Gatwick Airport Northern Runway Project

Environmental Statement
Appendix 18.8.1: Quantitative Health Assessment Results

Book 5

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1 Introduction

1.1 General

1.1.1 This document forms **ES Appendix 18.8.1: Quantitative Health Assessment Results** (Doc Ref. 5.3) of the Environmental Statement (ES) prepared on behalf of Gatwick Airport Limited (GAL) for the proposal to make best use of Gatwick Airport's existing runways and infrastructure (referred to within this report as 'the Project').

1.1.2 This document presents the quantitative health assessment model results for indicative scales of changes to health outcomes as a result of changes in air quality and noise due to the Project. Further details on interpretation of this data is given in **ES Chapter 18: Health and Wellbeing** (Doc Ref. 5.1) Section 18.8 and **Appendix 18.4.1: Methods Statement for Health and Wellbeing** (Doc Ref. 5.3).

1.1.3 The relationship between a change in air quality or noise exposure and a change in health outcomes is described by concentration response functions (CRF). The CRF is determined through scientific studies. The uncertainty in the exposure-response relationship is expressed in the scientific studies by presenting three types of CRF. The central CRF reflects the best evidence for what the relationship between a change in exposure and a change in health outcomes is likely to be. This is the CRF the assessment uses primarily. The literature also provides confidence intervals expressed as low and high CRF to show the range of potential effect around this central CRF estimate.

1.1.4 This document provides the results of the quantitative analysis of health outcomes for central, low and high CRF measures. The low and high CRF measures are provided for information in line with transparent reporting to show the range. The outcomes based on the low and high CRFs are considered less certain than the central CRF. It would not be methodologically appropriate to quote the low and high CRF results independently of each other and independently of the central CRF.

1.1.5 The low and high CRF have been taken into account by the assessment and do not change the conclusion that the Project results in a very low scale of change in population health outcomes.

2 Quantitative Health Assessment Results: Air Quality

2.1 Central CRF

Table 2.1.1: Assessment results: Air Quality central CRF (used in the ES 2023 assessment)

Quantitative Health Assessment Model: Air Quality

Results

Central CRF

Mortality Attributable Burden (AB)	Change in mortality risk in the local population equivalent to this number of deaths (not actual deaths)			Change expressed as an Incidence Rate			Change expressed as a percentage of the baseline incidence rate		
	2029	2032	2038	2029	2032	2038	2029	2032	2038
NO2 add'l mortality (unadjusted)	0.066	1.086	0.635	0.021	0.352	0.206	0.00000002%	0.00000026%	0.00000015%
NO2 add'l mortality (adjusted to 55% of the CRF for PM2.5 element)	0.036	0.601	0.351	0.012	0.195	0.114	0.00000001%	0.00000015%	0.00000009%
PM2.5 add'l mortality (unadjusted)	-0.043	0.096	0.069	-0.014	0.031	0.022	-0.00000001%	0.00000002%	0.00000002%
Total add'l mortality (adjusted NO2 + PM2.5)	-0.007	0.697	0.420	-0.002	0.226	0.136	0.00000000%	0.00000017%	0.00000010%
Hospital Admissions Attributable Burden (AB)									
NO2 add'l respiratory disease admissions	0.012	0.201	0.118	0.003	0.044	0.025	0.000000004%	0.00000007%	0.00000004%
PM2.5 add'l respiratory disease admissions	-0.004	0.009	0.006	-0.001	0.002	0.001	-0.000000001%	0.000000003%	0.000000002%
Total add'l respiratory disease admissions	0.008	0.210	0.124	0.002	0.045	0.027	0.000000003%	0.00000007%	0.00000004%
PM2.5 add'l cardiovascular disease admissions	-0.004	0.010	0.007	-0.001	0.002	0.002	-0.000000001%	0.000000003%	0.000000002%
Total add'l hospital admissions	0.004	0.220	0.131	0.001	0.048	0.028	0.000000001%	0.00000007%	0.00000004%

2.2 Low CRF

Table 2.2.1: Assessment results: Air Quality low CRF

Quantitative Health Assessment Model: Air Quality

Results

Low CRF

	Change in mortality risk in the local population equivalent to this number of deaths (not actual deaths)			Change expressed as an Incidence Rate			Change expressed as a percentage of the baseline incidence rate		
Mortality Attributable Burden (AB)	**2029**	**2032**	**2038**	**2029**	**2032**	**2038**	**2029**	**2032**	**2038**
NO2 add'l mortality (unadjusted)	0.023	0.381	0.223	0.007	0.123	0.072	0.00000001%	0.00000009%	0.00000005%
NO2 add'l mortality (adjusted to 55% of the CRF for PM2.5 element)	0.013	0.210	0.123	0.004	0.068	0.040	0.00000000%	0.00000005%	0.00000003%
PM2.5 add'l mortality (unadjusted)	-0.032	0.073	0.052	-0.011	0.024	0.017	-0.00000001%	0.00000002%	0.00000001%
Total add'l mortality (adjusted NO2 + PM2.5)	-0.020	0.283	0.175	-0.006	0.092	0.057	0.00000000%	0.00000007%	0.00000004%
Hospital Admissions Attributable Burden (AB)									
NO2 add'l respiratory disease admissions	0.007	0.117	0.068	0.002	0.025	0.015	0.000000002%	0.00000004%	0.00000002%
PM2.5 add'l respiratory disease admissions	0.003	-0.006	-0.004	0.001	-0.001	-0.001	0.000000001%	-0.000000002%	-0.000000001%
Total add'l respiratory disease admissions	0.010	0.111	0.064	0.002	0.024	0.014	0.000000003%	0.00000004%	0.00000002%
PM2.5 add'l cardiovascular disease admissions	-0.001	0.003	0.002	0.000	0.001	0.000	-0.0000000004%	0.000000001%	0.000000001%
Total add'l hospital admissions	0.008	0.114	0.066	0.002	0.025	0.014	0.000000003%	0.00000004%	0.00000002%

2.3 High CRF

Table 2.3.1: Assessment results: Air Quality high CRF

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Quantitative Health Assessment Model: Air Quality

Results

High CRF

	Change in mortality risk in the local population equivalent to this number of deaths (not actual deaths)			Change expressed as an Incidence Rate			Change expressed as a percentage of the baseline incidence rate		
Mortality Attributable Burden (AB)	**2029**	**2032**	**2038**	**2029**	**2032**	**2038**	**2029**	**2032**	**2038**
NO2 add'l mortality (unadjusted)	0.105	1.734	1.015	0.034	0.562	0.329	0.00000003%	0.00000042%	0.00000025%
NO2 add'l mortality (adjusted to 55% of the CRF for PM2.5 element)	0.058	0.962	0.563	0.019	0.312	0.182	0.00000001%	0.00000023%	0.00000014%
PM2.5 add'l mortality (unadjusted)	-0.048	0.108	0.077	-0.016	0.035	0.025	-0.00000001%	0.00000003%	0.00000002%
Total add'l mortality (adjusted NO2 + PM2.5)	0.010	1.070	0.640	0.003	0.347	0.207	0.00000000%	0.00000026%	0.00000016%
Hospital Admissions Attributable Burden (AB)									
NO2 add'l respiratory disease admissions	0.017	0.289	0.169	0.004	0.063	0.037	0.00000001%	0.00000010%	0.00000006%
PM2.5 add'l respiratory disease admissions	-0.011	0.024	0.017	-0.002	0.005	0.004	-0.000000003%	0.00000001%	0.00000001%
Total add'l respiratory disease admissions	0.007	0.313	0.186	0.002	0.068	0.040	0.000000002%	0.00000010%	0.00000006%
PM2.5 add'l cardiovascular disease admissions	-0.007	0.017	0.012	-0.002	0.004	0.003	-0.000000002%	0.000000005%	0.000000003%
Total add'l hospital admissions	0.000	0.330	0.198	0.000	0.071	0.043	0.000000000%	0.00000011%	0.00000006%

2.4 Central CRF Sensitivity Test

This sensitivity test uses the average (mean) concentrations of NO_2 and $PM_{2.5}$ across the 177,962 receptors to calculate the health outcome estimates. The same formula, baseline data and CRFs were used. This is a methodological verification exercise to confirm the findings through independent calculation. It also demonstrates in terms of proportionate EIA methods that a calculation using the total receptor number and the average concentration can be as robust in reaching an estimate to the population level health outcome as calculating the sum of multiple (in this case 177,962) individual receptor level health outcomes using individual receptor concentrations.

Table 2.4.1: Sensitivity Test: Air Quality central CRF

Quantitative Health Assessment Model: Air Quality

Results

Sensitivity Test: Central CRF

	Change in mortality risk in the local population equivalent to this number of deaths (not actual deaths)			Change expressed as an Incidence Rate			Change expressed as a percentage of the baseline incidence rate		
Mortality Attributable Burden (AB)	**2029**	**2032**	**2038**	**2029**	**2032**	**2038**	**2029**	**2032**	**2038**
NO2 add'l mortality (unadjusted)	0.066	1.088	0.635	0.021	0.352	0.206	0.00000002%	0.00000026%	0.00000015%
NO2 add'l mortality (adjusted to 55% of the CRF for PM2.5 element)	0.036	0.601	0.351	0.012	0.195	0.114	0.00000001%	0.00000015%	0.00000009%
PM2.5 add'l mortality (unadjusted)	-0.043	0.096	0.069	-0.014	0.031	0.022	-0.00000001%	0.00000002%	0.00000002%
Total add'l mortality (adjusted NO2 + PM2.5)	-0.007	0.698	0.420	-0.002	0.226	0.136	0.00000000%	0.00000017%	0.00000010%
Hospital Admissions Attributable Burden (AB)									
NO2 add'l respiratory disease admissions	0.012	0.201	0.118	0.003	0.044	0.025	0.000000004%	0.00000007%	0.00000004%
PM2.5 add'l respiratory disease admissions	-0.004	0.009	0.006	-0.001	0.002	0.001	-0.000000001%	0.000000003%	0.000000002%
Total add'l respiratory disease admissions	0.008	0.210	0.124	0.002	0.045	0.027	0.000000003%	0.00000007%	0.00000004%
PM2.5 add'l cardiovascular disease admissions	-0.004	0.010	0.007	-0.001	0.002	0.002	-0.000000001%	0.000000003%	0.000000002%
Total add'l hospital admissions	0.004	0.220	0.131	0.001	0.048	0.028	0.000000001%	0.00000007%	0.00000004%

3 Quantitative Health Assessment Results: Noise

3.1 Central Case Scenario, central CRF, low CRF and high CRF

Table 3.1.1: Assessment results: Noise Central Case scenario (Central CRF used in the ES 2023 assessment)

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Quantitative Health Assessment Model: Noise

Results

Health Outcome	Change in mortality risk in the local population equivalent to this number of deaths (not actual deaths)				Change expressed as an Incidence Rate per 100,000 people				Change expressed as a percentage of the baseline rate			
	2029	2032	2038	2047	2029	2032	2038	2047	2029	2032	2038	2047
CENTRAL CASE SCENARIO												
Central CRF												
Stroke incidence	0.003	0.135	0.138	0.137	0.015	0.720	0.834	0.837	0.0000001%	0.0000062%	0.0000072%	0.0000072%
Ischaemic Heart Disease (IHD) incidence	0.004	0.231	0.235	0.235	0.022	1.228	1.425	1.430	0.0000001%	0.0000071%	0.0000083%	0.0000083%
IHD mortality	0.004	0.184	0.187	0.186	0.021	0.978	1.131	1.135	0.0000001%	0.0000041%	0.0000047%	0.0000047%
Depression incidence (aircraft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0000001%	0.0000168%	0.0000196%	0.0000197%
Low CRF												
Stroke incidence	0.0	0.0	0.0	0.0	0.006	0.246	0.285	0.285	0.0000001%	0.000002%	0.000002%	0.000002%
Ischaemic Heart Disease (IHD) incidence	0.003	0.106	0.107	0.107	0.013	0.563	0.651	0.654	0.0000001%	0.000003%	0.000004%	0.000004%
IHD mortality	0.001	0.038	0.038	0.038	0.005	0.201	0.232	0.232	0.0000000%	0.000001%	0.000001%	0.000001%
Depression incidence (aircraft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0000001%	0.000014%	0.000017%	0.000017%
High CRF												
Stroke incidence	0.004	0.241	0.245	0.245	0.020	1.280	1.487	1.493	0.0000002%	0.000011%	0.000013%	0.000013%
Ischaemic Heart Disease (IHD) incidence	0.005	0.371	0.379	0.378	0.023	1.974	2.298	2.308	0.0000001%	0.000011%	0.000013%	0.000013%
IHD mortality	0.006	0.323	0.328	0.328	0.030	1.716	1.991	1.998	0.0000001%	0.000007%	0.000008%	0.000008%
Depression incidence (aircraft)	- 0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-0.00000001%	0.000020%	0.000023%	0.000023%

3.2 Slow Fleet Transition Case Scenario, central CRF, low CRF and high CRF

Table 3.2.1: Assessment results: Noise Slow Fleet Transition Case scenario (Central CRF used in the ES 2023 assessment)

Quantitative Health Assessment Model: Noise

Results

Health Outcome	Change in mortality risk in the local population equivalent to this number of deaths (not actual deaths)				Change expressed as an Incidence Rate per 100,000 people				Change expressed as a percentage of the baseline rate			
	2029	2032	2038	2047	2029	2032	2038	2047	2029	2032	2038	2047
SLOW FLEET TRANSITION CASE SCENARIO												
Central CRF												
Stroke incidence	0.007	0.161	0.135	0.145	0.028	0.610	0.701	0.800	0.0000002%	0.00001%	0.00001%	0.00001%
Ischaemic Heart Disease (IHD) incidence	0.010	0.273	0.229	0.247	0.044	1.036	1.195	1.363	0.0000003%	0.00001%	0.00001%	0.00001%
IHD mortality	0.009	0.219	0.183	0.197	0.039	0.830	0.951	1.087	0.0000002%	0.000003%	0.000004%	0.000005%
Depression incidence (aircraft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0000004%	0.00001%	0.00002%	0.00002%
Low CRF												
Stroke incidence	0.003	0.056	0.046	0.050	0.011	0.210	0.240	0.274	0.0000001%	0.000002%	0.000002%	0.000002%
Ischaemic Heart Disease (IHD) incidence	0.005	0.126	0.105	0.113	0.023	0.479	0.548	0.627	0.0000001%	0.000003%	0.000003%	0.000004%
IHD mortality	0.002	0.045	0.037	0.040	0.009	0.172	0.195	0.224	0.00000004%	0.000001%	0.000001%	0.000001%
Depression incidence (aircraft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0000004%	0.00001%	0.00001%	0.00002%
High CRF												
Stroke incidence	0.010	0.284	0.239	0.257	0.044	1.076	1.246	1.420	0.0000004%	0.00001%	0.00001%	0.00001%
Ischaemic Heart Disease (IHD) incidence	0.014	0.436	0.369	0.396	0.060	1.650	1.922	2.186	0.0000003%	0.00001%	0.00001%	0.00001%
IHD mortality	0.015	0.382	0.321	0.345	0.062	1.447	1.670	1.905	0.0000003%	0.00001%	0.00001%	0.00001%
Depression incidence (aircraft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0000004%	0.00002%	0.00002%	0.00002%