Appendix A

TOPIC BASED SCHEMES ASSESSMENT: AOS FOR AIRPORTS NPS

A-2 QUALITY OF LIFE

June 2018

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2 QUALITY OF LIFE

2.1 INTRODUCTION

2.1.1 This topic based assessment considers each airport expansion scheme under the Quality of Life (QoL) topic. These are London Heathrow Extended Northern Runway (LHR-ENR), London Heathrow Northwest Runway (LHR-NWR) and London Gatwick Second Runway (LGW-2R) (together the Shortlisted Schemes).

2.1.2 By law, before designating an Airports National Policy Statement (NPS) an Appraisal of Sustainability (AoS) must be carried out. This AoS is a strategic level assessment. It is based on the contents of the Airports NPS. The AoS considers alternatives to the Government's preferred scheme as set out in the Airports NPS, including the outline masterplans supplied to the Airports Commission (AC) for the three shortlisted schemes. This AoS considers the impacts of expansion without the benefits of the mitigation packages put forward by scheme promoters, unless stated otherwise. The Government has outlined that it expects a significant mitigation package to be put in place by the promoter of its preferred scheme to ensure that wherever possible significant effects are avoided, reduced or offset.

2.1.3 Further project-level design will be required which will inform an environmental impact assessment (EIA) carried out by the promoter. This would include an assessment, which is likely to include effects identified in the AoS as well as more detailed mitigation developed as detailed design progresses. This will also be developed through consultation with both affected communities and other stakeholders.

2.1.4 This assessment builds on the previous Sustainability Appraisal (SA) undertaken as part of the Airports Commission's (AC) Appraisal Framework[1] but also responds to the AoS Appraisal Framework. The Framework addresses QoL issues and addresses wellbeing issues which have been identified through a review of plans, policies and programmes, and also the national wellbeing baseline.

2.1.5 Each expansion scheme is considered against the AoS Appraisal Framework Objectives and Questions. The Objective and Question which are addressed within this assessment are as follows:

- **AoS Objective 3:** To maintain and where possible improve the QoL for local residents and the wider population
  - **AoS Question 5:** Will it help to maintain and improve QoL?

2.1.6 QoL is defined by the World Health Organisation as an:

"individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns. It is a broad ranging concept affected in a complex way by the person's physical health, psychological state, level of independence, social relationships, personal beliefs and their relationship to salient features of their environment".[2]

1 Airports Commission, 2014. *Appraisal Framework*. [online] Accessed 24/12/2015.
2 World Health Organization, 2016. *WHOQOL: Measuring QoL*. [online] Accessed 30/03/2016.

2.1.7 There are no accepted standard measures for determining QoL, outside of those already used to assess subjective wellbeing. There are a number of definitions in the available literature of measures which can affect QoL including the following:[3]

- **Employment status** – employment status has an influence on subjective wellbeing. In particular unemployment is associated with a strong negative impact on life satisfaction[4] [5].
- **Health status** – physical and mental health are both correlated with subjective wellbeing e.g. changes in disability status have been linked to causing changes in life satisfaction.[6]
- **Work/life balance** – there is evidence that aspects of work/life balance impact on subjective wellbeing, in particular commuting[7], and time spent caring for others.[8]
- **Education and skills** – Evidence exists that education is associated with subjective wellbeing in both its attainment and the additional income associated with that attainment.[9,10]
- **Social Cohesion** – social contact, social support, participation in the community, neighbourliness, and membership of community groups are all important components of subjective wellbeing.[8;11]
- **Governance and Basic Rights** – both neighbourhood and workplace trust are crucial factors in assessing subjective wellbeing[5]; democratic participation has been shown to affect subjective wellbeing[10].
- **Environmental quality** – Both noise nuisance[12] and air pollution[9] have a negative impact on life satisfaction.
- **Personal security** – personal safety and crime are key to subjective wellbeing, both individually[15] and collectively through perceived public safety[13]. Lower levels of life satisfaction are frequently reported by residents where high levels of crime exist and/or in deprived areas.[9]

2.1.8 Therefore, assessing QoL and wellbeing represents a multi-dimensional concept that is both complex and difficult to define.

2.2 POLICY AND LEGISLATION

2.2.1 Economic indicators, such as gross domestic product (GDP), are not always considered to represent a reliable measure of the living conditions that ordinary people experience in the UK. Improvements in the wellbeing of both people and their households have been added to the measures of assessing societal progress. Assessing such progress requires looking not only at the functioning of the economic system but also at the diverse experiences and living conditions of people. To date, due to its recent inclusion with government strategy, there is

[3] OECD, 2013. *OECD Guidelines on Measuring Subjective Well-being*. [online] Accessed 08/01/2016.
[4] Winkelmann, L. and Winkelmann, R., 1998. *Why are the Unemployed so Unhappy?* Evidence from Panel Data. *Economica*, 65, 1 – 15.
[5] Boarini, R., Comola, M., Smith, C., Manchin, R. and de Keulenaer, F., 2012. *What Makes for a Better Life?, The Determinants of Subjective Well-being in OECD Countries – Evidence From The Gallup World Poll.* [online] Accessed 08/01/2016.
[6] Lucas, R., 2007. Ad*aptation and the Set-Point Model of Subjective Well-Being: Does Happiness Change After Major Life Events?*. Current Directions in Psychological Science, 16, 2, 75-79.
[7] Stuzer, A. and Frey, B., 2008. *Stress that Doesn't Pay: The Commuting Paradox. Scand. J. of Economics,* 110, 2, 339–366.
[8] Kahneman, D, and Krueger, A. B., 2006. *Developments in the Measurement of Subjective Well-Being*. Journal of Economic Perspectives, 20, 1, 3-24.
[9] Blanchflower, D and Oswald, A., 2011. *International Happiness, Working Paper 16668*. National Bureau of Economic Research: Cambridge.
[10] Helliwell, J. F. and Huang, H., 2008. *Well-being and Trust in the Workplace, Working Paper 14589*. National Bureau of Economic Research: Cambridge.
[11] Boarini, R., Comola, M., Smith, C., Manchin, R. and de Keulenaer, F., 2012. *What Makes for a Better Life?, The Determinants of Subjective Well-Being in OECD Countries – Evidence from the Gallup World Poll*. [online] Accessed 30/03/2016.
[12] Weinhoold, D., 2008. H*ow big a problem is noise pollution? A brief happiness analysis by a perturbable economist.* [online] Accessed 24/12/2015.
[13] Helliwell, J. F. and Wang, S., 2011. *Trust and Well-being*. International Journal of Wellbeing, 1,1.

limited policy and legislation directly associated with the QoL topic. Therefore, as a substitute for policy a number of programmes which are associated with QoL are presented here.[14]

NATIONAL PLANNING POLICY FRAMEWORK 2012 (NPPF)

2.2.2 The NPPF[15] was published in March 2012 and is key in ensuring the planning system focusses on delivering sustainable development. According to the framework, pursuing sustainable development involves seeking positive improvements to the quality of the built, natural and historic environment as well as to people's QoL.

BETTER LIFE INITIATIVE AND THE WORK PROGRAMME

2.2.3 The Organisation for Economic Co-operation and Development's (OECD) Better Life Initiative and the work programme on Measuring Wellbeing and Progress[16] seeks to enable better understanding of QoL.

2.2.4 The OECD's Framework for Measuring Wellbeing and Progress is based on the recommendations made in 2009 by the AC on the Measurement of Economic Performance and Social Progress to which the OECD contributed significantly. This stated[17]:

2.2.5 "Measures of both objective and subjective wellbeing provide key information about people's QoL. Statistical offices should incorporate questions to capture people's life evaluations, hedonic experiences and priorities..."

2.2.6 The framework also reflects earlier OECD work and various national initiatives in the field, and is built around three domains and their relevant dimensions:

- Material conditions (including income and wealth, and housing);
- QoL (including education and skills, social connections, and environmental quality); and
- Sustainability of wellbeing over time.

MEASURING NATIONAL WELLBEING PROGRAMME

2.2.7 In 2012 the UK government launched the Measuring National Wellbeing (MNW) programme in a bid to:

"start measuring our progress as a country, not just by how our economy is growing, but by how our lives are improving; not just by our standard of living, but by our QoL".[18]

OFFICE FOR NATIONAL STATISTICS (ONS)

2.2.8 The ONS established a national programme to develop and publish an accepted and trusted set of statistics for wellbeing, to complement traditional economic measures such as GDP and support a rounded account of economic and social progress. Wellbeing is discussed in terms of the economy, people and the environment. Quantitative information such as the unemployment rate or number of crimes against a person are presented alongside qualitative data on people's thoughts and feelings, for example, satisfaction with jobs, leisure time and fear of crime.

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[14] Organisation for Economic Co-operation and Development, 2016. *Measuring Well-being and Progress: Well-being Research.* [online] Accessed 30/03/2016.
[15] Department for Communities and Local Government, 2012. *National Planning Policy Framework*. [online] Accessed 25/11/2016.
[16] OECD, 2016. *Better Life Initiative: Measuring Well-being and Progress* [online] Accessed 06/01/2017.
[17] Stiglitz, J. E., Sen, A. and Fitoussi, J., 2009. R*eport by the Common on the Measurement of Economic Performance and Social Progress*. [online] Accessed 06/01/2017.
[18] Cabinet Office, 2013. *Wellbeing: policy and analysis*. [online] Accessed 30/03/2016.

2.3 BACKGROUND TO THE ASSESSMENT

2.3.1 The assessment of QoL has been based on the following reports:

- Airports Commissions, 2014. *Community: Impact Assessment*[19].
- PricewaterhouseCoopers, 2014. *Module 11: QoL: Assessment*.[20]

2.3.2 For each of the three shortlisted schemes, the AC studied QoL across the following areas:

- Airport operations;
- Increased airport capacity leading to an increase in air quality emissions;
- Airside ground movements and airport operations;
- Connectivity;
- Changes in non-aviation transport patterns brought about by the surface access strategy;
- Airport development; and
- Construction of new facilities and surface access infrastructure.

2.3.3 Within the Community Impact Assessment, the AC studied impacts upon the immediate local community and conducted an equalities screening to identify any disproportionate effects of the scheme on 'protected' characteristics related to age, gender, religion or belief, disability, ethnicity, sexual orientation, gender reassignment, and pregnancy and maternity.

2.3.4 Leisure impacts (in relation to aviation travel for leisure) were taken into consideration by the AC. However, leisure impacts are not considered within this assessment as they would not have a determinable impact upon QoL within the study area and therefore do not form one of the Appraisal of Sustainability (AoS) Topics.

STUDY AREA

2.3.5 For the QoL assessment, two study areas were identified for the three airport expansion schemes. The local authorities within each study area have been identified due to their proximity to the expansion schemes. There is a single study area for both Heathrow expansion schemes, (LHR-NWR and LHR-ENR) and a second study area for the LGW-2R scheme:

HEATHROW	GATWICK
→ London Borough of Hillingdon	→ Tandridge
→ London Borough of Hounslow	→ Mole Valley
→ London Borough of Ealing	→ Mid Sussex
→ London Borough of Richmond upon Thames	→ Horsham
→ London Borough of Wandsworth	→ Reigate and Banstead
→ Slough Borough Council	→ Epsom and Ewell
→ Royal Borough of Windsor and Maidenhead	→ Crawley

[19] Airports Commission, 2014. *Community: Impact Assessment*. [online] Accessed 30/03/2016.
[20] Pricewaterhouse Coopers, 2014. *Module 11: QoL: Assessment*. [online] Accessed 30/03/2016.

HEATHROW	GATWICK
→ South Bucks District Council	
→ Runnymede Borough Council	
→ Spelthorne Borough Council	

2.4 INTERACTION WITH OTHER TOPICS

2.4.1 The assessment of the QoL topic is closely related to other topic-based assessments in the AoS. In particular, the following interactions are noted in Table 2.1.

Table 2.1: Interactions with Other Topics

TOPIC	INTERACTION
Community	QoL is linked to community viability where increases in noise, traffic and deterioration of air quality, alongside the direct impacts (loss of housing and community facilities) need to be considered.
Economy	Additional employment gained from airport expansion will improve household incomes and have a direct improvement upon QoL of those affected.
Air Quality	Air quality may be reduced by increased emissions from additional aircraft and surface transport leading to health impacts upon local residents.
Noise	Changes to noise could impact upon annoyance and loss of sleep of residents leading to a reduction in QoL.
Biodiversity	Changes to habitat type and distribution may affect the QoL of residents and users of natural areas.
Landscape	Changes to landscape and visual intrusion can have an adverse effect on QoL.
Historic Environment	Interaction with heritage assets is valued (e.g. via designations). In addition people enjoy and seek to know more about their local heritage which reinforces a community's sense of place. Proposals that harm the historic environment could result in direct, indirect and cumulative impacts on the community's QoL.
Water	Water forms a key element in the beauty of landscapes, provides habitats for biodiversity (recognised by the Water Framework Directive), as well as providing important focus for recreation.

2.4.2 The QoL topic also interacts with health. Health is defined in the Constitution of the World Health Organisation as[21]:

"A state of complete physical, mental, and social wellbeing not merely the absence of disease…"

2.4.3 Therefore QoL as a concept is distinct from but is related to health, in that physical health can affect a person's QoL. In addition to this QoL topic, potential health effects are identified in other AoS Topics including air quality and noise. A separate health impact analysis (HIA) has also been published.

[21] World Health Organization, 2017. *Constitution of WHO: principles*. [online] Accessed 06/01/2017.

2.4.4 An equalities assessment has also been undertaken for the Airports NPS. Population sub-groups identified as vulnerable or sensitive to particular exposures include people living in proximity to the airports that feature in the three schemes for expansion, and people living close to any potential development or areas of expansion that are likely to be built or extended as part of any of the schemes for airport expansion. These vulnerable population groups are detailed within the equalities assessment and HIA and are not assessed separately for in the QoL topic.

2.5 ASSESSMENT CRITERIA

2.5.1 The general criteria used for assessing the significance of effects within the AoS are set out in the methodology in Section 3 of the AoS to which this appendix is attached. Identification of significance is set out in Table 2.2.

Table 2.2: Identification of Significant Effects in the AoS

++	*Significant positive effect*
+	*Positive effect*
-	*Negative effect*
--	*Significant negative effect*
+/-, ++/--	*Mixed positive and negative effect*
?	*Uncertain effect*
0	*No relationship / neutral effect*

MEASURING SUBJECTIVE WELLBEING

2.5.2 Income, wealth and consumption, as well as other aspects of material living are often referred to as "material conditions". Measuring subjective wellbeing has often focused on the relationship between material conditions and subjective wellbeing.[22]

2.5.3 Restricting the measurement of subjective wellbeing to income (as has traditionally been the case[23]) has limitations. Although increasing household income may result in an improvement in subjective wellbeing for individuals within that household, increasing average incomes across the whole country does not necessarily give rise to a corresponding increase in the country's average subjective wellbeing.

2.5.4 Therefore focusing solely on economic growth, rather than looking at other indicators of subjective wellbeing, results in an incomplete picture. As a result, alternative measures for measuring wellbeing and QoL are starting to be developed, including the ONS Measures of National Wellbeing, and with ONS Personal Wellbeing measures[24].

2.5.5 As noted above, information from other AoS Topics has informed this assessment. These individual AoS Topics were assessed against baseline information from the ONS Measures of

[22] OECD, 2013. *OECD Guidelines on Measuring Subjective Well-being*, OECD Publishing. [online] Accessed 30/03/2016.
[23] Easterlin, 1974. *Does Economic Growth Improve the Human Lot? Some Empirical Evidence*. In David, P. A. and Reder, M. W., eds., *Nations and Households in Economic Growth: Essays in Honor of Moses Abramovitz*. Academic Press: New York.
[24] Office for National Statistics, 2015. M*easuring National Well-being : Personal Well-being in the UK, 2014 to 2015.* [online] Accessed 12/08/2016.

National Wellbeing, and with ONS Personal Wellbeing measures, to generate QoL indicators for the AoS. These are mapped in Table 2.3.

Table 2.3: Measures of Personal and National Wellbeing Mapped to QoL Indicators

PERSONAL WELLBEING	MEASURES OF NATIONAL WELLBEING[25]		AOS QOL INDICATORS
Life satisfaction	Personal Wellbeing	Health	Housing and Community Facilities
	Our relationships		
Happiness			
	What we do		Housing and Community Facilities
	Where we live		Noise
			Air Quality
			Traffic Volumes
			Housing and Community facilities
			Flooding
Anxiety	Personal finance		Employment and the Economy
	The economy		Employment and the Economy
Worthwhile	Education and skills		Employment and the Economy
	Governance[26]		Housing and Communities
	The Environment		Access to nature and cultural heritage.

2.5.6 This QoL assessment relies upon existing baseline data. Limitations to the information available means that not all QoL indicators are assessed but the following defined set of indictors have been used:

- Traffic Volumes - Chapter 8. Surface Access Assessment Commission: Final Report July 2015;[27]
- Housing and Communities – using AoS Appendix A.1 Community;
- Employment and the Economy – using AoS Appendix A.2 Economy;
- Noise – using AoS Appendix A.4 Noise;
- Air Quality – using AoS Appendix A.8 Air Quality;
- Access to Nature and Cultural Heritage – using AoS Appendices A.5 Biodiversity, A.11 Cultural Heritage and A.12 Landscape; and
- Flooding – using AoS Appendix A.7 Water.

2.5.7 The indicators were selected on the basis of availability of both baseline information and availability of airport expansion scheme information. A key determining factor in the selection of the indicators was the measurability, likelihood and scale of an indicator outcome.

[25] Office for National Statistics, 2016. *Measures of National Well-being.* [online] Accessed 12/08/2016.
[26] Governance affects social housing provision/ quality and community infrastructure. These are affected by local government plans and spending
[27] Airports Commission, 2015. *Final Report*, Chapter 8. [online] Accessed 06/01/2017.

2.6 SUMMARY OF BASELINE AND ISSUES

NATIONAL BASELINE

2.6.1 Personal wellbeing and health were assessed as part of a 2015 ONS survey.[28] Though a valuable source of data, the survey only includes data from adults and records no specific data from children under 18 years old; therefore it is somewhat limited in its reflection of the whole population. The survey reports across a range of indicators including the following broad measures:

- Happiness - Overall, how happy did you feel yesterday?
- Life Satisfaction - Overall, how satisfied are you with your life nowadays?
- Worthwhile - Overall, to what extent do you feel the things you do in your life are worthwhile?
- Anxiety - Overall, how anxious did you feel yesterday?[29]

2.6.2 The survey indicated that life-expectancy in the UK improved between both survey periods of 2006 to 2008 and 2009 to 2011, while the proportion of people satisfied with their health in the financial year ending 2013 showed no overall change (59.3%). This suggests that life-expectancy and an individual's satisfaction with their health are not entirely correlated.

2.6.3 The survey also identified that 40.7% of the population continue to experience health concerns. Three in ten people (31.4%) were dissatisfied with their health in the financial year ending 2013 and around two in ten people (18.8%) reported having a long-term illness or a disability that was either work-limiting or limited their day-to-day activities in July to September 2014.

2.6.4 When compared with a year earlier, 33% of indicators relating to wellbeing had improved, 42% showed no overall change, 21% were not assessed and 5% deteriorated.[30]

LOCAL BASELINE

2.6.5 Measures of wellbeing recorded at several local authorities were used to construct baselines for the populations living close to Heathrow and Gatwick, which may be affected by any changes brought about by airport expansion. This data is retrospective and can only be assumed to be representative of the local baseline in 2030.

2.6.6 Local baselines were analysed for the study areas for Heathrow and Gatwick (see paragraph 2.3.2).

2.6.7 These baselines were compared with the averages for the South East of England, Inner London, Outer London, Counties of Buckinghamshire, Surrey, West Sussex as well as England and the United Kingdom. In addition to quantitative data, three of the four measures (Life Satisfaction, Life Being Worthwhile and Happiness) were available as mapped data from the Open Data Communities website.[31] These maps were used to visually evaluate the spatial distribution of the average scores for three of the four measures.

[28] ONS, 2015. *Measuring National Well-being: Life in the UK, 2015*. [online]. Accessed: 13/05/2015.
[29] ONS, 2015. *Assessment of Change, March 2015 Release* [online]. Accessed: 13/05/2015.
[30] ONS, 2015. *Measuring National Well-being: Life in the UK* [online]. Accessed: 13/05/2015.
[31] Department for Communities and Local Government, 2016. *Open Access to Local Data – Societal Wellbeing.* [online] Accessed 30/03/2016.

LIFE SATISFACTION

GATWICK

2.6.8 Six of the seven districts close to Gatwick reported Life Satisfaction averages above those reported for the whole of the South East, only Reigate and Banstead reported an average below the South East average. All of the districts close to Gatwick reported averages above national (UK and England) Life Satisfaction averages and all were well above those for Inner and Outer London (see Figures 2.1 and 2.2).

HEATHROW

2.6.9 Four of the ten districts in the Heathrow area reported Life Satisfaction averages below the national average, and at or below the average for Outer London. Two of the districts reported Life Satisfaction averages below those reported for Inner London (Slough and Runnymede). Only one district of the ten local to Heathrow reported Life Satisfaction averages greater than the average reported for the South East as a whole (South Bucks) (see Figures 2.1 and 2.2).

Figure 2.1: Life Satisfaction Survey Output Measured Locally, Regionally and Nationally (ONS 2015 Survey Data)

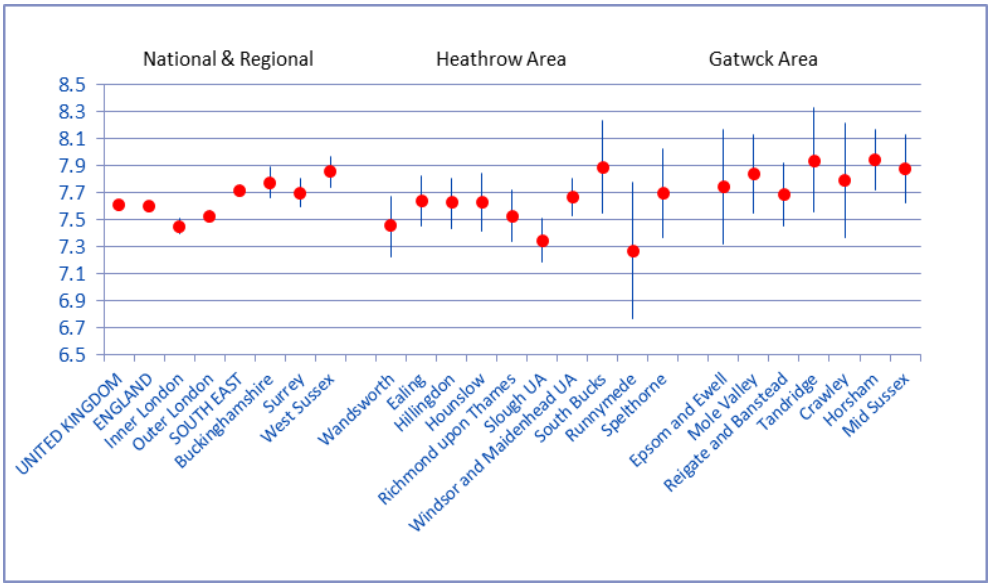
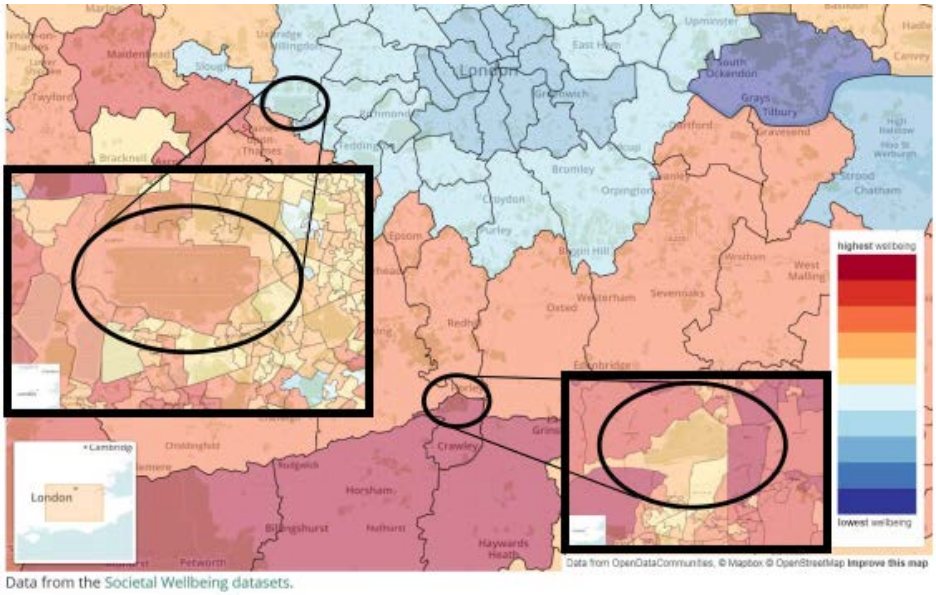


Figure 2.2: District Scaled Mapping of the Life Satisfaction Survey Output (Average) (ONS 2015 Survey Data)



Data from the Societal Wellbeing datasets.

LIFE BEING WORTHWHILE

GATWICK

2.6.10 Four of the seven districts close to Gatwick reported 'Life Being Worthwhile' averages above those reported for the whole of the South East. Of the districts close to Gatwick Epsom, Mole Valley, Tandridge, Horsham and Mid Sussex all reported averages greater than or equal to national (UK and England) averages. Reigate and Banstead reported an average for 'Life being Worthwhile' below that reported for those for Inner and Outer London (see Figures 2.3 and 2.4).

HEATHROW

2.6.11 Three of the ten districts reported 'Life Being Worthwhile' averages below the national average, and below the average for Outer London. Two of the districts reported average 'Life Being Worthwhile' averages below those reported for Inner London (Slough and Runnymede). Only one district of the ten local to Heathrow reported 'Life Being Worthwhile' averages greater than the average reported for the South East as a whole (Spelthorne) (see Figures 2.3 and 2.4).

Figure 2.3: Life Being Worthwhile Survey Output Measured Locally, Regionally and Nationally (ONS 2015 Survey Data)

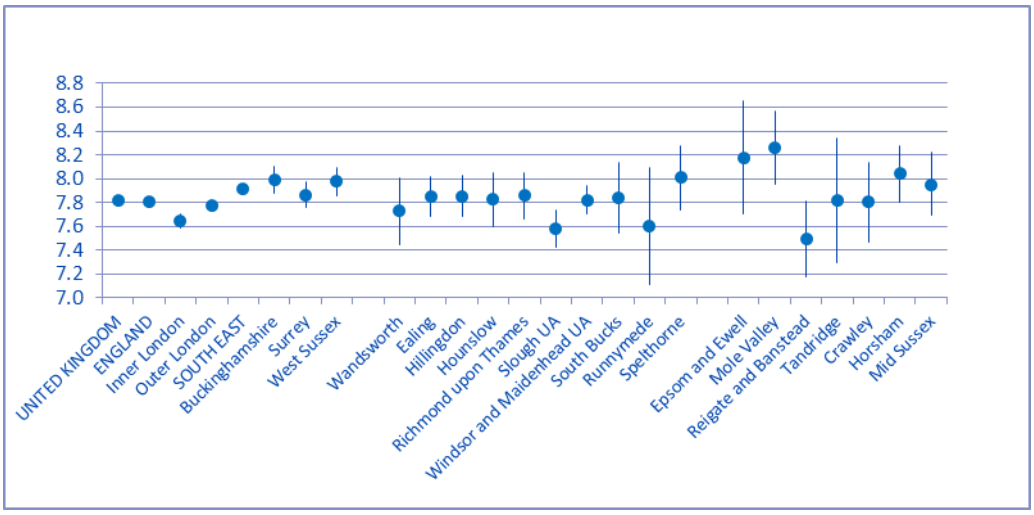
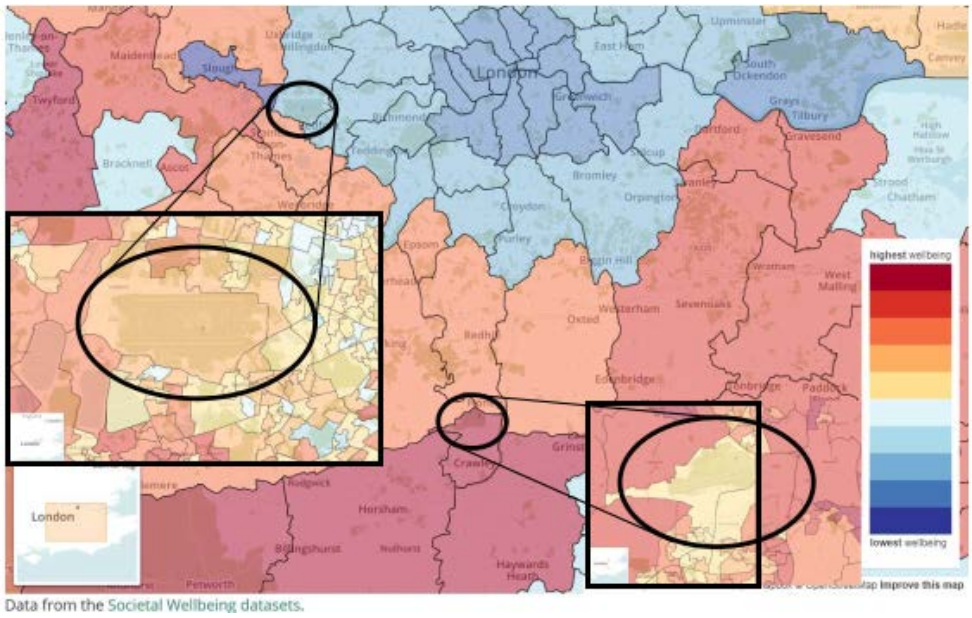


Figure 2.4: District Scale Mapping of the Life Being Worthwhile Survey Output (ONS 2015 Survey Data)



HAPPINESS

GATWICK

2.6.12 Six of the seven districts close to Gatwick reported 'Happiness' averages above the national average and the averages for inner and outer London. Only Reigate and Banstead reported a 'Happiness' average below that reported for the South East (see Figures 2.5 and 2.6).

HEATHROW

2.6.13 Five of the ten districts reported 'Happiness' averages below the national average, and below the average for Outer London. Two of the districts reported average 'Happiness' averages below those reported for Inner London (Hillingdon, Slough and Runnymede). Only two of the ten local districts to Heathrow reported 'Happiness' averages greater than the average reported for the South East as a whole (Hounslow and South Bucks) (see Figures 2.5 and 2.6).

Figure 2.5: Happiness Survey Output Measured Locally, Regionally and Nationally (ONS 2015 Survey Data)

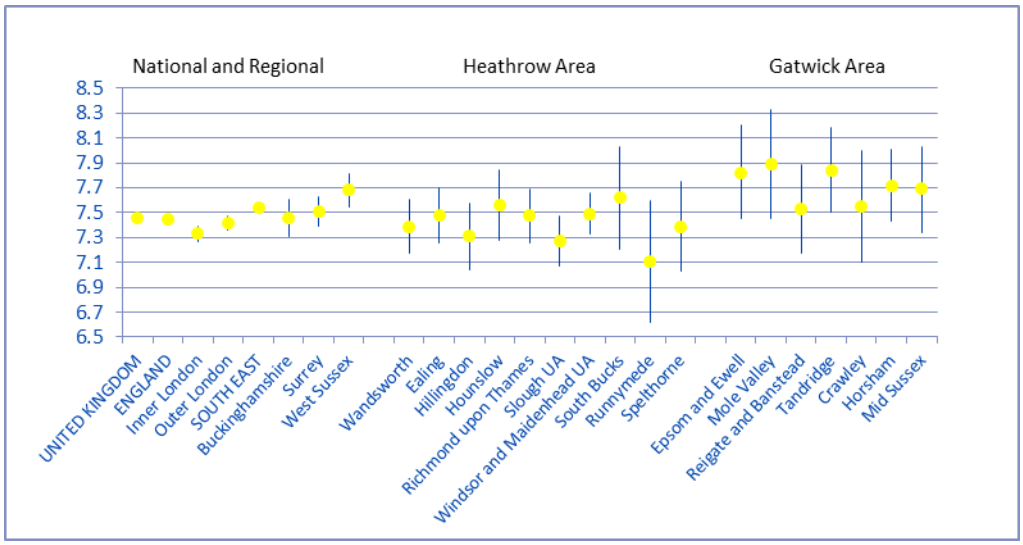
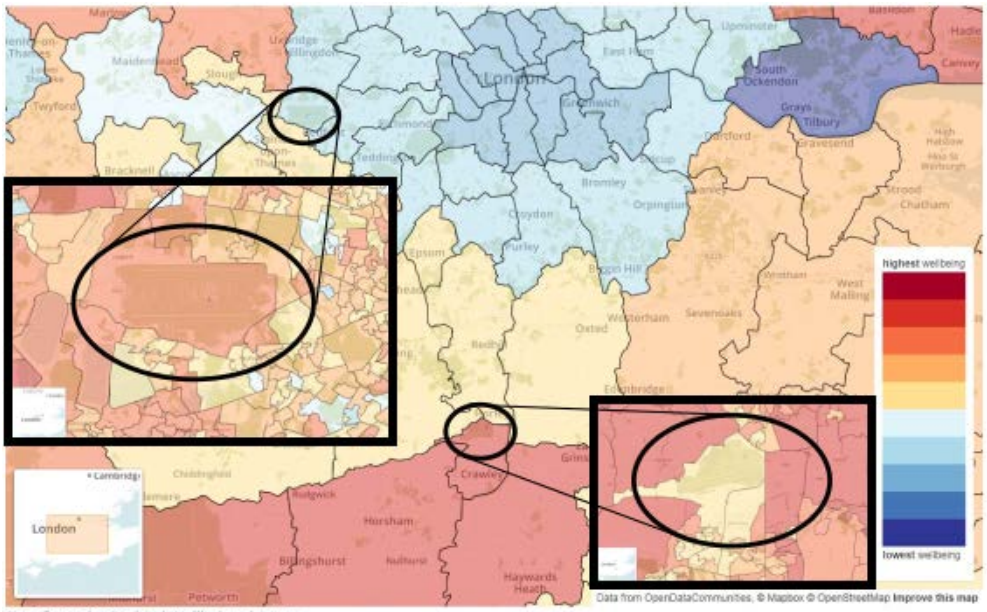


Figure 2.6: District Scale Mapping of the Happiness (Average) Survey Output (ONS 2015 Survey Data)



Data from the Societal Wellbeing datasets.

ANXIETY

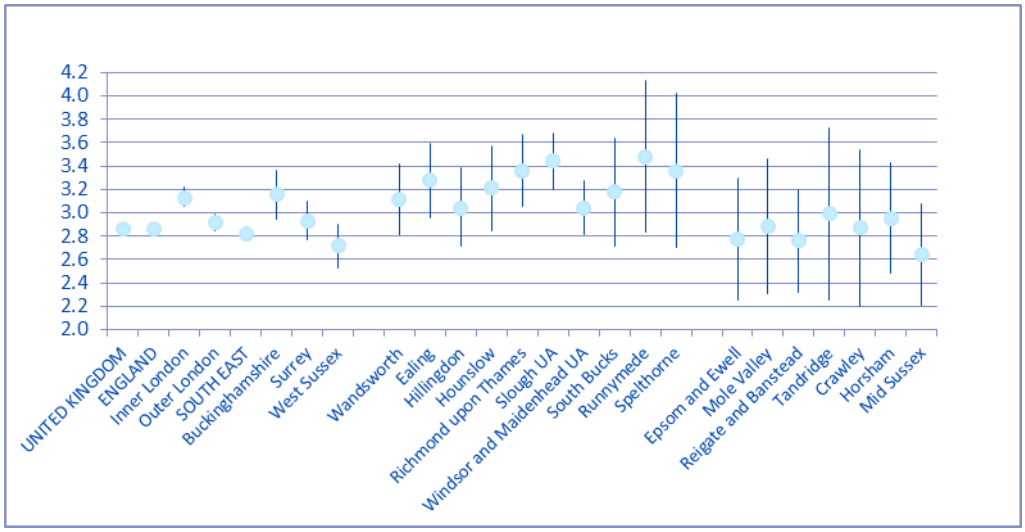
GATWICK

2.6.14 Four of the seven districts close to Gatwick reported 'Anxiety' averages above the national average for the UK and England. Four reported 'Anxiety' above that reported for the South East (Mole Valley, Crawley, Tandridge and Horsham), and two reported 'Anxiety' above that reported for outer London (Tandridge and Horsham); though all districts reported Anxiety averages lower than that reported for Inner London (see Figure 2.7).

HEATHROW

2.6.15 All of the ten districts reported 'Anxiety' averages above the national average, and above the average reported for Outer London. Three of the districts reported 'Anxiety' averages below those reported for Inner London (Wandsworth, Hillingdon and Windsor) (see Figure 2.7).

Figure 2.7: Anxiety Survey Output Measured Locally, Regionally and Nationally (ONS 2015 Survey Data)



COMMUNITY PROFILE

2.6.16 The community profile for each of the study areas affected by the proposed schemes is presented below to provide a context for the population affected. These profiles provide further detail of the local baseline used in this assessment of QoL.

GATWICK

2.6.17 Gatwick Airport is located in a largely rural area, with the town of Crawley to the south. As the most densely populated local authority in close proximity to Gatwick, the impact upon QoL as a consequence of the expansion of Gatwick airport will affect a larger number of people in Crawley (23.7 persons per hectare (pers/ha)). Reigate and Banstead District is the next most densely populated area (10.7 pers/ha), with the remaining local authorities within the Gatwick study area all equivalent, or below, the population density average in England.

2.6.18 The ethnic mix in the Gatwick study area is predominantly white, ranging from 79.8% of the population in Crawley to 95.8% in Horsham. This compares with a national average of 85.3%. The proportion of people from ethnic minority groups in Crawley tends to be similar to, or slightly higher than, the English averages, whereas ethnic minority groups in other local authority areas are all below English averages.

2.6.19 Life-expectancy in the Gatwick study area is slightly higher than the national average for men and women. For men, life-expectancy at birth ranges from 80.7 years in Tandridge District, to 82.4 years in Mole Valley, compared with a national average of 79.5 years. Life-expectancy for women at birth ranges from 83.7 years in Tandridge District to 85.0 years in both Mid Sussex and Mole Valley Districts, compared with a national average of 83.2 years.

2.6.20 The proportion of the population in full-time employment in the Gatwick study area is higher than the national average of 38.6%, ranging from 39.2% of the population in Mole Valley District to 47.2% in Crawley District. The percentage of the population unemployed in Crawley District is close to the national average (4.5% in Crawley, 4.4% in England). Unemployment in the remaining local authorities surrounding Gatwick is lower than the English average.

2.6.21 General qualification levels amongst residents in the Gatwick study area are higher than the national average. The percentage of people aged 16-74 years with no qualifications is lower in each local authority than the national average of 22.5%. In every local authority but one (Mid Sussex) the percentage of people aged 16-74 years who attained level 4/5[32] was higher than the national average of 27.4% (Mid Sussex was 26%).

HEATHROW

2.6.22 Heathrow is located within the London Borough of Hillingdon, which has a population density of 23.7 (pers/ha). All of the local authorities surrounding Heathrow are more densely populated than the national average of 4.1 pers/ha, with the most densely populated borough being the London Borough of Wandsworth with 89.6 pers/ha. Other considerably populated areas include the London Borough with Ealing (61 pers/ha), London Borough of Hounslow (45.4 pers/ha) and Slough Borough (43.1 pers/ha).

2.6.23 The local authorities surrounding Heathrow have a higher percentage of young people than the UK average. The median age is 33 years, 70% of residents are less than 44 years old and only 9% are at least 65 years old.

2.6.24 Ethnically, the Heathrow study area is much more mixed than the rest of the UK, with a lower proportion of residents who are white, compared with the national average of 85.3%. The proportion of the population in Slough Borough who identify themselves as Asian or Asian British (39.1%) is considerably higher than the average in England of 7%.

2.6.25 Life-expectancy across the areas surrounding Heathrow is similar to the English average, for both men and women. For men this ranges from 78.6 years in Slough Borough to 82.4 years in the London Borough of Richmond upon Thames, compared with an English average of 79.5 years. For women life-expectancy ranges from 82.9 years in Slough Borough to 86.0 years in the London Borough of Richmond upon Thames, compared with an English average of 83.2 years.

2.6.26 The proportion of the population in full-time employment in the Heathrow study area is higher than the English average of 38.6%. The proportion of the population that is unemployed in the study area varies: some local authorities have higher unemployment than the English average of 4.4% (Hounslow 4.6%, Ealing 5.2%, and Slough 5.4%). Unemployment in the remaining local authorities is lower than the English average.

2.6.27 General qualification levels amongst residents in the Heathrow study area are similar, or higher than the English average. The percentage of people aged 16-74 years with no qualifications is lower in each local authority than the English average of 22.5%. The percentage of people aged 16-74 years that attained level 4/5 is higher than the English average of 27.4% in all but two areas (25.8% in Slough and 25.9% in Spelthorne).

[32] Qualification in England, Wales and Northern Ireland are grouped into levels, from entry level to level 8. Qualifications that fall within level 4 include HNC, Certificate of higher education, and BTEC Professional award, certificate and diploma level. Level 5 includes HND, Higher diploma, Diploma of higher education, and Foundation degree, [online].

2.6.28 Across each of the local authorities close to Heathrow, pupils achieved between 66% and 80% of GCSE passes (grades A to C) which was within the top 50th percentile of local authorities, which is well above the English average.

FUTURE BASELINE AND ISSUES

2.6.29 The ONS has estimated that the population of the UK will reach 70 million by 2027[33]. Recent trends indicate that life-expectancy in the UK is increasing, and people are generally living longer and healthier lives. However, a significant proportion of the population have health concerns: 3 in 10 people (31.4%) were dissatisfied with their health in the financial year ending 2013 and around 2 in 10 people (18.8%) reported having a long-term illness or a disability that was either work-limiting or limited their day to day activities. Globally, ageing of the world's population is leading to a substantial increase in the numbers of individuals with disabling conditions or disease as a result of previous injury or illness. The non-fatal dimension of disease and injury will continue to place greater demands on health systems[34].

2.6.30 It is expected that there will be increasing demand for housing and other services, and pressures on supply in line with the population growth that is expected. The Cambridge Centre for Housing and Planning Research (2013) indicated that up until 2031 housing requirements are, on average, around 240,000 to 245,000 per year, with around 60% of all demand and need in the four southern regions (South East, South West, London, East of England).

SUMMARY OF ONS SURVEY BASELINE

2.6.31 Lower average scores of Life Satisfaction were reported across eight of the ten districts close to Heathrow than reported across all seven districts close to Gatwick.

2.6.32 The average scores of whether life is 'Worthwhile' were more variable amongst the seven districts close to Gatwick than the scores reported across the ten districts close to Heathrow. The districts close to Gatwick included both higher and lower scores than those districts close to Heathrow.

2.6.33 Higher average scores of Happiness were reported across five of the seven districts close to Gatwick, than reported across all ten districts close to Heathrow.

2.6.34 Average levels of anxiety were reported as greater across the ten districts close to Heathrow than across the seven districts close to Gatwick.

2.6.35 In summary, from the above ONS survey results, districts surrounding Heathrow appear to experience lower levels of life satisfaction, lower levels of happiness, a greater level of anxiety, and a similar range of scores for life being worthwhile. This implies that currently subjective QoL is better in the seven districts surrounding Gatwick airport than within the ten districts surrounding Heathrow airport.

SUMMARY OF BASELINE FOR AOS QOL INDICATORS

2.6.36 The majority of AoS QoL indicators are positive (largely better than the England average) for the Gatwick Study Area with the exception of noise where sleep disturbance is currently experienced at a number of properties (Table 2-4), where the baseline is negative.

2.6.37 The majority of AoS QoL indicators are either negative, or in the case of air quality and noise, significantly negative in the Heathrow Study Area (Table 2-4). Currently AoS QoL indicators

[33] Office for National Statistics, 2014. *National Population Projections: 2014-based Statistical Bulletin*. [online] Accessed 12/08/2016.

[34] Global, regional, and national incidence, prevalence, and years lived with disability for 301 acute and chronic diseases and injuries in 188 countries, 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013. The Lancet. Volume 386, No. 9995, p743–800, 22 August 2015.

which have a positive baseline are life expectancy, full-time employment, satisfaction with housing, the number of people with qualifications and opportunities to access the environment.

ENVIRONMENTAL NOISE

2.6.38 The health impacts of environmental noise are widely acknowledged. A number of reviews of impacts have been published (for example, World Health Organization (WHO) 2011) which highlight potential impacts on cardio-vascular disease, cognitive impairment and sleep disturbance and annoyance.

2.6.39 WHO consider the health burden of environmental noise in terms of Disability-Adjusted Life Years (DALYs). One DALY can be thought of as one lost year of "healthy" life. The sum of these DALYs across the population, or the burden of disease, can be thought of as a measurement of the gap between current health status and an ideal health situation where the entire population lives to an advanced age, free of disease and disability. Therefore any noise impacts resulting in one DALY lost can be thought of as one lost year of 'healthy life'.

2.6.40 An individual's health influences their QoL, in particular where sleep disturbances is experienced. Swift[35] provided a review of impacts in the vicinity of airports, focussing on sleep disturbance and stress as pathways leading to eventual cardiovascular outcomes and the potential mis-attribution of certain conditions, e.g. obesity and diabetes, as confounding factors whereas these conditions themselves may have resulted from sleep disturbance.

[35] Swift, 2010. *A Review of the Literature Related to Potential Health Effects of Aircraft Noise.* [online]

Table 2.4: Status of Study Area Baseline against Measures of National Wellbeing and AoS QoL Indicators

Personal Wellbeing	Measures of National Wellbeing[36]		AoS QoL Indicators	Gatwick Study Area Baseline Status	Heathrow Study Area Baseline Status
Life satisfaction	Personal Wellbeing	Health	Housing and Community Facilities	Life expectancy above national average satisfaction	Life expectancy at / around national average satisfaction
	Our relationships			Generally close to or above national average of satisfaction of belonging	Above and below national average of satisfaction of belonging
Happiness					
	What we do		Noise	Sleep disturbance at some properties	Sleep disturbance at many properties
	Where we live				
			Air Quality	Within Air Quality Objectives	Exceedance of Air Quality Objectives in some authorities within study area
			Traffic Volumes	Congestion limited	Current congestion problems in area surrounding Heathrow
			Housing and Community facilities	Above national average satisfaction	Above national average satisfaction
			Flooding	Gatwick is in a flood plain	Heathrow is in a flood plain
Anxiety	Personal finance		Employment and the Economy	Unemployment below national average	Unemployment is above national average in 3 large authorities with the study area
	The economy		Employment and the Economy	Full-time employment above national average	Full-time employment above national average
				Unemployment below national average	Unemployment is above national average in 3 large authorities with the study area
Worthwhile	Education and skills		Employment and the Economy	Number of people with qualifications above national average	Number of people with qualifications above national average
	Governance		Housing and Communities	Satisfaction with local services above national average	Satisfaction with local services below national average for 3 authorities with the study area
	The Environment		Access to nature and cultural heritage.	Numerous schemes to access the environment	Numerous schemes to access the environment

[36] Office for National Statistics, 2016. *Measures of National Well-being*. [online] Accessed 12/08/2016.

2.7 SCHEME DESIGN INCLUDED IN ASSESSMENT

2.7.1 The assessment has predicted impacts on QoL taking into account mitigations by design (i.e. those that are designed and incorporated into the schemes).

2.7.2 Scheme design which has been included in the assessment of effects on Community, Biodiversity, Landscape and Historic Environment have been set out within these topics of the AoS (see A.1, A.5, A.11 and A.12 respectively).

2.7.3 Assessments of the effects of potential noise and air quality impacts on QoL incorporate the same assumptions and limitations concerning scheme design, future demand for aviation and carbon policies as detailed in the respective Appendices A.4 and A.8.

2.7.4 A number of measures were proposed to reduce noise and adverse effects on air quality (see A.4 and A.8 respectively). However, these measures were not included within the respective AoS topic assessments at this stage.

2.7.5 There are no further measures for any of the schemes that have been proposed specifically in relation to QoL that have been included within this assessment.

2.8 APPROACH TO ASSESSMENT OF QOL

2.8.1 All of the three schemes were tested against how they will impact upon the QoL indicators for each study area and its population.

2.8.2 In order to provide consistency between personal wellbeing measures, national wellbeing measures and the QoL indicators in the AoS, the four broad personal wellbeing measures developed by the ONS have been mapped against relevant measures of national wellbeing, and the adopted AoS QoL indicators (see Table 2.3). The 'Health' measure of national wellbeing was not explicitly mapped across to an individual adopted AoS QoL indicator, though it is acknowledged as an indirect outcome of all the AoS QoL indicators. Potential health impacts (both direct and indirect) are assessed explicitly within a separate HIA report.

2.8.3 The noise thresholds and metrics considered in this assessment are detailed in the relevant topic Appendix A.4.

2.8.4 Impacts upon each of the objectives are represented within an appraisal table following the AoS format for other topics.

2.9 ASSESSMENT OF SHORTLISTED SCHEMES

Objective 3: To Maintain and Where Possible Improve the QoL for Local Residents and the Wider Population

LGW-2R

TRAFFIC VOLUMES

2.9.1 Upgrades to existing road and rail infrastructure during construction will cause disruption and severance impacts on local communities as well as road and rail users, leading to a significant negative impact on QoL.

2.9.2 The provision of improved, and more varied travel options would improve the resilience of the travel system, resulting in a positive impact upon QoL. However, in the long term this benefit is expected to be negated by the expansion of the airport and associated increase in passenger numbers. Further enhancements to the surface network would be needed for the benefits to be maintained.

2.9.3 An additional 9 km of cycle way and improved pedestrian routes provided during the operational phase will reduce the risk of road traffic incidents involving pedestrians and cyclists and contribute to physical activity and benefit wellbeing, contributing to a positive impact on QoL.

2.9.4 Any impacts on local air quality arising from changes in traffic volumes are addressed within the air quality section of this assessment.

HOUSING AND COMMUNITIES

2.9.5 It is anticipated that there will be involuntary relocation of 168 residential dwellings in both Crawley and Horsham districts[37]. Involuntary relocation and loss of community facilities have the potential to disrupt social support and networks which is likely to have a negative impact within these communities.

2.9.6 During the construction period there will be a reduction in the QoL, for those living in the study area. This will be caused by community severance, visual intrusion and noise.

2.9.7 Social isolation is likely to increase during construction resulting in a reduction in the QoL for those directly affected by relocation or disruption during the construction period. The community investment programme may partially offset this negative impact.

2.9.8 A residential care home, nursery facilities, green space and recreational land will be lost, and this will have a negative impact on the QoL of the elderly, children, and users of recreational spaces in general.

2.9.9 There is a potentially negative secondary impact of the LGW-2R generating demand for an additional 1,900 homes per year to be constructed. Provision of additional housing is likely to require support by the provision of additional community facilities, including schools, health centres, primary care centres and additional parks or open spaces. Assuming these additional facilities are sufficient to provide for the additional households, they are likely to have a neutral impact on QoL.

EMPLOYMENT AND THE ECONOMY

2.9.10 Expansion of Gatwick airport and a construction of a second runway will provide employment opportunities during both the construction and operational phase. Furthermore, companies involved in the supply chain for the airport are also expected to generate employment opportunities, resulting in an overall significant positive impact on QoL.

2.9.11 Economic benefits are separated into direct, wider and local impacts. Direct benefits include improved passenger convenience, enhanced availability of flights, reduced airport delays and improved connectivity for businesses which rely on airport transit. Passenger benefits include lower fares, frequency benefits and reduced delays, these benefits are expected to total £69.4bn. Lower fares will also reduce airline (producer) profits. The costs and benefits associated with transport economic efficiency fall directly on airports, airlines, passengers and affect government revenue and public finances. Producer impacts are expected to be -£65.1bn, and government revenue impacts are expected to be £4.6bn. Wider impacts are expected to include better access to foreign markets, gains from trade and greater exchange of knowledge and technology, improving the overall level of productivity in trade-related sectors of the economy.

2.9.12 Local employment opportunities as a consequence of expansion at Gatwick have been predicted to be between 9,000 and 21,000 local jobs in 2030, increasing to a total of between 25,000 and 60,000 local jobs in 2050.

[37] Airports Commission, 2014. *Community: Impact Assessment*. [online] Accessed 30/03/2016.

2.9.13 Businesses which either develop, or are maintained, by the expansion of the airport will generate a positive impact on the local economy and enhance local economic growth.

Noise

2.9.14 Construction phase impacts are likely to be negative, with potential for significance at sensitive receptors near to the new runway or along construction routes. The effects cannot yet be assessed in detail but as a worst case estimate can be considered as significant negative.

2.9.15 Increases in aircraft traffic movements will expose greater numbers of people to aviation noise. Compared to the do minimum scenario in 2030, the number of additional people in the local population who are predicted to experience exposure to noise >54 dB $L_{Aeq,16hr}$ at LGW-2R is 16,200 people by 2030, 14,700 people by 2040 and 21,300 people by 2050. This is expected to have significant negative effects on QoL due to increases in annoyance. [38]

2.9.16 The local ground noise assessment for LGW-2R indicates that the total population exposure to levels >57 dB $L_{Aeq,16hr}$ in 2030 is expected to be 1000, similar to the baseline situation (900 people in 2013, and 3,150 in 2030). Compared with the do minimum[39] in 2030, population exposure to ground noise >57 dB $L_{Aeq,16hr}$ is expected to be lower by 2,150, due to the relocation of some sources of ground noise following expansion, which is considered to result in positive effects on QoL.

2.9.17 The introduction of new flightpaths will result in disturbance for those people living close to the airport and experiencing increases in overflight aircraft noise. This disturbance will affect health, amenity and QoL. The total additional DALYs lost over a 60-year design life period has been estimated at 7,595, of which 5,307 are due to annoyance and 1,387 are due to sleep disturbance. The DALYs assessment of aircraft noise effects concludes the following:

- → All assessed effects are expected to result in additional DALYs lost compared with the do minimum;
- → Annoyance dominates the total estimated differences in DALYs lost; and
- → Annual DALYs lost due to annoyance are expected to increase over the assessment period.

2.9.18 The combined effects of the LGW-2R scheme on QoL due to increased annoyance and sleep disturbance are considered to be significant negative (--).

2.9.19 An assessment of the potential aviation noise impacts of each scheme on children's cognitive development has examined the numbers of schools exposed to daytime average contours down to 54 dB $L_{Aeq,16hr}$. The LGW-2R scheme is expected to result in increases in exposure at 12 schools by 2030, 10 by 2040 and 17 by 2050 to the >54 dB $L_{Aeq,16hr}$ daytime average noise level contour, and also increases for exposure >57 dB $L_{Aeq,16hr}$. Some reductions in exposure are expected for exposure >60 dB and >63 dB $L_{Aeq,16hr}$. These results can be interpreted as having mixed positive and negative effects (+/-) for children's cognitive development.

AIR QUALITY

2.9.20 Compliance with air quality requirements and legislation is a component of QoL.

2.9.21 A re-analysis of compliance[40] with the EU Ambient Air Quality Directive limit values taking into account the Government's 2017 Air Quality Plan and considering the start of operation of the

[38] The local noise assessments have been updated to consider a lower bound daytime average exposure level of 54 dB; this is in line with recent research. See Appendix A-4 Noise for more information.
[39] The "do minimum" scenario is where no expansion takes place at either Heathrow or Gatwick.
[40] WSP, October 2017, *2017 Plan Update to Air Quality Re-analysis, published as part of the revised draft Airports NPS Consultation documentation.*

LGW-2R scheme in any year after 2026indicates that LGW-2R is at a low risk of affecting the UKs compliance to limit values. Furthermore, with the scheme in operation, the maximum predicted annual mean nitrogen dioxide (NO_2) concentration with the scheme in operation at any receptor is 38.6µg/m^3 in 2030 (i.e. at residential properties or other location where long term exposure to air pollution is likely within 2km of the airport). This is within the annual mean Air Quality Objective (AQO) of 40µg/m^3 for NO_2 as set by the UK's Air Quality Strategy. There is a low risk that the objective could be exceeded with earlier opening, and the numbers of properties affected would be low. Actions set out in the Government's 2017 Air Quality Plan should act to reduce the risk of exceedance of both AQO and limit values.

2.9.22 The maximum predicted change in annual mean NO_2 concentrations brought about by the scheme at any receptor is 13.1µg/m^3 in 2030. Taking into account the latest DfT demand model forecasts, it is unlikely that scheme impacts would be significantly higher in earlier years.

2.9.23 Predicted PM_{10} (particulate matter with an aerodynamic diameter smaller than 10 microns) concentrations are all below the annual mean AQO value of 40µg/m^3 and below the daily mean (averaged over 24 hrs) of 50µg/m^3. The predicted incremental changes in ambient PM_{10} concentrations are all less than 4µg/m^3.

2.9.24 There is unlikely to be any risk of both PM_{10} and $PM_{2.5}$ (particulate matter with an aerodynamic diameter smaller than 2.5 microns) AQOs being exceeded in the assessment years, 2030, 2040 and 2050 within the LGW-2R study area. Therefore a low public exposure close to the airport was predicted due to the relatively low concentration of both PM_{10} and $PM_{2.5}$ around Gatwick airport, resulting in a negative impact on QoL[40].

2.9.25 Owing to the low population density around Gatwick airport, increased exposure of sensitive receptors to NO_2 as a result of direct emissions from aircraft is limited, resulting in a negative impact on QoL during operation.

2.9.26 It is predicted that 51,328 residents will be affected by an increase in NO_2 concentrations of greater than 0.5µg/m^3 at 20,985 properties. There are 62 properties likely to have an annual mean NO_2 concentration greater than 80% of the AQO concentration value of 40µg/m^3 (>32µg/m^3), placing them into an "at risk" status , which have been assessed as experiencing an increase in NO_2 concentrations[40].

2.9.27 Increases in exposure to air pollutants as a result of expansion at Gatwick airport are not predicted to be significant due to small changes in NO_2, PM_{10} and $PM_{2.5}$ concentrations. This will have a negative effect on the QoL for several thousand local residents.

ACCESS TO NATURE AND CULTURAL HERITAGE

2.9.28 A negative impact on the amenity value of the existing Crawley public rights of way and the Tandridge Border Path is anticipated during construction. In part this will be due to the loss of current open view from these locations. This loss of amenity will result in a negative impact on QoL and upon wellbeing due to reduced accessibility to nature and the living environment, and the tranquillity it can provide. In addition a reduction in recreational amenity of both Ifieldwood and the Tandridge Border Path during operation could result in a negative impact on wellbeing due to a decrease in access the local environment.

2.9.29 Buchan and Tilgate Country Parks are situated to the south of Crawley, however they are screened by the existing built up area, and therefore significant impacts on the QoL of Park users are not anticipated.

2.9.30 The permanent loss of Ancient Woodland of high amenity value on Bonnetts Lane would have a negative impact on wellbeing during the construction and operational phase of the airport due to a loss of access to nature and the living environment.

2.9.31 The loss of green space and recreational land may be offset by the LGW-2R scheme committing to a net biodiversity gain, resulting in a positive effect on QoL during operation.

2.9.32 There will be a temporary loss of these high amenity areas during the construction phase, with consequentially potential negative impacts on wellbeing due to a loss of access to nature and living environment. However, a combination of onsite mitigation and offsite enhancement measures of high-amenity areas (parks and high-value landscape) including the development of a linear park and habitat management could potentially offset any negative impacts on wellbeing during operational phase of the airport, resulting in a positive impact on QoL.

2.9.33 The historic environment assessment[41] identified direct impacts on 22 designated assets and 35 non-designated archaeological remains within the LGW-2R land-take; the setting of a further 10 designated assets could be subject to direct, long-term negative impacts within the study area (up to 300m), and from 300m to 2km the setting of a further 160 designated assets could potentially be negatively affected. It is acknowledged that there are also likely to be non-designated assets in this area of cultural heritage value that would be negatively affected. The heritage significance of assets has not been assessed, nor their context within historic landscapes. However, direct and indirect effects could have a negative effect on QoL of people who value these assets.

2.9.34 There would be no direct changes to the Surrey Hills Area of Outstanding Natural Beauty (AONB), High Weald AONB, Kent Downs AONB and the locally designated landscape (Area of Great Landscape Value). There is the potential for views from the AONBs towards construction activities and/ or operational airport to be changed which will have a negative impact on users of these spaces.

2.9.35 The majority of construction works would take place in the West Sussex landscape character area (LCA) LW8 Northern Vales[42] and a permanent loss of landscape features will occur during both construction and the operation of the airport.

FLOODING

2.9.36 The main issue for flooding associated with QoL is ensuring that airport expansion does not affect operation of the floodplain so that it displaces water or alter water flows increasing flooding elsewhere. There are areas downstream of Gatwick Airport which are at risk of flooding, therefore further development at Gatwick Airport has the potential to influence flood risk downstream.

2.9.37 Though likely to be infrequent in occurrence, flooding would have a detrimental impact upon the QoL of sections of the study area population, particularly properties within the floodplain of the River Mole, the Gatwick Stream, and Crawter's Brook and areas downstream of Gatwick airport which are at particular risk of flooding. Flooding brings with it physical risks, such as drowning and injuries (e.g. sprains/strains, lacerations and abrasions), as well as geographic displacement, damage to the home and/or possessions and stress caused by dealing with the aftermath. There are also effects on QoL associated with the stress of living with flood risk, whether this is real or perceived.

2.9.38 The scheme promoter has taken into consideration increased rainfall and peak river flows in preliminary design and assessment. It is acknowledged that further consideration of flood risk will need to be incorporated into detailed scheme design.

[41] Jacobs, 2014. 10. *Place: Assessment*. [online] Accessed 12/06/2016
[42] West Sussex County Council, 2005. *Landscape Character Assessment of West Sussex* [online] Accessed 24/12/2015

SUMMARY OF KEY QOL ISSUES – LGW-2R

Table 2.5: Summary of Effects on the QoL Indicators from LGW-2R

INDICATOR	CONSTRUCTION PHASE	OPERATIONAL PHASE
Traffic Volume	Significant Negative Effect *Disruption to road users and severance of small local communities will be experienced during the construction phase, causing negative impact on QoL through additional distress and anxiety to local residents.*	Mixed Positive/ Negative Effects *In the short term, the provision of improved, and more varied travel options would improve the resilience of the travel system and benefit QoL. However, in the long term this benefit is expected to be negated by the expansion of the airport and associated increase in passenger numbers. Further enhancements to the surface network would be needed for the benefits to be maintained.*
Housing and Communities	Significant Negative Effect *Loss of housing will have a negative impact on QoL, through loss of social networks and potential social isolation.*	Mixed Positive and Negative Effect *Negative impact on QoL through loss of housing, loss of amenity, loss of access to social networks, community severance, visual intrusion, noise, and due to loss of access to community and recreational facilities.* *A positive impact on QoL associated with provision of new housing, and new community facilities.*
Employment and the Economy	Positive Effect *Positive impact on QoL through additional employment opportunities from airport expansion construction jobs.*	Significant Positive Effect *Positive impact on QoL through additional employment opportunities from airport operational jobs and supporting industries.*
Noise	Significant Negative Effect *Construction noise impacts on QoL are likely to be temporarily negative, however the potential significance of the effects is not yet known.* *As a worst-case estimate, it is assumed the effects are significant.*	Significant Negative Effect *Significant negative impact on QoL due to a greater population exposed to an increase in aircraft noise causing annoyance.* *Positive impact on QoL due to a reduction in exposure to local ground noise.* *Significant negative impacts on QoL due to negative health outcomes, including annoyance and sleep disturbance.* *Mixed positive and negative impacts on QoL of school children: some schools could be at risk of increased exposure to excessive aircraft noise levels (potentially leading to impaired learning). Some schools may be subject to noise reductions, which could reduce negative effects on cognitive development.*
Air Quality	*During Construction, local properties will potentially be affected by elevated dust and particulate matter concentrations, however, air quality impacts on QoL were not specifically assessed.*	Negative Effect *Negative impacts on QoL due to increased exposure to NO_2 were predicted as a result of developments of the second runway at Gatwick. Increases in emission of exposure to air pollutants as a result of expansion at Gatwick airport have been predicted to be small and not significant due to small changes in NO_2, PM_{10} and $PM_{2.5}$ concentrations.*

INDICATOR	CONSTRUCTION PHASE	OPERATIONAL PHASE
Access to nature and cultural heritage	Negative Effect *A negative impact on QoL has been predicted as a consequence of temporary loss of the recreational amenity of the Crawley public rights of way and the Tandridge Border Path during construction.*	Negative Effect *A negative impact on QoL has been predicted as a consequence of loss of the recreational value of both Ifieldwood and the Tandridge Border Path.* *Onsite mitigation and offsite enhancement measures of high amenity areas may result in positive impacts on wellbeing.* *A negative impact on wellbeing is anticipated to arise due to loss of amenity associated with the permanent loss of Ancient Woodland.* *Loss and harm to cultural heritage assets will have a negative impact on the ability to understand, appreciate and enjoy them.*
Flooding	Negative Effect *A negative impact on QoL has been predicted as a consequence of potential or perceived increased flood risk during construction.*	Negative Effect *A negative impact on QoL has been predicted as a consequence of potential for increased flood risk during operation.* *Properties within the floodplain of the River Mole and the Gatwick Stream and Crawter's Brook as well as areas downstream of Gatwick airport are at particular risk of flooding.*

2.9.39 Cumulative effects may arise as a consequence of the construction phase of the airport running concurrently with other plans, policies, programmes and other major infrastructure projects, in particular major road and rail projects being developed in accordance with the London Plan and National Networks Policy Statement. Increased noise and decreased air quality may disproportionately affect communities which are located in close proximity to two or more schemes. However, the extent or significance of these effects is uncertain, and due to the dispersed nature of different sensitive communities they are unlikely to arise over wide geographical areas. Nearby projects which have been identified include:

- Improvements to the A27, south of Gatwick;
- Improvements to various sections of the M25 near to Gatwick; and
- Lower Thames Crossing rail improvements.

2.9.40 Cumulative effects are also anticipated to arise due to increasing demand for housing and other community infrastructure due to a growing population both attracted by development associated with airport expansion, but also by commercial and residential development brought about to support the growth plans of local authorities in their local development plans.

LHR-ENR

Traffic Volumes

2.9.41 Upgrades to existing road and rail infrastructure during construction will cause disruption and severance impacts on local communities as well as road and rail users, leading to a significant negative impact on QoL. This will primarily affect users of the A4, M25 and local roads.

2.9.42 The provision of improved, and more varied travel options would improve the resilience of the travel system, resulting in a positive impact upon QoL. However, in the long term this benefit is expected to be negated by the expansion of the airport and associated increase in passenger numbers. Further enhancements to the surface network would be needed for the benefits to be maintained.

2.9.43 Any impacts on local air quality arising from changes in traffic volumes are addressed within the air quality section of this assessment.

Housing and Communities

2.9.44 This scheme could result in the compulsory purchase of nearly 242 homes for airport expansion during the construction phase[43]. This housing will be lost, with compensation and relocation assistance provided. The impact of relocating households is likely to have a negative effect on QoL for the communities impacted.

2.9.45 Loss of the three pubs and industrial/employment land is expected, which will have a negative impact on QoL for those sections of the community who use pubs or those whose employment is affected by the loss of employment land.

2.9.46 A section of the Colne Valley Regional Park will be removed but could be replaced at a new and enhanced stretch of accessible countryside in the Colne Valley. This will have negative effects on QoL during construction; though during operation will have a positive impact on QoL.

2.9.47 During the construction period there will be a reduction in the QoL, for those living in the study area. This will be caused by community severance, visual intrusion and noise.

2.9.48 Social isolation is likely to increase during construction resulting in a reduction in the QoL for those directly affected by relocation or disruption during the construction period. The community investment programme may partially offset this negative impact.

2.9.49 There is a potentially negative secondary impact of LHR – ENR generating demand for an additional 450 homes per year to be constructed[44,45,46]. Provision of additional housing is likely to require support by the provision of additional community facilities, including schools, health centres, primary care centres and additional parks or open spaces. Assuming these additional facilities are sufficient to provide for the additional households, they are likely to have a neutral impact on QoL.

Employment and the Economy

2.9.50 Improved rail services and the development of a transport hub will provide additional high quality public transport options to local residents and therefore extend their access to a greater pool of employment opportunities. These improvements are likely to lead to positive impacts on QoL during both construction and operation.

2.9.51 Economic benefits are separated into direct, wider and local impacts. Direct benefits include improved passenger convenience, enhanced availability of flights, reduced airport delays and improved connectivity for businesses which rely on airport transit. Passenger benefits include lower fares, frequency benefits and reduced delays, these benefits are expected to total £57.2bn. Lower fares will also reduce airline (producer) profits. The costs and benefits associated with transport economic efficiency fall directly on airports, airlines, passengers and affect government revenue and public finances. Producer impacts are expected to be -£46.4bn, and government revenue impacts are expected to be £2.9bn. Wider impacts are expected to include better access to foreign markets, gains from trade and greater exchange of knowledge and technology, improving the overall level of productivity in trade-related sectors of the economy.

[43] Airports Commission, 2014. *Community: Impact Assessment*. [online] Accessed 30/03/2016.
[44] Airports Commission, 2015. *Final Report*. [online] Accessed 30/03/2016.
[45] Jacobs, 2014. 10. *Place: Baseline*. [online] Accessed 30/03/2016.
[46] Jacobs, 2014. 10. *Place Assessment*. [online] Accessed 30/03/2016.

2.9.52 Local employment opportunities as a consequence of expansion at Heathrow are predicted to generate between 48,000 and 97,000 local jobs in 2030 and between 31,000 and 63,000 local jobs in 2050. [47]

2.9.53 Businesses which either develop, or are maintained, by the expansion of the airport will generate a positive impact on the local economy and enhance local economic growth.

Noise

2.9.54 Construction phase impacts are likely to be negative, with potential for significance at sensitive receptors near to the runway extension or along construction routes. The effects cannot yet be assessed in detail but as a worst case estimate can be considered as negative and potentially significant.

2.9.55 As current flightpaths from Heathrow result in noise exposure over densely populated areas of west London, exposure to overflight noise is relatively high. Compared to the do minimum in 2030, the number of additional people in the local population who are predicted to experience exposure to noise >54 dB $L_{Aeq,16hr}$ as a consequence of LHR-ENR is 27,200 in 2030 and 1,300 in 2040; this is expected to have significant negative effects on QoL due to increases in annoyance. A reduction in people exposed to noise >54 dB $L_{Aeq,16h}$ of 18,200 is expected by 2050; this is expected to have positive effects on QoL due to reductions in annoyance.[48]

2.9.56 The local ground noise assessment for LHR-ENR indicates that the total population exposure to levels >57 dB $L_{Aeq,16hr}$ in 2030 is expected to be 29,300, similar to the baseline situation (30,650 people in 2013 and 30,750 in 2030)[49]. Compared with the do minimum in 2030, population exposure to ground noise >57 dB $L_{Aeq,16hr}$ is expected to be lower by 1,450, which could have a slight positive effect on QoL, but this benefit may be offset for the populations in close proximity to the airport that are affected by ground noise, due to increases in airspace noise near the runways.

2.9.57 The introduction of new flightpaths will result in disturbance for those people living close to the airport and experiencing increases in overflight aircraft noise. This disturbance will affect health, amenity and QoL. The total additional DALYs lost over a 60-year design life period has been estimated at 9,901, of which 12,671 are due to annoyance, and -3,964 (ie a beneficial reduction in the total) are due to reductions in sleep disturbance). The DALYs assessment from aircraft noise concludes the following:

- → all effects are expected to result in initial increases in annual DALYs lost across the assessment period compared with the do minimum;
- → the additional annual DALYs lost due to annoyance and sleep disturbance are expected to reduce steadily over time, and DALYs lost due to sleep disturbance are expected to be reduced compared with the do minimum beyond the 2042 assessment year; and
- → the combined effects of annoyance and sleep disturbance dominate total changes in annual DALYs lost, which accordingly get steadily smaller over time, resulting in a marginal reduction in total annual DALYs lost by 2050 compared with the do minimum.

2.9.58 The combined effects of the LHR-ENR scheme on QoL due to annoyance and sleep disturbance are considered to be predominantly significant negative (--), although it is acknowledged that there may be some significant positive effects for those benefitting from reductions in sleep disturbance.

[47] Department for Transport, 2016. *Airport Capacity in the South East: Further Review and Sensitivity Report.* [online] Accessed 25/11/2016.
[48] The local noise assessments have been updated to consider a lower bound daytime average exposure level of 54 dB; this is in line with recent research. See noise appendix for more information.
[49] Jacobs, 2014. 5. *Noise: Local Assessment*. Prepared for the Airports Commission, p 271. [online] Accessed 21/12/2015.

2.9.59 The LHR-ENR scheme is expected to result in increases in exposure of schools to noise >57 dB $L_{Aeq,16h}$ and higher noise contours up to >69 dB $L_{Aeq,16h}$ over the assessment period. There is also expected to be a reduction in exposure to noise at 8 schools in 2040 and 29 schools in 2050 to noise >54 dB $L_{Aeq,16h}$. These results can be interpreted as having predominant significant negative effects for children's cognitive development and consequently a predominant significant negative effect on their QoL.

Air Quality

2.9.60 Large areas including the airport site and nearby major roads have annual mean NO_2 levels in excess of the EU Directive limit value of 40µg/m^3. Therefore existing air quality at and surrounding Heathrow is poor.[50] Four of the adjacent local authorities to Heathrow have declared Air Quality Management Areas (AQMAs) for exceedances of the annual mean NO_2 AQO, mainly due to emissions from road transport.

2.9.61 A re-analysis[51] of the AC's air quality impact assessment[52] has been undertaken taking into account the Government's 2017 Air Quality Plan and revised surface access strategies for LHR-ENR. The re-analysis indicates that the LHR-ENR scheme impacts on compliance with limit values alongside some roads within Greater London. However, the maximum predicted annual mean NO_2 concentration with the scheme at any residential property or other location where long term exposure to air pollution is likely within 2km of the airport with the scheme in operation is 37.2µg/m^3. This is within the annual mean AQO. The maximum predicted change in concentrations brought about by the scheme at any receptor is 14.0µg/m^3 (with the proposed LHR-ENR). There is a low risk that the objective could be exceeded with opening of the scheme prior to 2030, but the numbers of properties affected would be low. Actions set out in the Government's 2017 Plan should act to reduce the risk of exceedance of both AQO and limit values.

2.9.62 Additional measures at the national, local and London level, including measures aimed at reducing emissions on the wider road network, could potentially mitigate the risks of impacts on compliance further.

2.9.63 Applying the Institute of Air Quality Management impact descriptors[53] to air quality impacts, health outcomes as a consequence of changes in air quality associated with LHR-ENR have been assessed as potentially moderately adverse effect, due to an increase in mortality and morbidity as well as an increase in respiratory effects and cardiovascular risk within the study area population.

2.9.64 Predicted PM_{10} concentrations are all well below the annual mean AQO. The predicted incremental changes in PM_{10} concentrations are all less than 6µg/m^3, which is of minor negative effect upon QoL.

2.9.65 It is predicted that 100,392 people will be affected by higher NO_2 concentrations (on average by 0.7 µg/m^3) at 38,656 properties. There are 113 "at risk" properties (>32 µg/m^3) that would experience an increase in annual mean NO_2 concentrations.

2.9.66 Expansion of Heathrow would result in an increase in emissions from aircraft and road traffic associated with the airport. Vehicle emissions reductions predicted to occur over time independent of airport expansion will offset this partly. However due to the densely populated urban area surrounding Heathrow an increase in emissions of air pollutants as a result of its expansion will result in several thousand local residents as well as sensitive receptors being

[50] Table 2.3. Updating and Screening Assessment, The London Borough of Hillingdon, 2015 [online] Accessed 21/12/2015
[51] WSP October 2017, *2017 Plan Update to Air Quality Re-analysis, published as part of the revised draft Airports NPS Consultation documentation*
[52] WSP|Parsons Brinckerhoff, 2016, *Air Quality Re-analysis, impact of new pollution climate mapping projection and national air quality plan*. [online] Accessed 01/12/2016
[53] Moorcroft and Barrowcliffe et al.,2015. *Land-use Planning & Development Control: Planning for Air Quality*. Institute of Air Quality Management: London

affected by poorer air quality, resulting in a reversal of air quality improvements predicted to occur as a consequence of improved emissions reduction over time. This will have a significant negative effect on the QoL for those several thousand local residents.

Access to Nature and Cultural Heritage

2.9.67 The loss of high-value recreational and landscape areas during both the construction and operational phases of airport expansion at LHR-ENR, such as Colne Valley Regional Park and the Hillingdon Lower Colne Floodplain character area, could have a negative impact on the QoL of users of the recreational area and local residents who value the presence of these open areas. Research commissioned by Defra has found that the most important attributes of open space are: 'visual appeal'; 'escape from hustle/bustle'; and 'rest and relaxation'.[54]

2.9.68 A proportion of the impacts on amenity, and accessibility to recreational areas, landscape and the environment are likely to be temporary, as mitigation and improvement measures, involving compensation for lost habitat and replacement of lost recreational areas are planned. This may offset some of the negative impacts on QoL due to loss of access to nature and cultural heritage.

2.9.69 The Place Assessment[55] identified direct impacts due to loss of 7 designated assets and 74 non-designated heritage assets. The setting of a further 30 designated heritage assets could be subject to negative impacts within the study area (up to 300m) during construction and operation, and from 300m to 2km the setting of a further 168 designated assets could potentially be negatively affected during construction and operation. There are also likely to be non-designated assets in this area of cultural heritage value that would be affected. The heritage significance of assets has not been assessed but direct and indirect effects during construction and operation could have a negative effect on QoL on people who value these assets.

Flooding

2.9.70 Development of the LHR-ENR scheme is expected to lead to a loss of up to 45ha of undefended flood plain, with 33ha set aside for as floodplain compensation, leading to a decrease in the overall flood storage for the catchment. This may result in increased risk of flooding in the area around the airport in addition to flood risk from groundwater.

2.9.71 Though likely to be infrequent in occurrence, flooding would have a severely detrimental impact upon the QoL of sections of the study area. Flooding brings with it physical risks, such as drowning and injuries (e.g. sprains/strains, lacerations and abrasions), as well as the geographic displacement, damage to the home and/or possessions and stress caused by dealing with the aftermath. There are also effects on QoL associated with the stress of living with flood risk, whether this is real or perceived.

2.9.72 Increased rainfall and peak river flows have been taken into account during early design and assessment. It is acknowledged that further consideration of flood risk will need to be incorporated into detailed scheme design.

[54] Dickens, R, Angulo, M, Turner S, Gill, J, Abdul, M, and H Hirani. *Environmental Noise: Valuing impacts on: sleep disturbance, annoyance, hypertension, productivity and quiet*. Department for Environment Food & Rural Affairs

[55] Jacobs, 2014. 10. *Place: Assessment* [online]. Accessed 06/01/2017.

SUMMARY OF KEY QOL ISSUES – LHR-ENR

Table 2.6: Summary of Effects upon QoL Indicators from LHR-ENR

INDICATOR	CONSTRUCTION PHASE	OPERATIONAL PHASE
Traffic Volume	Significant Negative Effect *Existing congestion contributes to lowering the QoL of both road users and local residents.* *Disruption to the road network during construction will result in extended journey times and inevitably degrade local air quality, resulting in a negative impact upon the QoL of local residents.*	Mixed Positive/ Negative Effects *In the short term, the provision of improved, and more varied travel options would improve the resilience of the travel system and benefit QoL. However, in the long term this benefit is expected to be negated by the expansion of the airport and associated increase in passenger numbers. Further enhancements to the surface network would be needed for the benefits to be maintained.*
Housing and Communities	Significant Negative Effect *A significant negative impact on QoL for those experiencing loss of housing and displacement and for the remaining residents who will experience the disruption of an extended construction period.*	Mixed Positive and Negative Effects *Negative impact on QoL through loss of housing, loss of amenity, loss of access to social networks, community severance, visual intrusion, noise, and due to loss of access to community and recreational facilities.* *Positive impact on QoL due to new community and recreational facilities provided.*
Employment and the Economy	Positive Effect *Positive impact on QoL local and nationally, through additional employment opportunities from airport expansion construction jobs.*	Significant Positive Effect *Significant positive impact on QoL both locally and nationally, through additional employment opportunities from airport operational jobs and supporting industries.*
Noise	Significant Negative Effect *Construction noise impacts on QoL are likely to be temporarily negative, however the potential significance of the effects is not yet known.* *As a worst-case estimate, it is assumed the effects are significant.*	Significant Negative Effect *Significant negative impact on QoL due to a greater population exposed to an increase in aircraft noise causing annoyance.* *Predominantly significant negative impacts on QoL due to negative overall health outcomes. For sleep disturbance, total DALYs lost over 60 years are expected to be reduced compared with the do minimum (significant positive).* *Significant negative impact on QoL of school children who could be at risk of exposure to excessive aircraft noise levels, leading to impaired learning.*
Air Quality	*During construction, local properties will potentially be affected by elevated dust and particulate matter concentrations, however, air quality impacts on QoL were not specifically assessed, as construction air quality effects are unknown at this stage.*	Significant Negative Effect *Due to the densely populated urban area surrounding Heathrow an increase in emissions of air pollutants as a result of its expansion will affect several thousand local residents as well as other sensitive receptors. A significant negative impact on QoL is anticipated, affecting several thousand local residents, as well as other sensitive receptors.*
Access to Nature and	Negative Effect	Negative Effect

INDICATOR	CONSTRUCTION PHASE	OPERATIONAL PHASE
Cultural Heritage	*A negative temporary impact on the QoL of users of recreational areas and local residents who value the presence of these amenity spaces.*	*A negative impact on QoL is predicted, as the impacts of the interruption and loss of high-value recreational areas are likely to be mitigated through planned compensation of habitat and displacement of recreational areas.* *Loss and harm to cultural heritage assets will have a negative impact on the ability to understand, appreciate and enjoy them.*
Flooding	Negative Effect *A negative impact on QoL has been predicted as a consequence of potential or perceived increased flood risk during construction.*	Negative Effect *A negative impact on QoL has been predicted as a consequence of potential increased flood risk in areas downstream of the River Colne, Colne Brook and Wraysbury River.*

2.9.73 Cumulative effects may arise as a consequence of the construction phase of the airport running concurrently with other major infrastructure projects, in particular major road and rail projects. Increased noise and decreased air quality may disproportionately affect communities which are located in close proximity to two or more schemes. However, due to dispersed nature of different sensitive communities they are unlikely to arise over wide geographical areas. Nearby projects which have been identified include:

- HS2;
- Crossrail; and
- Great Western Electrification Programme.

2.9.74 Cumulative effects are also anticipated to arise due to increasing demand for housing and other community infrastructure due to a growing population both attracted by development associated with airport expansion, but also by commercial and residential development brought about to support the growth plans of local authorities in their local development plans.

LHR-NWR

Traffic Volumes

2.9.75 Upgrades to existing road and rail infrastructure during construction will cause disruption and severance impacts on local communities as well as road and rail users, leading to a significant negative impact on QoL. This will primarily affect users of the A4, M25 and local roads.

2.9.76 The provision of improved, and more varied travel options would improve the resilience of the travel system, resulting in a positive impact upon QoL. However, in the long term this benefit is expected to be negated by the expansion of the airport and associated increase in passenger numbers. Further enhancements to the surface network would be needed for the benefits to be maintained.

2.9.77 Any impacts on local air quality arising from changes in traffic volumes are addressed within the air quality section of this assessment.

Housing and Communities

2.9.78 This scheme will result in the compulsory purchase of nearly 783 homes for expansion resulting in a significant negative impact on QoL. This housing will be lost; and relocation compensation, along with replacement housing schemes will be progressed with land earmarked for development by local authorities.

2.9.79 Changes to community facilities, including the loss of Harmondsworth Primary School, during construction will lead to a negative impact on QoL. A new primary and nursery school serving both Harmondsworth and Sipson will be provided as a replacement, along with a new community centre which will be developed around the existing central courtyard of St Mary's Church, Harmondsworth. The impact on QoL during operation, as a result of these new facilities, is likely to be neutral as the new development will replace existing facilities.

2.9.80 Loss of the War Memorial Recreation Ground in Sipson, will lead to a negative impact on QoL during construction. Though, reprovision to an area to be agreed in consultation with local residents and stakeholders should result in a positive impact on QoL.

2.9.81 During the construction period there will be a reduction in QoL for those living in the study area. This will be caused by community severance, visual intrusion and noise.

2.9.82 Social isolation is likely to increase during construction resulting in a reduction in the QoL for those directly affected by relocation or disruption during the construction period. The community investment programme may partially offset this negative impact.

2.9.83 There is a potentially negative secondary impact of the Northwest Runway generating demand for between 300 and 500 homes per local authority per year to be constructed.[44,45,46] Provision of additional housing is likely to require support by the provision of additional community facilities, including schools, health centres, primary care centres and additional parks or open spaces. Assuming these additional facilities are sufficient to provide for the additional households, they are likely to have a neutral impact on QoL.

Employment and the Economy

2.9.84 Expansion of Heathrow airport and a construction of a third runway will introduce employment opportunities during both the construction and operational phases. Furthermore, the additional supply chain will also generate a number of employment opportunities in the area.

2.9.85 Economic benefits are separated into direct, wider and local impacts. Direct benefits include improved passenger convenience, enhanced availability of flights, reduced airport delays and improved connectivity for businesses which rely on airport transit. Passenger benefits include lower fares, frequency benefits and reduced delays. These benefits are expected to total £67.6bn. Lower fares will also reduce airline (producer) profits. The costs and benefits associated with transport economic efficiency fall directly on airports, airlines, passengers and affect government revenue and public finances. Producer impacts are expected to be -£55.0bn, and government revenue impacts are expected to be £3.5bn.

2.9.86 Wider impacts are expected to include better access to foreign markets, gains from trade and greater exchange of knowledge and technology and improving the overall level of productivity in trade-related sectors of the economy.

2.9.87 Local employment opportunities as a consequence of expansion at Heathrow are predicted to be between 57,000 and 114,000 local jobs in 2030, increasing to a total of between 39,000 and 78,000 local jobs in 2050.

2.9.88 As a consequence it is predicted that there will be a significant positive impact on QoL, both locally and nationally, through additional employment opportunities from airport operational jobs and supporting industries. In addition it is predicted that there will be a positive impact on QoL through greater opportunities to access employment and services as a consequence of improved rail services.

Noise

2.9.89 Construction phase impacts are likely to be negative, with potential for significance at sensitive receptors near to the runway extension or along construction routes. The effects cannot yet be

assessed in detail but as a worst case estimate can be considered as negative and potentially significant.

2.9.90 As current flightpaths from Heathrow result in noise exposure over densely populated areas of west London, exposure from aircraft noise is relatively high. Compared to the do minimum in 2030 the additional number of people in the local population predicted to be exposed to noise >54 dB $L_{Aeq,16hr}$, as a consequence of LHR-NWR is 92,700 people by 2030, 52,900 people by 2040 and 36,800 people by 2050This is expected to have significant negative effects on QoL due to increases in annoyance.[56]

2.9.91 The local ground noise assessment for LHR-NWR indicates that the total population exposure to levels >57 dB $L_{Aeq,16hr}$ in 2030 is expected to be 27,000, similar to the baseline situation (30,650 people in 2013, and 30,750 in 2030).[57] Compared with the do minimum in 2030, population exposure to ground noise >57 dB $L_{Aeq,16hr}$ is expected to be lower by 3,750. This is due to relocation of some sources of ground noise away from more densely populated areas[58]. This could have a positive effect on QoL, provided those affected are not also subjected to significant increases in airspace noise, which would offset this potential benefit. This may be the case for some communities located around the southwest of the southernmost runway of LHR-NWR.

2.9.92 The introduction of new flightpaths will result in disturbance for those people living close to the airport and experiencing increases in overflight aircraft noise. This disturbance will affect health and QoL. The total additional DALYs lost over a 60-year design life period have been estimated at 20,439, of which 23,661 are due to increased annoyance effects, and -5,397 (ie a beneficial reduction in the total) are due to reductions in sleep disturbance. The DALYs assessment of aircraft noise concludes the following:

- → all effects are expected to result in initial increases in annual DALYs lost compared with the do minimum;
- → for sleep disturbance, annual DALYs lost are expected to be greater in 2030, with the increases steadily reducing over time, with reductions in DALYs lost beyond 2042 (compared with the do minimum);
- → additional DALYs lost each year to annoyance also steadily reduce but more gradually beyond 2040 (than sleep disturbance); and
- → annoyance and sleep disturbance effects dominate total estimated differences in annual DALYs lost across the assessment period, which accordingly get steadily smaller over time, although total annual DALYs lost due to the LHR-NWR scheme remains higher by 2050 (compared with the do minimum).

2.9.93 The combined effects of the LHR-NWR scheme on QoL due to annoyance and sleep disturbance are considered to be predominantly significant negative (--), although it is acknowledged that there may be some significant positive effects for those benefitting from reductions in sleep disturbance.

2.9.94 The LHR-NWR scheme is expected to result in increases in exposure to noise >54 dB $L_{Aeq,16hr}$ of 44 schools in 2030 and 27 schools in 2040, but a reduction of 6 by 2050. The scheme is also expected to result in increases in exposure of schools to noise >57 dB $L_{Aeq,16h}$ and higher noise contours up to >69 dB $L_{Aeq,16h}$. These results can be interpreted as having predominant significant negative effects for children's cognitive development and consequently a predominant significant negative effect on their QoL.

[56] The local noise assessments have been updated to consider a lower bound daytime average exposure level of 54 dB; this is in line with recent research. See Appendix A-4 Noise for more information.
[57] Jacobs, 2014. *5. Noise: Local Assessment. Prepared for the Airports Commission*, p 271. [online] Accessed 21/12/2015.
[58] Jacobs, 2014. *5. Noise: Local Assessment, Prepared for the Airports Commission*, p. 197. [online] Accessed 21/12/2015.

Air Quality

2.9.95 Large areas including the airport site and nearby major roads have annual mean NO_2 levels in excess of the EU Directive limit value[40] of 40µg/m^3. Therefore existing air quality at and surrounding Heathrow is poor.[50] Four of the adjacent local authorities to Heathrow have declared AQMAs for exceedances of the annual mean NO_2 AQO, mainly due to emissions from road transport.

2.9.96 A reanalysis,[59] of the AC's air quality impact assessment[60] has been undertaken taking into account the Government's 2017 Air Quality Plan. The re-analysis indicates that there is a risk that the LHR-NWR scheme will impact on compliance with limit values alongside some roads within Greater London.

2.9.97 However, the maximum predicted concentration at any residential property or other location where long term exposure to air pollution is likely within 2km of the airport with the scheme in operation is 34.7µg/m^3. This is within the annual mean AQO. The maximum predicted change in concentrations brought about by the scheme at any receptor is 10.8µg/m^3 (with the proposed LHR-NWR). There is a low risk that the objective could be exceeded with opening of the scheme prior to 2030, but the numbers of properties affected would be low. Actions set out in the Government's 2017 Plan should act to reduce the risk of exceedance of both AQO and limit values

2.9.98 Additional measures at the national, local and London level, including measures aimed at reducing emissions on the wider road network, could potentially mitigate the risks of impacts on compliance further.

2.9.99 Applying the Institute of Air Quality Management impact descriptors[61] to air quality impacts, health outcomes as a consequence of changes in air quality associated with LHR-NWR have been assessed as a potentially moderate adverse effect, due to an increase in mortality and morbidity as well as an increase in respiratory effects and cardiovascular risk within the study area population.

2.9.100 Predicted PM_{10} concentrations are all below the annual mean AQO. The predicted incremental changes in PM_{10} concentrations[40] are all less than 6µg/m^3, which is of negative effect upon the QoL.

2.9.101 It is predicted that 121,377 people will be affected by higher NO_2 concentrations (on average 0.9 µg/m^3) at 47,063 properties. There are 14 "at risk" properties (>32 µg/m^3) that would experience an increase in annual mean NO_2 concentrations.[40]

2.9.102 The scheme for a northwest runway at Heathrow would result in an increase in emissions from aircraft and road traffic associated with the airport. Vehicle emissions reductions predicted to occur over time independent of airport expansion will offset this partly. However due to the densely populated urban area surrounding Heathrow an increase in emissions of air pollutants as a result of the northwest runway would affect several thousand local residents as well as sensitive receptors being affected by poorer air quality, resulting in a reversal of the baseline air quality improvements. This will have a significant negative effect on the QoL of those several thousand local residents.

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59 WSP, October 2017, 2017 Plan Update to *Air Quality Re-analysis, published as part of the revised draft Airports NPS Consultation documentation*

60 WSP|Parsons Brinckerhoff, 2016, *Air Quality Re-analysis, impact of new pollution climate mapping projection and national air quality plan*. [online] Accessed 01/12/2016

61 Moorcroft and Barrowcliffe. et al., 2015. *Land-use Planning & Development Control: Planning for Air Quality*. Institute of Air Quality Management: London.

Access to Nature and Cultural Heritage

2.9.103 The permanent and temporary loss of high value recreational areas including part of the Colne Valley Regional Park and the Hillingdon Lower Colne Floodplain character area would result in a negative impact on the QoL of users of the Regional Park and local residents who value the presence of these open spaces.

2.9.104 A proportion of the impacts on amenity, and accessibility to recreational areas, landscape and the environment are likely to be temporary. Mitigation and enhancement measures are proposed including new green spaces and expanded park areas, with improvements to recreational areas. The impacts are likely to occur within less than 5 years after construction whilst these improvements and enhancements are being carried out. This may offset some of the negative impacts on QoL due to loss of access to nature and cultural heritage.

2.9.105 The AC's Place Assessment[62] identified direct negative impacts due to loss of 21 designated heritage assets and 167 non-designated archaeological remains; the setting of a further 54 designated assets could be subject to direct, long-term negative impacts within the study area (up to 300m), and from 300m to 2km the setting of a further 166 designated assets could potentially be negatively affected. It is acknowledged that there are also likely to be non-designated assets in this area of cultural heritage value that would be negatively affected. The heritage significance of assets has not been assessed but direct and indirect effects could have a negative effect on QoL on people who value these assets.

Flooding

2.9.106 Development of the LHR-NWR scheme is expected to lead to a loss of up to 40ha of undefended flood plain, however 47ha are being set aside for as floodplain compensation, leading to an increase in the overall flood storage for the catchment.

2.9.107 Though likely to be infrequent, flooding would have a severely detrimental impact upon the QoL of sections of the study area. Flooding brings with physical risks, such as drowning and injuries (e.g. sprains/strains, lacerations and abrasions), as well as the geographic displacement, damage to the home and/or possessions and stress caused by dealing with the aftermath. There are also effects on QoL associated with the stress of living with flood risk, whether this is real or perceived.

2.9.108 The scheme promoter has taken into consideration increased rainfall and peak river flows into preliminary design and assessment, in addition to increasing flood storage. It is acknowledged that further consideration of flood risk will need to be incorporated into detailed scheme design.

[62] Jacobs, 2014. 10. Place: Assessment [online]. Accessed 25/11/2016.

SUMMARY OF KEY QOL ISSUES – LHR-NWR

Table 2.7: Summary of Effects upon QoL Indicators from LHR-NWR

INDICATOR	CONSTRUCTION PHASE	OPERATIONAL PHASE
Traffic Volume	Significant Negative Effect *Existing congestion contributes to lowering the QoL of both road users and local residents.* *Disruption to the road network during construction will result in extended journey times.*	Mixed Positive / Negative Effects *In the short term, the provision of improved, and more varied travel options would improve the resilience of the travel system and benefit QoL. However, in the long term this benefit is expected to be negated by the expansion of the airport and associated increase in passenger numbers. Further enhancements to the surface network would be needed for the benefits to be maintained.*
Housing and Communities	Significant Negative Effect *A significant negative impact on QoL for those experiencing loss of housing and displacement and for the remaining residents who shall experience the disruption of an extended construction period and those who are transferred to the substitute for Harmondsworth Primary School and replacement community facilities.*	Mixed Positive/ Negative Effects *Negative impact on QoL through loss of housing, amenity, loss of access to social networks, community severance, visual intrusion, noise, and due to loss of access to community and recreational facilities.* *Positive effect on QoL through improved social networks as a consequence of a new community centre in Harmondsworth.* *The loss and displacement of the War Memorial Recreation Ground would result in a negative impact on wellbeing due to loss of recreation and amenity.* *Positive impact on QoL due to new community and recreational facilities provided.*
Employment and the Economy	Positive Effect *Positive impact on QoL local and nationally, through additional employment opportunities from airport expansion construction jobs.*	Significant Positive Effect *Significant positive impact on QoL both locally and nationally, through additional employment opportunities from airport operational jobs and supporting industries.* *In addition predicted positive impact on QoL through greater opportunities to employment and services as a consequence of improved rail services*
Noise	Significant Negative Effect *Construction noise impacts on QoL are likely to be temporarily negative, however the potential significance of the effects is not yet known.* *As a worst-case estimate, it is assumed the effects are significant.*	Significant Negative Effect *Significant negative impact on QoL due to a greater population exposed to an increase in aircraft noise causing annoyance.* *Predominantly significant negative impacts on QoL due to negative overall health outcomes. For sleep disturbance, total DALYs lost over 60 years are expected to be reduced compared with the do minimum (significant positive).* *Significant negative impact on QoL of school children who could be at risk of exposure to excessive aircraft noise levels, leading to impaired learning.*

Indicator	Construction Phase	Operational Phase
Air Quality	*During construction, local properties will potentially be affected by elevated dust and particulate matter concentrations, however, air quality impacts on QoL were not specifically assessed at this stage.*	Significant Negative Effect *The LHR-NWR scheme to expand Heathrow airport is at risk of worsening exceedances alongside individual roads in Central London. Due to the densely populated urban area surrounding Heathrow an increase in emissions of air pollutants as a result of its expansion will affect local residents as well as other sensitive receptors.*
Access to nature and cultural heritage	Negative Effect *Potential for a temporary negative impact on the wellbeing of users of the local recreational areas and local residents who value the presence of these amenity areas*	Mixed Positive/Negative Effects *A positive impact on QoL is predicted, as the interruption and loss of high value recreational areas impacts are likely to be mitigated through compensation of habitat and displacement of recreational areas are planned.* *Additionally, loss and harm to cultural heritage assets will have a negative impact on the ability to understand, appreciate and enjoy them.*
Flooding	Negative Effect *A negative impact on QoL has been predicted as a consequence of potential or perceived increased flood risk during construction.*	Negative Effect *A negative impact on QoL has been predicted as a consequence of potential increased flood risk downstream on the River Colne.* *Provision of additional floodplain areas as compensation.*

2.9.109 Cumulative effects may arise as a consequence of the construction phase of the airport running concurrently with other major infrastructure projects, in particular major road and rail projects. Increased noise and decreased air quality may disproportionately affect communities which are located in close proximity to two or more schemes. However, due to the dispersed nature of different sensitive communities they are unlikely to arise over wide geographical areas. Nearby projects which have been identified include:

- HS2;
- Crossrail; and
- Great Western Electrification Programme.

2.9.110 Cumulative effects are also anticipated to arise due to increasing demand for housing and other community infrastructure due to a growing population both attracted by development associated with airport expansion, but also by commercial and residential development brought about to support the growth plans of local authorities in their local development plans.

2.9.111 A summary of the assessment is provided for Appraisal Question 5 under Objective 3.

Objective 3: To Maintain and Where Possible Improve the QoL for Local Residents and the Wider Population

Question 5: Will It Help To Maintain and Improve QoI

AoS Topic	LGW-2R	LHR-ENR	LHR-NWR
Description of Impact	**Traffic Volume** Significant disruption to road users and severance of small local communities will be experienced during the construction phase of the scheme, causing distress and anxiety to residents. During the operational period of the scheme, improved infrastructure and access to public transport may provide improvements to QoL in the short term, however these are expected to be negated by long term increasing demand for infrastructure. **Housing and Communities** Loss of housing/ forced moves will cause distress and have significant adverse impacts upon wellbeing. Social isolation likely to increase during construction from loss of community facilities, resulting in a reduction in the QoL of those directly affected by relocation or disruption during the construction period. New housing and community facilities will provide greater opportunities for leisure. **Employment and the Economy** New employment and business from an expanded airport will be of significant benefit to QoL locally and nationally from enhanced local and national economic growth. **Noise**	**Traffic Volume** Significant disruption to road users and severance of small local communities will be experienced during the construction phase of the scheme, causing distress and anxiety to residents. During the operational period of the scheme, improved infrastructure and access to public transport may provide improvements to QoL in the short term, however these are expected to be negated by long term increasing demand for infrastructure. **Housing and Communities** Loss of housing/ forced moves will cause distress and have significant adverse impacts upon wellbeing. Social isolation likely to increase during construction from loss of community facilities, resulting in a reduction in the QoL of those directly affected by relocation or disruption during the construction period. New housing and community facilities will provide greater opportunities for leisure. **Employment and the Economy** New employment and business from an expanded airport will be of significant benefit to QoL locally and nationally from enhanced local and national economic growth. **Noise** Local exposure to construction noise and	**Traffic Volume** Significant disruption to road users and severance of small local communities will be experienced during the construction phase of the scheme, causing distress and anxiety to residents. During the operational period of the scheme, improved infrastructure and access to public transport may provide improvements to QoL in the short term, however these are expected to be negated by long term increasing demand for infrastructure. **Housing and Communities** Loss of housing/ forced moves will cause distress and have significant adverse impacts upon wellbeing. Social isolation likely to increase during construction from loss of community facilities, resulting in a reduction in the QoL of those directly affected by relocation or disruption during the construction period. New housing and community facilities will provide greater opportunities for leisure. **Employment and the Economy** New employment and business from an expanded airport will be of significant benefit to QoL locally and nationally from enhanced local and national economic growth. **Noise**

AoS Topic	LGW-2R	LHR-ENR	LHR-NWR
	Local exposure to construction noise and vibration can cause annoyance, for the duration of works. Increases in significant community annoyance due to aircraft noise exposure. Increases in effects which would lead to negative health outcomes, including due to sleep disturbance. Loss of sleep can increase anxiety and hypertension.[63] Mixed impacts on QoL of school children: some schools could be at risk of increased exposure to excessive aircraft noise levels (potentially leading to impaired learning). Some schools may be subject to noise reductions, which could reduce negative effects on cognitive development. Increased noise levels in primary schools can delay reading development. **Air Quality** Poor air quality has a direct impact upon sensitive receptors, exacerbates symptoms surrounding cardiovascular and impaired lung functions and has strong dose-response relations with increased morbidity and mortality. **Access to nature and cultural heritage** Indirect potential negative impact upon wellbeing during construction as a consequence of a reduction in recreational amenity of the Crawley public rights of way and the Tandridge Border Path.	vibration can cause annoyance, for the duration of works. Increases in significant community annoyance due to aircraft noise exposure. Increases in effects which would lead to negative health outcomes. Reductions in night-time noise-related sleep disturbance. Reduced loss of sleep could lower anxiety and hypertension.[64] General increases in noise exposure of schools, which can delay reading development. **Air Quality** Poor air quality has a direct impact upon sensitive receptors, exacerbates symptoms surrounding cardiovascular and impaired lung functions and has strong dose-response relations with increased morbidity and mortality. **Access to nature and cultural heritage** Negative impact on the wellbeing of users of high value recreational areas including the Colne Valley Regional Park, and local residents who value the presence of such amenity areas. Indirect overall benefit to wellbeing through improving access to nature and the living environment, through mitigation and improvement measures, involving compensation of habitat and displacement of recreational areas. **Flooding** Direct potential negative impact upon wellbeing during construction and operation as a	Local exposure to construction noise and vibration can cause annoyance, for the duration of works. Increases in significant community annoyance due to aircraft noise exposure. Increases in effects which would lead to negative health outcomes. Reductions in night-time noise-related sleep disturbance. Reduced loss of sleep could lower anxiety and hypertension.[65] General increases in noise exposure of schools, which can delay reading development. **Air Quality** Poor air quality has a direct impact upon sensitive receptors, exacerbates symptoms surrounding cardiovascular and impaired lung functions and has strong dose-response relations with increased morbidity and mortality. **Access to nature and cultural heritage** Negative impact on the wellbeing of users of high value recreational areas including the Colne Valley Regional Park, and local residents who value the presence of these amenity areas. Indirect overall benefit to wellbeing through improving Access to Nature and the living environment, involving extensive mitigation and improvement measures.

[63] Clark,C, 2015. *Aircraft noise effects on health*. Prepared for the Airports Commission. [online] Accessed 30/03/2016.
[64] Clark,C, 2015. *Aircraft noise effects on health*. Prepared for the Airports Commission. [online] Accessed 30/03/2016.
[65] Clark,C, 2015. *Aircraft noise effects on health*. Prepared for the Airports Commission. [online] Accessed 30/03/2016.

AoS Topic	LGW-2R	LHR-ENR	LHR-NWR
	Indirect temporary loss of high amenity during the construction phase could result in potentially negative impacts on wellbeing during construction. Indirect negative impact on wellbeing due to permanent loss of Ancient Woodland during construction and operational phases. Indirect potential negative impact upon wellbeing as a consequence a reduction in recreational amenity for users of the Ifieldwood and the Tandridge Border Path during operation. Onsite mitigation and offsite enhancement measures of high amenity areas could potentially indirectly off-set any negative impacts on wellbeing during operational phase of the airport. **Flooding** Direct potential negative impact upon wellbeing during construction and operation as a consequence of potential and perceived increase in flood risk. It is acknowledged that detailed design at the next stage will identify opportunities to mitigate flood risk.	consequence of potential and perceived increase in flood risk. It is acknowledged that detailed design at the next stage will identify opportunities to mitigate flood risk.	**Flooding** Direct potential negative impact upon wellbeing during construction and operation as a consequence of potential and perceived increase in flood risk. It is acknowledged that detailed design at the next stage will identify opportunities to mitigate flood risk.
Direct/ Indirect/ Cumulative	**Traffic Volume (Construction):** Direct / Indirect / Cumulative **Traffic Volume (Operation):** Direct / Indirect **Housing and Communities (Construction):** Indirect / Cumulative **Housing and Communities (Operation):**	**Traffic Volume (Construction):** Direct / Indirect / Cumulative **Traffic Volume (Operation):** Direct / Indirect **Housing and Communities (Construction):** Indirect / Cumulative **Housing and Communities (Operation):**	**Traffic Volume (Construction):** Direct / Indirect / Cumulative **Traffic Volume (Operation):** Direct / Indirect **Housing and Communities (Construction):** Indirect / Cumulative **Housing and Communities (Operation):**

AoS Topic	LGW-2R	LHR-ENR	LHR-NWR
	Indirect / Cumulative **Employment and the Economy:** Indirect / Cumulative **Noise:** Direct / Cumulative **Air Quality**: Direct / Indirect / Cumulative **Access to nature and cultural heritage (Construction):** Direct / Indirect / Cumulative **Access to nature and cultural heritage (Operation):** Direct / Indirect / Cumulative **Flooding** Direct / Indirect / Cumulative	Indirect / Cumulative **Employment and the Economy:** Indirect / Cumulative **Noise:** Direct / Cumulative **Air Quality**: Direct / Indirect / Cumulative **Access to nature and cultural heritage (Construction):** Direct / Indirect / Cumulative **Access to nature and cultural heritage (Operation):** Direct / Indirect / Cumulative **Flooding** Direct / Indirect / Cumulative	Indirect / Cumulative **Employment and the Economy:** Indirect / Cumulative **Noise:** Direct / Cumulative **Air Quality:** Direct / Indirect / Cumulative **Access to nature and cultural heritage (Construction):** Direct / Indirect / Cumulative **Access to nature and cultural heritage (Operation):** Direct / Indirect / Cumulative **Flooding** Direct / Indirect / Cumulative
Probability (High, Medium, Low, Very Low)	**Traffic Volume:** High **Housing and Communities:** High **Employment and the Economy:** High **Noise**: High **Air Quality:** High **Access to Nature/ and living environment**: High **Flooding**: Very Low	**Traffic Volume**: High **Housing and Communities**: High **Employment and the Economy:** High **Noise**: High **Air Quality**: High **Access to Nature/ and living environment**: High **Flooding**: Very Low	**Traffic Volume**: High **Housing and Communities**: High **Employment and the Economy**: High **Noise**: High **Air Quality**: High **Access to Nature/ and living environment**: High **Flooding**: Very Low
Phase, Duration (Long-term, Medium-term, Short-term), Frequency	**Traffic Volume**: Construction, Medium-term, Continuous Operation, Long-term, Continuous **Housing and Communities**:	**Traffic Volume**: Construction, Medium-term, Continuous Operation, Long-term, Continuous **Housing and Communities**:	**Traffic Volume:** Construction, Medium-term, Continuous Operation, Long-term, Continuous **Housing and Communities**:

AoS Topic	LGW-2R	LHR-ENR	LHR-NWR
	Construction, Long-term, Continuous Operation, Long-term, Continuous **Employment and the Economy**: Operation, Long-term, Continuous **Noise**: Construction, Long-term, Continuous Operation, Long-term, Continuous **Air Quality**: Construction, Long-term, Intermittent Operation, Long-term, Continuous **Access to nature and cultural heritage :** Construction, Long-term, Continuous Operation, Long-term, Continuous **Flooding:** Construction, Long-term, Intermittent Operation, Long-term, Intermittent	Construction, Long-term, Continuous Operation, Long-term, Continuous **Employment and the Economy:** Operation, Long-term, Continuous **Noise**: Construction, Long-term, Continuous Operation, Long-term, Continuous **Air Quality**: Construction, Long-term, Intermittent Operation, Long-term, Continuous **Access to nature and cultural heritage:** Construction, Long-term, Continuous Operation, Long-term, Continuous **Flooding:** Construction, Long-term, Intermittent Operation, Long-term, Intermittent	Construction, Long-term, Continuous Operation, Long-term, Continuous **Employment and the Economy:** Operation, Long-term, Continuous **Noise**: Construction, Long-term, Continuous Operation, Long-term, Continuous **Air Quality**: Construction, Long-term, Intermittent Operation, Long-term, Continuous **Access to nature and cultural heritage:** Construction, Long-term, Continuous Operation, Long-term, Continuous **Flooding:** Construction, Long-term, Intermittent Operation, Long-term, Intermittent
Permanent/ Temporary **Irreversible/ Reversible**	**Traffic Volume:** Construction, Temporary, Reversible Operation, Permanent, Irreversible. **Housing and Communities:** Construction Temporary, Reversible Operation, Permanent, Irreversible **Employment and the Economy:** Permanent, Irreversible. **Noise:**	**Traffic Volume:** Construction, Temporary, Reversible Operation, Permanent, Irreversible. **Housing and Communities:** Construction Temporary, Reversible Operation, Permanent, Irreversible **Employment and the Economy:** Permanent, Irreversible. **Noise**:	**Traffic Volume:** Construction, Temporary, Reversible Operation, Permanent, Irreversible. **Housing and Communities:** Construction Temporary, Reversible Operation, Permanent, Irreversible **Employment and the Economy:** Permanent, Irreversible. **Noise**:

AoS Topic	LGW-2R	LHR-ENR	LHR-NWR
	Construction, Temporary, Reversible Operation: Permanent, Irreversible **Air Quality**: Permanent **Access to nature and cultural heritage:** Permanent, Irreversible **Flooding:** Permanent, Irreversible	Construction, Temporary, Reversible Operation: Permanent, Irreversible **Air Quality:** Permanent **Access to nature and cultural heritage:** Permanent, Irreversible **Flooding:** Permanent, Irreversible	Construction, Temporary, Reversible Operation: Permanent, Irreversible **Air Quality**: Permanent **Access to nature and cultural heritage:** Permanent, Irreversible **Flooding:** Permanent, Irreversible
Magnitude and Spatial Extent, incl. Transboundary	**Traffic Volume:** Construction, High, Local Operation, Medium, Local **Housing and Communities:** Construction, High, Local Operation, Medium, Local **Employment and the Economy:** Construction, High, Local Operation, Medium, National **Noise**: Construction, High, Local Operation, High, Local, Regional **Air Quality**: Operation, High, Local, Regional, National, **Access to nature and cultural heritage:** Construction and Operation, Low, Regional **Flooding:**	**Traffic Volume:** Construction, High, Local Operation, Medium, Local **Housing and Communities:** Construction, High, Local Operation, Medium, Local **Employment and the Economy:** Construction, High, Local Operation, High, National **Noise**: Construction, High, Local Operation, High, Local, Regional **Air Quality**: Operation, Medium, Local, Regional, National, **Access to nature and cultural heritage:** Construction and Operation, Low, Regional **Flooding:**	**Traffic Volume:** Construction, High, Local Operation, Medium, Local **Housing and Communities:** Construction, High, Local Operation, Medium, Local **Employment and the Economy:** Construction, High, Local Operation, High, National **Noise:** Construction, High, Local Operation, High, Local, Regional **Air Quality:** Operation, Significant, Local, National, **Access to nature and cultural heritage:** Construction and Operation, Low, Regional **Flooding:**

AoS Topic	LGW-2R	LHR-ENR	LHR-NWR
	Construction, Medium, Local Operation, High, Local	Construction, Medium, Local Operation, High, Local	Construction, Medium, Local Operation, High, Local
Assumptions and Limitation	**Traffic Volume** Surface access arrangements to provide additional capacity and encourage modal shift to rail. **Housing and Communities** All involuntary forced moves will be via Compulsory Purchase Orders. **Employment and the Economy** Passenger forecasts up to 2050 **Noise** Future mix of fleet aircraft types. **Air Quality** Passenger growth, transport modes and modal shift. **Access to nature and cultural heritage** Detailed designs unavailable **Flooding** Specific site specific drainage plans not fully developed	**Traffic Volume** Infrastructure improvements to provide additional capacity and encourage modal shift to rail. **Housing and Communities** All involuntary forced moves will be via Compulsory Purchase Orders. **Employment and the Economy** Passenger forecasts up to 2050 **Noise** Future mix of fleet aircraft types. **Air Quality** Passenger growth, transport modes and modal shift. **Access to nature and cultural heritage** Detailed designs unavailable **Flooding** Specific site specific drainage plans not fully developed	**Traffic Volume** Infrastructure improvements to provide additional capacity and encourage modal shift to rail **Housing and Communities** All involuntary forced moves will be via Compulsory Purchase Orders. **Employment and the Economy** Passenger forecasts up to 2050 **Noise** Future mix of fleet aircraft types. **Air Quality** Passenger growth, transport modes and modal shift. **Access to nature and cultural heritage** Detailed designs unavailable **Flooding** Specific site specific drainage plans not fully developed
Significance of Impacts	**Construction Phase**		
Traffic Volume:	Significant negative effect (--)	Significant negative effect (--)	Significant negative effect (--)
Housing and Community:	Significant negative effect (--)	Significant negative effect (--)	Significant negative effect (--)
Employment and Economy:	Positive effect (+)	Positive effect (+)	Positive effect (+)
Noise:	Significant negative effect (--)	Significant negative effect (--)	Significant negative effect (--)

AoS Topic	LGW-2R	LHR-ENR	LHR-NWR
Air Quality:	Effect unknown at this stage	Effect unknown at this stage	Effect unknown at this stage
Access to nature and culture heritage:	Negative effect (-)	Negative effect (-)	Negative effect (-)
Flooding	Negative effect (-)	Negative effect (-)	Negative effect (-)
Significance of Impacts	**Operational Phase**		
Traffic Volume:	Mixed positive/negative effect (+/-)	Mixed positive/negative effect (+/-)	Mixed positive/negative effect (+/-)
Housing and Community:	Mixed positive/negative effect (+/-)	Mixed positive/negative effect (+/-)	Mixed positive/negative effect (+/-)
Employment and Economy:	Significant positive effect (++)	Significant positive effect (++)	Significant positive effect (++)
Noise:	Significant negative effect (--)	Significant negative effect (--)	Significant negative effect (--)
Air Quality:	Negative effect (-)	Significant negative effect (--)	Significant negative effect (--)
Access to nature and culture heritage:	Negative effect (-)	Negative effect (-)	Mixed Positive / Negative effect (+/-)
Flooding	Negative effect (-)	Negative effect (-)	Negative effect (-)

2.10 MITIGATION MEASURES

2.10.1 There are a number of measures proposed for mitigation to reduce the magnitude of effects from the AoS topics comprising the QoL indicators. These are listed in the respective appendices for the assessment on Community (A.1), Noise (A.4) Biodiversity (A.5), Air Quality (A.8) Landscape (A.11) and Historic Environment (A.12). At this stage, no additional measures have been proposed specifically for QoL.

2.10.2 Although many of the measures proposed are likely to be effective in reducing the magnitude of negative effects, the exact package of mitigation would need to be determined for the preferred scheme at the time of detailed design. The overall effectiveness of reducing negative effects or enhancing positive effects on QoL is likely to be complex and again should be addressed as part of an assessment for detailed design. For this assessment the residual effects on QoL remain as assessed in the tables above.

2.11 ASSUMPTIONS AND LIMITATIONS

2.11.1 As no comprehensive analysis of the impacts of the differing schemes upon health was applied within the QoL assessment, this AoS QoL assessment has been supplemented by a standalone HIA.

2.11.2 As scheme details were at a policy level this assessment was limited by the level of detail available about the promoters' schemes, including surface access. The assessment was based on a desk-based review.

2.11.3 No targeted stakeholder consultation has taken place for this policy-level analysis.

2.11.4 Detailed spatial data and health data specific to each scheme would better inform effects on QoL, as would a health impact assessment conducted during the detailed design of the preferred policy alternative.

2.11.5 There is uncertainty regarding the surface access arrangements for an expansion to Gatwick airport. It has been assumed that infrastructure changes will provide additional road capacity and encourage modal shift from road to rail.

2.11.6 There is also uncertainty regarding the surface access arrangements for an expansion to Heathrow airport. It has been assumed that infrastructure changes will provide additional road capacity and encourage modal shift from road to rail.

2.11.7 It has been assumed that all involuntary moves will be via Compulsory Purchase Orders (CPOs) or asset replacement. Adversarial CPOs are more likely to result in distress, increase in anxiety and have a negative effect on wellbeing.

2.11.8 The effects on the economy have been assessed during airport operation for the years 2030 and 2050. Based on passenger forecasts[66] the positive effects are assumed to remain constant each year after 2050.[67] [68]

2.11.9 Current Defra guidance uses 45dB as the lower cut-off[69] threshold for assessing annoyance and sleep disturbance, and this threshold has therefore been adopted for the purposes of this AoS.

[66] Airports Commission, 2015. *Economy – Wider Impact Assessment*, p. 22. [online] Accessed 30/03/2016.
[67] Airports Commission, 2015. *Economy – Wider Impact Assessment,* p.10. [online] Accessed 30/03/2016.
[68] Airports Commission, 2015. *Economy – Wider Impact Assessment,* p. 22. [online] Accessed 30/03/2016.
[69] Department for Environment, Food and Rural Affairs, 2014. *Environmental Noise: Valuing impacts on: sleep disturbance, annoyance, hypertension, productivity and quiet*. [online]. Accessed 04/07/2016.

2.11.10 The assumptions regarding the assessment of noise impacts are described within the noise assessment within this AoS. However, these include the future demand for aviation, mixes of fleet aircraft types, flight paths, future operational procedures and changes in population densities. The nature of these assumptions will have a considerable influence on the prediction of noise exposure. In this assessment the 'central scenario' has been assumed; sensitivity testing is described in Appendix A-4 Noise.

2.11.11 Air quality forecasts are based on several assumptions about passenger growth, transport mode increase in low-emission vehicles, modal shift to public transport and increasing electrification of rail. The limitation of these assumptions is that these measures may not take place and therefore emissions of pollutants from activity associated with the expanded airport will be much higher than forecast.

2.11.12 There is uncertainty regarding the details of flight paths arising from the lack of a detailed design for each scheme at this point in the process and from application of the UK Future Airspace Strategy.

2.12 CONCLUSIONS

2.12.1 The majority of AoS QoL indicators for the Gatwick study area are positive (largely better than the England average) with exception to noise where sleep disturbance is currently experienced at a number of properties (Table 2-4), where the baseline is negative.

2.12.2 For the Heathrow study area, the majority of AoS QoL Indicators are either negative, or in the case of Air Quality and Noise, significantly negative (Table 2-4). Currently AoS QoL indicators which have a positive baseline are life expectancy, full-time employment, satisfaction with housing, the number of people with qualifications and opportunities to access the environment.

SUMMARY OF QoL IMPACTS: LGW-2RW

Negative impacts on QoL from expansion at LGW-2R

2.12.3 The LGW-2R scheme is predicted to have a negative impact on QoL through:

- Loss of residential homes;
- Additional traffic volume causing distress and anxiety to local residents during both the construction and operational phases;
- Loss of social networks during the construction phase;
- Increases in the population exposed to aircraft noise causing annoyance and sleep disturbance;
- Small increase in exposure to NO_2 during the operational phase;
- Loss of recreational amenity during the construction phase, although this could potentially be offset by displacement or mitigation;
- Permanent loss of Ancient Woodland;
- Direct loss, indirect effects, and cumulative impacts on sites of cultural heritage; and
- Increased risk of flooding through loss of floodplain and increase in non-permeable surface.

2.12.4 The LGW-2R scheme is predicted to have a negative impact on several of the indicators of QoL, most significantly due to a direct negative impact from an increase in the population being exposed to noise, and worsening air quality.

2.12.5 The scheme is expected to cause degradation in the largely positive baseline for the AoS QoL Indicators.

Positive impacts on QoL from expansion at LGW-2R

2.12.6 The LGW-2R scheme is predicted to have a positive impact on QoL through:

- Short term improvements to traffic volume improving local residents' access to broader range of services and opportunities in the short term, though this will be negated in the long-term due to increases in traffic over time;
- New housing providing a benefit to QoL;
- Improved social networks through new community facilities;
- Additional employment opportunities both locally and nationally, as a result of construction jobs during the construction phase; and
- Additional employment opportunities, both locally and nationally, from airport operational jobs and in the supporting industries.

2.12.7 The LGW-2R scheme has been predicted to result in a significant positive impact on QoL for residents within the study area. The primary reason for these benefits is the indirect positive impact upon QoL from additional employment opportunities, as well as expected short term improvements to the transport system which will improve access to employment and services and facilities.

2.12.8 This scheme is predicted to improve a number of the QoL indicators, many of which already have a positive baseline.

SUMMARY OF QoL IMPACTS: LHR-ENR

Negative impacts on QoL from expansion at LHR-ENR

2.12.9 The LHR-ENR scheme is predicted to have a negative impact on QoL through:

- Additional traffic volume causing additional distress and anxiety to local residents during the construction phase;
- Loss of housing and displacement and for the remaining residents who shall experience the disruption of an extended construction period during the construction phase;
- Loss of amenity and social network due to loss and displacement of the Punch Bowl Pub during the operational phase;
- Loss of industrial / employment land, leading to negative impacts on employment;
- Additional pressures on existing facilities by the occupants of relocated households;
- Increases in the population exposed to aircraft noise causing annoyance;
- Impaired learning of school children who are at risk of exposure to excessive aircraft noise levels during the operational phase;
- Several thousand local residents as well as other sensitive receptors being exposed to worsening air quality;
- Loss of habitat and recreational areas reducing access to the environment;
- Direct loss , indirect effects and cumulative impacts on sites of cultural heritage; and
- Increased risk of flooding through loss of floodplain and increase in non-permeable surface.

2.12.10 This would result in a degradation of the largely negative existing baseline for the Heathrow study area's AoS QoL indicators. Worsening impacts from poor air quality and increased noise

effects have been predicted. This is compounded by the baseline situation where the corresponding AoS QoL indicators relating to air quality and noise are already significantly negative.

2.12.11 The LHR-ENR scheme is predicted to have a significant negative impact on QoL, in particular due to a direct negative impact upon QoL due to increased exposure of receptors to night-time noise and to worsening air quality.

Positive impacts on QoL from expansion at LHR-ENR

2.12.12 The LHR-ENR scheme is predicted to have a positive impact on QoL through:

- Short term beneficial improvements to traffic volume improving local residents' access to broader range of services and opportunities in the short term, though this will be negated in the long-term due to increases in traffic over time;
- Additional employment opportunities, locally and nationally, resulting from jobs during the construction phase;
- Additional employment opportunities, both locally and nationally, resulting from jobs during the operation of the airport and in the supporting industries;
- Potential reductions in the population suffering from sleep disturbance;
- Enhancements to habitat and recreational areas during the operational phase, improving amenity through improved access to the environment; and
- Compensation of floodplain results in an overall increase in floodplain area and reduction in flood risk.

2.12.13 The LHR-ENR scheme is expected to result in indirect positive impact upon QoL from additional employment opportunities, as well as expected short term improvements to the transport system which will improve access to employment and services and facilities.

2.12.14 This scheme has been predicted to improve upon a number of AoS QoL indicators, many which have been established to be below national or local levels. In particular, the negative unemployment indicator is predicted to improve as an indirect outcome of the LHR-ENR scheme.

SUMMARY OF QoL IMPACTS: LHR-NWR

Negative impacts on QoL from expansion at LHR-NWR

2.12.15 The LHR-NWR scheme is predicted to have a negative impact on QoL through:

- Disruption to the road network during construction will result in extended journey times, degraded journey ambience and increased congestion during the construction phase;
- Loss of housing, and displacement and for the remaining residents experiencing the disruption of an extended construction period;
- Loss of amenity and social network due to loss and displacement of Harmondsworth Primary School and community facilities during the construction phase;
- Loss of recreation and amenity from the removal of the War Memorial Recreation Ground during the construction phase;
- Additional pressures on existing facilities by the occupants of relocated households;
- Increases in the population exposed to aircraft noise causing annoyance;
- Impaired learning of schoolchildren at risk of exposure to excessive aircraft noise levels;
- Several thousand local residents as well as other sensitive receptors being exposed to worsening air quality;

- Loss of access to the environment and recreational areas for local residents during the construction phase;
- Direct loss, and indirect effects and cumulative impacts on sites of cultural heritage; and
- Increased risk of flooding through loss of floodplain and increase in non-permeable surface.

2.12.16 Overall the scheme would also result in a degradation of the largely negative existing baseline which has been established in the Study Area's AoS QoL indicators. This degradation would arise as a consequence of a decline in air quality and an increase in some noise effects. This is particularly an issue for the AoS QoL indicators which are currently significantly negative.

Positive impacts on QoL from expansion at LHR-NWR

2.12.17 The expansion to include a second runway at LHR-NWR has been predicted to have a positive impact on QoL through:

- Short term improvements to traffic volume improving local residents' access to broader range of services and opportunities in the short term, though this will be negated in the long-term due to increases in traffic over time;
- Additional employment opportunities, both locally and nationally, from airport expansion construction jobs from airport operational jobs and supporting industries;
- Potential reductions in population suffering from sleep disturbance;
- Compensation and improvement measures to loss of habitat and recreational areas during the operational phase, improving amenity through improved access to nature and the living environment; and
- Significantly positive impact on QoL for those experiencing lower sleep disturbance due to reduced exposure to night time noise.

2.12.18 The expansion scheme at LHR-NWR has been predicted to result in a significant positive impact on QoL for residents within the Heathrow study area. The primary reason for these benefits is the indirect positive impact upon QoL from additional employment opportunities, as well as expected short term improvements to the transport system which will improve access to employment and services and facilities.

2.12.19 This scheme has been predicted to improve upon a number of AoS QoL indicators, many of these indicators have been established to be below national or local levels. In particular, the negative unemployment indicator is predicted to improve as an indirect outcome of the LHR-NWR scheme.

Objective 3: To Maintain and Where Possible Improve the QoL for Local Residents and the Wider Population

2.12.20 This QoL chapter provides a response to the AoS Objective 3 regarding the schemes of airport expansion.

2.12.21 There are a wide range of mitigation options available for all three schemes, and these are explored in the relevant topic chapters.

2.12.22 Airport expansion will result in additional air traffic which negatively impacts upon both QoL and wellbeing, in particular through noise and air pollution for residents within both study areas. These negative impacts upon QoL are predicted to be greater for the two Heathrow expansion schemes, LHR-ENR and LHR-NWR, than for the LGW-2R scheme.

2.12.23 Economic growth generated through airport expansion is predicted to have an indirect positive impact on QoL. Locally this growth would provide an opportunity for job creation, supporting the local economy, the local education and the local skills mix.

2.12.24 Employment at both Gatwick and Heathrow is predominantly low skilled. Jobs are accessible to those without higher-level qualifications. Therefore, it is likely that the new jobs will match the current skills of the population.

2.12.25 Current trends on airport direct employment also suggest that there is capacity for some of these new jobs to be filled by unemployed people from the study areas. The number of jobs expected to be created, and the current rates of unemployment are generally higher around Heathrow than Gatwick, resulting in the greatest potential benefit for LHR-NWR.

2.12.26 In addition direct QoL benefits are expected for passengers. Passengers will benefit from lower fares once current capacity constraints have been removed whilst also benefitting from greater air service frequencies. Wider economic benefits across the impacts considered (trade, agglomeration, tax take and increased business output) are also expected. In all these cases the LHR-NWR is expected to return the greatest benefit.

2.12.27 The competitiveness of the UK economy will also be enhanced to the largest extent by the LHR-NWR scheme given the productivity benefits occurring as a consequence of enhanced trade and increased agglomeration as there will be more clustering of businesses near to the airport.

Table 2.8: Impacts of Expansion Schemes against Measures of National Wellbeing and AoS QoL Indicators during Construction

Personal Wellbeing	Measures of National Wellbeing[70]		AoS QoL Indicators	Gatwick Study Area LGW-2R Impacts	Heathrow Study Area LHR-ENR Impacts	Heathrow Study Area LHR-NWR Impacts
Life satisfaction	Personal Wellbeing	Health	Housing and Community Facilities	--	--	--
	Our relationships			--	--	--
Happiness						
	What we do		Housing and Community Facilities	--	--	--
	Where we live		Noise	--	--	--
			Air Quality	-	-	-
			Traffic Volumes	--	--	--
			Housing and Community facilities	--	--	--
			Flooding	-	-	-
Anxiety	Personal finance		Employment and the Economy	++	++	++
	The economy		Employment and the Economy	++	++	++
Worthwhile	Education and skills		Employment and the Economy	++	++	++
	Governance		Housing and Communities	--	--	--
	The Environment		Access to nature and cultural heritage.	-	-	-

[70] Office for National Statistics, 2016. *Measures of National Well-being*. [online] Accessed 12/08/2016.

Table 2.9: Impacts of Expansion Schemes against Measures of National Wellbeing and AoS QoL Indicators during Operation

Personal Wellbeing	Measures of National Wellbeing[71]		AoS QoL Indicators	Gatwick Study Area LGW-2R Impacts	Heathrow Study Area LHR-ENR Impacts	Heathrow Study Area LHR-NWR Impacts
Life satisfaction	Personal Wellbeing	Health	Housing and Community Facilities	+	-	+/-
	Our relationships			+	-	+/-
Happiness						
	What we do		Housing and Community Facilities	+/-	+/-	+/-
	Where we live		Noise	--	--	--
			Air Quality	-	--	--
			Traffic Volumes	+/-	+/-	+/-
			Housing and Community facilities	+	-	+/-
			Flooding	-	-	-
Anxiety	Personal finance		Employment and the Economy	++	++	++
	The economy		Employment and the Economy	++	++	++
Worthwhile	Education and skills		Employment and the Economy	++	++	++
	Governance		Housing and Communities	+	-	+/-
	The Environment		Access to nature and cultural heritage.	-	-	+/-

[71] Office for National Statistics, 2016. *Measures of National Well-being*. [online] Accessed 12/08/2016.