the identification of the number of receptors falling within 350m from the boundary of the proposed sites. It is clear that construction will impact on far more people at the Heathrow location (NWR - 4,148, ENR - 3,760, Gatwick - 977).

11. In addition, the Heathrow area, in terms of potential traffic congestion, needs to be carefully assessed given that the Jacobs Surface Access Appraisal report states that many sections of the modelled network around the Heathrow area are over, or approaching, capacity in 2030 due to increases in background demand (para 5.5.2, page 65, Appraisal Framework Module 4, Nov 2014). This is without Heathrow expansion. The air quality impacts of construction traffic induced congestion will impact across a wider area than the 350m from the boundary assessment as presented in the consultation report.

12 The Council does not believe there can be any confidence in the conclusion that either option to expand at Heathrow could be implemented and that there would be no predicted exceedences of the air quality objectives.

National assessment

13 This assessment has confirmed that, even without expansion, the Heathrow area, as measured by the PCM model, is predicted to continue to be non-compliant in terms of meeting the EU limit value for annual mean nitrogen dioxide as far into the future as 2030. European air quality legislation requires the limit value to have been met by 2010 (Ambient Air Quality Directive (2008/50/EC)).

14 The increase in pollution by either of the Heathrow options (NWR - 1.3ug/m³ annual mean nitrogen dioxide, ENR 2.8-8.2ug/m³ annual mean nitrogen dioxide) clearly impacts negatively on the ability to reach air quality compliance in this area. The expansion schemes would render the Heathrow area the most polluted hotspot in the Greater London Urban Area.

15 The national networks NPS makes it clear that there will refusal of consent for development if the air quality impacts: *Affect the ability of a non-compliant area to achieve compliance within the most recent timescales reported to the European Commission at the time of the decision.*

16 The lack of sufficient detail on issues such as the re-routing of the Bath Road, which is currently an identified road in excess of the Limit Value, has not been properly assessed. Without the appropriate assessment it cannot be assumed that this link will not continue to be a non-compliant road with the implementation of the NWR option.

17 As the Heathrow area zone, even without expansion, has been predicted by the UK Government to be non-compliant in terms of meeting the Limit Value, the Council believes that priority must be given to address the current situation and ensure that the zone is fully compliant with European legislation as soon as possible. Until this is done and the reductions are secured, the Heathrow location should not even be considered for expansion.

18 The Council's position is supported by the recent Supreme Court Judgement (R (on the application of ClientEarth) (Appellant) v Secretary of State for the Environment, Food and Rural Affairs (Respondent), [2015] UKSC 28) which has made it clear that the Government must develop, consult and submit an Air Quality Plan to Europe by 31st December 2015. The importance of this Judgement was made clear, as set out in the Supreme Court Press Release issued accompanying the full Judgement:

The CJEU judgment leaves no doubt as to the seriousness of the breach, which has been continuing for more than five years, nor as to the responsibility on the national court to secure compliance. Further, during those five years the prospects of early compliance have become worse (2014 projections predicting non-compliance in some zones after 2030). The Secretary of State accepted that a new plan has to be prepared. The new government should be left in no doubt as to the need for immediate action, which is achieved by an order that new plans must be delivered to the Commission not later than 31 December 2015.

Road vehicle emission improvements

19 The air quality assessment results, both local and national, are reliant on the assumptions used in regards to future vehicle emissions i.e. Euro 6 technology. The 2011 Air Quality Plan submitted to Europe indicated that the Heathrow area would be compliant by around 2020. This position was re-assessed in July 2014 and Defra stated that compliance is now not expected till post 2030. The reason behind this is explained below:

What has changed?

"The emission factors for nitrogen oxides (NO and NO₂) from road traffic have been updated to reflect more accurate assumptions on the performance of modern diesel vehicles and older petrol cars. These projections do not take into account any additional measures to tackle NO₂ beyond those included in the plans published in 2011. The assumptions, however, are more pessimistic than in previous projections. This is largely due to the failure of the European vehicle emission standards for diesel cars to deliver the expected emission reductions of NOx". (Updated projections for Nitrogen Dioxide (NO₂) compliance, Defra 2014)

20 The Council does not believe that it is sound to recommend a location for airport expansion based upon predictions in improvements to road technologies that have not yet been shown to be proven and have a history, as illustrated above, which has shown that assumed reductions have not occurred in reality.

Health

21 Given the Council's concerns about the likely impacts on health, it commissioned Public Health by Design (PhD) to review the Consultation documents. The report by PhD, 'Equity Focused Review Report of the Airports Commission's Air Quality Local Assessment', dated May 2015 is attached to this response. The main points arising from the report, as set out in its Executive Summary include the following:

- 'The AC's Air Quality Local Assessment aimed to use both the damage cost approach and the impact pathway approach to assess the health impacts of air pollution from the three proposed airport schemes. However, only a partial impact pathway assessment was undertaken.'
- 'The assessment undertook what it called a partial impact pathway assessment quantifying only the short-term health impacts of Nitrogen Dioxide (NO₂) and Particulate Matter (PM) on morbidity. It presents estimates only for 2030 ("2030 snapshot") and not the 60-year assessment period. It also did not consider long-term impacts of PM on mortality and loss of life expectancy. The partial impact pathway assessment therefore does not fulfil the purpose of being a comprehensive assessment, as recommended by the DEFRA guidance, as it provides an incomplete analysis of the full range of quantifiable health impacts.'
- 'There is also no discussion of health impacts where quantification is not currently recommended by DEFRA such as air quality impacts on children, other chronic effects, other additional morbidity effects of short-term exposure.'

- 'The assessment does not present the actual estimates of health impacts e.g. years of life lost, respiratory hospital admissions and cardiovascular hospital admissions.'
- 'The way the affected population is calculated also underestimates the affected population because only the population in the Principal Study Area is reported and the population living along key routes in the Wider Study Area is not discussed. Apart from underestimating an important output of the air quality assessment in its own right, this underestimation in turn affects the quantification and monetisation of the population health impacts in the partial impact pathway assessment.'
- 'Most importantly, there is no consideration and discussion of the potential for widening inequalities in health from impacts on residents already facing significant environmental and socio-economic disadvantage. This lack is not equivalent as there are more disadvantaged residents living around Heathrow than Gatwick in both the Principal and Wider Study Areas.'

22. In support of the evidence from the PhD report, we consider that both the Heathrow options increase substantially the pollution burden on the surrounding communities. For the NWR option NOx emissions are shown to increase by 26.2%, PM10 emissions by 15.7% and PM2.5 emissions by 22.7% by 2030. For the ENR option it increases NOx emissions by 20.4%, PM10 emissions by 12% and PM2.5 emissions by 16.9% by 2030. These increases are across an area where the current population, in terms of health, is already disadvantaged.

23 The Air Quality Assessment shows that the Heathrow options impact on substantially more people, in terms of increases in nitrogen dioxide concentrations, than the Gatwick location with the NWR option impacting on the highest population (Gatwick 51,328 people, Heathrow NWR 121,377 people, Heathrow ENR 100,389 people).

24 It is noted that the methodology for calculating the population exposed has used an averaging approach over each postcode area. This assumes an even distribution of population within each postcode. To enable the Council to fully understand the accuracy of this approach, we request that the following information is provided as soon as possible:

- Datasets of population forecasts within Hillingdon that were provided by CACI;
- All GIS files and maps with the population data, the study area extents and estimated changes in pollutant concentrations;
- The data file with the estimated population exposure to changes in air quality as micrograms per cubic metre per person per postcode.

25 The Council has serious concerns that because there has been no analysis of the total impacts of an expanded Heathrow to 2050, that there is an under-estimation of the potential impacts on health and that the numbers of people exposed are likely to be higher.

26 The Council believes that as one of the principal aims of the Ambient Air Quality Directive is to protect human health by avoiding, reducing or preventing harmful concentrations of air pollutants (Air Quality Consultation document p13), the Heathrow location for expansion should be disregarded and rejected.

27 In terms of national policy, the national planning policy framework should prevent unacceptable risks from pollution and ensure new development is appropriate for its location (Air Quality Consultation document p16). The Council considers that any proposal to develop in the Heathrow location would put at risk the health of substantial numbers of people and therefore Heathrow should be rejected as a location for airport expansion.

Health costs

28 The biggest costs to health, as monetised in the consultation using the Defra Green Book guidance for health impacts and environmental damage, come from the Heathrow NWR option. (Gatwick £73.6m NOx, £246.9m PM10, Heathrow NWR £94.2m NOx, £863.5m PM10, Heathrow ENR £69.6m NOx, £618.7m PM10). At levels above £50m, the Green Book guidance states an Impact Pathway approach should be considered.

29 Despite this, the Air Quality Consultation has only provided a partial impact pathway analysis based on a snapshot in 2030. In terms of the options, the health impacts, as costed for increased hospital admissions, are:

- Heathrow NWR £2.8m -10.8m,
- Heathrow ENR £1.1m - £4.2m,
- Gatwick £1.0m - £4.0m.

30 It is clear that the biggest cost to health comes from the options to expand at Heathrow with the Heathrow NWR option being the most severe. The partial assessment only considers nitrogen dioxide and particulate matter related to ill health, but not particulate matter related loss of life expectancy. The Council is very concerned that this factor, along with the fact that the consultation has not carried out a full Impact Pathway with an analysis of the total impacts of an expanded Heathrow out to 2050, means that the potential health impacts on affected residents have been under-estimated along with the estimated monetary costs of the health impacts.

Latest health evidence

31 The recent health evidence from the Health Risks of Air Pollution in Europe (HRAPIE) project, WHO, 2014, (Air Quality Consultation document, page 12) shows a strengthening of the connection between exposure to nitrogen dioxide and health impacts including chronic effects. The effects are now thought evident when the nitrogen dioxide annual mean levels are at a threshold above 20ug/m3, i.e. half of the current limit value.

32 The maps presented in this consultation (maps 5.6 and 5.7 and 6.6 and 6.7) indicate that with health effects occurring at levels as low as 20ug/m3, the impacts on the populations around Heathrow from expansion are likely to bring many more communities into this level of health risk exposure.

33 The Air Quality Consultation document states that the Green Book is to be updated to take account of these most recent findings (page 34) which gives further weight to the

Council's concerns that the health costs as presented in this consultation are underestimated.

34 The Council considers that given the substantial population potentially adversely impacted by increased pollution i.e. between 100,000 -121,000 people, that expansion at Heathrow should not be supported on health grounds alone. In addition, given that the current scientific evidence indicates a more precautionary approach should be taken in regard to nitrogen dioxide concentrations, this gives added weight for any consideration of the Heathrow location to be dismissed.

Flawed process

35 The Council is gravely concerned that the consultation document refers to another more detailed air quality analysis to be carried out once an option has been chosen: *"Following more detailed air quality analysis which is anticipated for any chosen scheme, a full Impact Pathway Assessment would be required and further discussion with Defra would be expected"* (App G, p171).

36 The Airports Commission's appraisal process is meant to be assessing each scheme equally in order to inform a final recommendation. Any further "*detailed air quality analysis*" and full Impact Pathway Assessment must be done now before any final recommendation on the location for airport expansion is made. The Council considers that not to do so would present a fundamental flaw in the appraisal process.

Question 7

Do you have any comments on the Commission's business case, including methodology and results?

Legal implications:

1 The Air Quality Consultation document makes clear that the Heathrow area is currently non-compliant with the Limit Value. This could have legal implications as the European legislation, which has 2010 as the compliance date, states compliance should be reached as soon as possible and it is to be achieved at all relevant locations in accordance with European legislation.

2 Furthermore the expansion of Heathrow, at either option, would delay compliance with the Limit Value. This could also have legal and financial implications as the European legislation states compliance should be reached as soon as possible and it should be noted that the EU have the ability to pass down fines to failing Member States.

3 The Council advises that the Airports Commission should consider the legal implications of any decision to recommend expansion at the Heathrow location.

Constrained use of new infrastructure.

4 If the assumptions used to mitigate the air quality issues, such as delivery of the predicted reductions in vehicle emissions, do not prove adequate in reality, the use of the new runway could be heavily constrained in terms of its use and its ability to realise full capacity.

5 A sensitivity analysis in terms of constrained use, should be carried out to assess the impact on the business case. The Council considers that such an analysis should be done prior to any final recommendation on location or specific option to expand.

Inadequate surface access

6 The analysis has been based on an inadequate surface access appraisal, and the consequences of this, has resulted in an air quality assessment which has not assessed the full implications of an expanded Heathrow. This in turn means the full requirements needed to mitigate the impacts of the airport at full passenger capacity on both roads and public transport has not been accounted for and therefore not properly costed.

7 The Air Quality Consultation document casts doubt as to whether the NWR mitigation measures to ensure total airport-related road vehicle trips to and from the airport do not increase relative to current day, is actually deliverable. (Air Quality Consultation document, Table 5.16, page 81),

8 Alongside on-airport initiatives which have been assessed in terms of achieving reductions in emissions, the Air Quality Consultation document highlights two further mitigation measures for reducing pollution. One is aimed at reducing traffic volumes, namely a congestion charge and one at reducing emissions per vehicle by means of the implementation of an ultra-low emission zone. Both such options could have an impact on other Airports Commission's appraisals such as the local economy and surface access modules.

9 The Council is unaware of any details as to the implementation and costs of such mitigation measures and any consequences they may have in terms of local community impacts or local economic impacts. These should be evaluated and costed before any decision is made as to the appropriate location for expansion.

Health Impacts

10 The impacts on health of the full airport expansion have not been properly assessed. Recent scientific studies suggest that health impacts could be apparent at lower levels than current limits and a full Impact Pathway analysis has yet to be undertaken. These additional costs in terms of monetised health impacts have not been assessed and therefore not factored into the business case. The Council believes this must be done for all the airport options prior to any final recommendation being made on the preferred location for expansion.

11 The Public Health by Design advice on this aspect, as presented as part of the London Borough of Hillingdon response, is attached for your information. This supports the Councils' concerns and recommends a full impact pathway assessment of the wider study area for all three schemes and consideration of the inequality/equity impacts on residents already experiencing health disadvantages by taking account of existing conditions.

Question 8

Do you have any further comments?

1 This Air Quality appraisal cannot be read in isolation. The Council's comments regarding the inadequacies of the Air Quality appraisal in terms of mitigation measures, in terms of health impacts, of inadequate surface access provision and lack of relevant information such as local roads and freight impacts all impinge on the proper assessment of, and hence the conclusions of, this module. The absence of the appropriate information has not been addressed and therefore the inadequacies of the inputs to this appraisal have been compounded in this assessment, which makes the final conclusions far from robust.

2 However, flawed as they are, the Council firmly believes that the implications of this air quality assessment simply add weight to the argument that this part of west London is not the right place for airport expansion.

3 This assessment has under-estimated the health implications of expansion at the Heathrow location. It has failed to address the current situation in terms of health burden and failed to quantify the additional costs to health from a fully expanded airport. This is not an acceptable situation. The provision of full Health Impact Assessments should have been provided for each scheme at each location prior to any final recommendation.

4. Given the above, and together with the consultation documents that the Airports Commission published in November 2014, it is clear that the Heathrow options should be rejected on the grounds of the severe environmental impacts arising from both options which will:

- put 100,000-121,000 people, already at a distinct health disadvantage, at further risk from increased air pollution;
- escalate hospital costs by up to £10m which, given the emerging health evidence, may prove to be an under-estimate;
- potentially cost the UK Government in fines for non-compliance with EU air quality legislation;
- expose 580,500 people to aviation noise, increasing to 637, 700 by 2050, along with the additional health costs this brings including impacts on children and their educational attainment, which, to date, have also not been properly assessed;
- put further pressures on the surrounding local authorities to provide for up to an extra 70,800 houses, 50 new primary schools, and 6 new secondary schools in areas; and
- in addition, for the Council specifically, the NWR option destroys three local villages at a cost of over 1,000 houses and associated community buildings such as schools.

Airports Commission's Air Quality Local
Assessment May 2015 Consultation

Equity Focused Review Report of the Airports Commission's Air Quality Local Assessment

*Supplementary and follow on review report to the earlier review report **Equity Focused
Review Report of the Airports Commission's Community Health Relevant Assessments***

FINAL REPORT

May 2015

Commissioned by the London Borough of Hillingdon

Public Health by Design is a public health consultancy whose goal is to deliver innovative, effective and value-for-money consultancy, research and capacity building in health impact assessment, health impact evaluation, healthy urban planning and healthy public policy.

We want to help you – businesses, local and national government, NGOs - to deliver better public and community health and wellbeing at policy, plan, programme, project and service levels; as a direct objective, as part of social responsibility programmes and as part of best practice proposal design, implementation, operation, decommissioning/ closure and restoration.

PhD QUALITY ASSURANCE

TITLE: Equity Focused Review Report of the Airports Commission's Air Quality Local Assessment			
PREPARED BY: Public Health by Design [REDACTED]			
COMMISSIONED BY: London Borough of Hillingdon			
PROJECT NO: 14-021-SV – LBH UK HA SHEFPR			
	Name	Signature	Date
Prepared by	Dr Salim Vohra (SV) Dr Filipe Silva (FS)	[REDACTED]	21-05-2015
Approved by	Dr Salim Vohra	[REDACTED]	21-05-2015

DRAFTS

Revision Number	Details	Prepared by	Reviewed by	Approved by	Date
01	Draft	SV/FS	SV/FS	SV	20-05-2015

- ❖ This report has been prepared by Public Health By Design Limited ("PhD") for the use of the Client and any other stakeholders that the Client considers appropriate.
 - ❖ It has been produced in line with generally accepted international best practice public health consultancy principles and the project's terms of reference.
 - ❖ Information provided by third parties and referred to in the report has been assumed to be correct and has not been separately verified by PhD unless explicitly stated in the report.
 - ❖ No third parties should make decisions based on this report without discussing it first with the Client and PhD.
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Executive Summary

Introduction

- ES.1 This review report has been commissioned by the London Borough of Hillingdon (LBH).
- ES.2 It is a supplementary and follow on review report to the earlier review report *Equity Focused Review Report of the Airports Commission's Community Health Relevant Assessments* that was also commissioned by LBH.
- ES.3 The aim of this Review was to review the Airports Commission's (AC's) Air Quality Local Assessment, published in May 2015, from a health equity perspective i.e. using a "health equity lens".

Local air quality assessment

- ES.4 The AC's Appraisal Framework and the Air Quality Local Assessment states that DEFRA's supplementary Green Book guidance will be used. DEFRA's guidance recommends the use of the damage cost approach, as an initial screening estimate, followed by the impact pathway approach where a more detailed assessment is appropriate and proportionate.
- ES.5 The AC's Air Quality Local Assessment aimed to use both the damage cost approach and the impact pathway approach to assess the health impacts of air pollution from the three proposed airport schemes. However, only a partial impact pathway assessment was undertaken.
- ES.6 A comprehensive impact pathway assessment could have been attempted by using a set of scenarios that used extrapolations into the future of the modelled levels of air pollution and modelling of future mortality rates with support from DEFRA and Public Health England.
- ES.7 The assessment undertook what it called a partial impact pathway assessment quantifying only the short-term health impacts of Nitrogen Dioxide (NO₂) and

Particulate Matter (PM) on morbidity. It presents estimates only for 2030 ("2030 snapshot") and not the 60-year assessment period. It also did not consider long-term impacts of PM on mortality and loss of life expectancy. The partial impact pathway assessment therefore does not fulfil the purpose of being a comprehensive assessment as recommended by the DEFRA guidance as it provides an incomplete analysis of the full range of quantifiable health impacts.

- ES.8 There is also no discussion of health impacts where quantification is not currently recommended by DEFRA such as air quality impacts on children, other chronic effects, other additional morbidity effects of short-term exposure.
- ES.9 The assessment does not present the actual estimates of health impacts e.g. years of life lost, respiratory hospital admissions and cardiovascular hospital admissions.
- ES.10 The way the affected population is calculated also underestimates the affected population because only the population in the Principal Study Area is reported and the population living along key routes in the Wider Study Area is not discussed. Apart from underestimating an important output of the air quality assessment in its own right, this underestimation in turn affects the quantification and monetisation of the population health impacts in the partial impact pathway assessment.
- ES.11 Most importantly, there is no consideration and discussion of the potential for widening inequalities in health from impacts on residents already facing significant environmental and socio-economic disadvantage. This lack is not equivalent as there are more disadvantaged residents living around Heathrow than Gatwick in both the Principal and Wider Study Areas.

Conclusion

- ES.12 Overall, the Airports Commission's Air Quality Local Assessment would have benefited from a comprehensive impact pathway assessment.
- ES.13 There are some potentially significant gaps in estimating the full range of health impacts and in considering and assessing (qualitatively or quantitatively) the potential

inequality/equity aspects of changes in air pollution both at the airports as they currently operate and for future with and without scheme options.

ES.14 The recommendations identified in this review report if undertaken are likely to improve the quality of the analysis of the existing Air Quality Local Assessment undertaken by the Airports Commission.

1 Introduction

1.1 Background

- 1.1.1 This Review Report has been commissioned by the London Borough of Hillingdon (LBH).
- 1.1.2 It is a supplementary and follow on review report to the earlier review report *Equity Focused Review Report of the Airports Commission's Community Health Relevant Assessments* that was also commissioned by LBH.
- 1.1.3 The aim of this Review was to review the Airports Commission's Air Quality Local Assessment, published in May 2015, from a health equity perspective i.e. using a "health equity lens".
- 1.1.4 The objectives, similar to the previous review report, were to:
- i. Assess how, and to what extent, the health and wellbeing impacts, and their equitable/inequitable distribution, have been taken into account.
 - ii. Provide, where possible and appropriate, recommendations for enhancing the comprehensiveness and quality of the assessment undertaken.

1.2 Health Equity

- 1.2.1 The World Health Organization (WHO) describes health equity in the following way:¹

Equity is the absence of avoidable or remediable differences among groups of people, whether those groups are defined socially, economically, demographically, or geographically. Health inequities therefore involve more than inequality with respect to health determinants and access to the resources needed to improve and maintain health or health outcomes. They also entail a failure to avoid or overcome inequalities that infringe on fairness and human rights norms.

¹ World Health Organization (WHO). (2015). Equity. Health systems. Available at <http://www.who.int/healthsystems/topics/equity/en/>

- 1.2.2 Reducing health inequities is important because health is a fundamental human right and its progressive realization will eliminate inequalities that result from differences in health status (such as disease or disability) in the opportunity to enjoy life and pursue one's life plans.
- 1.2.3 A characteristic common to groups that experience health inequities—such as poor or marginalized persons, racial and ethnic minorities, and women—is lack of political, social or economic power. Thus, to be effective and sustainable, interventions that aim to redress inequities must typically go beyond remedying a particular health inequality and also help empower the group in question through systemic changes, such as law reform or changes in economic or social relationships.
- 1.2.4 Internationally the WHO Commission on the Social Determinants of Health in “Closing the Gap in a Generation” (2008) and the Marmot Review in the UK in “Fair Society, Healthy Lives” (2010) demonstrated and advocated the importance of considering health inequities and inequalities when assessing the health and wellbeing impacts of policies and projects.^{2 3}

1.3 Health Impact Assessment (HIA)

- 1.3.1 The international Gothenburg consensus definition of HIA is: “A combination of procedures, methods and tools by which a policy, program or project may be judged as to its potential effects on the health of a population, and the distribution of those effects within the population.”⁴
- 1.3.2 The more recent International Association for Impact Assessment’s definition of HIA, which updates the earlier Gothenburg Consensus definition, is that HIA is:
- “A combination of procedures, methods and tools that systematically judges the potential, sometimes unintended, effects of a policy, plan, programme or project on the

² World Health Organization (WHO). (2008). Closing the gap on a generation: Health equity through action on the social determinants of health. Commission on Social Determinants of Health. Available at: <http://www.instituteofhealthequity.org/projects/commission-on-social-determinants-of-health>

³ The Marmot Review. (2010). Fair Society, Healthy Lives: Strategic Review of Health Inequalities in England post-2010.

⁴ WHO European Centre for Health Policy. (1999). Health impact assessment: main concepts and suggested approach. Gothenburg consensus paper. WHO Regional Office for Europe.

health of a population, including the distribution of those effects within the population, and identifies appropriate actions to manage those effects.”⁵

- 1.3.3 HIA uses both a biomedical and social definition of health, recognising that though illness and disease (mortality and morbidity) are useful ways of measuring health they need to be fitted within a broader understanding of health and wellbeing to be properly useful (see Figure 1). This definition builds on and is complementary to the longer established World Health Organization definition that “Health is a state of complete physical, social and mental wellbeing and not simply the absence of disease or infirmity”.⁶

Figure 1 Determinants of health and wellbeing⁷



⁵ International Association for Impact Assessment. Health Impact Assessment International Best Practice Principles. Special Publication Series No. 5. Fargo, USA. 2006.

⁶ World Health Organization. (1948). Preamble to the Constitution of the World Health Organization as adopted by the International Health Conference. New York, 19-22 June 1946, and entered into force on 7 April 1948.

⁷ Department of Health. (2007). Draft guidance on health in strategic environmental assessment. Original Source: Hugh Barton and Marcus Grant (2006), drawing on Whitehead and Dahlgren (1991) and Barton (2005). United Kingdom Public Health Association (UKPHA) Strategic Interest Group and the WHO Healthy Cities Programme.

2 Methodology and Scope of this Review

2.1 Introduction

2.1.1 The Review reviewed the following key documents:

- Air quality local assessment including associated appendices.

2.2 Review approach

2.2.1 All documents were reviewed by both members of the team.

2.2.2 Where appropriate and possible key references mentioned in the above documents were reviewed.

2.2.3 Notes were made and preliminary synthesis review briefings were produced.

2.2.4 The preliminary review briefings were then reviewed and commented on by officers at LBH.

2.2.5 Where recommendations are identified for improving the comprehensiveness and quality of the assessment they take account of the constraints and limitations discussed within the assessments documents i.e. the recommendations are extensions of the existing methodologies used and based on existing data sets.

2.3 Limitations of this Review

2.3.1 The traffic and air quality modelling assumptions and detailed methodology have been not been scrutinised in relation to transport and air quality modelling best practice.

3 Air Quality Local Assessment

3.1 Introduction

- 3.1.1 A review of the Airports Commission's (AC's) Air Quality Local Assessment was undertaken to:
- 3.1.2 Assess how and to what extent the health and wellbeing impacts, and their equitable/inequitable distribution, have been taken into account.
- 3.1.3 Provide, where possible and appropriate, recommendations for enhancing the comprehensiveness and quality of the assessment undertaken.

3.2 Review findings

- 3.2.1 The AC's Appraisal Framework and the Air Quality Local Assessment states that DEFRA's supplementary Green Book guidance will be used. DEFRA's guidance recommends the use of the damage cost approach, as an initial screening estimate, followed by the impact pathway approach where a more detailed assessment is appropriate and proportionate.
- 3.2.2 The damage cost approach provides a good overall estimate, in monetary terms, but is judged to not be sufficient on its own in cases where the adverse air quality impacts are judged to be significant. For example, when the damage cost approach estimates the adverse impacts to be greater than £50 million in damage costs. This is because this method is an approximation of the likely average health impacts of air pollution on an average population (and non-health impacts such as building soiling from PM) and does not account for the health, demographic and socio-economic characteristics of the affected local population.
- 3.2.3 When damage cost estimates are greater than £50 million (and compliance with legally binding air quality objectives is expected) the impact pathway approach should be undertaken. DEFRA considers this to be the central methodology and it provides a fuller assessment. Appendix A provides a summary of the Green Book and DEFRA's guidance that is relevant for health impacts and air quality.

- 3.2.4 The AC's Air Quality Local Assessment aimed to use both the damage cost approach and the impact pathway approach to assess the health impacts of air pollution from the three proposed airport schemes.
- 3.2.5 The damage cost part of the assessment was undertaken and estimated that the damage cost for each of the schemes would be greater than £50 million.
- 3.2.6 However, only a partial impact pathway assessment was undertaken. The reasons presented were:
- “the level of detail available on future pollution concentrations, and
 - the difficulty in predicting mortality rates of the relevant populations from 2030 to 2050 and beyond.”
- 3.2.7 A comprehensive impact pathway assessment could have been attempted by using a set of scenarios that used extrapolations into the future of the modelled levels of air pollution and modelling of future mortality rates with support from DEFRA and Public Health England. Given that incremental changes to the concentrations of air pollutants have been estimated for 2030 and, while uncertainty increases for estimations further into the future, assumptions could have been made to allow for reasonable scenarios and extrapolations further into the future.
- 3.2.8 Future mortality rates of relevant populations could have been developed from assumptions about secular trends in mortality rates and demographic changes, the use of life tables, or assuming that existing mortality rates held true for future years. In addition, statistical methods such as Monte Carlo could have been used to take account of uncertainties.
- 3.2.9 The assessment undertook what it called a partial impact pathway assessment quantifying only the short-term health impacts of Nitrogen Dioxide (NO₂) and Particulate Matter (PM) on morbidity. It presents estimates only for 2030 (“2030 snapshot”) and not the 60-year assessment period. It also did not consider long-term impacts of PM on mortality and loss of life expectancy. The partial impact pathway assessment therefore does not fulfil the purpose of being a comprehensive assessment as recommended by

the DEFRA guidance as it provides an incomplete analysis of the full range of quantifiable health impacts.

- 3.2.10 There is also no discussion of health impacts where quantification is not currently recommended by DEFRA such as air quality impacts on children, other chronic effects, other additional morbidity effects of short-term exposure.
- 3.2.11 The assessment does not present the actual estimates of health impacts e.g. years of life lost, respiratory hospital admissions and cardiovascular hospital admissions. It would have been straightforward to report these estimates, as shown in Appendix B.
- 3.2.12 The way the affected population is calculated also underestimates the affected population because only the population in the Principal Study Area is reported and the population living along key routes in the Wider Study Area is not discussed. Apart from underestimating an important output of the air quality assessment in its own right, this underestimation in turn affects the quantification and monetisation of the population health impacts in the partial impact pathway assessment.
- 3.2.13 Most importantly, there is no consideration and discussion of the potential for widening inequalities in health from impacts on residents already facing significant environmental and socio-economic disadvantage. This lack is not equivalent as there are more disadvantaged residents living around Heathrow than Gatwick in both the Principal and Wider Study Areas. One approach to analysing equity issues would be to qualitatively and quantitatively assess the numbers of people experiencing airport and non-airport related air pollution and the magnitude of their exposure to this air pollution, both now (existing) and future (with and without the proposed schemes) and weight this by level of socio-economic deprivation. For example, the Index of Multiple Deprivation can be overlain on the air quality spatial maps to enable a qualitative consideration and discussion of where existing air pollution burdens are and whether future modelled increases and decreases in air pollution are likely to be experienced in areas already facing high levels of deprivation. Then an estimate of the number of people experiencing airport-related air pollution by level of deprivation could be developed. One additional way of accounting for the existing unequal burden of disease related to air pollution, given that air pollution has no threshold for adverse health impacts, would

be to estimate the quantifiable health impacts from the existing baseline, future with and without scheme, and between schemes, using a lower public health threshold, such as $20\mu\text{gm}^{-3}$, for both annual means of PM10 and NO2 rather than the current $40\mu\text{gm}^{-3}$.

3.3 Recommendations

3.3.1 The earlier review report sent to the AC recommended the following approach in relation to the AC's air quality assessment:

3.3.2 An impact pathway assessment approach as part of the second stage assessment should be used as this approach can provide a more comprehensive quantification of health endpoints (using established exposure response functions from the Committee on the Medical Effects of Air Pollution (COMEAP), Clean Air For Europe Cost-Benefit Analysis modelling framework (CAFE-CBA) or the World Health Organization (WHO), including impacts from Ozone (O_3), to take full account of potential impacts on public health from changes to air quality.^{8 9 10}

3.3.3 We would again reiterate this recommendation and add the following to improve the quality and depth of the AC's Air Quality Local Assessment.

3.3.4 The AC's Air Quality Local Assessment should:

- Undertake a comprehensive impact pathway assessment of the air quality health and wellbeing impacts, for both the Principal and Wider Study Areas, for all three schemes.
- Explicitly consider and discuss the inequality/equity impacts on residents already experiencing disadvantage by taking account of the existing baseline health status as well as existing environmental and socio-economic burdens.

⁸ Committee on the Medical effects of Air Pollution (COMEAP) Available at <https://www.gov.uk/government/groups/committee-on-the-medical-effects-of-air-pollutants-comeap#publications>

⁹ Clean Air For Europe (CAFE-CBA) Available at <http://www.cafe-cba.org/>

¹⁰ WHO Available at http://www.who.int/topics/air_pollution/en/

- Explicitly report the number of properties and population affected by scheme-related air pollution for both the Principal and Wider Study Areas (not just the Principal Study Area).
- Explicitly report the estimated health impacts that are used to derive the monetary values e.g. years of life lost, respiratory hospital admissions and cardiovascular hospital admissions.
- Explicitly acknowledge and discuss the implications of the health impacts where quantification is not currently recommended by DEFRA such as air quality impacts on children, other chronic effects, other additional morbidity effects of short-term exposure.

4 Conclusion

- 4.1.1 Overall, the Airports Commission's Air Quality Local Assessment would have benefited from a comprehensive impact pathway assessment.
- 4.1.2 There are some potentially significant gaps in estimating the full range of health impacts and in considering and assessing (qualitatively or quantitatively) the potential inequality/equity aspects of changes in air pollution both at the airports as they currently operate and for future with and without scheme options.
- 4.1.3 The recommendations identified in this Review Report if undertaken are likely to improve the quality of the analysis of the existing Air Quality Local Assessment undertaken by the Airports Commission.

Appendix A:

Key Summary Extracts from Green Book and DEFRA Supplementary Guidance on Health impacts and Air Quality

HM Treasury's Green Book (July 2011)

This publication states that all new policies, programmes and projects should be subject to comprehensive but proportionate assessment so as best to promote the public interest. It presents the techniques and issues that should be considered when carrying out assessments and describes how the economic, financial, social and environmental assessments of a policy, programme or project should be combined.

The first step is to justify the action, ensuring there is a clearly identified need and that any proposed intervention is likely to be worth the cost. The second step is to set out the desired outcomes and objectives to identify the full range of options that may be available to deliver them.

The third step is to carry out an option appraisal, often the most significant part of the analysis. More fully, the appraisal may develop as follows:

- Identify and value the costs of each option.
- Identify and value the benefits of each option.
- If required, adjust the valued costs and benefits for:
 - Distributional impacts (the effects of proposals on different sections of society);
 - Relative price movements.
- Adjust for the timing of the incidence of costs and benefits by discounting them, to obtain their present values.
- If necessary, adjust for material differences in tax between options.
- Adjust for risk and optimism to provide the Base Case, and consider the impacts of changes in key variables and of different future scenarios on the Base Case.
- Consider unvalued impacts (both costs and benefits), using weighting and scoring techniques if appropriate.

Following option appraisal, decision criteria and judgment should be used to select the best option or options, which should then be refined into a solution. Evaluation is similar in technique to appraisal, although it uses historic rather than forecast data, and takes place after the event.

The ultimate outcome of any appraisal is a decision whether or not to proceed with a proposal or a particular option. As these decisions will often have far reaching consequences, the presentation of the conclusions and recommendations to decision makers and key stakeholders can be as important as the analysis itself. In all cases, transparency is vital. Presentations and reports should be clear, logical, well founded, and geared towards helping the decision at hand. Summary reports in particular should be drafted in non-technical language wherever possible.

Reports should provide sufficient evidence to support their conclusions and recommendations. They should provide an easy audit trail for the reader to check calculations, supporting evidence and assumptions. Major costs and benefits should be described, and the values attached to each clearly shown rather than netted off in the presentation of the analysis. This should help to ensure that decision makers understand the assumptions underlying the conclusions of the analysis, and the recommendations put forward. Appraisal reports should contain sufficient information to support the conduct of any later evaluation.

There is a wide range of generic issues that may need to be considered as part of any assessment. Two of which are: 1) Equality – Impacts on various groups in society should be considered as part of an appraisal; 2) Health – the impacts of proposals on health should be considered, and evaluation made of the impact on health of poverty, deprivation and unemployment, as well as poor housing or workplace conditions.

Most appraisals will identify some costs and benefits for which there is no readily available market data. In these cases, a range of techniques can be applied to elicit values, even

though they may in some cases be subjective. There will be some impacts, such as environmental, social or health impacts, which have no market price, but are still important enough to value separately. Regarding this valuation of non-market impacts, the Green Book, Annex 2 page 62, provides examples of how the Department for Transport (DfT) values the reduction of the risk of death and the prevention of non-fatal casualties in the context of road transport, with values uprated in line with assumed changes in GDP per head.

Regarding air quality sophisticated modelling tools exist to forecast emissions from different sources and estimate the impact on ambient concentration levels of different pollutants at different locations. Research has been funded to develop a methodology for quantifying and monetising, where appropriate, the health and environmental impacts of air quality changes.

Adjustments will often be required to take account of distributional impacts, and relative price changes to develop the Base Case. As for all adjustments, they should be shown separately, clearly and explicitly in any supporting tables of data.

Regarding distributional analysis, it is important that the distributional implications of each option are considered, enhancing the understanding of the fairness of proposals, their social impacts and their scale. The impact of a policy, programme or project on an individual's well-being will vary according to his or her income; the rationale being that an extra pound will give more benefit to a person who is deprived than to someone who is well off. Other distributional issues may also arise, and should be considered e.g. a proposal may have differing impacts according to age, gender, ethnic group, health, skill, or location. These effects should be explicitly stated and quantified wherever feasible. Generally though, these other distributional issues are largely correlated with income. Therefore, if more in depth analysis is undertaken, it should focus on how the cost and benefits of a proposal are spread across different socio-economic groups. For the purposes of project appraisal, relative prosperity may often be best defined by relative income, adjusted for household size, and divided into quantiles (e.g. quintiles or deciles). The equity impact of competing options can

be compared by charting the impact each has on different 'quantiles' of the income distribution. Proposals that deliver greater net benefit to households or individuals in lower income quantiles are rated more favourably than those that benefit higher quantiles. A more in depth analysis uses distributional weights to adjust explicitly for distributional impacts in the cost- benefit analysis. Benefits accruing to households in a lower quantile would be weighted more heavily than those that accrue to households in higher quantiles. Conversely, costs would be weighted more heavily for households in lower quantiles. Where appraisers decide not to adjust explicitly for distributional impacts, they must provide a justification for this decision. This judgement should be informed by the following considerations:

- The significance of the impact of distributional analysis to the proposal under consideration;
- The ease with which distributional impacts can be measured; and
- The scale of the impact associated with a particular project or proposal.

Regarding the consideration of unvalued costs and benefits, the Green Book states these should also be appraised; they should not be ignored simply because they cannot easily be valued. All costs and benefits must therefore be clearly described in an appraisal, and should be quantified where this is possible and meaningful. Fully involving stakeholders is very important in making judgments between monetised and non-monetised effects.

Regarding equity, an important rationale for government intervention is the achievement of equity objectives. Before acting, an assessment should be made of the extent of the inequality to be redressed, and the reasons it exists.

Any distributional effects identified should be explicitly stated and quantified as far as possible. At a minimum, this requires appraisers to identify how the costs and benefits accrue to different groups in society.

It follows from this that a rigorous analysis of how the costs and benefits of a proposal are spread across different socio-economic groups is recommended. Where it is considered

necessary and practical, this might involve explicitly recognising distributional effects within a project's Net Present Value.

Valuing impacts on air quality: Supplementary Green Book guidance (DEFRA, May 2013)¹¹

The supplementary Green Book guidance should be used in conjunction with the Green Book when assessing proposals that lead to changes in UK air pollution. Three approaches to value changes in air quality are presented: 1) the damage cost approach (DCA), 2) the impact pathway approach (IPA) and 3) the abatement cost approach (ACA).

Damage-cost approach (DCA) assesses the scale of air quality impacts where they are less significant, i.e. valued at less than £50m. DCA was derived from the impact pathway approach (IPA) methodology to offer an approximation of the value of impacts, as it is a simpler approach, estimating an average impact on an average population affected by changes in air quality (Source: <https://www.gov.uk/air-quality-economic-analysis>). Since they are approximations it is recommended they should be reported only when they are less than £50m and when air quality is not the main objective of the policy decision.

Impact-pathway approach (IPA) is the central methodology. It is more resource and time intensive, requiring estimation of emissions, dispersion, population exposure and outcomes. IPA provides a fuller assessment and is suitable for cases where air quality impacts are significant, i.e. valued at more than £50m. Using the IPA also depends on a range of other factors such as the importance of air quality to the specific decision. This approach should be considered in consultation with DEFRA¹².

Abatement-cost approach (ACA) is suitable for cases where the change in air quality is likely to affect compliance with legally binding obligations. The ACA only values those changes in air quality in excess of the relevant obligation i.e. the cost of abatement to restore compliance. Changes below the obligation should be valued using the impact pathway approach. Additional guidance documents on each approach are provided by DEFRA.

¹¹https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/197893/pu1500-air-quality-greenbook-supp2013.pdf

¹² If estimates are higher than £50m, consider using an impact pathway assessment and contact igcb@defra.gsi.gov.uk for advice.

Air Quality Appraisal – Damage Cost Methodology (DEFRA, February 2011)¹³

At present damage costs are recommended for use in policy analysis where cost-benefit analysis is appraising the policy over a period of 20 years or less and either:

- the policy does not have air quality improvements as its main objectives; or
- scoping analysis is being carried out to help filter potential policy options at the initial stage of the process.

The damage costs are dominated by chronic mortality health impacts and are based on a 6% per 10µg.m-3 PM2.5 change in hazard rate.

The damage costs presented in this paper exclude several key effects as quantification and valuation is not possible or is highly uncertain. These are listed below and should be highlighted when presenting valuation results where appropriate. The key health effects that have not been included are:

- Potential additional morbidity from acute exposure to PM;
- Potential mortality effects in children from acute exposure to PM;
- Potential morbidity effects from chronic (long-term) exposure to PM or other pollutants;
- Effects of exposure to ozone, including health impacts;

The effects on health of air pollution changes can also be presented as quantified health impacts instead of the monetised impacts discussed in the main part of this paper. These show:

- Chronic mortality effects – by quantifying the numbers of life years lost (over 100 years) per tonne of pollutant reduced
- Morbidity effects – by quantifying the number of hospital admissions saved per year (for both respiratory and cardiovascular illnesses) per tonne of pollutant reduced.

¹³ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/182391/air-quality-damage-cost-methodology-110211.pdf

The table below sets out the health benefits per tonne consistent with the annual pulse approach. As no valuation is necessary the calculation to determine the air quality related health benefits of your policy is simply:

Total health impact = Sum of number of tonnes of pollutant reduced (across appraisal period) x Health benefits per tonne.

	Years of life lost over 100 years		Respiratory hospital admissions (per annum)	Cardiovascular hospital admissions (per annum)
	No lag	40 year lag		
PM (Transport) ¹⁴	2.059	2.238	0.017	0.017
• Central London	10.226	9.409	0.079	0.080
• Inner London	10.517	9.677	0.082	0.082
• Outer London	6.870	6.321	0.053	0.053
• Inner conurbation	5.438	5.003	0.042	0.042
• Outer conurbation	3.379	3.109	0.026	0.026
• Urban big	4.028	3.706	0.031	0.031
• Urban large	3.245	2.985	0.025	0.025
• Urban medium	2.551	2.347	0.020	0.020
• Urban small	1.611	1.482	0.013	0.013
• Rural	0.694	0.638	0.005	0.005
PM (ESI)	0.112	0.103	0.001	0.001
PM (Domestic)	1.298	1.194	0.010	0.010
PM (Agriculture)	0.448	0.412	0.003	0.003
PM (Waste)	0.962	0.885	0.007	0.007
PM (Industrial)	1.164	1.071	0.009	0.009
NO _x	0.082	0.089	0.001	0.001
SO ₂	0.121	0.132	0.001	0.001

¹⁴ Damage costs for PM (transport) are at a UK-wide level, with disaggregated damage costs presented below split by current National Transport Model area. For further information on the breakdown of National Transport Model and populations covered by each sub-area, to help determine which area is most appropriate to use, please visit http://www.dft.gov.uk/stellent/groups/dft_econappr/documents/divisionhomepage/030708.hcs p.

Impact pathway guidance for valuing changes in air quality (DEFRA, May 2013)¹⁵

Impact-pathway approach (IPA) is the central methodology. It is more resource and time intensive, requiring estimation of emissions, dispersion, population exposure and outcomes. IPA provides a fuller assessment and is suitable for cases where air quality impacts are significant, i.e. valued at more than £50m. Using the IPA also depends on a range of other factors such as the importance of air quality to the specific decision. This approach should be considered in consultation with DEFRA¹⁶.

The location of emissions has a substantial effect upon the scale of air quality impacts, particularly for health impacts, as impacts in highly populated areas will be much larger. The impact pathway approach recognises the importance of geographical location.

A large volume of information is needed to complete an impact pathway assessment fully and there are uncertainties in each step. The following steps are required for the IPA:

1. Emissions and dispersion
2. Quantification of impacts

The first stage for the IPA is to estimate the changes in both the level of different pollutants emitted and the resulting change in ambient concentration.

The second stage concerns quantification of impacts. Air pollution has a range of impacts, grouped into the broad areas of health, amenity, productivity and ecosystems. Evidence is most developed for health impacts. Impacts on productivity and ecosystems are at present usually expressed qualitatively. There is unlikely to be a significant amenity impact at prevailing levels of air pollution as it is generally not detectable in ambient concentrations. Regarding health, impacts are quantified for short-term and long-term exposure.

¹⁵ <https://www.gov.uk/government/publications/air-quality-impact-pathway-guidance>

¹⁶ If estimates are higher than £50m, consider using an impact pathway assessment and contact igcb@defra.gsi.gov.uk for advice.

A range of morbidity and mortality effects of short-term exposure to PM₁₀, SO₂, O₃ and NO₂ are quantified using COMEAP recommended concentration-response coefficients. The evidence supporting the association between respiratory hospital admissions and short-term exposure to NO₂ used to be considered less robust than for the other pollutants and calculation of these effects used to be recommended for sensitivity analysis only and not for central estimates.¹⁷ The emerging international scientific consensus is now that the evidence is strong enough for these to be included in the central estimates.¹⁸

Calculating the short-term health effects of pollutants requires 1) estimating pollutants concentrations and resident population affected to calculate population-weighted mean concentrations; 2) collecting baseline rates of the relevant health endpoints from national statistics; 3) estimating changes in concentrations of pollutants from a comparison of the baseline concentrations with the “with measure” scenario; and 4) producing an estimate of the health impact by first combining the concentration-response coefficient with the estimated change in emissions to give the change in risk and apply it to the baseline rate of each health endpoint.

For long-term effects, the impact of long-term exposure to particles is estimated in terms of mortality and life expectancy. Calculations entail first obtaining information on current mortality rates, predict future mortality rates using current rates, life tables and assumptions about future demography in the absence of air pollution changes. Then, an alternative scenario capturing the effect of the change in air pollution is estimated by adjusting mortality rates based on exposure-response coefficients. Comparing the predicted life expectancy with between the baseline scenario and the with pollution scenario provides an estimate of the effect of the change in pollution. Sensitivity analysis can be undertaken to

¹⁷ This is the position expressed the “Impact pathway guidance for valuing changes in air quality” from Defra, May 2013

¹⁸ See WHO REVIHAAP and HRAPIE projects for a detailed discussion of this issue. Available at <http://www.euro.who.int/en/health-topics/environment-and-health/air-quality/activities/health-aspects-of-air-pollution-and-review-of-eu-policies-the-revihaap-and-hrapie-projects>

test underlying assumptions. Detailed information on this methodology is provided by COMEAP.¹⁹

Valuation of impacts

Values for a range of morbidity and mortality health endpoints have been agreed, drawing on evidence on the willingness to pay to reduce the health impacts associated with air pollution. These values are reported in the DEFRA impact pathway guidance for valuing changes in air quality and should be updated to current prices. It is also recommended for the health values to be uplifted by 2% per year for analyses spanning a number of years, following an approach taken by the Department of Health.²⁰ Values calculated also need to be discounted to reflect the fact that current benefits have greater value in the present than future benefits. To do this a 3.5% discount rate should be applied in line with Treasury Green Book recommendations.

Values are given for acute mortality, chronic mortality, respiratory hospital admissions and cardiovascular hospital admissions.

Uncertainties

There are uncertainties along each step of the IPA. Assumptions for both central modelling and sensitivity analysis should be set out clearly to ensure that results can be interpreted correctly.

Emissions and dispersions often need to be projected into the future, inevitably introducing uncertainty about future projections. It is recommended that these uncertainties are reflected as modelling uncertainties rather than in the monetary valuation with the exception of trans-boundary air pollution.

The main uncertainty around the quantification of health impacts concerns the size of the concentration-response coefficients, especially for the long-term effects of particles.

¹⁹ COMEAP (2009), 'Long-term exposure to air pollution: effect on mortality', available from www.comeap.org.uk/documents/reports/

²⁰ Policy appraisal and health: a guide from the Department of Health, Department of Health, 2004.

Additional uncertainties relate to the impact on respiratory hospital admissions from changes to NO₂ i.e. whether to include them as part of the central or sensitivity analysis, and the different assumptions about coefficients and the lags on effects that could be applied. A detailed discussion of these uncertainties is found elsewhere.²¹

Uncertainties about valuation relate to the chosen values attributable to each health outcome and changes in technology costs. A range is provided for the recommended health values in Table F of DEFRA's impact pathway guidance for valuing changes in air quality.

Given the range of uncertainties the IGCB also recommends the use of alternate methodologies which may reflect a range of differing assumptions across the impact pathway methodology. In particular it is recommended that the Clean Air for Europe values also be applied as a sensitivity.

Social cost benefit analysis and the consideration of inequalities

Social cost benefit analysis (SCBA) provides a framework to compare different policies. It focuses on the overall societal impact of any decision. Simply put, the social costs and benefits of each policy are quantified and valued in monetary terms. Costs can be subtracted from the benefits to estimate the net cost or benefit and alternative options can be ranked. However, a monetised net cost does not automatically mean a measure is not worthwhile and a monetised net benefit may not mean a measure is worthwhile. Not all concerns can be captured by the quantified costs and benefits, such as distributional considerations and non-monetised impacts. These should also inform the decision making process.²²

Often supplementary qualitative assessments are needed where monetary values are unavailable. Uncertainties surrounding the quantification and valuation of costs and benefits

²¹ See Chapter 5 of Volume 3 of the Air Quality Strategy, available from www.gov.uk/government/publications/an-economic-analysis-to-inform-the-air-quality-strategy

²² Impact pathway guidance for valuing changes in air quality. Defra, May 2013

also need to be considered when results are interpreted. Any distributional impacts should still be reflected in the wider consideration of any policy.⁷

Appendix B:

Illustrative Presentation of the Estimated Health Impacts of Each Proposed Scheme

Illustrative Presentation of the Estimated Health Impacts of Each Proposed Scheme

The DEFRA Air Quality Appraisal Damage Cost Methodology describes a simple method to estimate health impacts as quantified health impacts instead of the monetised impacts. A table²³ is provided that sets out the health effects attributable to each tonne of emissions on Page 21. As no valuation is necessary the calculation to determine the air quality related health effects of a policy is obtained by simply multiplying the sum of number of tonnes of pollutant emitted (across the appraisal period) by the health effects factor per tonne.

Applying this simple approach to the estimated emissions in 2030 attributable to each proposed scheme as presented in the AC's Air Quality Local Assessment (Tables 4.3, 5.3 and 6.3) enables the quantification of health impacts attributable to each proposed scheme. These effects are presented in Table 1 below.

Table 1: Estimates of annual (2030) health effects from scheme-related emissions using damage-cost approach

	YoLL ^a	RHA ^b	CVHA ^b
Gatwick 2R	321.6	3	3
Heathrow NWR	994.9	9	9
Heathrow ENR	739.1	6	6

YoLL = years of life lost; RHA = respiratory hospital admissions; CVHA = cardiovascular hospital admissions

^a Figures rounded to 1 decimal place

^b Figures rounded to the nearest unit

NB: For simplicity, the quantification of health impacts is the sum of the health impacts of NO_x and PM₁₀

These estimations should be undertaken for the entire appraisal period, which in this case is 60 years. Assuming the emissions estimated for 2030 occur every year of the appraisal

²³ Table in Annex 2 of Air Quality Appraisal – Damage Cost Methodology, DEFRA, February 2011.

period²⁴, the health effects presented in the table below can be attributed to each proposed scheme.

Table 2: Estimates health effects from scheme-related emissions for the 60 year appraisal period using damage-cost approach

	YoLL ^a	RHA ^b	CVHA ^b
Gatwick 2R	19,295.5	192	192
Heathrow NWR	59,691.0	517	517
Heathrow ENR	44,347.5	386	386

YoLL = years of life lost; RHA = respiratory hospital admissions; CVHA = cardiovascular hospital admissions;

^a Figures rounded to 1 decimal place;

^b Figures rounded to the nearest unit;

This calculation method used above follows the same methodology as the damage cost approach. However, and as already discussed in the main text of this report, for situations where the health-related air quality impacts are significant, as is the case in each of the three proposed schemes, an impact pathway assessment approach should be used to estimate and monetise the health impacts. The AC local air quality assessment has generated the majority of the data required to undertake this calculation.²⁵ However, as the detailed data on the population exposed is not presented in their report, we are unable to attempt a calculation of our own.

²⁴ This is likely to not be the case but we do not have the data on the estimated emissions for each year to be able to perform a more accurate estimation.

²⁵ The AC local air quality assessment reports that future incremental pollutants concentrations have been calculated at least for the 2030 scenario; an estimation of the population within each study area has been undertaken based on the datasets provided by CACI.

Appendix C:

Review Team Biography

REVIEW TEAM

Salim Vohra

Dr Salim Vohra has 22 years of experience in public health medicine in various settings and over 12 years of experience of undertaking health impact assessment (HIA).

He has led HIAs in a range of sectors – economic, energy, health services, housing, transport, regeneration and waste at project and policy levels - either as stand-alone HIAs or ones that were part of environmental and social assessments and strategic environmental assessments/sustainability appraisals. His recent HIAs include High Speed 2, Thames Tideway Tunnel, A6-Manchester Airport Relief Road, gas refining project in Qatar, tight gas fracking project in Ukraine and an oilfield redevelopment in Iraq.

He was lead author for three guides: a Health Scotland HIA guide of greenspace and an international guide on HIA and an occupational health risk assessment guide for the International Council on Mining and Metals.

He led a review for the English Department of Health on how HIA is carried out by government departments '*Putting Health in the Policy Picture*'.

He led the wellbeing stream for the Scottish Governments '*Environmental Determinants of Public Health*' (EDPHiS) research project and was a leading member of the health work package for the European Commission research project '*Improving the Implementation of Environmental Impact Assessment*' (IMP3).

He has worked with the World Health Organization on capacity building and incorporating HIA into environmental assessments.

His educational background is in medicine (MBChB), environmental epidemiology (MSc) and public health policy (PhD). He is an Honorary Fellow of Staffordshire University and Conjoint Lecturer at the University of South Wales for his expertise in HIA. He is also co-Chair of the Health (HIA) Section of the International Association for Impact Assessment and an Editorial Board member for Environmental Impact Assessment Review. He is an Associate of the Faculty of Public Health and member of the Transport and Health Study Group.

Filipe Silva

Filipe has 6 years of experience in public health medicine in various settings. He has experience of undertaking health impact assessment and health assessment components of environmental and social assessments, public health research and epidemiology, epidemiological surveillance, health systems management, community development and health promotion work in both high income and low to middle income countries, within public, private and voluntary sector organisations. He has a strong interest in quantification, particularly in relation to the health impacts of air pollution.

He has participated in twelve projects including stand-alone health impact assessments and the health assessment component of ESIAs and SESAs on policies, plans and projects in the oil and gas, extractives, transport and urban planning sectors. He has a strong focus on the quantitative assessment of health effects, particularly in relation to air pollution. He is currently a director at PhD responsible for business development in Latin America.

Filipe has a Bachelor and Masters in Medicine by the University of Oporto and a Masters in Public Health by the London School of Hygiene and Tropical Medicine with a focus on health in EIA and SEA, environmental health and environmental epidemiology. He has undertaken additional specific training in geographical information systems applied to public health research and practice, health impact assessment (IMPACT, University of Liverpool), strategic environmental assessment and environmental impact assessment principles and practice.

Filipe is clinically registered with the Portuguese Medical Association. He is also a member of the Portuguese Impact Assessment Association and the International Association for Impact Assessment.

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Company Registration Number: 8650493

VAT Registration Number: 71088216

Registered Office: 15 Shelburne Drive Hounslow Middlesex TW4 5LA