IMPACT

THE INTERNATIONAL HEALTH IMPACT ASSESSMENT CONSORTIUM

FINAL

A Rapid Health Impact Assessment of Birmingham International Airport’s Proposed Runway Extension

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Executive Summary

Introduction
1. IMPACT – the International Impact Assessment Consortium – based in the division of Public Health, a WHO Collaborating Centre at the University of Liverpool, was commissioned by Birmingham International Airport Limited (BIAL) to undertake a Health Impact Assessment (HIA) of the development and operation of proposals to extend the main runway. The HIA is described as a Rapid HIA involving secondary (existing) and some primary (new) data collection and analysis. This HIA has had a regional scope, but also undertook a local analysis of the potential impacts. In addition to assessing the geographical distribution of these potential effects, other variations, e.g., by population sub-groups, have also been considered.

2. HIA is concerned with improving health and reducing health inequalities. The aim of HIA is to inform and influence policy decision-making by enabling decision-makers to consider the health implications of their policies during the policy planning process. It is a systematic process, which aims to identify what the potential health effects of a new policy, strategy, or project, such as the proposed runway extension might be on a particular group of people, such as local residents. HIA can be done at international, national, regional, City or even ward level. It considers which key health determinants, e.g., employment, noise, air quality, will be affected and how this in turn will impact on the health and well being of the population. In addition HIA considers whether the policy will affect our physical, emotional and social well being, as well as possibly affecting ill health. Recommendations are then made to the policy-makers to mitigate against health risks and enhance health benefits.

3. This executive summary outlines the methods and process, the data collected and evidence of impacts (the findings), the conclusion and recommendations.

Summary of the Runway Extension Proposal
4. Birmingham International Airport Limited (BIAL) has submitted a planning application to extend the Main Runway (Figure 1). The plans for this runway extension were published in BIAL’s Master Plan published in November 2007, having previously been published in BIAL’s Draft Master Plan, which was formally consulted on between October 2005 and March 2006.

5. BIAL acknowledges that Birmingham International Airport’s development must be carried out in “an environmentally sustainable way, mitigating impacts on the environment and people, as well as considering climate change”.

6. The proposed runway extension is required to remove current operating restrictions enabling the operation of a larger range of direct long-haul services. Market analysis indicates demand for such provision, for example, to and from India, China and the Western USA. The development is proposed to take place at the south east end of the Main Runway, and will entail placing the A45 in a new tunnel under the extended runway and on a new, locally diverted alignment. Associated with the
extension will be a range of additional requirements, including the need for a Starter Extension, longer Runway End Safety Areas, a new Air Traffic Control Tower, revised Public Safety Zones and treatment of ‘Obstacle Limitation Surfaces’.

7. It is anticipated that given the planning, design and construction processes involved, the runway extension could be operational for 2012.

Figure 1-1 Map of the proposed runway extension for Birmingham International Airport (2030)
HIA methodology

8. The assessment was conducted using a validated generic HIA methodology (Figure 2) between June and November 2007. IMPACT’s work took approximately 85 days.

Figure 2 A generic HIA methodology

9. The scope of the assessment was determined by the BIA HIA Steering Group. The Steering Group was an independent body responsible for the commissioning, project management and overall design of the HIA; the membership included the Chair and a member of the Airport Consultative Committee, and a representatives from each of the following: Solihull Care Trust, Solihull Metropolitan Borough Council, Birmingham East & North Primary Care Trust, Birmingham City Council, West Midlands Strategic Health Authority and BIAL’s Community and Environment Unit. This HIA is described as a rapid HIA; ‘rapid’ refers to the depth of the assessment and the type of data that is collected and analysed. Rapid HIAs mainly use routinely collected data although some new data may also be collected, and from these data evidence is identified and impacts defined. However, unusually for a rapid HIA, this assessment also undertook quantitative modelling of the noise impacts.

10. The policy analysis (section 4) involved the collection and analysis of a range of policy documents to determine the context of the runway extension proposals. Relevant secondary data were identified and retrieved from various sources to develop a profile of the population in Solihull and Birmingham, particularly those residing in the wards close to the airport (section 5). Evidence from the literature was
also gathered and distilled (section 6). Stakeholder data were collected via focus
groups with local residents and representatives from local community groups,
interviews and focus groups with representatives of local organisations and
interviews with key informants (‘expert witnesses’) (section 6). Evidence from all
data sources was aggregated and the key health impacts of the runway extension
proposals on the local population, including the differential impacts, were
characterised in the impact analysis (section 7).

11. There were a number of limitations to this study. In particular there was a reliance
on the timely access to data from other impact assessments. In addition it was not
possible to validate the assumptions or quality of the data from other assessments.
Within the resources available it was not possible to undertake a more
comprehensive assessment, including wider ranging participatory approaches; as
such, stakeholders self-selected whether they engaged with the project or not. This
limited engagement is reported as a potential bias. Similarly modelling and
quantification of a wider range of impacts other than noise was not possible, and a
sensitivity analysis of the noise-related modelling was not undertaken.

Findings
12. The West Midlands is seriously lagging behind the national levels of employment
and economic output; south east Birmingham and north Solihull, areas proximal to
the airport are particularly affected. Although there have been significant
improvements in educational achievement across the West Midlands in recent years,
there are considerable variations across the region, with lower levels of skills
amongst the unemployed, ethnic minority groups and populations living in deprived
areas; this reflects national trends.

13. Associated with high levels of income deprivation are poor levels of physical and
mental health, e.g., circulatory and respiratory conditions, mood and anxiety
disorders and life expectancy. Health inequalities are clearly apparent.

14. The runway extension proposals clearly fit with key economic and aviation
policies, although there are tensions between sustainable transport for sustainable
growth (as described in the Eddington and Stern Reviews) and the health inequalities
(as described in the Independent Inquiry into Health Inequalities) agenda.

15. Although there may be net employment gains for the Region resulting from the
development of the proposed runway, there are a number of issues. This relates to
the sensitivity of the employment/income forecasts, the lack of forecast data for the
wider employment/income benefits, the lack of forecast data for full environmental,
social and health costs, and whether economic activity and income per capita will
increase in those areas or groups currently experiencing below the regional average
employment or income levels.

16. If there is an increase in employment associated with an increase in per capita
income in the region, it is probable that there will be positive impacts on population
health, physical and mental. If there is an increase in employment in those areas or
population groups currently experiencing below the regional average employment or
income levels, it is probable that there will be a reduction in health inequalities. Similarly, if there are improvements in the local economy, there are also likely to be long term health gains, although there may be a significant lag in when these health improvements occur.

17. The construction phase of the development will involve creating employment opportunities in occupations with particular work hazards but with no greater level of risk than would be expected for similar construction projects. Those jobs that are created as a result of the proposed runway extension will include some high paid, high quality jobs as well as a proportion of low paid, low skill jobs. ‘Job quality’ is associated with productivity and performance; it is unclear at a national level if job quality is improving. Poor ‘job quality’ is associated with poor health; low paid, poor quality and precarious jobs have similar health scores to the unemployed.

18. The proposed runway extension will have both positive and negative impacts on social capital (social support/control). At the construction phase, it is assumed that road congestion will be exacerbated as a consequence of the development and that the effects on social networks for some local people will be predominantly negative. However, when operational there will probably be positive impacts for those people able to use air travel as a result of the enhanced ‘connectivity’ the runway affords, but negative impacts for those affected by additional traffic, noise and the loss of community facilities. Enhancing social networks and support protects against poor mental and physical health.

19. There is some evidence that a number of residents proximal to the airport do not feel they have been engaged in the development of the runway extension proposal. There is also evidence of an amplified perception of the risks associated with the runway extension; people with low control beliefs and who currently experience psychosocial stress will be particularly affected. In addition to heightened risk perceptions, low control and low involvement in decision-making is associated with negative physical and mental health impacts.

20. There is a very low probability of an aircraft accident with or without the runway extension. Although a very low probability, if an aircraft accident occurred it is possible that there would be some third party fatalities. New Public Safety Zones (PSZs) have been developed to the north and south of the runway for the proposed runway extension. Government policy is that there should be no increase in the number of people living, working or congregating in the PSZs based on the 1 in 100,000 ($10^{-5}$) individual risk contour of death or injury to people on the ground. There are more stringent requirements based on 1 in 10,000 ($10^{-4}$) individual risk contour preventing new or replacement developments; although there are no such applicable properties it is unclear the number of residential or commercial properties within the new PSZs. Once completed, the tunnelling of the A45 represents a potential positive improvement to third party risk. The risk level of other accident hazards at the airport, such as the fuel farm, remains low; however it would be appropriate to review this as well as emergency services preparedness. Although there is a low probability of an aircraft accident, for some residents the perception of the risk of an aircraft or other accident is greater than the actual risk, contributing to anxiety and their perceptions of other risks associated with the runway extension.
21. Road traffic volume and congestion on the surrounding highways and road networks is likely to be only marginally affected by the proposed runway extension when it is operational. There is a perception that the Airport contributes more extensively to existing traffic congestion than it actually does. Annoyance about the predicted increase in background traffic volumes may also be directed at BIA. It is unclear what the effects of the construction phase will be, or how this could be phased with the other transport infrastructure developments. Road traffic accidents (RTAs) may increase with the increase in road traffic volume, but the proposed runway extension’s contribution to this is likely to be very low; however, it is likely that children and people living in deprived areas will be most adversely affected by these RTAs.

22. Exposure to noise will definitely increase with and without the runway extension. This will increase the proportion of the population annoyed by aircraft noise and sleep disturbed. In addition, it will increase the proportion of children whose learning is detrimentally affected by noise. The increase in noise will particularly affect people who are already vulnerable, e.g., older people or people with an existing condition. However, in the long term it could potentially disadvantage those children whose educational attainment may be affected by noise.

23. Air quality will probably reduce slightly with and without the runway extension. This will have a corresponding negative impact on health although this is also assessed to be a marginal effect. However, airport ground workers will have a greater exposure to some pollutants and may be more adversely affected than the population as a whole.

24. The runway extension is likely to contribute to CO₂ and other ‘greenhouse’ gas emissions and as a consequence climate change and its negative effects on health.

25. While there are both positive and negative health impacts associated with the proposed runway extension, it is probable that the negative impacts,

- the increase in exposure to noise,
- the increase (negligible) in risk of accidents (road and third party),
- the increase (negligible) in exposure to air pollutants,
- the reduction in social networking (and support),
- the decrease in personal control,
- the increase in perceived risks.

will be disproportionately, and in some case cumulatively, experienced by children and people living or working close to the airport, people on low incomes or economically inactive, older people, people with poor mental health and people with an existing circulatory or respiratory condition. Many of these groups are likely to be particularly vulnerable to exposure to these health risk factors and conditions. In addition, many of these groups are likely to already be experiencing multiple deprivation, e.g., on low income, above average exposure to noise and air pollutants, and related to this poorer health than national and regional averages. Furthermore these groups are likely to have less resources or choice to change their
circumstances. Conversely, there was insufficient evidence to indicate how many of these disadvantaged groups would particularly benefit from the potential positive impacts of the runway extension, that is, high quality jobs.

**Conclusion**

26. There is general support for BIA’s proposed runway extension — not going ahead with the proposal would potentially disadvantage the West Midlands’ economic growth and development. Furthermore, the notable impacts will occur with or without the runway extension; the difference between the scenarios is relatively small. However, a precautionary approach must be applied; action is needed at local and national level to address the issues raised, particularly the potential that already disadvantaged areas and groups will be further detrimentally affected, exacerbating health inequalities even further, in the short and long term.
# Recommendations

## IMPACTS (section 6 & 7)

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<tr>
<th>Noise</th>
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<th>Future action</th>
<th>Recommendations for additional action*</th>
<th>Responsible agencies</th>
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<tr>
<td>• High levels (above 55 dB (A)) of noise impact negatively on morbidity &amp; mortality;</td>
<td>SMBC, Section 106 agreement; BIAL, Noise policy; BIAL, Night flying policy; BIAL, Noise preferential routes (NPRs); BIAL, Engine ground running controls; BIAL, Noise and track-keeping system; BIAL, Sound insulation scheme; BIAL, Community Trust Fund; BIAL, Aircraft</td>
<td>BIAL, Planning Statement, December 2007 - additional 800 properties eligible for noise insulation with runway extension. In particular: Make noise and track information publicly available through the ‘webtrak’ system. Work with airlines to encourage further improvements in noise reduction and track-keeping, with a 95% ‘on-track’ target. Conduct noise monitoring studies using the portable noise monitor.</td>
<td>Mitigation When deciding the boundaries of the sound insulation scheme decisions should be based on the minimisation of negative health impacts:</td>
<td>BIAL</td>
</tr>
<tr>
<td>• Population groups particularly affected include unborn babies, infants &amp; children, people with decreased personal abilities (older people, people with mental health problems), people undertaking complex cognitive tasks (e.g., school children), people who are blind or hearing impaired;</td>
<td></td>
<td></td>
<td></td>
<td>BIAL</td>
</tr>
<tr>
<td>• Noise levels will probably increase with &amp; without the proposed runway extension;</td>
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<td>BIAL</td>
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<td>• Increased noise levels will probably have negative impacts on: Annoyance Sleep disturbance Children’s learning;</td>
<td></td>
<td></td>
<td></td>
<td>SMBC, BCC</td>
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<tr>
<td>• Increased noise levels will</td>
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### Mitigation

- When deciding the boundaries of the sound insulation scheme decisions should be based on the minimisation of negative health impacts:
  - In order to take into account insulation scheme when calculating sleep disturbance convert Lnight inside to Lnight outside using methods recommended by the night noise position paper (European Commission Working Group on Health and Socio Economic Aspects 2004);
  - It is recognised that international standards and guidelines vary. Until such time that these are incorporated into national policy guidelines, identify examples of best practice consistent with UK policy and where appropriate adapt to the local context (see for example Schipol airport);
- Future developments including schools and health care facilities should not take place within the 50 dB (A) day time contour.

### Monitoring

- SMBC, BCC
| possibly have negative impacts on coronary (heart) health. | Complaints Policy; BIAL, Communicating adverse impacts on local Communities Policy. | Work with National Air Traffic Services to implement Continuous Descent Approaches. Revise the noise information booklet. Prepare revised biennial noise contours for 2008 based on actual traffic. Implement the next phases of the Sound Insulation Scheme. Implement the next phase of the Schools Environment Improvement Programme. Apply general principles of construction site noise control according to guidance given in BS. | Monitoring of noise should be carried out in such a way that allows for identification and monitoring of potential health impacts:  
- Provide noise measurements for; Lday, Levening, Lnight, Lden and LAeq 16h (Defra 2006);  
- Range monitored should include Lden 45-75dB(A) and LNight 40-70 dB(A);  
- The estimated number of dwellings, people, schools and hospitals in a certain area that are exposed to specific values of the noise indicator (European Parliament 2002);  
- Consider other measurements where appropriate including Lmax and SEL which could be used to calculate sleep motility and number of awakenings;  
**Children**  
In order to minimise the potential negative impacts on children, adopt the | BIAL/SMBC |
In the planning process noise exposure should be considered with other environmental aspects. It is recommended that new schools should not be planned close to existing airports, where noise exposure exceeds the WHO (2000) recommended levels for school playgrounds. It is advised that measures need to be taken to reduce noise in existing schools, where noise exposure is excessive.

- Children exposed to adverse environmental conditions, such as aircraft and road traffic noise should have quiet relaxing areas at or near home, e.g., schools, for psychological restoration.

**Communication and risk perception**
- Provide an accessible overview (written in plain English) of the relationship between noise and health;
- Include an assessment of potential health impacts with noise reporting so that public can understand and assess risk for themselves.
### Air quality

- Air pollution has a negative affect on respiratory and circulatory morbidity and mortality;
- Population groups particularly affected include unborn babies, infants & children, pregnant women, older people, people with existing respiratory and circulatory conditions;
- Air pollution will probably, but negligibly, increase with & without the proposed runway extension;
- Negligible increases in air pollution will probably have corresponding negligible negative impacts on health;
- Airport ground staff will experience greater exposure to air pollutants and may possibly experience negative health effects.

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<td>BCC, Air quality action plan; SMBC, Air quality policy; BIAL, Air quality strategy including access to historical air quality data via the internet, monitoring and sharing of wide range of emissions data</td>
<td>Raise awareness of air quality issues among partner organisations on the Airport site. Conduct a tyre smoke study, investigating air quality impacts with Manchester Metropolitan University. Conduct a biennial Nitrogen Dioxide Study.</td>
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### Mitigation

The HIA supports the ES recommendations that:

1. “Careful consideration to control dust raising activities is recommended through the Construction Environmental Management Plan proposed by BIAL for the construction phase”;

### Monitoring

- Include the measurement and monitoring of PM$_{2.5}$ as part of routine air quality monitoring.

### Communication and risk perception

- Provide an accessible overview (written in plain English) of the relationship between air quality and health;
- Include an assessment of potential health impacts with air quality reporting so that public can understand and assess risk for themselves.

### Transport

- Road transport has positive and negative impacts on health;
- Major determinant of air pollution,

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<td>WMRA, Local Transport Plan (LTP); BCC, LTP; BIAL, Runway Extension Travel Plan, December 2007</td>
<td>Mitigation: As part of the Construction Methods Mitigation (CMM) develop, monitor and publish a CMM statement on road traffic impacts and mitigation measures to deal with road traffic</td>
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### Mitigation

- BIAL/SMBC
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| Associated with road traffic accidents - injuries and fatalities, especially affecting people from poorer neighbourhoods and children; Enables access to people, places; Road traffic will increase with and without the proposed runway extension; Road traffic accident (RTAs) *rates* from the increased in road traffic are speculated to be equivalent to that of any busy highway; The number of RTAs are speculated to increase with the additional volume of traffic, but the contribution of the proposed runway extension is speculated to be negligible; Air transport also has positive and negative impacts on health:  
  - Aircraft accidents - very low risk, but high impact of passenger and third party casualties;  
  - Determinant of noise and air pollution | *In particular:* Establish the new monitoring procedures set out in the Airport Surface Access Strategy.  
Establish a Steering Group for the Airport Transport Forum.  
Produce revised Access, Bus and Rail Guides, where appropriate.  
Investigate the feasibility of extending real time rail and road information to further locations within the passenger terminals.  
Complete improvements for cyclists and pedestrians under and near to the Bickenhill Lane issues during the proposed runway extension’s construction phase at the earliest opportunity; Include low emission (noise and air) construction equipment and materials in the runway extension construction contracts and the Code of Construction Practice.  
**Safety**  
Monitor and enforce restrictions of developments in new $10^4$ and $10^5$ risk contours.  
**Communication and risk perception**  
Monitor and publish the CMM and traffic information during the construction phase; Contact transport authorities to request dissemination to both developers and the public of the various transport infrastructure developments close to BIA, e.g., M42, NEC and the likely timing of these. |

BCC/SMBC

SMBC/BCC

BIAL/ SMBC/BCC

BIAL/ SMBC/BCC
Air traffic movements (ATMs) will increase with and without the proposed runway extension;  
The additional risk of aircraft accidents with the proposed runway extension is probably negligible;  
The additional risk of third party casualties associated with aircraft accidents with the proposed runway extension is probably negligible.

<table>
<thead>
<tr>
<th>Social capital</th>
<th>Mitigation</th>
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</table>
| High levels of social support will protect against poor mental and physical health;  
Low control, low involvement in decision-making focused on 'dread' issues is associated with heightened perceptions of public health risk;  
some community stakeholders do not feel engaged with the proposed runway extension and this is possibly contributing to their perception of risks;  
It is probable that there will be a high level of social support at the airport;  
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some community stakeholders do not feel engaged with the proposed runway extension and this is possibly contributing to their perception of risks;  
It is probable that there will be a high level of social support at the airport. |

BCC, Statement of Community Involvement in Planning;  
SMBC, Statement of Community Involvement in Planning;  
BIAL, Community and Environment Action Plans, 2007-8;  
BIAL, Consultative  
Local Government & Public Involvement in Health Act, October 2007.  
BIAL specific action:  
Maintain an active programme of educational visits and opportunities.  
In partnership with teachers, develop additional resources  
Include a requirement to adopt the 'Considerate Contractors Scheme' standards in the proposed runway extension constructor contracts and the Code of Construction Practice.  
Review formal, e.g., BIA Consultative Committee (CC), and informal mechanisms to engage with local residents and communities;  
Establish a Health Forum linked to the BIA CC which receives regular reports on health impact data related to the airport's activities;  
Support local residents and communities in targeted areas (complementing/liaising with existing stakeholders).  
BIAL  
BIAL  
BIAL/SCT/ BENCPT  
BIAL/SMBC/BCC
be an increase in accessibility to people and places in the US and far east with the proposed runway extension, however people on high incomes will probably benefit from this most;
- It is probable that employment associated with the runway extension will facilitate positive mental health linked to new positive social networks for those moving from unemployment into employment; however people with low skills will probably benefit least from these employment opportunities.
- It is probable that the increase in noise and traffic with and without the runway extension development will reduce opportunities for social interactions and networking within affected communities, with a negative impact on health and well being;
- The runway extension itself will definitely affect opportunities for social Committee.

<table>
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<tr>
<th>Committee.</th>
<th>that support the delivery of the educational curriculum.</th>
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<tr>
<td>BIAL/BCC/BENPCT/SMBC/SCT</td>
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</table>

**Data and monitoring**
- Collect data in targeted areas on social capital (social support, integration, networks, control beliefs, involvement in decision-making) mental health and perceived health risks and monitor.

**Communication and risk perception**
- Review and implement BIAL's Community involvement and communications strategy;
- Promote the development of local Community involvement and communications strategies.

| BIAL |
| BCC/BENPCT/SMBC/SCT |

**Data and monitoring**
- Incorporate ‘the development of community enterprise’ as a criterion for the Community Trust Fund.
- Develop an improved programme of ‘community outreach’, with planned visits to community groups and local ward meetings, parish councils and community events.
- Ensure that key shareholder groups are kept informed of developments through the Community Alerting System.

| BIAL |
| BIAL/SMBC/BCC/BENPCT/SCT |

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| BIAL |
| BCC/BENPCT/SMBC/SCT |

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- Ensure that key shareholder groups are kept informed of developments through the Community Alerting System.
interactions for the residents of Bickenhill village with the removal of some facilities and amenities.

<table>
<thead>
<tr>
<th>Economy &amp; employment</th>
<th>AWM, West Midlands Economic Strategy; BCC, Development Birmingham: an economic strategy for the City; SMBC, Economic development strategy for Solihull 2003-2006; BIAL, BIA Masterplan: Towards 2030; BIA Job Centre, BIAL, Job Junction; BIAL, ‘Moving Forward’; BIAL, Engineering</th>
<th>BIAL specific action: Incorporate the new NVQ in Aviation into staff training programmes.</th>
<th>Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Higher levels of employment in a population are associated with lower mortality rates; however, employment which is low paid, poor quality and insecure is associated with poor health equivalent to unemployed health scores; • It is probable that the runway extension will lead to employment opportunities in Solihull, Birmingham and West Midlands; • It is possible that some of these employment opportunities may benefit people currently resident in West Midlands; • It is speculated that an unknown proportion of these jobs will also be filled by people from outside West Midlands; • It is possible that a proportion of those jobs created and obtained by</td>
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<td>BIAL</td>
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<td>BIAL/SMBC/ BCC to AWM</td>
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<td></td>
<td>BIAL/SMBC/ BCC to Airport employers, AWM</td>
</tr>
</tbody>
</table>
unemployed local people will be poor quality, low paid, fixed term and/or part-time, and may involve hazardous work; if their household income is below that of when they were unemployed it is probable that there will be negative long term health effects;

- It is speculated that some population groups, e.g., people with low skills, people with disabilities, ethnic minority groups, may be less able to take up or benefit from the ‘high tech’ employment opportunities the economic ‘connectivity’ the runway extension affords;
- It is probable that the economic growth attributed to the runway extension will result in improved health outcomes for the region;
- It is probable that the health gains will be experienced by those with increased per capita income;
- It is speculated that vulnerable groups in the labour market will benefit least from income growth in local entrepreneurs including Airport related service providers;

- Define targeted areas and groups e.g., the unemployed and those on Employment Support Allowance, less able to take up the employment opportunities from the airport’s development.

**Data and monitoring**

- Undertake sensitivity analysis on the direct/indirect/induced employment and income forecasts;
- Consider undertaking quantitative modelling with sensitivity analyses to develop forecasts for the wider employment/income benefits attributed to increased ‘connectivity’;
- Consider the full environmental, social and health costs associated with the proposed runway extension by undertaking more detailed modelling with sensitivity analyses;
- Monitor Local Labour Agreements through the Section 106 agreement;
- Audit and monitor the relative high/low quality jobs associated with airport operations;
- Develop strategies to promote ‘job quality’ across occupations in the airport context.

**Communication**

- As part of an overall Community communications strategy, promote awareness of the work the airport is
the region.

<table>
<thead>
<tr>
<th>Climate change</th>
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<tbody>
<tr>
<td>- It is possible that the proposal will contribute to climate change;</td>
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<tr>
<td>- It is also possible that this will contribute to a number of current and predicted negative health impacts on vulnerable populations.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mitigation</th>
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<tbody>
<tr>
<td>- Support the development of BIAL’s Climate Change Strategy</td>
</tr>
</tbody>
</table>

| BIAL, Action Energy programme; |
| BCC, Sustainability Strategy & Action Plan; |
| ‘See Transport’ |
| SMBC, Draft Sustainable Community Strategy, January 2008; |
| BIAL commitment to Sustainable Aviation Strategy (with airlines, airports and aircraft manufacturers) [www.sustainableaviation.co.uk](http://www.sustainableaviation.co.uk) and ‘aviation industry’ action to counter climate change and improve local environmental impacts. |

BIAL/Airport employers

BIAL
### Health inequalities

- It is probable that the negative impacts:
  - the increase in noise levels,
  - the increase (negligible) in risk of accidents (road and third party),
  - the increase (negligible) in exposure to air pollutants,
  - the reduction in social networking (and support),
  - the decrease in personal control,
  - the increase in perceived risks

will be disproportionately, and in some cases cumulatively, experienced by children and people living or working close to the airport, people on low incomes or economically inactive, older people, people with poor mental health and people with an existing circulatory or respiratory condition. In addition, many of these vulnerable groups have

<table>
<thead>
<tr>
<th>Recommendations to reduce health inequalities by targeting action have been integrated into the above sections.</th>
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<tr>
<td>BCC, Draft Birmingham 2026, April 2008.</td>
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</table>
less choice and/or capacity to change their situation, either by finding coping mechanisms or choosing to move house.

- Many of these groups will be particularly vulnerable to exposure to these health risk factors and conditions:
- Many of these groups will already be experiencing multiple deprivation, e.g., on low income, above average exposure to noise and air pollutants, and related to this poorer health than national and regional averages.
1 Introduction

1.1 IMPACT – the International Impact Assessment Consortium – based in the division of Public Health, a WHO Collaborating Centre at the University of Liverpool, was commissioned by Birmingham International Airport Limited (BIAL) to undertake a Health Impact Assessment (HIA) of the development and operation of proposals to extend the main runway. The HIA is described as a Rapid HIA involving secondary (existing) and some primary (new) data collection and analysis. This HIA has had a regional scope, but also undertook a local analysis of the potential impacts. In addition to assessing the geographical distribution of these potential effects, other variations, e.g., by population sub-groups, have also been considered.

1.2 HIA is concerned with improving health and reducing health inequalities. The aim of HIA is to inform and influence policy decision-making by enabling decision-makers to consider the health implications of their policies during the policy planning process. It is a systematic process, which aims to identify what the potential health effects of a new policy, strategy, or project, such as the runway extension proposal might be on a particular group of people, such as local residents. HIA can be done at international, national, regional, City or even ward level. It considers which key health determinants, e.g., employment, noise, air quality, will be affected and how this in turn will impact on the health and well being of the population. In addition HIA considers whether the policy will affect our physical, emotional and social well being, as well as possibly affecting ill health. Recommendations are then made to the policy-makers to mitigate against health risks and enhance health benefits.

1.3 This report will describe the scope of the assessment, including the methods and process, the data collected and the evidence defined from these data. The potential health impacts emerging from the analysis of this evidence will then be defined mainly in broad, qualitative terms. Finally, conclusions and recommendations for the HIA Steering Group are presented. It is envisaged that this report will then be submitted to BIAL for their consideration.
2 Summary of the Project

2.1 Birmingham International Airport Limited (BIAL) has submitted a planning application to extend the Main Runway (Figure 2.1). The plans for this runway extension were published in BIAL’s Master Plan published in November 2007 and having previously been published in BIAL’s Draft Master Plan, which was formally consulted on between October 2005 and March 2006.

2.2 BIAL also acknowledges that Birmingham International Airport’s development must be carried out in “an environmentally sustainable way, mitigating impacts on the environment and people, as well as considering climate change”.

2.3 The proposed runway extension is required to remove current operating restrictions enabling the full operation of a range of direct long-haul services. Market analysis indicates demand for such provision, for example, to and from India, China and the Western USA. The development is proposed to take place at the south east end of the Main Runway, and will entail placing the A45 in a new tunnel under the extended runway and on a new, locally diverted alignment. Associated with the extension will be a range of additional requirements, including the need for a Starter Extension, longer Runway End Safety Areas, a new Air Traffic Control Tower, revised Public Safety Zones and treatment of ‘Obstacle Limitation Surfaces’.

2.4 It is anticipated that given the planning, design and construction processes involved, the proposed runway extension could be operational for 2012.
Figure 2-1 Map of the proposed runway extension for Birmingham International Airport
3 Methodology

Introduction
3.1 This section describes the methodology, methods and procedures used in this HIA, together with the limitations of the study.

Methods and procedures
3.2 The assessment was conducted using a validated generic HIA methodology (Figure 3.1) between June and November 2007. IMPACT’s work took approximately 85 days.

Figure 3-1 A generic HIA methodology

3.3 The HIA methodology is underpinned by a set of values and principles as in Table 3-1.
Table 3-1 HIA principles and values

- HIA reflects a **socio-environmental model of health**
- HIA contributes to **reducing health inequalities**
- HIA is conducted using **ethical** research practices
- HIA methods and tools are **robust**
- HIA processes and the identification of impacts is **transparent**
- HIA uses **participatory approaches** with stakeholders affected by the project
- HIA contributes to **good governance**

3.4 A socio-environmental model of health is represented in Figure 3-2. It illustrates how the health status of a population is negatively affected by their exposure to various risk factors and conditions such as noise and air pollution, enhanced by various positive factors such as feeling in control, and protected by factors such as social support. A HIA will assess how a project will affect these health determinants and ultimately a population’s health outcomes.

Figure 3-2 A socio-environmental model of health determinants
Scoping

3.5 The scope of the assessment was determined by the HIA Steering Group. The Steering Group was an independent body responsible for the commissioning, project management and overall design of the HIA; the membership included the Chair and a member of the Airport Consultative Committee, and a representatives from each of the following: Solihull Care Trust, Solihull Metropolitan Borough Council, Birmingham East & North Primary Care Trust, Birmingham City Council, West Midlands Strategic Health Authority and BIAL’s Community and Environment Unit. This HIA is described as a rapid HIA; ‘rapid’ refers to the depth of the assessment and the type of data that is collected and analysed. Rapid HIAs mainly use routinely collected data although some new data may also be collected, and from these data evidence is identified and impacts defined. However, unusually for a rapid HIA, this assessment also undertook quantitative modelling of the noise impacts.

The aim was defined as:

‘To identify the potential health effects, at development and operational stages, of the new runway extension and associated developments in Birmingham International Airport, including their differential distribution, on defined populations by undertaking a HIA of these proposals using a validated HIA methodology.’

3.6 The HIA was commissioned as a Rapid HIA involving secondary (existing) and some primary (new) data collection and analysis; however some additional analysis involving modelling of noise impacts was also undertaken which is not usual in a rapid HIA.

3.7 The HIA Steering Group agreed that IMPACT would:

- undertake a policy analysis of the draft Environment Statement (ES), other Impact Assessments and relevant official documents,
- develop a profile of relevant data complementary to the ES,
- undertake a review of the literature,
- identify community and organisational stakeholders, define a sample frame, develop tools, plan and facilitate focus groups and interviews,
- identify key informants, develop tools, plan and facilitate interviews,
- analyse evidence from the data collected and characterise health impacts,
- plan and facilitate a consensus building workshop with stakeholders to agree and prioritise impacts, and to define recommendations,
- develop a report describing the HIA methods, process, findings and recommendations to be submitted to the HIA Steering Group,
- undertake an evaluation of the HIA process and impact including identifying the recommendations agreed by the HIA Steering Group and BIAL

3.8 In addition to the terms of reference for the HIA describing the aims, objectives and methods, a scoping report was developed which described the geographical boundaries, and the outcomes from a stakeholder, data and document mapping process. During this mapping process, community and organisational stakeholder categories to be engaged were identified, including groups, organisations and named
contacts. The indicator map defined relevant data to be collected, the specific indicator categories, operational definitions and data sources. In addition, relevant official documents to be collected and analysed were also defined.

**Policy analysis**

3.9 The policy analysis involved identifying the policy context of the runway extension proposal. Local, regional and national strategies relevant to the two proposals, including economic, transport and emergency incidents, were collected, reviewed and analysed. It also involved reviewing the draft ES and other impact assessments, in particular their findings. The policy analysis is presented in section 4.

**Profiling**

3.10 Developing the profile also sets the context by describing the baselines health and socio-demographic position of the population affected by the proposal, in this case residents and communities proximal to the airport in both Solihull and Birmingham. Developing the profile involved searching, collecting and analysing secondary data from a range of datasets, e.g., mortality and morbidity rates across the region. The profile findings are described in section 5.

**Literature review**

3.11 A brief review of relevant evidence from the published literature was undertaken and is presented in section 6. The purpose of this was to define published evidence of the effects of airport operations, and where possible the effect of changes to these operations, on the health of populations. In addition, up to date evidence of the effects of key determinants known to be affected by airport operations such as transport, employment, noise, air quality and accidents and their impacts on health was also reviewed. Databases searched included the World Health Organisation, Centre for Reviews and Dissemination, York, the NHS HIA Gateway, the NHS National Library for Health, Evidence Based Public Policy, Aviation Safety, and the Health & Safety Executive. Search terms and their combinations included airport, aircraft, airplane, aviation, accidents, safety, risk, noise, air quality, monitoring, contours, road traffic, transport, travel, employment, economy, climate change, health, effects, impacts.

3.12 Evidence from the literature is usually defined in terms of the confidence or ‘strength’ of the findings. For the purpose of this HIA a hierarchy of evidence from I to V was defined; this evidence hierarchy includes evidence from the literature as well as evidence from key informants and stakeholders. Level I provides the strongest evidence of effect and refers to ‘reviews of reviews’ or meta analyses, level II refers to systematic reviews or reviews of several HIAs; level III refers to single studies or HIAs, level IV evidence is from expert witnesses (key informants), level V evidence from stakeholders.

3.13 The limitations of the HIA prohibited a comprehensive literature search. As such, the search prioritised ‘reviews of reviews’ and systematic reviews. It has not been possible to review the research design of all of the studies identified and as such, it is not possible to comment on their quality and the findings from these. However, where a number of single studies reinforced each other this was considered reasonable evidence and are included in section 6.
**Participatory approaches**

3.14 The purpose of participatory qualitative approaches is to gather evidence from the experience, knowledge, opinion and perceptions of stakeholders and key informants. ‘Stakeholders’ are defined as individuals or groups of people who have a stake in the policy or project under investigation; ‘key informants’ are experts or specialists in a specific policy field such as noise and health. 18 categories of community and organisational stakeholders were defined in the mapping process (appendix – stakeholder map). In addition, 7 categories of key informants were also defined. From this stakeholder map, groups and individuals to be engaged in the HIA were identified by both purposive\(^1\) and snowballing\(^2\) sample methods. This involved searching various voluntary organisations databases, e.g., Solihull and Birmingham Councils for Voluntary Services, Birmingham Index for Voluntary Organisations, Sure Start, Age Concern, Patient & Public Involvement Forums, identifying schools and parent teachers associations surrounding the airport, and discussing relevant contacts with community development, communications and diversity leads within the statutory agencies in Birmingham and Solihull. As a result a database of over 800 contacts was developed. To this database, members of BIA’s Airport Consultative Committee, Environment Monitoring Working Group and Airport Transport Forum were added. All contacts on the database were then invited to attend one of four local workshops – two during the day and two in the evening - held in the second week of September. A press release was also issued by IMPACT the week before the workshops to invite local people to attend.

3.15 The four workshops followed the same format (appendix). There were 77 participants at the four workshops. The notes and flipcharts from these workshops were written up and analysed using content and thematic analysis.

3.16 During the same period the telephone interviews with some organisational stakeholders and key informants were also undertaken. The tape recordings from these were transcribed and submitted to content and thematic analysis.

3.17 The findings from these focus groups and interviews are included in section 6.

**Impact analysis**

3.18 Impact analysis, the characterisation of health impacts, was based on the analysis of all evidence that had been collected. In addition a quantitative assessment was undertaken on the effects of noise. The methods are described below and the findings in section 6.

**Sleep disturbance**

3.19 In order to estimate how people living near the airport may be affected by night noise we have calculated how many people are likely to suffer from highly disturbed sleep using the information from the noise contours. We have applied it to different

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\(^1\) A non-random sampling method which aims to sample a group of people with a particular characteristic, e.g., older people

\(^2\) A non-random sample method which involves an initial group (e.g., community workers) identifying people they know with a particular characteristic e.g., older people
scenarios in order to attempt to estimate the possible magnitude of health effects relating to changes in noise with and without the runway extension.

3.20 We calculated this using a statistical model developed for the analysis of the relationship between noise exposure and noise annoyance (van Kempen, Staatsen, & van Kamp 2005). The model for sleep disturbance was based on a meta analysis of a number of studies (van Kempen, Staatsen, & van Kamp 2005). The statistical model is specific to aircraft noise. The relationships for self reported sleep disturbance are based on analyses of the 15 data sets with more than 12000 individual observations of exposure-response combinations, from 12 field studies (European Commission Working Group on Health and Socio Economic Aspects 2004). The curves are based on data in the L (outside, maximally exposed facade) range 45-65 dB(A).

2.21 Function for % of people experiencing highly sleep disturbed: \( \%_{HSD} = 18.147 - 0.956 \times L_{night} + 0.01482 \times (L_{night})^2 \)

The scenarios are
- baseline 2006
- 2012 with runway extension
- 2012 without runway extension
- 2022 with runway extension
- 2022 without runway extension
- 2030 with runway extension
- 2030 without runway extension

These scenarios were selected because noise contours have been modelled for these years. The noise contours were provided by BIAL and form part of the Environmental Statement.

Assumptions
- That the populations within the noise contours are accurate. Populations were estimated using using 2006 population data (based on 2001 census) supplied by CACI Information Services. This means that the populations within the contours are estimates.
- For all scenarios it has been assumed that the population remains constant.
- The statistical model is correct

**Noise and children**

3.22 In order to develop an understanding of potential changes in the number of children whose learning may be potentially affected by aircraft noise we have estimated the number of primary schools within the 54 daytime noise contour. The WHO guideline value is 55 dB(A) for outside noise at schools. Children in the RANCH study had an average exposure of 52 dB(A) (external). We have looked at the number of primary schools within the 54 daytime noise contour because this is the closest available noise
contour to the WHO guidelines and RANCH study. We have not tried to estimate the number of children attending those schools.

The scenarios are the 54 daytime noise contour at:

- baseline 2006
- 2012 with runway extension
- 2012 without runway extension
- 2022 with runway extension
- 2022 without runway extension
- 2030 with runway extension
- 2030 without runway extension

Assumptions
- For all scenarios it has been assumed that populations remain constant
- For all scenarios it has been assumed that there are no changes in the provisions of schools in the area

**Annoyance**

3.23 A position paper on the dose response relationship between transport noise and health developed by a working group for the European Commission provides recommendations and guidance on calculating numbers of people annoyed by aircraft noise for annoyed and highly annoyed. These recommendations are based on exposure-response curves indicating the percentage of people (severely) annoyed or sleep disturbed at certain noise exposure levels that have been derived by Miedema et al. (Miedema et al., 2001, 2003). These curves are recommended for use in the EU Directive on Noise (World Health Organization, 2004). The annoyance curves of Miedema and Oudshoorn (2001) are based on a pooled analysis of datasets from noise annoyance studies in several regions, inside as well as outside Europe.” (van Kempen, Staatsen, & van Kamp 2005).

3.24 The dose response curves are calculated using Lden. As the noise contours provided by BIAL used Leq as the noise indicator rather than Lden we were not able to apply the recommended statistical model.

3.25 Therefore, it is not possible to quantify the potential changes in annoyance levels.

**Prioritisation, recommendations and peer review**

3.26 All stakeholders who attended the four workshops in September were invited to attend a consensus-building workshop in November; 19 people attended this workshop. During this the initial findings from the HIA were presented and any gaps were identified. In addition the impacts were prioritised and recommendations were
defined. The draft report was submitted for peer review to a Director of Public Health and a noise specialist for impact validation.

**Limitations**

3.27 There were a number of limitations to this study. There was a reliance on the timely access to data from other impact assessments and sources and this presented some issues. Related to this it was not possible to validate the quality of data and so their reliability. Finally, although there is always a necessary compromise between brevity and rigour in any study, the time and resources available prevented multiple methods being used, involved stakeholders self-selecting (rather than researcher-selected) and limited the scope of the analysis. This limited engagement is reported as a potential bias.

Specific limitations are presented below.

**Sleep disturbance**

3.28 One of the reasons for carrying out modelling in health impact assessment is to improve the transparency of the impact assessment process. The assumptions made in the calculations are explicit, which means they are open to be challenged. This can provide a good basis for discussing health impacts. There are however limitations to the modelling carried out;

- The numbers calculated provide an estimation of the impact of night noise on sleep disturbance. The actual number of people experiencing highly disturbed sleep may be different from what we have estimated.
- No sensitivity analysis has been carried out.
- Populations included children. It is unknown if the model used is also applicable to children.
- The scenarios used were very simple. The only factor that changed in the scenarios was the number of people living within certain noise contours. We did not take into account issues such as the mitigating effects of noise insulation and potential demographic changes.
- Research indicates that some population sub groups are more susceptible to impacts from noise. Statistical models have not yet been developed that can be applied to specific population sub groups such as men/women, children and disabled people.
- The model is applicable from 45-75dB(A). Because of the limited range available from the noise contours we have not been able to include people in the 45-47 range and have given everyone in the 63dB(A) band the same value (63dB(A)). This means that we have probably slightly underestimated highly disturbed sleep.
- The model is also based on noise levels at the house façade so can not take into account differences in noise insulations/ location of bedrooms.
- We have only considered highly disturbed sleep – impacts for sleep disturbed overall and lowly sleep disturbed could also be also modelled.
- It was beyond the scope of the assessment to take into account other causes of noise exposure such as road traffic noise although it is acknowledged that a road noise assessment was conducted.
Noise and children

- The numbers calculated provide an estimation of the number of primary schools exposed to noise levels equal or above 54dB(A). We have not calculated the number of children potentially exposed. We have also not included other schools such as secondary schools.
- The noise contours are estimates, the actual number of schools exposed may be different from what we have estimated.
- No sensitivity analysis has been carried out.
- The scenarios used were very simple. The only factor that changed in the scenarios was the noise contours. We did not take into account issues such as noise insulation, potential demographic changes or changes to schools.
- The model is also based on noise levels at the school façade so can not take into account differences in noise insulation.
- We were unable to take into account other causes of noise exposure such as road traffic noise.

Annoyance

- It was not possible to quantify the potential changes in numbers of people annoyed.
- We were unable to take into account other causes of noise exposure such as road traffic noise.
4 Policy Analysis

Introduction
4.1 This section presents an analysis of Birmingham International Airport Limited’s proposals to extend the main runway. It examines the rationale and context of the proposal to extend the runway; the synergy of the proposal with aviation policies and the relationship of the proposal to non-health care strategies, such as transport, environment, employment and economic development.

Policy map
4.2 A document map was developed defining relevant legislation and policies against health determinant areas identified during scoping, including noise, air quality and transport.

4.3 The key points of the documents were summarised and are presented in Table 4-1.
<table>
<thead>
<tr>
<th>Level</th>
<th>Policy</th>
<th>Focus</th>
<th>Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td>EU</td>
<td>Directive 96/62/EC Air Quality Framework Directive</td>
<td>Air Quality</td>
<td>Establishes a framework under which the EU will set limit values or target values for specified pollutants. The Directive identifies twelve pollutants for which limit or target values will be set in subsequent daughter directives. They are; sulphur dioxide, nitrogen dioxide, particulate matter, lead, carbon monoxide, benzene, ozone, polyaromatic hydrocarbons, cadmium, arsenic, nickel and mercury.</td>
</tr>
</tbody>
</table>
|       | An action plan for airport capacity, efficiency and safety in Europe. COM(2006) 819 final | Airport | Provides an action plan and strategy for tackling congestion (capacity crunch) at European airports. Five key actions: 
1. make better use of existing airport capacity; 
2. a consistent approach to air safety operations at aerodromes; 
3. promote “co-modality”, the integration and collaboration of the transport modes; 
4. improve the environmental capacity of airports and the planning framework for new airport infrastructure; 
5. develop and implement cost efficient technological solutions. |
|       | Directive 2002/49/EC of The European Parliament and of the Council of 25 June 2002 relating to the assessment and management of environmental noise | Environmental noise | Defines a common approach intended to avoid, prevent or reduce on a prioritised basis the harmful effects, including annoyance, due to exposure to environmental noise. The directive also aims to provide a basis for developing Community measures to reduce noise emitted by the major sources, in particular road and rail vehicles and infrastructures, aircraft, outdoor and industrial equipment and mobile machinery. |
|       | Directive 2002/30/EC of the European Parliament and of the European Council, Rules and procedures with regard to the introduction of noise-related operating restrictions at Community airports | Airport noise | Provides a framework for addressing airport noise. The Directive allows airports with a noise problem to introduce a set of operating restrictions including the gradual withdrawal of the noisiest aircraft. |
| WHO | Air Quality Guidelines for Europe, 2000 | Air Quality | The guidelines aim to provide a basis for protecting public health from adverse effects of air pollutants and to eliminate or reduce exposure to those pollutants that are known or likely to be hazardous to human health or wellbeing. The guidelines provide background information and guidance to (inter)national and local authorities in making risk assessment and risk management decisions. The guidelines provide a basis for setting standards or limit values for air pollutants. |
| Air quality guidelines global update 2005: Particulate matter, ozone, nitrogen dioxide and sulphur dioxide | Air Quality | |
| WHO Guidelines for community noise, 1999 | Noise | |
| UK | Environment Act 1995 The Air Quality Strategy for England, Wales, Scotland and Northern Ireland, 2000. Addendum February 2003 | Environment Air Quality | Required the development of an Air Quality Strategy. The strategy aims to protect human health and the environment "without imposing unacceptable economic or social costs". The strategy has 4 main aims: • social progress which meets the needs of everyone; • effective protection of the environment; • prudent use of natural resources; and • maintenance of high and stable levels of economic growth and employment. The strategy contains objectives and standards for 8 pollutants, which are known to have adverse effects on both the environment and human health. Local authorities are required to assess and review current and future air quality in their area. LAs develop their own strategies for achieving the air quality objectives in their areas. |
| The Future of Air Transport White Paper, 2003 | Air Transport | Set out a strategic policy framework for the development of airport capacity for the next 30 years, neither authorising nor precluding any particular development, but listing conclusions regarding developments of a number of airports, inc Birmingham. Recognises that building more and more capacity is not a sustainable way to meet increasing demand into the future. Calls for revised Masterplans containing environmental controls and mitigation plans, proposals for improved surface access and appropriate measures to address blight. |
| The Future of Air Transport Progress Report, Dec 2006 | Air Transport | Notes overall achievements since the introduction of the White Paper, such as UK leading the debate in Europe for aviation to be included in the EU Emissions Trading Scheme; Civil Aviation Act 2006 passed; Aviation industry progress in reducing noise of the fleet and addressing local air quality issues; Improved passenger facilities through terminal development and refurbishments; Improved engagement with local communities through publication of long term proposals with environmental mitigation measure. Notes that delivery of the White Paper is slow and gives a changed priority in light of other research on environment and climate change, to make the most of existing airports, ie extend runways rather than building additional runways, including Birmingham. Identifies evidence for the rising importance of aviation to |
the economy and the need for greater global connectivity. Birmingham is cited throughout as an example of good practice with regard to for example, handling blight, light rail link and bus/coach terminus development, 2:1 compensation for wildlife conservation land, waste management facility, business and education links.

<table>
<thead>
<tr>
<th>Regional</th>
</tr>
</thead>
</table>
| **West Midlands Regional Transport Strategy. Incorporated into the Regional Spatial Strategy 2004.** | Transport | West Midlands Regional Assembly lead the Regional Transport Partnership, whose members include Advantage West Midlands and BIA. It has five priorities:  
- Promote a change of hearts and minds of the regions’ population  
- Make better use of the existing regional transport networks  
- Provide a Comprehensive Public Transport System that serves Urban Areas  
- Improve access to BIA and NEC  
- Ensure that West Midlands is a reliable hub to serve Regional, National and International connections  
The Strategy has twelve policy strands, with a crosscutting theme of changing travel patterns and travelling behaviour across the West Midlands.  
- Developing access and mobility  
- Reducing the need to travel  
- Walking and Cycling  
- Promoting travel awareness  
- Integrated Public Transport network  
- Strategic Park and Ride  
- Car Parking Standards and management  
- Demand management (towards congestion charging)  
- National and Regional Transport networks (inc M42 and BIA) development  
- Freight  
- Airports (in light of Future of Air Transport White paper)  
- Priorities for investment (inc access to BIA) |

| WMRA Transport Delivery Plan 2005 | Transport | Provides information upon how the priorities for investment identified in the Regional Transport Strategy are being progressed, in time periods to 2011-2011-2015 and after 2015. Major infrastructure developments for road, rail and air are included in the first period, with further refinement and more local linking developments thereafter. |

| Delivering Advantage. The West Midlands Economic Strategy and Action Plan 2004-2010 | Economy | Advantage West Midlands, the Regional Development Agency, has national lead responsibility for transport issues and is an active partner in the Regional Transport Partnership. It supports the runway extension, which together with other initiatives such as transport infrastructure improvements (such as the M42) and employment opportunities, will be a key pillar in developing West Midlands as a business base. |

<table>
<thead>
<tr>
<th>Local</th>
</tr>
</thead>
</table>
| **Birmingham Air Quality Action Plan, 2006** | Air Quality | Contains air quality review and assessment. Lists 41 actions and 6 headings:  
- reducing vehicle emissions  
- improving public transport to reduce traffic volumes |
<table>
<thead>
<tr>
<th><strong>BIAL</strong></th>
<th><strong>Towards: 2030 Planning a sustainable future for air transport in the Midlands: Airport Master Plan to 2030, BIA 2007.</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BIAL Air Quality Strategy</strong></td>
<td><strong>Noise policy including night flying policy</strong></td>
</tr>
<tr>
<td><strong>Air Quality</strong></td>
<td><strong>Noise</strong></td>
</tr>
</tbody>
</table>
| • Measure, monitor and report ambient air quality levels using equipment compatible with the Automatic Urban Network and share this data with local authorities and other interested parties.  
• Carry out diffusion tube monitoring of Nitrogen Dioxide within the local community.  
• Establish a database of emissions generated by airport operations.  
• Minimise the use of Auxiliary Power Units and Ground Power Units by providing Fixed Electrical Ground Power (FEGP) on aircraft stands, where practicable.  
• Increase understanding of air quality issues in the community and workforce.  
• Introduce measures to improve local air quality.  | **Airport Company has established a number of noise policies in line with the requirements of the Section 106 Planning Agreement with Solihull Metropolitan Borough Council.** |

- improving the road network to reduce congestions
- using area planning measures to reduce traffic volumes
- reducing air pollution from industry, commerce and residential areas
- changing levels of travel demand/promotion of alternative modes of transport
**Review and analysis**

4.4 There is general cohesion between the proposal to extend the existing runway and international, regional and local aviation, economic, environment and transport policy. As is often the case with proposals involving UK planning procedures, the synergy with current policy is less clearly demonstrated in respect of wider population health and wellbeing and future community sustainability beyond that which is required to meet current guidelines and statutory requirements for the area of immediate concern.
5 Profile

Introduction
5.1 The purpose of the health profile is to give a picture of the health and socio-demographic context of the Birmingham International Airport runway extension proposal in order to better understand its potential health impacts and the particular population groups that may be affected. The profiling has involved collecting and analysing secondary (existing) data on a range of indicators that relate to the content and context of the proposal, and its possible impacts on health or health determinants. Indicators are measurable variables that reflect the state of a community or of persons or groups in a community.

5.2 The profile contains, where available, trend (time series) data and local level data. Trend data illustrates changes over time, and local data illustrates local variations in health/health determinants and the inequalities that exist at local levels. The structure of the health profile is based upon the health determinant categories of the socio-environmental model of health (Dahlgren and Whitehead, 1993) that underpins HIA methodology, and health outcomes. Figure 5-1 shows the structure of the health profile. These are not discrete categories and some indicators fall into more than one category.

Figure 5-1 Structure of the Community Health Profile
The area

5.3 The geographic units of analysis for this HIA are wards within Birmingham and Solihull that are proximal to the impacts of the proposal, the Local Authority areas of Birmingham and Solihull and the West Midlands Region. In addition, England has been selected for comparison. Units of analysis are the areas/topics that are the focus of the analysis of the HIA. Where the level of aggregation of the secondary data used within the profile does not fit exactly to the units of analysis, the nearest equivalent data aggregation has been used, for example UK or GB data in the place of England data.

Biological factors

Population Structure

Population

5.4 Population counts from the 2001 Census for the Local Authority areas of Birmingham and Solihull, the West Midlands Region and the targeted wards are provided in Table 5-1. The 2004 population estimates for are defined in Table 5-2 below.

Table 5-1 Total Population Counts and Percentage of Population by Gender (Census, 2001)

<table>
<thead>
<tr>
<th>All Persons Count</th>
<th>Males</th>
<th>%</th>
<th>Females</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acocks Green</td>
<td>26271</td>
<td>Acocks Green</td>
<td>46.7%</td>
<td>Acocks Green</td>
</tr>
<tr>
<td>Bickenhill</td>
<td>13561</td>
<td>Bickenhill</td>
<td>48.0%</td>
<td>Bickenhill</td>
</tr>
<tr>
<td>Bordesley Green</td>
<td>31343</td>
<td>Bordesley Green</td>
<td>48.7%</td>
<td>Bordesley Green</td>
</tr>
<tr>
<td>Chelmsley Wood</td>
<td>10927</td>
<td>Chelmsley Wood</td>
<td>48.6%</td>
<td>Chelmsley Wood</td>
</tr>
<tr>
<td>Elmdon</td>
<td>9796</td>
<td>Elmdon</td>
<td>48.0%</td>
<td>Elmdon</td>
</tr>
<tr>
<td>Hodge Hill</td>
<td>24825</td>
<td>Hodge Hill</td>
<td>48.5%</td>
<td>Hodge Hill</td>
</tr>
<tr>
<td>Kingshurst and Fordbridge</td>
<td>13297</td>
<td>Kingshurst and Fordbridge</td>
<td>48.9%</td>
<td>Kingshurst and Fordbridge</td>
</tr>
<tr>
<td>Knowle</td>
<td>10823</td>
<td>Knowle</td>
<td>48.8%</td>
<td>Knowle</td>
</tr>
<tr>
<td>Meriden</td>
<td>11811</td>
<td>Meriden</td>
<td>48.7%</td>
<td>Meriden</td>
</tr>
<tr>
<td>Shard End</td>
<td>23154</td>
<td>Shard End</td>
<td>48.4%</td>
<td>Shard End</td>
</tr>
<tr>
<td>Sheldon</td>
<td>20129</td>
<td>Sheldon</td>
<td>49.2%</td>
<td>Sheldon</td>
</tr>
<tr>
<td>Silhill</td>
<td>12401</td>
<td>Silhill</td>
<td>48.9%</td>
<td>Silhill</td>
</tr>
<tr>
<td>Smith's Wood</td>
<td>10943</td>
<td>Smith's Wood</td>
<td>48.0%</td>
<td>Smith's Wood</td>
</tr>
<tr>
<td>South Yardley</td>
<td>27620</td>
<td>South Yardley</td>
<td>47.3%</td>
<td>South Yardley</td>
</tr>
<tr>
<td>Stechford and Yardley North</td>
<td>24837</td>
<td>Stechford and Yardley North</td>
<td>47.2%</td>
<td>Stechford and Yardley North</td>
</tr>
<tr>
<td>Sutton New Hall</td>
<td>32363</td>
<td>Sutton New Hall</td>
<td>48.5%</td>
<td>Sutton New Hall</td>
</tr>
<tr>
<td>Tyburn</td>
<td>22284</td>
<td>Tyburn</td>
<td>48.4%</td>
<td>Tyburn</td>
</tr>
<tr>
<td>Washwood Heath</td>
<td>27822</td>
<td>Washwood Heath</td>
<td>48.9%</td>
<td>Washwood Heath</td>
</tr>
<tr>
<td>Birmingham</td>
<td>977087</td>
<td>Birmingham</td>
<td>48.1%</td>
<td>Birmingham</td>
</tr>
<tr>
<td>Solihull</td>
<td>199517</td>
<td>Solihull</td>
<td>47.7%</td>
<td>Solihull</td>
</tr>
<tr>
<td>West Midlands</td>
<td>5267308</td>
<td>West Midlands</td>
<td>48.7%</td>
<td>West Midlands</td>
</tr>
<tr>
<td>England</td>
<td>49138831</td>
<td>England</td>
<td>48.1%</td>
<td>England</td>
</tr>
</tbody>
</table>

(Source: ONS Neighbourhood Statistics, 2003)
Table 5-2 2004 Mid-year Population Estimates (all ages, thousands)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Birmingham</td>
<td>995.5</td>
</tr>
<tr>
<td>Solihull</td>
<td>201.6</td>
</tr>
<tr>
<td>West Midlands</td>
<td>5,326.7</td>
</tr>
<tr>
<td>England</td>
<td>50,110.7</td>
</tr>
</tbody>
</table>

(Source: ONS, 2005)

**Age and Sex Structure**

5.4 Population pyramids for England (Figure 5-2), the West Midlands (Figure 5-3), Birmingham (Figure 5-4) and Solihull (Figure 5-5) are below.

**Figure 5-2 Population Pyramid England – Mid-year estimates 2004 (thousands)**

![Population Pyramid England](image)

(Source: ONS, 2005a)

**West Midlands Population Structure**

5.5 In comparison to the UK and England the West Midlands population contained a higher percentage of infants, children and young people aged 0-19. However, there were a lower percentage of people between the ages of 20 and 44. The older age groups were roughly similar to those found in the UK and England.
5.6 The population structure of Birmingham is different to that of the UK and England in a number of ways. A higher percentage of children and younger people between the ages of 0 and 29 can be observed and a lower percentage of people between the ages of 35 and 79.

Figure 5-4 Birmingham Population Pyramid – Mid-year estimates 2004

5.7 Solihull has a different population structure to Birmingham; it also has a different structure to England. The population pyramid shows a lower percentage of infants aged 0 to 4 and a higher percentage of children aged 5 to 14 than England; although the percentages are lower than in Birmingham. There were a significantly lower percentage of people in the
younger working age groups aged 20 to 34 and a higher percentage of people aged 50 to 80.

Figure 5-5 Solihull LA Population Pyramid Mid-year Estimate 2004

Ward Level Population Structure
5.8 Significant variations in ward level population structure by age, sex and ethnicity exist at local levels. Figure 9-1 and Table 9-1 Ranked Age Structure by Ward and Comparative Areas (Census 2001) of the appendix contain summary data for each of the wards considered within the HIA together with average figures for Birmingham, Solihull and the West Midlands for comparison. The data has been ranked to show the ward level variations.

Sex Structure
5.9 Figure 9-1 contains data on sex structure within the selected wards and Birmingham and Solihull. The lowest percentage of males were found in the ward Shard End (46.7%) and the highest in Meriden (49.2%).

Age Structure
5.10 Table 9-1 contains ranked data for the percentage of people by age groups at ward level, lower ranks have a lower percentage of people within the age group. There were large variations between the age structures of the wards and the comparison areas. For example, there were more than twice the number of 0 to 15 year olds living in Bordesley Green (33.4%) than in Elmdon (16.5%) and conversely more than twice the percentage of people aged 65+ in Elmdon (24.1%) than in Bordesley Green (10.0%); both areas had a substantially different age structure than the England average.

Ethnic Structure

Ethnicity and Health Inequalities
5.11 According to the 2001 census (cited by POST, 2007), 92% of the UK population is White, which includes significant non-British White minorities such as Irish people. A further 4% of the population is Asian or Asian British, 2% are Black or Black British and 1.5% are
Mixed. Black and Minority Ethnic (BME) populations are concentrated in urban areas, particularly in deprived areas, where they make up a much bigger share of the population.

5.12 However, the distribution of BME groups in the UK is currently changing, and they are becoming less geographically segregated. The UK is likely to become more multi-ethnic in the future. BME groups now account for 73% of the UK’s total population growth, due to differences in fertility rates and inward migration.

5.13 BME groups generally have worse health than the overall population, although some BME groups fare worse than others, and patterns vary from one health condition to the next. Evidence suggests that the poorer socio-economic position of BME groups is the main factor driving ethnic health inequalities, e.g., (Bhopal, 2007).

**Ethnic Structure of the West Midlands**

5.14 According to the Commission for Racial Equality (CRE) the West Midlands is the most ethnically diverse English region outside London, according to 2001 census data. Nearly one in seven of its population (13.9%) are from ethnic groups other than White British.

5.15 The West Midlands is the only English region, apart from London, where the proportion of residents from the White British group falls below the national average of 87%. The West Midlands largest conurbation Birmingham is second only to London in terms of its ethnic diversity. With nearly 200,000 Asian and 60,000 black residents, Birmingham is home to more people from these groups than most entire regions of England (excluding London, only the Yorkshire and The Humber region has more Asian residents, and none has more black residents).

5.16 The region is home to one in six of all Asians in Britain. In Birmingham 20% of the population is Asian. There are more Pakistanis living in the West Midlands - 155,000 - than in any other English region, London included.

5.17 Across the entire region, the population is split fairly evenly between Indians and Pakistanis; at town and city level, though the tendency is for one group to predominate over the other. In Birmingham, for example, the ratio of Pakistanis to Indians is two to one.

5.18 In terms of its black population, the West Midlands is also second only to London, both numerically (104,000 people) and as a proportion of all residents (2%). The latter figure is nearly twice that of the next region in the list, the South East.

5.19 Fifteen percent of all Black Caribbeans living in Britain live in the West Midlands, but only a couple of towns and cities, such as Birmingham, have black populations (4.6% of all residents) significantly above the national average for England. Nowhere else in the country has a black population so dominated by the Black Caribbean group; here, they outnumber people of African descent by more than seven to one.

5.20 Most other ethnic minority groups are represented in the West Midlands in similar proportions to other regions of England. There is, however, a much higher percentage of people from the Mixed White and Black Caribbean group than the national average - nearly
40,000 people, or 0.8% of all residents. In Birmingham, this figure is even higher, at between 1.5% and 2%; across the whole of England, only a few inner London boroughs have marginally higher proportions of this group (CRE, 2005-2007). In 2001, 6.5% of people living in the West Midlands were born abroad, up from 5.3% in 1991 (CRE, 2005-2007).

Figure 5.6 Variations in Ethnic Structure (Percentages)

Ethnic Structure of Birmingham and Solihull
5.21 Birmingham is the second most diverse city Britain. According to the CRE (2006), based on 2001 Census data, people from ethnic minority groups account for more than a third of its population. It has the largest concentrations of many groups outside of London, particularly Asians and Black Caribbeans. In two wards - Washwood Heath and Bordsley Green Pakistanis form the majority ethnic group. Ranked data showing (selected) ward level variations in ethnicity is contained within Figure 5-7.

5.22 The city exhibits very extreme concentrations of particular ethnic groups, with the Pakistani predomination in the east and a large Indian population in the north-west of the city centre. One in five people in the entire city are Asian; a total of 191,000 people. Put another way, nearly half of all south Asians in the West Midlands live in Birmingham. Of those, more than half (104,000) are Pakistani, 56,000 are Indian and 21,000 Bangladeshi.

5.23 One in seven of all people in the city are Muslim, three quarters of these Muslims are of Pakistani origin. Currently, ethnic minorities in Birmingham are concentrated in inner-city areas, forming an 'inner ring'.

5.24 In recent years, it has been groups from Eastern Europe, the Middle East and North Africa who have formed the majority of new arrivals to the city. Somalis, who have often come to Birmingham via stays in Holland, Denmark and Sweden, now number approximately 8,000 people. Between 4,000 and 5,000 Kurdish asylum seekers and refugees live in Birmingham, the vast majority from Iraq (CRE, 2006).
5.25 Solihull had a BME population of 5.41% (April 2001), much lower than in Birmingham (29.65%) and also lower than in England (9.08%) and the West Midlands (11.26%). This represents a rise of 2.51% from 2.9% in 1991. It must be noted that this increase may in part reflect a reclassification of ethnic groups in the 2001 Census. In Birmingham, the wards under consideration by the HIA have percentages of BME populations ranging from 73.2% in Washwood Heath to 6.2% in Sheldon. In Solihull, the wards have percentages of BME populations ranging from 2.52% in Meriden to 7.49 in Silhill.

**Individual lifestyle factors**

**Transport and Mobility**

5.26 The number of walking and cycling trips in the West Midlands decreased between 1995-7 and 2004-5, as did the number of journeys by public transport. Walking and cycling accounted for 23% of all trips in the region, with private transport accounting for 69% of journeys and public transport 8%.

The total number of trips per person in the region remained at 1.075 in 2004-5.

The total distance travelled per person in the region in 2005-6 was 6,872 miles, an increase of 166 miles per person since 1995-7.

20% of the total mileage was on shopping and personal business, 29% on commuting and business, 5% on education and escorting children to education, and the remaining 16% on leisure and other pursuits (Defra, 2007).

**Car Ownership**

5.27 Table 9-6 contains data on car and van ownership by number of vehicles per household at ward, LA region and England level.
5.28 The percentage of people who do not own a car or van in Birmingham (38.49%) at (selected) ward level varies between 47.44% in Washwood Heath and 16.46% Sutton New Hall. The percentage of people who do not own a car or van in Solihull (20.55%) is much lower and at (selected) ward level varies between 44.94% in Chelmsley Wood and 10.02% in Meriden. The percentage not owning a car or van in the West Midlands is 26.77% compared to 26.84% in England.

Physical Activity
5.29 19.3% of adults in the West Midlands participated in sports for at least 3 days per week for 30 minutes (moderate participation); this was the lowest level of participation for the regions of England (Sport England, 2006). Significantly more men than women reported carrying out moderate physical activity every day of the week (men 17%, women 14%) but generally there was little difference in physical activity between men and women. Physical activity is more common amongst younger age groups (WMRO, 2005).

5.30 In Birmingham only 22% of women and 37% of men get enough exercise to maintain a healthy lifestyle. While another 25% of people are inactive and don’t do any physical activity at all (HoBT PCT, 2007).

Social and Community networks

Satisfaction in local area
5.31 Householder satisfaction in the characteristics of the local area changed little from 86% to 85% in the West Midlands between 1999-00 and 2005-6; this compares to 87% in England (Defra, 2007).

Active community participation
5.32 Informal volunteering in the West Midlands increased from 33% to 39% of the population between 2001 and 2005; this compares to 37% in England. Formal volunteering changed little from 28% to 29% of the population (England average 29%). Overall 51% of the population were regular volunteers (England average 50%) (Defra, 2007).

Living and working conditions

Occupational Morbidity – West Midlands
5.33 According to the Health and Safety Executive (HSE, 2007) the latest survey of self-reported work-related illness (SWI) carried out in 2005/06 estimated that, in the West Midlands, 183,000 people suffered from an illness which they believe was caused or made worse by their current or past work. The prevalence (4.7% of people ever employed) was not statistically significantly different to England (4.6%). Trend data shows a reduction in occupational morbidity between 2001 and 2006 in the West Midlands region and England.
5.34 According to the HSE (2007) in 2005/06, there were 12 fatal injuries to workers in the West Midlands, 2,810 reported major injuries to employees and 11,881 over 3 day injuries to employees. There were 15 fatal and 1,293 non-fatal injuries to members of the public.

5.35 In the West Midlands in 2005/06, the rate per 100,000 employees was 121.9 for fatal and major injuries, and 514.3 for over 3 day injuries, compared with Great Britain averages of 109.5 and 445.2 respectively.

5.36 Over the period 2001/02 to 2005/06, major injuries to employees stayed at the same level compared to an increase of 2% in Great Britain as a whole. Over 3 day injuries to employees fell by 9%, the same as in Great Britain. Non-fatals to members of the public increased by 5%, compared to an increase of 2% in Great Britain.

5.37 The Services industries accounted for between 51% and 62% of fatal and major injuries to employees over the five-year period. In 2005/06, the Construction industry had the highest rate of fatal and major injuries to employees (294.6).

5.38 The Services industries accounted for approximately 59% to 68% of over 3 day injuries to employees over the five-year period. In 2005/06 the highest rate of over 3 day injuries to employees was in the Manufacturing industry (845.6).

5.39 Based on the Labour Force Survey (LFS), the rate of reportable injury in the West Midlands was 1,360 per 100,000 workers in 2004/05 (three-year average), similar (not statistically significantly different) to the Great Britain average of 1,200 (HSE, 2007).

**Local Authority Rates – Birmingham and Solihull**

5.40 HSE estimated injury rates place Birmingham LA within the central 50% of all GB local authorities (609.5 injuries per 100,000, central rate = 500-708 per 100,000) and Solihull LA within the lowest 25% (480.9 injuries per 100,000, lower rate – below 500 per 100,000). The
figures are based on total reported Injuries per 100,000 employees, annual average 2003/04 - 2005/06 (HSE, 2007a).

Deprivation

Index of Multiple Deprivation 2004 (IMD 2004) – West Midlands Region

5.41 Nearly 15% of England’s most deprived SOAs are located in the West Midlands, the third highest rate by region. As the region only has a 10.7% share of all SOAs in England, the West Midlands therefore has a disproportionate share of England’s most deprived SOAs (WMPHO, 2004).

Deprivation by Local Authority District

5.42 18 Districts in the West Midlands contain SOAs which feature in England’s 10% most deprived. Birmingham alone accounts for over half of the region’s most deprived SOAs with 243 (out of 474). It is also worth noting that the list includes Solihull, which is generally acknowledged as one of the region’s most affluent districts but can now be shown to contain areas of severe deprivation (WMPHO, 2004).

5.43 Local authorities in England have been ranked according to the average IMD 2004 rank of their constituent Lower Level SOAs. The ranks range from 1 (most deprived LA in England) to 354 (least deprived). Figure 9-3 illustrates the rankings of the local authorities in the West Midlands region in comparison to the national picture. Birmingham is the 15th most deprived local authority in England with a rank of 15; it the most deprived local authority in the region and one of the most deprived nationally. Based on the income domain alone, Birmingham is the most income deprived local authority in England. Solihull has a higher ranking of 183 making it the 183rd most deprived local authority in England of the 354 local authorities. Birmingham has 55.6% of people living in the 20% most deprived areas of England, whereas Solihull has 16.3.

5.44 Geographic variations in deprivation exist at local levels, together with associated inequalities in health status.

Local Level Deprivation

5.45 Birmingham City Council (BCC, 2007a), have estimated the percentage of the Birmingham population in each Ward falling within the most and least deprived Super Output Areas in England. Figure 5-9 displays the SOA level deprivation data. Nine of the twenty-two wards in Birmingham were estimated to have at least 75% of their population falling within the 10% most deprived Super Output Areas in England. They include two of the wards considered within this study, Washwood Heath (98.9%) and Bordesley Green (78.8%). Based on these estimates Washwood Heath has the highest percentage of people falling within the 10% most deprived SOAs within England in Birmingham. At the opposite end of the scale Sutton New Hall had 84% of the population falling within the 50% least deprived Super Output Areas in England and 0% of the population falling within the 10% most deprived (BCC, 2007a). Table 9-4 contains further ward level data on deprivation in Birmingham.

5.46 It should be noted that not all people living within deprived areas will be deprived and also that variations in deprivation/inequality exist within wards, together with associated
inequalities in health status. Sub-ward level variations in deprivation are illustrated by the Lower Layer SOA data within figure 5-9.

**Figure 5-9 Birmingham IMD 2004**

5.47 Although Solihull is recognised as one of the most affluent districts within the West Midlands, it contains areas of deprivation and severe deprivation at local levels. Figure 5-10 contains SOA level IMD 2004 data for Solihull together with ward boundaries. The map shows the geographic variations of deprivation that exist within Solihull. The wards considered within the HIA are identified. The highest levels of multiple deprivation in Solihull can be seen within the wards of Smith’s Wood, Chemsley Wood, Kingshurst and Fordbridge. Lower levels of multiple deprivation can be seen within Meriden and parts of Elmdon, Silhill, Knowle and Bickenhill.
Economic Activity

Economically Active – Employees
5.48 Recent data (Figure 5-11) shows that the proportion of people in employment/employees who are resident in Birmingham (63%, 55.7%) are far lower than in Solihull (78.5%, 67.8%) and lower than the West Midlands (72.9%, 64%) and Great Britain (74.3%, 64.6%) averages. Similar proportions of people are employees in the West Midlands as in Great Britain although the Great Britain average of people in employment is higher.
**Unemployment**

5.49 Figure 5-12 shows the percentage of economically active people who are unemployed. Based on these figures the percentage of economically active people in Birmingham who are unemployed is far higher in Birmingham (9.5%) than in the West Midlands (5.5%) and Great Britain (5.3%) and more than double the percentage in Solihull (4%).

**Jobseekers Allowance (JSA) Claimants**

5.50 JSA claimant data is routinely collected and available at a variety of geographic levels, it is commonly used as an indicator of unemployment/claimant trend behaviour. Figure 5-12 shows JSA claimants trend data for the areas considered by the HIA. The rate of JSA claimants in Birmingham is more than double the England rate and far higher than in the West Midlands; the rate in Solihull is lower than in England. Between 2001 and 2007 JSA claimant rates have increased slightly in Birmingham (+0.2%) and the West Midlands (+0.1%) and decreased slightly in Solihull (-0.1%) and England (-0.2%).

Figure 5-12 Jobseeker’s Allowance Claimant Count (total) (resident working age population) (Jan-01 to Jan-07) (percentages)

**Unemployment in Solihull by Ward**

5.51 According to Solihull MBC (2007), based on JSA claimant counts, there is a wide variance in the unemployment rates across the Borough, ranging from 0.7% in Knowle to 6% in Chelmsley Wood (April 2006). Although this data is not directly comparable with the above data because of the different time periods (April as opposed to January), it does allow for an understanding of variations within Solihull.
Education and Skills

5.52 In Solihull and Birmingham during 2003/2004 64.1% and 56.4% of school children, respectively, received 5 A to C grade GCSEs; both areas were significantly better than the England average of 52% (DoH, 2006a & b). Almost 74 per cent per cent of 19-21 year-olds in the West Midlands were qualified to Level 2 or above (e.g. five GCSEs at grades C or above, NVQ level 2 or equivalent) in Spring 2006, up from around 66 per cent in 1997. The increase of 7.9 percentage points represents the largest regional increase between these years. In comparison the national average increased by 4.5 percentage points from 71 to 75.5 per cent (Defra, 2007).

5.53 According to the Learning and Skills Council for Birmingham and Solihull (2003) variations exist in levels of basic skills, defined as ‘up-to GCSE level’. They found variations by geography (LA and ward level), ethnicity and employment status; with lower levels of skills amongst the unemployed, minority ethnic groups and populations living within deprived areas. Populations in Birmingham had lower levels of basic skills than those in Solihull. Table 9-7 to Table 9-10 contain examples of data on basic skills by ethnicity, employment status and area of residence.

General socio-economic, cultural and environmental factors

Health Service Activity and Access

Access to Accident & Emergency Departments and Minor Injury Units

5.54 Data on the number of people attending NHS Accident & Emergency Departments and Minor Injury Units within the Birmingham and Solihull area during 2006-07 is contained within Error! Reference source not found.
Table 5-3 Attendances at NHS Accident & Emergency Departments and minor Injury Units (2006-07)

<table>
<thead>
<tr>
<th>Name</th>
<th>First attendances</th>
<th>Follow up attendances</th>
<th>Total attendances</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birmingham Children’s Hospital NHS Foundation Trust</td>
<td>41,678</td>
<td>1,556</td>
<td>43,234</td>
</tr>
<tr>
<td>Birmingham East And North PCT</td>
<td>6,979</td>
<td>170</td>
<td>7,149</td>
</tr>
<tr>
<td>Heart Of Birmingham Teaching PCT*</td>
<td>21,071</td>
<td>11,849</td>
<td>32,920</td>
</tr>
<tr>
<td>Heart Of England NHS Foundation Trust</td>
<td>152,878</td>
<td>0</td>
<td>152,878</td>
</tr>
<tr>
<td>University Hospital Birmingham NHS Foundation Trust</td>
<td>78,764</td>
<td>3,229</td>
<td>81,993</td>
</tr>
</tbody>
</table>

*Attendances at NHS walk in centres are now included in the attendance figures.

(Source: DoH QMAE, 2007)

5.55 Table 5-4 shows PCT performance data on the percentage of patients being offered appointments with GPs and Primary Care Professionals (PCPs) within the national target of 2 working days (GPs) or 1 working day (PCPs). All areas achieved a 100% score.

Table 5-4 Access to General Practitioners (GPs) and Primary Care Professionals (PCPs)

<table>
<thead>
<tr>
<th>PCT</th>
<th>Percentage patients offered 1st appointment within 2 working days (Dec)</th>
<th>Percentage patients offered 1st appointment with PCP within 1 working day (Dec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eastern Birmingham PCT</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>North Birmingham PCT</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Solihull PCT</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

(Source: Healthcare Commission, 2007)

Table 5-5 shows the percentage of category A ambulances calls by PCT that met the 8 minute response target. 76% of responses met the target.

Table 5-5 Ambulance category A calls meeting 8-minute target

<table>
<thead>
<tr>
<th>PCT</th>
<th>Percentage Meeting Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eastern Birmingham PCT</td>
<td>76%</td>
</tr>
<tr>
<td>Heart of Birmingham Teaching PCT</td>
<td>76%</td>
</tr>
<tr>
<td>North Birmingham PCT</td>
<td>76%</td>
</tr>
<tr>
<td>Solihull PCT</td>
<td>76%</td>
</tr>
</tbody>
</table>

(Source: Healthcare Commission, 2007)

Productivity

5.56 Labour productivity in the West Midlands was £29,800 Gross Value Added (GVA) per workforce job in 2003, up from £21,800 in 1996; an increase of £8,000. Productivity increased in all regions in England between 1996 and 2003; the increase in the West Midlands (37 per cent) was greater than the England average increase in percentage terms.

5.57 Average labour productivity in England increased by over £8,000 GVA per job, or 35 per cent during this period, and in 2003 was £32,100 GVA per job (Defra, 2007).
Health Outcomes

Health Status and Morbidity

Self Reported General Health Status (Census 2001)
5.58 Figure 5-14 contains data on the self reported general health status by available selected wards and comparison areas. A higher proportion of people in the West Midlands (9.73%) reported their health as 'not good' than in England (just over 9%). The percentage of people in Birmingham that reported their health as 'not good' was 10.86%. The percentage of people in Solihull that reported their health as 'not good' was 8%.

Ward Level Self Reported Health Status (Census 2001, Birmingham)
5.59 Local level variations in the reporting of general health exist, these are illustrated within Figure 5-14. Based on 2001 Census data, the percentage of people reporting their health as 'not good' was highest in Shard End ward (14.9%) and lowest in Sutton New Hall (10.86%). None of the Birmingham wards with available data had lower levels of 'not good' health than the Birmingham average.

Ward Level Self Reported Health Status (Census 2001, Solihull)
5.60 The percentage of people reporting their health as 'not good' in Solihull ranged between 5.5% (Knowle) and 11.91% (Chelmsley Wood).

Limiting Long-Term Illness
5.61 Figure 5-15 shows the percentage of people (available areas) reporting that they had at least one limiting long-term illness at the time of the 2001 Census. An average of 17.93% of people in England reported having at least one limiting long-term illness, this was lower than in the West Midlands (18.86%). The percentage in Solihull was lower still at 16.33%. However, in Birmingham 19.65% of people reported limiting long-term illness. The highest levels (selected wards) in Birmingham and Solihull were in Shard End (24.76%) and Chelmsley Wood (20.84%) respectively. The lowest levels (selected wards) in Birmingham and Solihull were in Sutton New Hall (19.65%) and Knowle (13.63%).
respectively. None of the selected wards in Birmingham had levels of limiting long-term illness below the national, regional or local authority averages.

**Figure 5-15 Percentage of People Reporting at Least One Limiting Long-term Illness (2001)**

![Graph showing percentage of people reporting at least one limiting long-term illness by ward.](Source: ONS, Census 2001)

**Chronic Sickness and Limiting Long-term Illness**

5.62 Although data was not available for the units of analysis for the HIA, the data within Figure 5-16 provides us with an indication of the relative levels of chronic conditions, by sex and condition group, experienced by those reporting limiting long-term illness.

**Figure 5-16 Chronic Illness: Rate per 1000 Reporting Longstanding Condition Groups, by Sex (Great Britain, 2005)**

![Graph showing rate per 1000 reporting longstanding condition groups by sex and condition group.](Source: HSE, 2005)

**Self-reported Acute Sickness**

5.63 Table 9-4 includes data on the self-reported acute sickness by region and sex. Based on this data, the percentage of men (17%) and women (21%) who reported acute sickness was highest in the West Midlands region compared to 15% (men) and 18% (women in
England. However, the severity of illness (mean number of days) for men (8.2 days) and women (7.9 days) in the West Midlands region was 5th highest compared to the nine regions in England.

**Cardiovascular Disease (CVD) – England and the West Midlands**

5.64 Rates of CVD increase with age for both sexes with the large majority of incidence occurring amongst people over the age of 54. The prevalence of CVD is increased between the years of 1994 and 2003 within England.

5.65 Among men aged 35 and over in England as a whole, 18% reported any CVD condition. CVD in the West Midlands (20.1%) was higher than the England average and joint highest regionally; Yorkshire and the Humber had the same rate. Similar geographic differences in the distribution of Ischaemic Heart Disease (IHD) or stroke were also seen (HSE, 2003). Rates of any CVD condition amongst women in the West Midlands were 17.7% and third highest nationally and also higher than the England average (16.5%).

**Mental Health**

5.66 It is difficult to measure mental health or ill health at a community or Local Authority level, and to compare one area with another. As such a range of mental health data has been drawn on, including suicide rates, self-reported mental health, mood and anxiety disorders. Further explanation of mental health statistics is provided in the appendix.

**National Suicide Rates**

5.67 The suicide rate in England and Wales 2003-2005 (pooled) was 17.6 suicides per 100,000 population for males and 5.5 per 100,000 for females. Almost three-quarters of suicides were among men. The all person suicide rate was 11.4 per 100,000 population.

5.68 The rate of suicide in Birmingham was 12.9 per 100,000, higher than the West Midlands rate (11.7 per 100,000) and much higher than the rate in Solihull (7.5 per 100,000). The West Midlands rate was third highest by region in England.

**Self-reported Psychosocial Health, by Age and Sex (West Midlands)**

5.69 In 2003 11% of men and 14% of women in the West Midlands had a high General Health Questionnaire score for mental health domain questions (4+). This is similar to the national levels (11% and 15% respectively).

**IMD Sub-domain - Adults Under 60 Suffering from Mood or Anxiety Disorders**

5.70 This is one of the indicators from the ‘Health Deprivation and Disability Domain’ and measures the proportion of adults under 60 suffering from mood or anxiety disorders in each area. This is a composite indicator that includes; prescription data, secondary care data, health related benefits and suicide. The data presented is a derived score rather than actual rates. The value 0 is approximately the average proportion across all Super Output Areas (SOAs) in England. Figure 5-17 shows the range of values for the SOAs within each ward.
Local Authority Level Data on Mental Health

5.71 As with the other mental health indicators, the DoH Local data (2007) (Figure 5-18) shows lower than average levels of psychological morbidity, based on benefit claimants, in Solihull than in England and significantly higher levels of morbidity in the more economically deprived Local Authority of Birmingham.

Disease Prevalence

5.72 Quality and outcomes framework data covers 99.6% of GP registered patients in England and although it has some of the inherent weaknesses of all morbidity and General
Practitioner data, it is a useful source of crude morbidity prevalence data. A number of the traditional issues of GP data reliability have been overcome by the use of ICT systems and the monitoring of data coding within practices. PCT level QoF prevalence data for CHD, stroke and transient ischaemic heart attack and asthma is shown in Figure 5-19 to Figure 5-21.

Figure 5-19 CHD Unadjusted Disease Prevalence (April 2004 – March 2005)

5.73 Birmingham East and North PCT (BEN PCT) now cover the wards in Birmingham considered by the HIA. BEN PCT was formerly made up of North Birmingham PCT and Eastern Birmingham PCT. North Birmingham PCT covered some of the most affluent wards in Birmingham and the West Midlands. The normal association between poor health status and deprivation are not evident from the QoF data on CHD and stroke and transient ischaemic heart attack prevalence. However, it should be noted that this data has not been standardised for the differences in age structure that exist between these areas, and that age is a major factor in the prevalence of these conditions.

Figure 5-20 Stroke and Transient Ischaemic Attack Unadjusted Disease Prevalence (April 2004 – March 2005)
Road Traffic Accidents Casualties
5.74 Figure 5-22 show data on the numbers of road casualties in the West Midlands, Birmingham and Solihull in 2005 and 2006. According to Mott MacDonald (2007) in 2006 the total number of people in the West Midlands injured in accidents was 11,587, a 5.1% decrease on the previous year; a similar pattern can be seen in Birmingham (-5%) and Solihull (-3.79%). However, the number of fatalities in the West Midlands increased by 17.2% to 102. The number of Killed or Seriously Injured (KSIs) increased by 1.0% to 1,142. The number of slight casualties in the West Midlands in 2006 fell by 5.7% to 10,445 from the previous year; a similar pattern can be seen in Birmingham (-4.9%) and Solihull (-3.7%).

Life Expectancy
5.75 Figure 5-23 contains local authority level life expectancy data for Birmingham, Solihull and comparison areas. This data, together with the data on deprivation illustrates the association between geographic location, deprivation and life expectancy; with higher life expectancies being found in the relatively affluent area of Solihull and lower life expectancies being found in the more deprived area of Birmingham. It should be noted that variations in
deprivation and life expectancies exist at more local levels and that not all people living in deprived areas will themselves be deprived. Figure 5-24 contains information on local level variations in life expectancy.

Figure 5-23 Life Expectancy at Birth (years) 1999-2003

![Bar chart showing life expectancy for males, females, and all persons in various areas.]

(Source ONS, Census 2001 Experimental Statistics)

Life Expectancy by Ward
5.76 Figure 5-24 shows the variations in life expectancy that exist at ward level within Birmingham and Solihull (selected wards). There is a 6.1 year difference for males and 5.8 year difference for females between the lowest (Washwood Heath) and Highest (Sutton New Hall) life expectancies in the (available) wards in Birmingham that are considered within the HIA. According to Solihull Care Trust (2006) Solihull has the greatest polarity of any English local authority; this is evident from the ward level life expectancy statistics. There is a 8.5 year difference for males and 8.3 year difference for females between the lowest (Fordbridge) and Highest (Knowle) life expectancies in the (selected) wards in Solihull that are considered within the HIA.

Figure 5-24 Life Expectancy (selected wards) (1999 to 2003) (2001 Census Wards)

![Bar chart showing life expectancy for men and women in various wards.]
Mortality

Mortality – All Causes

5.77 Figure 5-25 contains Directly age Standardised Rates (DSR) of mortality from all causes for Birmingham, Solihull, the West Midlands and England. Table 9-2 contains the associated data together with the actual numbers of deaths (OBS). The DSR represents the number of deaths from all causes per 100,000 (standardised) population. The highest all persons rate was in Birmingham (712.18) followed by the West Midlands (660.3) and England (633.46) averages, the Solihull rate (557.1) was lowest. Males have far higher all cause mortality rates than females at all geographic levels.

Figure 5-25 Mortality from All Causes, All Ages, Directly age-Standardised Rates (DSR) 2003-05 (Pooled). Deaths per 100,000 European Standard Population.

Mortality – Coronary Heart Disease (CHD)

5.78 Figure 5-26 contains Directly age Standardised Rates (DSR) of mortality from CHD for Birmingham, Solihull, the West Midlands and England. The DSR represents the number of deaths from CHD per 100,000 (standardised) population. The highest all persons rate was in Birmingham (130.14) followed by the West Midlands (113.41) and England (110.07) averages. Deaths from CHD were lowest in Solihull (98.97). Males have far higher CHD mortality rates; the rates for men were more than double that of women at all geographic levels. Data on death rates from CHD amongst people aged under 60 years is shown within Figure 9-2.
Conclusion

5.79 The area surrounding the airport is a culturally diverse where resources are targeted in order to reduce inequalities and improve the health and well-being of the population.

5.80 The profile presents a range of existing data from secondary sources for indicators of relevance to the wider determinants of health and this HIA in particular. It is therefore unsurprising that the profile reflects patterns of relative affluence and deprivation as described in other summary documentation, e.g. the Department of Health Community Health Profile (www.communityhealthprofiles.info) and Annual Public Health Reports.

5.81 The Profile uses ward level data (generally the lowest geographical level published in public health literature) where available to describe the characteristics of the wards surrounding the airport. Lower geographical levels of analysis (output areas) are coming into usage which better describe discreet communities and so identify local “hotspots” (such as Shard End), but as yet not all datasets can be manipulated at this level, making comparison and interpretation of change over time problematic.

5.82 It is clear from the profile that the wards at the north end of the runway experience high levels of deprivation, with a population profile that suggests its residents are among those experiencing some of the worst health in the area. This makes the residents of these wards particularly vulnerable to any negative health impacts of the development. Correspondingly positive benefits could be most usefully targeted here to address existing health inequalities.
6 Health impacts

Introduction

6.1 This section describes the evidence of potential health impacts from the proposed runway extension that has been collected from different data sources. The data sources include other impact assessments, the literature, ‘key informants’ (experts or specialists in a specific policy field such as noise and health), and ‘stakeholders’ (individuals or groups who have a stake in the policy or project under investigation). For convenience the evidence of impacts are described under the following health determinant headings:

- Transport
- Employment and the economy
- Social capital
- Air quality
- Noise
- Climate change
- Other impacts

Transport

Evidence from other impact assessments

6.2 York Aviation (YALL, May 2007) have produced air traffic forecasts for the proposed runway extension. YALL used Department for Transport forecasts to 2020 for different service carriers and routes, and extrapolated these forecasts to 2030 based on key assumptions. In addition, Arup have undertaken a Transport Assessment (TA) (December 2007) which describes the policy context, current transport data for private and public road traffic as well as for walking and cycling, and the assessment of future scenarios with and without the runway extension at certain time points, predominantly 2012, 2022 and 2030.

6.3 YALL’s forecasts for aircraft traffic movements (ATMs) are in Table 6-1:

<table>
<thead>
<tr>
<th></th>
<th>2006</th>
<th>2012</th>
<th>2022</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>No runway extension</td>
<td>109,194</td>
<td>145,004</td>
<td>169,119</td>
<td>188,563</td>
</tr>
<tr>
<td>Runway extension</td>
<td>109,194</td>
<td>148,001</td>
<td>181,791</td>
<td>205,400</td>
</tr>
</tbody>
</table>

Source: York Aviation LLP

6.4 In addition YALL prepared forecasts with additional scenarios including ATMs for ‘environmentally constrained’ conditions – a lower growth forecast based on environmental charges imposed on aviation in general – which gives ATMs with a runway extension of 143,795, 169,459 and 185,500 at 2012, 2022 and 2030, respectively. Forecasts for environmentally constrained and low GDP growth had even lower levels of ATMs.

6.5 Air Passenger transport forecasts for the same scenarios are provided in Table 6-2:
Table 6-2 Air Passenger forecast summary

<table>
<thead>
<tr>
<th></th>
<th>2006</th>
<th>2012</th>
<th>2022</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>No runway extension</td>
<td>9,056,000</td>
<td>12,438,000</td>
<td>18,393,000</td>
<td>23,337,000</td>
</tr>
<tr>
<td>Runway extension</td>
<td>9,056,000</td>
<td>13,079,000</td>
<td>20,939,000</td>
<td>27,189,000</td>
</tr>
</tbody>
</table>

Source: York Aviation LLP

6.6 There were similar reductions in passenger numbers for environmentally constrained models: 12,725,000, 19,470,000 and 24,479,000 at 2012, 2022 and 2030, and even lower levels for environmentally constrained and low GDP.

6.7 Ultra high growth is expected to 2015 on long-haul routes to the Middle East, Indian sub-continent and China, followed by high growth. However growth in short-haul routes is also expected, especially by Lost Cost Carriers. Associated with the increase in passenger numbers and long-haul flights, YALL define a potential shift in aircraft type from the small turboprops to the larger B737/757/767/777.

6.8 The TA has defined targets (Table 6-3) for the modal share of public transport with the runway extension based on the successful implementation of the BIA Travel Plan.

Table 6-3 Public Transport mode share targets (including walking and cycling)

<table>
<thead>
<tr>
<th></th>
<th>2006</th>
<th>2012</th>
<th>2022</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employees</td>
<td>23.2%</td>
<td>25%</td>
<td>30%</td>
<td>35%</td>
</tr>
<tr>
<td>Passengers</td>
<td>21.7%</td>
<td>25%</td>
<td>30%</td>
<td>35%</td>
</tr>
</tbody>
</table>

Source: Ove Arup, 2007b

6.9 Using indicators including passenger forecasts, flight schedules, aircraft type, the TA has estimated the number of passenger-generated road trips as a result of the runway extension, taking into account modal shifts to public transport. The forecast passenger vehicle trips for private transport including taxis during the peak morning (8-9 am) and evening (5-6 pm) periods are described in Table 6-4:

Table 6-4 Air passenger person trips by vehicle forecasts for AM and PM peaks

<table>
<thead>
<tr>
<th>Passengers</th>
<th>2006</th>
<th>2012</th>
<th>2022</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM</td>
<td>PM</td>
<td>AM</td>
<td>PM</td>
<td>AM</td>
</tr>
<tr>
<td>No runway extension</td>
<td>1348</td>
<td>1644</td>
<td>2755</td>
<td>3070</td>
</tr>
<tr>
<td>Runway extension</td>
<td>-</td>
<td>-</td>
<td>2932</td>
<td>3096</td>
</tr>
</tbody>
</table>

Source: Ove Arup, 2007b

6.10 The TA also forecasts BIA employee-generated trips for the with/without runway scenarios which assumes the mode share of public transport defined above (Table 6-5).
Table 6-5 Employee trips by vehicle forecasts for AM and PM peaks

<table>
<thead>
<tr>
<th>Employees</th>
<th>2006 AM</th>
<th>2006 PM</th>
<th>2012 AM</th>
<th>2012 PM</th>
<th>2022 AM</th>
<th>2022 PM</th>
<th>2030 AM</th>
<th>2030 PM</th>
</tr>
</thead>
<tbody>
<tr>
<td>No runway extension</td>
<td>328</td>
<td>353</td>
<td>435</td>
<td>469</td>
<td>644</td>
<td>694</td>
<td>817</td>
<td>880</td>
</tr>
<tr>
<td>Runway extension</td>
<td>-</td>
<td>-</td>
<td>458</td>
<td>493</td>
<td>684</td>
<td>737</td>
<td>850</td>
<td>889</td>
</tr>
</tbody>
</table>

Source: Ove Arup, 2007b

6.11 Additional forecasts have been produced for bus, rail, coaches, walking and cycling trips. Cycling and walking are expected to increase by nearly three times in 2030 with 63 and 68 trips in the am and pm peak periods.

6.12 By considering the displacement from other airports the impact of vehicle travel on highways and local road networks associated with the runway extension has been determined in the TA. On junction 6 of the M42, the analysis forecasts an additional 126 (1.5%) road vehicles in the 2012 am peak hour flow and 34 (0.4%) vehicles in the 2012 pm peak hour flow as a result of the runway scenario. By 2017, 185 additional vehicles (2%) are forecast in the am peak hour flow and 239 (2.7%) in the pm peak hour flow. This runway associated road traffic growth is against an expected 36%/26% am/pm peak hour growth at junction 6 of the M42 between 2006 and 2017. No data on the 2022 and 2030 scenarios were available. At the Stonebridge Roundabout, the TA forecasts a runway associated road traffic growth of 0.1% between 2006 and 2017. No data were available on 2022 and 2030 scenarios. Similarly, in the A45 Coventry Road/Damson Parkway junction the TA forecasts a runway associated road traffic growth of 0.1% between 2006 and 2017; this is expected to increase to 0.4% and 0.6% in the am/pm peak periods by 2022 against a background growth of 17.3% for the same period. No data were available on the 2030 scenario.

6.13 Congestion, or the average delay per vehicle on the M42 at junction 6, is expected to increase to 118 seconds in the am peak period by 2012; this is predominantly due to background traffic growth, the runway is said to contribute very slightly to this. By 2017 the delay time doubles to 147 seconds. The pm peak period delays are significantly lower. The delays on Damson Parkway attributed to the proposed runway are reported to be much less – 18 seconds in the am peak and 5 seconds in the pm peak in 2012 and less than this in 2017. There was no specific analysis on the affects of construction traffic or works on the network, including vehicle delays and congestion.

**Evidence from the Literature and key informants**

6.14 Strong evidence (level II) from the literature defines the health effects of transport, air and road, associated with airport operations (Health Council of the Netherlands, 1999). These health effects are mediated through their direct and indirect impacts on key health determinants:
6.15 Evidence on the effects of each of these factors on health in the context of air and/or road transport will be presented later in this section.

6.16 In addition to the effects from normal airport operations, there is also the abnormal or ‘disturbed’ operation of airport systems, when accidents may occur. There are various categories of accidents due to airport operations; this review will focus on the risk to third party safety, that is, the effects on people in the vicinity of the airport from aircraft accidents during landing or take off. The review will also consider other accidents associated with airport operations and road traffic around the airport. The health effects of these accidents are loss of life and injuries.

**Aircraft accidents**

6.17 In the EU-25, there has been an average of 6 accidents and 91.4 on-board fatalities per annum since 1997; in the period, 2000-2005 there were less than 2 accidents per million flights involving fatalities (EASA, 2007). In the UK between 1992 and 2001 there was 1 fatal accident in the UK involving 16 passenger and crew fatalities (4 injuries); during the same period there were 2 third party injuries (CAA, 2002). Over the last 50 years, aviation safety in the UK has dramatically improved with over 4000 million kilometers flown or nearly 3,700,000 flights per fatal accident (CAA, 2003). Although aircraft accident rates decreased with the introduction of the jet aircraft, there is evidence that the risk of an aircraft accident occurring is levelling off (Health Council of the Netherlands, 1999). The majority of accidents involving fatalities occurred during the parked/taxiing/take off period (43%) and landing (47%); similarly different aircrafts and air operators have different accident rates, e.g., data from 1959 indicate F-28, 707/720 and DC8 having the highest fatal accident rates. Various other factors have been shown or are likely to influence the accident rate, e.g., construction, maintenance, cargo and weight of the aircraft and air traffic control and guidance systems. The ‘safety culture’ in the various organisations associated with aircraft flying, maintenance and processing has been said to be ‘paramount’. Similarly the availability and preparedness of the emergency services will affect the scale and consequence of any accident. However it is noted that the commercial aircraft accident rates worldwide are higher than in the UK or EU. In the last 10 years there have been a total of 552 accidents worldwide, 89 involving 5,149 onboard and 249 external fatalities, giving a 10 year accident rate for the total commercial jet fleet of 1.2 per million departures (Boeing, 2007).

6.18 Hillestad (1993) estimated 40 third party fatalities per year worldwide associated with aircraft accidents between 1970 and 1992; data over the last 10 years indicates that this rate is reducing closer to 25 third party fatalities per annum worldwide. In addition there is a range of aircraft accident categories some of which have greater consequences for third party fatalities, e.g., ‘runway excursions’ and mid air/near mid air collisions.
6.19 Assessing the risks of accidents has involved three steps:

- Assessing the probability of a crash
- Assessing the geographical distribution of a crash
- Assessing the consequences of a crash

6.20 Historical data have been used to assess crash risks, however there are still many uncertainties in doing this, e.g., not enough is known about the frequency of flights of a certain type or the accident consequences of certain materials. Fundamentally, it is not known if accident risk rates will reduce further through new generation aircraft models, safety systems and the operation of these.

6.21 Third party risk is usually described in terms of individual risk; this is the probability that a person will die from an accident per year if he or she stays at a given location 24 hours per day, day in day out. In the UK the maximum tolerable level of individual third party risk of being killed from an aircraft accident is 1 in 10,000 per year. Public Safety Zones (PSZ) have been designated around the ends of runways at the busiest airports to protect against accidental injury associated with aircraft take off and landing. These PSZ have been created by modelling accident and individual risk data around the airport; they correspond essentially to the 1 in 100,000 risk contours and have been developed for each airport considering the number and types of aircraft movement to 2015. Figure 6.1 shows the individual risk contours for Birmingham International Airport in 1997 undertaken on behalf of the Department of Transport (Evans et al, 1997). In the Netherlands, a Government policy has been adopted to reduce the number of people exposed to individual risks higher than 1 in 100,000 ($10^{-5}$) (Ale & Piers, 2000). In addition, the sum total of the individual risk at the location of each dwelling within the $10^{-6}$ and $10^{-5}$ bands may not increase.

6.22 In 2002, the Department for Transport published policy guidance to control development in airport PSZ so that the number of people living, working or congregating in these areas is reduced. At BIA in 1997 there were no households in the $10^{-4}$ risk band, 40 households (102 people) in the $10^{-5}$ and $10^{-4}$ bands, and 1294 households (3136 people) in the $10^{-6}$ and $10^{-5}$ bands (Evans et al, 1997). The PSZ were required to be remodelled every 7 years, and where a runway was extended or a landing threshold moved. New PSZ (Figure 6.2) have been developed to the north and south of the runway for the proposed runway extension to 2030, which corresponds to 10-5 third party risk contours, and prevent new or replacement developments; however the number of existing properties or households affected compared with the 2015 risk contours is not defined. If there are no additional properties/households in the new $10^{-5}$ risk contours, the potential number of casualties in any incident will be maintained.

6.23 For large airports with between 300,000 and 1 million ATMs per year it has been estimated that there is an average crash rate of between 1 and 2 crashes per decade; in 1992, for Amsterdam Schipol RAND estimated an average of 5 third party fatalities every 10 years.

6.24 Although the probability of airport crashes is low and contributes very slightly to the mortality risk of the population in the vicinity of an airport, when they do occur they have a
high impact for on board fatalities and to a lesser extent external, third party casualties. However, the fact that aircraft accidents have such a catastrophic potential makes third party risks particularly dreaded and exaggerates the risk levels. This heightened perception of the accident risk may contribute to anxiety and interact with other public health impacts of an airport.

Figure 6-1 Individual risk contours at Birmingham Airport (1997)
Other accidents

6.25 There are limited data available on non-aircraft accidents, e.g., accidents during fuelling operations. However it has been commented on that in the Netherlands the level of risk people are exposed to from airport operations is higher than considered acceptable for industry, e.g., chemical installations (Ale & Piers, 2000) (Figure 6.3). In addition, the risk of such accidents and their management need to be considered in light of the lessons from other major incidents such as at the Buncefield oil storage depot; the Buncefield Major Investigation Board made specific recommendations concerning the design and storage of fuel storage sites following their investigation (Buncefield Board, 2006, 2007). Expert opinion stresses the importance of the preparedness of local emergency services in dealing with a major incident as vital in minimizing the consequences of such an event.
6.26 Hazardous operations may be carried out in businesses in an airport operations system, directly or indirectly related to the airport activities. It is possible to estimate the accident risk associated with these operations in specific cases. Expert evidence suggests some airport occupational hazards similar to types of industrial activities.

6.27 Evidence of the relative risk of different modes of transport in the European Union, expressed in casualty rates per 100 million passenger or vehicle kilometers (Table 6-6) shows that road transport has the greatest risk of fatality (ETSA, 1999).

Table 6-6 Fatality risks by mode of travel

<table>
<thead>
<tr>
<th>Transport mode</th>
<th>Fatality per 10^8 person km</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road</td>
<td>1.1</td>
</tr>
<tr>
<td>Rail</td>
<td>0.04</td>
</tr>
<tr>
<td>Ferry</td>
<td>0.33</td>
</tr>
<tr>
<td>Air</td>
<td>0.08</td>
</tr>
</tbody>
</table>

Source: ETSA, 1999

6.28 Other evidence shows that Great Britain has one of the lowest road accident and casualty rates, with 37 accidents and 51 casualties per 100 million vehicle km in 2006 (DfT, 2007). The known risk factors associated with road accidents include vehicle speed, road type, traffic mix, vehicle type, especially mass and design, weather conditions, time of day, and personal risk factors such as alcohol or substance use. Particularly vulnerable road users are motorcyclists, cyclists and pedestrians. Most (about 65%) road accidents occur in urban areas (A, B & C roads) with 4-5% on motorways (DfT, 2007; Health Scotland, 2007; WHO, 2000).

6.29 Expert opinion does not consider that road traffic accidents around an airport will differ significantly from other areas with intensive traffic; the importance of modal
shifting from road to public transport was particularly emphasised as a means to reduce the impact of airport-related road traffic impacts.

**Evidence from Stakeholders**

**Impacts and concerns**

6.30 Issues with road traffic associated with the airport were consistently raised by community stakeholders in each of the four workshops held in September; the consensus-building workshop in November raised traffic impacts as one of their top three priorities.

6.31 There was a general awareness of the consequences of road traffic-related air and noise pollution on their health. There were concerns that with the runway extension the additional passengers would result in significant additional road traffic and congestion on a road network that was judged as already ‘stretched’ and the additional risk of accident.

6.32 The close proximity of the airport to other high-traffic venues and areas was seen to exacerbate congestion issues, with impacts on commuters, and businesses as well as local residents.

6.33 Issues with the phasing of other developments, e.g., at the NEC, M42 and business park, at the same time as the airport were commented on. Some also identified the potential of added disruption to traffic during the construction of the runway and the diversion of the A45 and the development of possible ‘rat runs’ through residential areas as road users try to find alternative routes. The compromise to safety with the additional traffic was identified as one of the factors deterring walking and cycling.

6.34 Public transport currently was seen as inadequate by community stakeholders with, e.g., restricted bus services and baggage limits for rail users.

6.35 Organisational stakeholders also shared some of the concerns regarding road traffic, congestion and the anxiety and stress this can cause; however there was a view that the contribution of airport-related traffic to this was seen as higher than it actually was by local communities.

6.36 However it was also acknowledged that the timing of peak road traffic may be added to by peak airport and NEC associated traffic occurring during morning and evening rush hours.

6.37 Improving the modal split of transport to public transport was seen as really important by organisational stakeholders; the successful Transport Innovation Fund bid was also seen as another way to increase public transport use via the proposed light rail scheme and reduce congestion on key traffic routes around the airport.

6.38 Safety issues were also raised by some community stakeholders. These issues focused on two main concerns: the increased risk of aircraft crashes if the runway was
extended and how the relocation of the fuel depot with the runway extension may affect the risk of accidents. In relation to this housing under development and some schools close to the proposed runway extension were seen as particularly vulnerable.

**Differential impacts**

6.39 The negative effects of air and road traffic (exposure to accidents and pollutants) disproportionately affect people from low incomes, deprived neighbourhoods and children. In addition, people on low incomes are less likely to benefit from the positive effects of transport – access to people and places – as they are less likely to have access to a car or to afford air travel.

**Employment and the economy**

**Evidence from other impact assessments**

6.40 The Economic Impact Assessment (EcIA) (York Aviation, December 2007) defines the current context in relation to economic strategy and performance at regional and sub-regional levels and forecasts the potential employment and income impacts, the economic costs and benefits and wider economic impacts resulting from the runway extension proposal. In particular it emphasises the decline in the West Midlands manufacturing base with just over 15% of employment in the manufacturing sector in 2005 down from 20% in 2001, although this is said to be at a higher level than Great Britain as a whole at just over 11%, reflecting its importance to the regional economy. The growth in the service sector has helped to counter balance this trend with nearly 79% of people being employed in this sector in 2005 compared to 68% in 1995. In addition it refers to the significant growth in ‘business-related tourism’ from, for example, the National Exhibition Centre (NEC) and International Convention Centre (ICC).

6.41 The EcIA reports the levels of unemployment in local authority districts, travel-to-work areas in the BIA catchment area and the region in 2007; this shows higher levels of unemployment (3.3-4.4%) in 4 of the 5 travel-to-work areas than the regional and national rates of 3.2% and 2.4%, respectively. It suggests that ‘there are localised pockets of unemployment’. If figures for people of working age unable to work due to ill health were included, these rates would be even higher.

6.42 The EcIA states that: 
‘…greater orientation towards services and advanced manufacturing sectors makes [the regional economy] more ‘global’ in its outlook and has a heightened propensity to use air services. As a result BHX [BIA] has heightened importance for the future growth of the region’.

6.43 Economic forecasts to 2020 have West Midlands’ Gross Value Added of 2.4% per annum with employment up by 0.3% per annum; both of these rates are slightly below the UK average of 2.6% and the proposed runway extension is seen as important in driving economic development. However, regional economic prospects are also seen to underpin the future success of BIA, and ‘its ability to generate demand for air travel’.
There is therefore a reciprocal relationship – growth dependent on air travel and BIA dependent on growth.

6.44 The EcIA then quantified the benefits – journey time savings, air fare savings, Government revenue, producer (BIA) benefits – and costs – construction, aircraft emissions, surface access emissions – from 2006 to 2052 in relation to the runway extension proposal.

6.45 The key findings from the EcIA are as follows:

Cost-benefit analysis (CBA)

| For the period 2006 to 2052 it has been estimated that the runway extension project will generate total discounted benefits of £2.211 billion (at 2006 prices). The discounted value of the costs associated with the project is estimated at £1.659 billion. The net value of the project is therefore £553 million. The benefit-cost ratio for the project is therefore, 1.33. |

Wider economic benefits

<table>
<thead>
<tr>
<th>The main wider economic benefits from the runway extension project (not included in the CBA) were defined as:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Catalytic impact – extending economic opportunities, e.g., influencing company location (including from overseas), export success, competitiveness, inbound tourism;</td>
</tr>
<tr>
<td>• Business impacts – economic importance of long haul services for ‘connectivity’ to important, emerging international markets, e.g., in the Far East for businesses, their partners and suppliers;</td>
</tr>
<tr>
<td>• Inward investment – economic importance of long haul services for increasing West Midlands’ competitiveness;</td>
</tr>
<tr>
<td>• Inbound tourism – economic importance of long haul services for increasing tourism-related trips and expenditure;</td>
</tr>
<tr>
<td>• Journey time and air fare savings for ‘stimulated’ passengers – economic benefits at alternative airports where new passengers replace those displaced to BIA;</td>
</tr>
<tr>
<td>• Regional economic ‘connectivity’ – links between West Midlands and global economic centres, contributing to elevating Birmingham’s ‘Global and World Cities’ ranking.</td>
</tr>
</tbody>
</table>

6.46 Additional benefits not calculated in the EcIA included health and health-related benefits from employment.

Wider economic costs

<table>
<thead>
<tr>
<th>The wider economic costs from the runway extension project not included in the CBA are as follows:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Aircraft noise – property devaluation based on noise exposure;</td>
</tr>
<tr>
<td>• Air quality and health impacts – NO2 emissions and the associated health effects of exposure.</td>
</tr>
</tbody>
</table>

6.47 Additional costs not considered in the EcIA included BIA’s noise violation penalties, sound insulation and vortex schemes, the health and health-related costs associated with noise exposure, e.g., educational underperformance, NHS costs, outbound tourism, e.g., decreasing trips and expenditure in the West Midlands.
6.48 The EcIA predicted job gains and losses, as well as analysing the Gross Value Added, resulting from the proposed runway extension.

6.49 In the **West Midlands region**, it has been estimated that the proposed runway extension would support approximately 13,430 FTE jobs in 2012 and generate approximately £400 million of income (2006 prices), rising to 17,630 FTE jobs and £568 million of income in 2022, and then to 19,090 FTE jobs but with income rising to £824 million in 2030.

6.50 Compared to a ‘no runway extension’ scenario there will be a net employment gain of 1,910 FTE jobs in 2022 in the former County of West Midlands rising to 2,440 in 2030 with a net annual income of £61 million (at 2006 prices) in 2022 across the former County of West Midlands rising to £92 million by 2030 (Table 6-7).

### Table 6-7 Net employment and income impacts of the proposed runway extension

<table>
<thead>
<tr>
<th>Employment (FTE jobs)</th>
<th>2012</th>
<th>2022</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birmingham</td>
<td>+80</td>
<td>+320</td>
<td>+410</td>
</tr>
<tr>
<td>Solihull</td>
<td>+370</td>
<td>+1440</td>
<td>+1840</td>
</tr>
<tr>
<td>Former County of West Midlands</td>
<td>+490</td>
<td>+1910</td>
<td>+2440</td>
</tr>
<tr>
<td>West Midlands region</td>
<td>+510</td>
<td>+2040</td>
<td>+2610</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Income (£ million)</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Birmingham</td>
<td>+7</td>
<td>+36</td>
<td>+54</td>
</tr>
<tr>
<td>Solihull</td>
<td>+3</td>
<td>+13</td>
<td>+20</td>
</tr>
<tr>
<td>Former County of West Midlands</td>
<td>+12</td>
<td>+61</td>
<td>+92</td>
</tr>
<tr>
<td>West Midlands region</td>
<td>+15</td>
<td>+74</td>
<td>+113</td>
</tr>
</tbody>
</table>

*Source: YALL, December 2007*

6.51 In addition it is estimated that the capital programme associated with the proposed runway extension will support 370 FTE jobs and generate £8.2 million income (2006 prices) in the West Midlands region.

6.52 In addition to this, however there was an assessment of the businesses and properties that will be affected by the land take in the development of the runway extension. From this, it has been estimated that by 2012 approximately 30 FTE jobs may be lost due to this with an associated loss of income of approximately £0.8 million.

### Evidence from the Literature and key informants

**Aviation, the economy and employment**

6.53 There is some evidence from the literature (OEF, 1999) that economic growth would be inhibited by restricting air travel; it has been estimated that aviation growth in the last 10 years was worth £550 million per annum to the economy. In addition, if air travel was restricted to 3.5% per annum as opposed to the predicted 4.0% it is estimated this would reduce UK GDP by 2.5% by 2015. However, there was less conclusive evidence from the SACTRA report (DfT, 1999) which analysed the effect of transport on the economy. This indicated that although there was an association with traffic flows and economic growth, evidence that this was a causal relationship was weak; furthermore, the report emphasised that where the links are between areas of
different levels of competitiveness there were likely to be winners and losers with employment flowing to the most competitive area. In addition the report defined the need to consider environmental costs and benefits as part of any economic assessment.

6.54 Although all of the four UK HIAs of airport developments examined identified local economic and employment growth as potential benefits to health, there was no evidence available from key informants involved in two of these HIAs on the actual effects of these developments on either employment or economic development. Both HIAs had identified employment as a positive impact for local economies and labour markets and had used Section 106 agreements (TCPA, 1990) to ensure job opportunities benefited local people through local labour agreements as a Planning Obligation. One key informant was unclear whether this was being monitored. The other key informant indicated the difficulty in getting data from the airport operator to monitor the uptake of direct employment opportunities by local people in spite of the inclusion of this in the Section 106 agreement.

Employment and health
6.55 There is a body of knowledge that shows higher levels of employment leads to better health of the population. For example a study on the impact of unemployment rates on mortality in European Union (EU) countries showed a clear decline in mortality with increases in employment (Brenner, 2002). Employment also benefits mental health, for example through social interactions and involvement in a collective effort. In general being in work is better for health than having no job; however there do seem to be exceptions to this rule. Some work characteristics can be as damaging to health as unemployment. Workers in jobs that are poor quality, low paid and precarious (insecure) have similar health scores to the unemployed (Burchell, 1996).

6.56 There is an extensive evidence-base, underpinned by long-standing surveillance systems, which shows the relationship between different occupations, exposure to physical and chemical work hazards and risks to health. From the evidence, workers in the construction industry are known to have a higher than average prevalence of work-related ill health, e.g., musculoskeletal disorders (HSE, 2007), and are more at risk of workplace death and injuries, e.g., falls from height (Davies & Jones, 2005). There is also evidence of the differential distribution of health effects according to occupation, skill level, contract type, hours worked, gender, age and ethnicity. In the case of construction work, construction labourers and tradespeople were still identified as the most at risk occupations even after adjusting for risk differentials such as personal and work factors; the adjusted relative risk for construction labourers was 231 (Davies & Jones, 2005).

6.66 In the U.K, health problems most commonly associated with work are:

- Musculoskeletal disorders (MSD)
- Psychological disorders
- Injuries from accidents at work
6.67 In addition to specific occupational risk factors, there is also a growing literature on the relationship between the psychosocial work environment and employee health which transcends occupations (e.g., Ferrie et al, 2002; Marmot et al, 1997).

Research has shown the psychosocial work factors that affect health include:

- High demand, low control jobs – increased risk of cardiovascular disease in people with jobs characterised by low control
- High effort, low reward jobs – Increased risk of cardiovascular disease
- Anticipation of job loss or job insecurity – increase in psychological disorders (especially anxiety, depression), self-reported ill-health, cardiovascular disease and associated risk factors
- High levels of worker support - offset some negative effects of job insecurity

6.68 In general working conditions that are low control and make high psychological demands on workers ('job strain' model) have an increased risk of:

- Coronary Heart Disease (CHD)
- MSD
- Psychological disorders
- Sickness absence

6.69 These risks have been shown to be independent of individual psychological characteristics; high demand, low control work is more common with less skilled jobs and lower socioeconomic groups. It is believed that psychological factors at work may play an important part in the social gradient in ill health.

6.70 Specific ‘job strain’ work characteristics associated with health-related problems at work includes:

- Changing nature of work, e.g., labour market flexibility
- High levels of repetitive, stressful work
- Increased time pressures
- Increased work intensification
- Increased multi-skilling demands

6.71 There is evidence that when there is a perceived imbalance between individual effort and reward this results in emotional distress or ‘active coping’ characterised by feelings of anger, frustration and dissatisfaction; this in turn is associated with changes in the nervous and hormone systems (neuro-hormonal response). Studies have shown a two to six times increase in relative risk of cardiovascular disease and a 2.6 and 1.7 times increase in psychiatric risk for men and women, respectively (Stansfield et al, 1998).

6.72 Other health effects include:

- MSD
- Gastrointestinal disorders
- Fatigue
- Sleep disturbance
- Sickness absence
- Coronary restenosis (re-blocking of coronary arteries)

6.73 Trends in UK and EU employment show an increase in demand for labour market flexibility, e.g., part-time hours and fixed term contracts. There are physical and
psychological health effects associated with both ‘actual’ job insecurity, e.g.,
temporary/fixed term contracts, and ‘perceived’ job insecurity, e.g., loss of valued
features of a job. An increased use of health services has also been reported. Some
recent work indicates that the most acute deterioration in health status occurs when
employees move from secure to insecure jobs; these health effects are not mediated
by the normal ‘job strain’ main psychosocial work characteristics such as low control
suggesting that during organisational change a different type of ‘job strain’ model
applies compared with a stable state organisation.

6.74 Research indicates that the negative impacts on health from working conditions
and organisational change can be offset when workers are provided with information
and given the opportunity to discuss possible changes. However there is also inequity
in these opportunities with unskilled workers being least engaged in these exchanges.
It has also been found that social support in the workplace ameliorates the effects of
job strain.

6.75 It is clear that a healthy workforce is a key prerequisite for a productive, high
performing economy. Barriers to employment due to ill-health may vary with
occupational group; for example poor health in manual workers is seen as more of a
barrier to the labour market than poor health in non-manual workers. Although
evidence indicates unemployment is unlikely to be due to ‘direct health selection’, it has
been shown that ill health is a risk factor for initial job loss and subsequent re-
employment. Whereas unemployment levels in England fell and have now levelled off,
working age inactivity rates have shown flat trends followed by a recent rise. Incapacity
benefit (IB) has generally been available to people who have been unable to work for
28 weeks or more due to ill health or disability; levels have remained fairly static since
1999, but the new Employment Support Allowance (ESA) regime and ‘Pathways to
Work’ programmes are aiming to change this.

The economy and health
6.76 In the long term (over several decades) the health of populations improve with
economic development in a country. However, in the short to medium term (a few to
twenty years or so) there is mixed evidence regarding the relationship between
economic growth and health. For example, there is some evidence of the lagged
effects of the economy on mortality, with increases in mortality being produced by
recessions several years before (Brenner, 1995). More recently using a GDP-
unemployment model Brenner (2002) has predicted reductions in all cause mortality
over a 2 to 14 year period across the EU with increases in GDP and employment
related to an increase in per capita income. Other evidence (e.g., Granados, 2005;
Ruhm, 2005), however suggests that declining mortality and morbidity accelerate
during economic recession and level off or increase during economic growth. Different
effects have also been found on different social groups, ethnic groups, ages, men and
women; e.g., Granados (2005) showed that there were stronger effects for women and
the non-white population. Pathways postulated to explain this include both the material
and psychosocial effects of economic upturns: expansion of traffic and industrial activity
directly raising accidental injury rates and increasing exposure to work related hazards,
decreased immunity as a result of stress, reduced sleep, social support and interactions, and unhealthier lifestyles.

6.77 There is also evidence that countries of the same level of economic development achieve very different levels of life expectancy and child mortality; conversely countries with a much lower GDP per person have achieved a similar health status to much richer countries (Sen, 2001). Economic growth therefore does not automatically produce improved health.

6.78 Finally, to reiterate a point made above while economic development can improve health, improved health can promote economic development.

**Evidence from Stakeholders**

6.79 The employment and economy did not feature that highly in the workshops held for community members to discuss what they felt the potential impacts of the runway extension would be. However when they were mentioned, there were mixed views about the runway development’s contribution to the local economy and employment.

6.80 Some people felt that there may be benefits to the economy, whilst others felt that these benefits would be outweighed by the ‘tourism deficit’ and an acceleration of manufacturing decline in the region with the outflow of jobs to those parts of the world with cheaper production costs. The experience of car manufacturing at MG Rover, Longbridge being moved to Nanjing, China was cited as an example together with the growing trend for people in the UK to holiday abroad. In addition it was felt that any economic assessments should consider the full impacts of the runway development on environmental factors such as climate change. It was recommended that air travel subsidies should be removed to reflect the costs to the environment.

6.81 In discussions about the potential employment opportunities it was generally agreed that there would be job gains at Birmingham Airport as a result of the development; however there were a number of concerns associated with this. Firstly the jobs that would be created from the development were seen as low paid, poor quality, low skill jobs which were likely to be outsourced, contract work, e.g., baggage handlers. Secondly, the opportunities for local people were queried; there was a general perception that economic migrants, e.g., from Eastern Europe, would mostly benefit from these employment opportunities. It was felt that Local Labour Agreements were difficult to achieve but should be recommended to protect ‘local jobs for local people’.

6.82 In relation to employment opportunities not directly associated with the airport runway extension, there were also concerns that there was a skills deficit in the local population that would prevent local people from taking up the ‘high tech’ jobs that Advantage West Midlands were aspiring to develop. Similarly, entrepreneurial capacity development was said to be ‘one step removed’ from local communities. It was recommended that more should be done to prepare and facilitate this, e.g., with further apprenticeship opportunities.
6.83 Organisational stakeholders were generally more positive about the potential economic and employment benefits from the runway extension development. A number of stakeholders saw the runway extension as key to the economic development of the Region, and Birmingham as a ‘world city’ and an advanced technological manufacturing base. They saw the economic benefits of not having to travel to more distant airports to fly directly to the emerging markets of the Far East and US. It was said that many businesses had attributed their growth and their increase in employees to BIA; however it was acknowledged that the ‘trickle down’ effect was not readily apparent. That is, the benefits to big business of economic growth was not seen ‘on your doorstep…with the shops making thousands of pounds more because of the airport…’. As such it was suggested that there is a gap between growth in economic wealth at regional or even individual business levels and at a community level, particularly to the north of BIA. Economic migration was seen as having positive effects on the economy by not only filling job vacancies but also through taxation. However, there were concerns that infra-structure developments, e.g., housing, may lag behind the needs of local people during the development adding to social tensions. Finally local skills gaps and the lack of competitiveness of the region were seen as barriers to communities benefiting from the growth associated with the runway development.

**Differential impacts**

6.84 Over the last 25 years or so there has been an ever expanding literature on the differences in health status between different socioeconomic groups due to differential exposure to various risk factors and conditions; the lower the social position the greater the exposure to health hazards such as low income, unemployment, work-related risk factors, poor quality housing, various pollutants. In addition it is likely that exposure to one risk factor is associated with exposure to others (Blane et al, 1997).

6.85 However, there are three consistent features of these health inequalities (Whitehead & Dahlgren, 2006):

- Health inequalities are not due to random variations but are systematic – morbidity and mortality increases with declining social position;
- Health inequalities are socially reproduced – social processes not biological determinants account for these differences – and are therefore modifiable. ‘No law of nature decrees that children from poorer families should die at twice the rate of rich families’
- Health inequalities are unjust.

6.86 Related to this, there is also evidence of clear labour market inequalities (LMI); e.g., in the UK people with disabilities and chronic health conditions, ethnic minority groups, lone parents, people with no qualifications, older people and women have lower employment rates than the working age population as a whole. There are also geographical LMI across the UK. Some of these groups have poorer health than the population as a whole according to a number of health measures, e.g., people who are chronically sick or disabled, Bangladeshis and Pakistanis, although as discussed above direct health selection is unlikely; as such there is a double disadvantage for these groups. In addition, there is some evidence that when employed these groups tend to be recruited into poor quality jobs – low pay, low skills, poor psychosocial and physical work environments, as well as being insecure.
**Social capital**

**Evidence from other impact assessments**

6.87 The ES (Ove Arup, October 2007) has included an assessment on the effects of the proposed runway development on communities proximal to the development. This study area was defined around Bickenhill Village and the A45/Coleshill Road corridor; the population affected being estimated at 586. The assessment considered the direct effects of the development on ‘community resources’, buildings (schools, hospitals and places of worship), open space (recreational and public rights of way) and private properties (homes and businesses).

6.88 The methodology and criteria selected to assess the significance of the community effects was taken from Department of Transport guidance (1993) applied to roads and bridge construction. Community effects of major significance defined in the assessment included the removal of the rugby posts at the rugby ground on Catherine de Barnes Lane negating its use and the closure of the residential caravan park due to excessive noise which cannot be rectified through noise insulation. Other impacts, such as the demolition of the post office and Clock Inn at Bickenhill, were assessed as moderate significance.

6.89 Community impact mitigation measures were said to emphasise BIA’s value of the local community. Initiatives such as the sound insulation scheme, investment in local schools, education support, the Community Trust Fund and employment opportunities were listed. In addition informal and formal mechanisms to engage and inform communities were described; e.g., independent Airport Consultative Committee, BIA newsletters, the Environment and Community reports and the Environmental Helpline.

**Evidence from the Literature and key informants**

**Social capital and health**

6.90 Social capital has been described as the ‘norms and social relations embedded in the social structures of societies that enable people to co-ordinate action to achieve desired goals’ (Grootaert, 1998). It is seen as the essential link between economic and human development, and to reducing poverty and inequalities. It includes social relationships and networks for social support, and the integration in a community; in addition it encompasses interactions between individuals and institutions (Muntaner, 2000). This includes the governance and accountability of such bodies particularly where their decision-making affects the personal control of individuals in a population. It is generally accepted that communities with high social capital are healthier than communities with low levels (Kawachi, Kennedy, & Wilkinson 1999; Muntaner, Lynch, & Davey Smith 2000; van Kemenade 2003).

6.91 There is a strong evidence base of the relationship between social support and health. Various epidemiological studies (Giles et al, 2005; Stewart-Brown, 1998; House et al, 1988; Berkman & Syme, 1979) have shown that social support (the extent and quality of personal networks) acts as a protective factor against premature mortality.
and illness as well as helping in recovery. In addition to protecting against physical ill health, social support contributes to positive emotional well being. Social support may influence health directly, e.g., by encouraging healthier behaviour such as smoking cessation and physical activity, and indirectly acting as an ameliorator of adverse health impacts (Hemingway & Marmot, 1999). As described earlier, one of the positive impacts of employment on mental health is the social support and interactions with work colleagues.

6.92 There is strong evidence linking involvement in community organisations with increased social support and reduced isolation, as well as increased employability. In addition the development and involvement in community enterprises can facilitate the transition from informal to formal economic activity (Nathan, 2000). Chanan (1999) argues that community involvement should be an integral part of any development scheme contributing to the development of social capital. Halpern (1995) found substantial improvements in residents’ mental health when they were actively involved in the regeneration of their housing estate. Conversely, the powerlessness, apathy, disillusionment and frustration of communities when they have no say in decisions which affect their quality of life or are only involved in a tokenistic way, can seriously undermine social capital, future participation and the long term health of the population (Carley et al, 2000; Bennett et al, 2000; Turok et al, 1999).

6.93 Control beliefs refer to individuals’ beliefs regarding the extent to which they can control or influence outcomes (e.g., staying healthy, how they work) (Skinner 1996). The link between perceived control and positive health outcomes is empirically well-established (Bailis et al. 2001). People who feel in control of their lives are generally healthier. Low control beliefs are thought to affect health outcomes through direct stress-induced physiological activation or unhealthy behaviours (Bailis et al. 2001; Brunner 1997). Research has found that people of low socio-economic status report lower levels of control beliefs. Bosma (2005) found that people who have low control beliefs (e.g., powerlessness and fatalism) accounted for more than half of the raised mortality risk for people of low socio-economic status. As described earlier, in a work setting low control jobs (‘job strain’) are associated with increased risk of CHD, MSD and mental health problems and are also likely to have a lower socioeconomic position.

6.94 In addition to the impact of social support and control on health, there is a growing evidence base that the perception of public health risk is influenced by various risk attributes (Renn, 1997) (Table 6-8), including levels of control.
Table 6-8 Qualitative risk attributes that affect risk perception

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Direction of influence</th>
</tr>
</thead>
<tbody>
<tr>
<td>personal control</td>
<td>increases risk tolerance</td>
</tr>
<tr>
<td>institutional control</td>
<td>depends on confidence in institutional performance; can increase/decrease risk tolerance</td>
</tr>
<tr>
<td>familiarity</td>
<td>increases risk tolerance</td>
</tr>
<tr>
<td>voluntariness</td>
<td>increases risk tolerance</td>
</tr>
<tr>
<td>dread</td>
<td>decreases risk tolerance</td>
</tr>
<tr>
<td>inequitable risk and benefits</td>
<td>depends on individual utility, strong social incentive for rejecting risks</td>
</tr>
<tr>
<td>artificial risk</td>
<td>amplifies attention to risk, often decreases risk tolerance</td>
</tr>
<tr>
<td>blame</td>
<td>increases quest for social and political responses</td>
</tr>
</tbody>
</table>

6.95 Psychometric research has suggested that people tend to categorise risks intuitively and according to composite dimensions: novelty and dread. Commercial aviation scores highly in the latter category along with nuclear power stations and relates to the potential fatal consequences of their activity and their magnitude. The dread factor however is often coupled with low levels of personal control, which will then tend to amplify the perceived risk. It has been suggested that this is difficult to predict because of different institutional behaviour and population groups (individual control and social capital); however, for a given institution/population this will depend on the decision-making process, communication strategy, and serious incidents such as accidents (Health Council of the Netherlands, 1999).

**Social capital and transport**

6.96 Transport can contribute to social support by increasing access to people and places, including work and services. However road traffic volume can also affect social interactions; Appleyard (1981) showed that with light road traffic (2,000 vehicles per day) people living in the area had three times more social networks compared to people living on streets with heavy traffic (16,000 vehicles per day).

**Evidence from Stakeholders**

**Impacts and concerns**

6.97 Community stakeholders attending the September workshops identified both positive and negative impacts of the proposed runway extension on social capital. Significantly social capital was prioritised as one of the top three impacts in the November consensus building workshop. Some community members recognised the potential benefits of increased accessibility or ‘connectivity’ that the runway extension would bring to more distant parts of the world for maintaining contact with family and friends. The benefits to people with disabilities were particularly emphasised.

6.98 However there were many people who raised issues about how the noise from both air and road traffic affected their daily interactions, e.g., with their neighbours. One head teacher described how children’s play and communication with each other in the playground were affected as a result of the noise from aircraft. Another resident mentioned how difficult it was to hold a conversation with people outside because of the noise and stressed ‘you can’t double glaze your garden’. Others referred to people
becoming ‘hostages in their home’ as a result of the noise and traffic. The proposed runway extension was seen as likely to exacerbate this, as well as removing amenities for walking and other social events.

6.99 In addition to this, many expressed feelings of being ignored by the airport and unable to influence decisions.

6.100 From those that attended, there were a large proportion of community members who expressed feelings of disillusionment, cynicism, bitterness and even anger directed towards the airport. In particular, people living in the deprived areas to the north of the runway were said to be more resigned and less likely to complain; they also felt there were communication issues in Birmingham regarding the proposed development because of Solihull being the lead planning authority. People with existing mental health problems such as anxiety or depression were said to be particularly affected by the social effects of airport operations.

**Differential impacts**

9.101 People on low incomes (59%) are less likely to have access to a car compared with people on higher incomes (8%) (ONS, 2004). 18% of non-car owners find seeing friends and family difficult because of transport problems as opposed to 8% with access to a car (SEU, 2003). In addition, low-income households are more likely to live in deprived urban neighbourhoods with heavy traffic (Dorling, 2006; IMD, 2004). As such people on low incomes are disproportionately disadvantaged by the negative effects transport has on social interactions and support, but are less likely to be able to benefit from social support as a result of enhanced accessibility.

6.102 Whitehead, Dahlgren (2006) and others (Mackenbach, 2005; Wilkinson, 2005) have argued that psychosocial determinants of health, including lack of control (in the workplace or communities) and lack of social support, are socially structured and relate to social position. To reduce inequalities requires ‘increasing the freedom and power among people with the most limited possibilities of controlling and influencing their own life and society’ (Dahlgren, 2003).

**Air Quality**

**Evidence from other impact assessments**

6.103 Air quality has been assessed as part of the EIA. This considered particulate matter PM10, Nitrogen dioxide (NO2) and dust. Carbon Monoxide, Nitrogen Oxide and Hydrocarbons are other major pollutants emitted from aircraft engines (CATE 2005). These were not assessed as part of the EIA because levels were considered by the EIA assessors to be negligible. Air quality dispersion modelling was carried out for PM10 and NO2.

6.104 It is beyond the scope of this HIA to assess the quality and accuracy of this study. For the purposes of the HIA we have assumed that the modelling results are correct.
**NO2**

<table>
<thead>
<tr>
<th>Nitrogen dioxide, NO2-extension</th>
<th>Number of sites exceeding UK annual mean guideline - Within airport (15 sites)</th>
<th>Nitrogen dioxide, NO2-No extension</th>
<th>Number of sites exceeding UK annual mean guideline - Outside airport (28 sites)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006 actual</td>
<td>2012</td>
<td>2022</td>
<td>2030</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2006</td>
<td>2012</td>
<td>2022</td>
<td>2030</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

(Ove Arup and Partners Ltd 2007a)

6.105 The dispersion modelling indicates that NO2 concentrations are expected to increase by 0 – 8% beyond the airport boundary as a result of the proposed runway extension. These increases will still be within Air Quality guidelines (values ranging from 20-33 in 2030 with runway extension - Guideline value is 40).

6.106 However, annual NO2 levels in excess of the guidelines are found at some sites within the airport.

- Within the airport, NO2 concentrations are generally below but not well below the air quality objectives and are expected to remain so by 2030;
- At roadside locations and locations near to taxiing aircraft within the Airport, NO2 concentrations are above but not well above the air quality objectives and are expected to increase to well above the objectives by 2030;
- At roadside locations outside the airport, NO2 concentrations are above but not well above the air quality objectives and are expected to fall below the objectives by 2030.

(Ove Arup and Partners Ltd 2007a)

6.107 This suggests that there is a risk that airport workers may be exposed to levels of NO2 that could damage their health. The main risk would be to workers at roadside locations and locations near to taxiing aircraft within the Airport. This is also supported by a study carried out on Birmingham Airport workers where it was found that airport workers who spent most of their working day in the aircraft taxiing area had “excess upper and lower respiratory tract symptoms, in keeping with a respiratory irritant”.

(Tunnicliffe et al. 1999).
<table>
<thead>
<tr>
<th>Particulate matter - Extension</th>
<th>Number of sites exceeding UK guideline- Within airport (15 sites)</th>
<th>Number of sites exceeding UK guideline- Outside airport (28 sites)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PM10</td>
<td>0 0 0 0</td>
<td>0 0 0 0</td>
</tr>
<tr>
<td>PM10</td>
<td>0 0 0 0</td>
<td>0 0 0 0</td>
</tr>
</tbody>
</table>

6.108 The air quality study indicates “all locations outside the airport, the air quality objectives for this pollutant are expected to be achieved either with or without the proposed runway extension” (Ove Arup and Partners Ltd 2007a).

6.109 Measurements and dispersal modelling has not been carried out for PM$_{2.5}$. Both COMEAP (Committee on the Medical Effects of Air Pollutants) and the WHO recommend PM$_{2.5}$ for monitoring air quality (COMEAP 2007; WHO 2006). The evidence also points to PM$_{2.5}$ as the most satisfactory index of particulate air pollution for quantitative assessments of the effects of policy interventions. The best studied effects and those which we recommend for use in quantification exercises are effects on: all-cause mortality, on cardio-pulmonary mortality and on lung cancer mortality (COMEAP 2007). PM$_{2.5}$ affects a larger proportion of populations surrounding the airport because it disperses more easily than PM$_{10}$. For assessing the potential health impacts measurement and dispersal modelling of PM$_{10}$ would have been beneficial.

**Evidence from the literature and key informants**

6.110 In the UK, air quality guidelines are derived from EC Air Quality Directive (96/62/EC). These values are informed by the WHO guidelines on air quality (WHO 2006). However it should be noted that impacts on health may be observed at levels below the guidelines (World Health Organisation Europe 2006). The objective of the Directive is to improve air quality throughout Europe by controlling the level of certain pollutants and monitoring their concentrations.

6.111 The Committee on the Medical Effects of Air Pollutants’ report on long-term exposure to air pollution and mortality concluded that there is “little doubt that long-term exposure to air pollutants has an effect on mortality and thus decreases life expectancy” (COMEAP 2007). Air pollution is currently estimated to reduce the life expectancy of every person in the UK by an average of 7-8 months (Defra et al. 2007).

6.112 Exposure to air pollution is largely determined by the concentration of air pollutants in the environments where people spend their time and the amount of time they spend within them (WHO 2005) (see Figure 6-4). Human exposure can be defined
as “the event when a person comes into contact with a pollutant of a certain concentration during a certain period of time”

Figure 6-4 Exposure and health effect relationship

6.113 The dominant substances emitted at airports are nitrogen oxides (NO₂ and NO, also denoted together as NOₓ), carbon dioxide (CO₂), carbon monoxide (CO), volatile organic compounds (VOC), sulphur dioxide (SO₂) and particulate matter (PM). (Health Council of the Netherlands: Committee on the Health Impact of Large Airports 1999).

6.114 Epidemiological studies have shown a significant relationship between variations in air pollution levels and mortality and hospital admissions for respiratory and cardiovascular conditions. These associations are observed for NO₂, SO₂, CO, O₃, PM10 and PM2.5 (Health Council of the Netherlands: Committee on the Health Impact of Large Airports 1999).

Table 6-9 Air pollutant effects on health adapted from UK air quality guidelines

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Potential effects on health</th>
</tr>
</thead>
<tbody>
<tr>
<td>Particulate Matter (PM-PM₁₀ and PM₂.₅)</td>
<td>Both short-term and long-term exposure to ambient levels of PM is consistently associated with respiratory and cardiovascular illness and mortality as well as other ill-health effects. The associations are believed to be causal. It is not currently possible to discern a threshold concentration below which there are no effects on the whole population’s health. PM10 roughly equates to the mass of particles less than 10 micrometers in diameter that are likely to be inhaled into the thoracic region of the respiratory tract. Recent reviews by WHO and Committee on the Medical Effects of Air Pollutants (COMEAP) have suggested exposure to a finer fraction of particles (PM2.5, which typically make up around two thirds of PM10 emissions and concentrations) give a stronger association with the observed ill health effects, but also warn that there is evidence that the coarse fraction between (PM10 – PM2.5) also has some effects on health.</td>
</tr>
<tr>
<td>Oxides of nitrogen (NOₓ)</td>
<td>NO₂ is associated with adverse effects on human health. At high levels NO₂ causes inflammation of the airways. Long term exposure may affect lung function and respiratory symptoms. NO₂ also enhances the response to</td>
</tr>
</tbody>
</table>
allergens in sensitive individuals. NO\textsubscript{x} also contributes to the formation of secondary particles and ground level ozone, both of which are associated with ill-health effects.

**Ozone (O\textsubscript{3})**

Exposure to high concentrations may cause irritation to eyes and nose. Very high levels can damage airways leading to inflammatory reactions. Ozone reduces lung function and increases incidence of respiratory symptoms, respiratory hospital admissions and mortality.

**Sulphur dioxide (SO\textsubscript{2})**

Causes constriction of the airways of the lung. This effect is particularly likely to occur in people suffering from asthma and chronic lung disease. Precursor to secondary PM and therefore contributes to the ill-health effects caused by PM\textsubscript{10} and PM\textsubscript{2.5}.

**Benzene**

Benzene is a recognised human carcinogen which attacks the genetic material and, as such, no absolutely safe level can be specified in ambient air. Studies in workers exposed to high levels have shown an excessive risk of leukaemia.

**Carbon monoxide (CO)**

Substantially reduces capacity of the blood to carry oxygen to the body’s tissues and blocks important biochemical reactions in cells. People with existing diseases which affect delivery of oxygen to the heart or brain, such as angina, are at particular risk.

**1,3-butadiene**

1,3-butadiene is also a recognised genotoxic human carcinogen, as such, no absolutely safe level can be specified in ambient air. The health effect of most concern is the induction of cancer of the lymphoid system and blood–forming tissues, lymphoma and leukaemia.

**Polycyclic aromatic hydrocarbons (PAHs)**

Studies of occupational exposure to PAHs have shown an increased incidence of tumours of the lung, skin and possibly bladder and other sites. Lung cancer is most obviously linked to exposure to PAHs through inhaled air. Individual PAHs vary in their ability to induce tumors in animals or humans. The carcinogenic potency of some PAHs is unknown or uncertain. Individual PAHs have been classified by the International Agency for Research on Cancer, with three classified as “probably carcinogenic to humans”, including B[a]P, and three classified as “possibly carcinogenic to humans”.

**Dust**

6.115 Construction may cause dust, which can be annoying. In terms of the health effects, construction activities produce mostly particles which are bigger than 10 micrograms. Particles of this size can be removed by our respiratory system so do not pose a significant threat to health. Dust will mainly be caused during the construction period. There are 23 properties located within 25m from the worksite (Ove Arup and Partners Ltd 2007a).
6.116 However, the machines that are potentially causing the dust can be a source of pollution. This is especially the case for off road machinery.

6.117 Odour is also a potential problem as a cause of annoyance and stress. The primary source of airport operations related odour annoyance appears to be VOC emissions by aircraft. Adjusting idling and taxiing procedures can already lead to some improvement (Health Council of the Netherlands: Committee on the Health Impact of Large Airports 1999).

**Airports and air pollution**

6.118 Airports are very often seen as the hub of economic activity of the region. This can bring benefits to a region in terms of employment and economy; however, it also attracts a number of activities which are polluting. Airports contribute to air pollution in a variety of ways:

- Road traffic to and from airport
- Airport ground traffic
- Airplanes taxiing, landing and taking off
- Other ground activities such as engine testing, power raising plants etc.

6.119 Studies show that, in general, levels of air pollutants in the vicinity of airports are similar to those observed in urban areas elsewhere. A literature review carried out in the Netherlands concluded, “there are no convincing indications that air pollution in the vicinity of an airport causes extra health risks as compared to other urban areas”. (Health Council of the Netherlands: Committee on the Health Impact of Large Airports 1999). Studies of airports in the UK, Germany and Netherlands have confirmed that road traffic is in general the most important contributor to air pollution in the vicinity of airports (Health Council of the Netherlands: Committee on the Health Impact of Large Airports 1999). For example it was estimated that the relative contribution of airport operations at Amsterdam Schiphol (including ground traffic at the airport) to the emission levels of NO\(_x\), CO, VOC, SO\(_x\) and black smoke in the 20x20 km\(^2\) region surrounding the airport in 1990 to be 3-9%, depending on the component (Den Boeft et al). The air quality assessment carried out as part of the EIA also confirms this (Ove Arup and Partners Ltd 2007a). A study carried out by Birmingham University of respiratory disease around the airport provides further support for this;

“...This comprehensive study showed no significant effect on general or respiratory health attributable to activities of the airport in people who live nearby”

(Institute of Public and Environmental Health 2000).

**Evidence from stakeholders**

6.120 Air quality was identified as having a significant impact on health by most stakeholders. There was often concern expressed that they did not know what the impacts of air quality are on their health.

6.121 Some stakeholders also expressed concern that they did not know if the air quality assessment work carried out by the airport and as part of the EIA was of good quality.
6.122 Fumes were also identified as a problem. The smell was considered annoying and it also caused anxiety about potential health impacts.

6.122 Other problems identified caused by fumes;

- Not being able to hang out washing,
- Not being able to barbeque in summer
- Having to shut windows and doors

**Differential impacts**

6.123 Certain population groups are more susceptible to health impacts (see Table 6-10). Children, older people and people with lower socio-economic status may be physiologically more vulnerable. These population groups also tend to stay during the day in those places where they live potentially increasing their exposure compared to other groups.

<table>
<thead>
<tr>
<th>Population group</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Individuales already affected by chronic respiratory or cardiac diseases</strong> such as COPD, pneumonia and ischaemic heart disease. Also type 2 diabetes. (World Health Organisation Europe 2006)</td>
<td>Higher death rates</td>
</tr>
<tr>
<td><strong>Individuals with asthma</strong> (World Health Organisation Europe 2006)</td>
<td>Morbidity associated with exposure to PM as well as increases in symptoms, medication use and visits to hospital emergency departments.</td>
</tr>
<tr>
<td><strong>Population groups with lower socioeconomic status.</strong> Higher susceptibility is also found in the least educated sections of the population and residents of deprived inner cities. In addition, people with lower socioeconomic status have more risk factors for the health effects of air pollution, for example airways diseases, active and passive smoking and type 2 diabetes. (World Health Organisation Europe 2006)</td>
<td>Increased risk of mortality and morbidity</td>
</tr>
<tr>
<td><strong>Older people</strong> When people age air pollution contributes to the development of cardiovascular and respiratory disease. This does not mean that the disease process did not begin a lot earlier but the clinical manifestation tends to appear in the older age groups. (World Health Organisation Europe 2006)</td>
<td>The increases in mortality associated with particulate air pollution are greatest among the elderly.</td>
</tr>
<tr>
<td><strong>Children and infants</strong> Children include prenatal stage where the respiratory system is developing and when</td>
<td>The developing foetal lung, as well as the infant lung, is more susceptible to injury by lung toxicants (including air pollutants) at</td>
</tr>
</tbody>
</table>
air pollution exposure of the mother can affect the development of the foetus. (World Health Organisation European Centre for Environment and Health 2005).

doses below the no-effect level for adults. Air pollution also impacts on the prevalence and incidence of cough and bronchitis and infant mortality.

**Airport workers**
A study at Birmingham International Airport demonstrated a statistically significant association between high exposure to aviation fuel or jet stream and a cough with phlegm and a running nose amongst male airport workers (Tunnicliffe, O’Hickey, Fletcher, Miles, Burge, & Ayres 1999). This observation appears to confirm the hypothesis that VOC may be an irritant to the upper airways inducing sensibility to other components like NOx and fine particles. (Health Council of the Netherlands: Committee on the Health Impact of Large Airports 1999)

Increased morbidity

6.124 Groups vulnerable to health impacts caused by air pollution identified by stakeholders were:

- Vulnerable to physical health effects
  - Children – especially children who are at home
  - Older people – especially retired people
  - People who are at home a lot
  - People who work outdoors
  - People suffering from sleep deprivation due to airport noise
- Vulnerable to stress caused by perceived pollution
  - People who are already depressed
  - People with pre-existing respiratory problems
  - People suffering from sleep deprivation due to airport noise
  - People with generally lower tolerance to change

**Noise**

**Evidence from other impact assessments**

6.125 Noise was assessed as part of the EIA. The Environmental Research and Consultancy Department of the Civil Aviation Authority developed noise contours for the current (2006) situation and for the years 2012, 2022, and 2030 with and without the runway extension. Average summer day (0700-2300) and night (2300-0700) Leq contours were produced for all forecast years. Daytime contours were plotted from 54 to 72 dB(A) at 3 dB intervals. Night time contours were plotted from 48 to 66 dB(A) also at 3 dB intervals.

6.126 Historically in the UK, Airports, the CAA and DfT have used Leq contours. The ES Scoping Report was agreed with Solihull MBC and accepted the use of Leq contours. Directive 2002/49/EC requires the use of harmonised noise measures. From
2007 countries will have to produce noise contours using L_{night} and L_{DEN} (European Parliament 2002). These indicators are also being used in the quantification of health impacts of noise. By harmonising noise indicators it will facilitate the assessment and monitoring of health impacts. As the noise study did not use L_{DEN} we were unable to apply the recommended statistical model for calculating annoyance levels.

6.127 The noise study shows that with and without the airport extension there will be an increase in the number of people affected by noise (see Table 6-11 and Table 6-12).

Table 6-11 Estimated population within average summer day (0700-2300) contours

<table>
<thead>
<tr>
<th>dB(A)</th>
<th>2006</th>
<th>2012 ext</th>
<th>2012 no ext</th>
<th>2022 ext</th>
<th>2022 no ext</th>
<th>2030 ext</th>
<th>2030 no ext</th>
</tr>
</thead>
<tbody>
<tr>
<td>54</td>
<td>19247</td>
<td>27483</td>
<td>29317</td>
<td>49536</td>
<td>41914</td>
<td>61509</td>
<td>55986</td>
</tr>
<tr>
<td>57</td>
<td>15533</td>
<td>19722</td>
<td>19189</td>
<td>21137</td>
<td>20894</td>
<td>24848</td>
<td>22112</td>
</tr>
<tr>
<td>60</td>
<td>7755</td>
<td>10359</td>
<td>9777</td>
<td>14280</td>
<td>12183</td>
<td>18565</td>
<td>14869</td>
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<td>63</td>
<td>3042</td>
<td>3976</td>
<td>4619</td>
<td>6395</td>
<td>6085</td>
<td>8532</td>
<td>7253</td>
</tr>
<tr>
<td>66</td>
<td>490</td>
<td>525</td>
<td>1063</td>
<td>1850</td>
<td>1747</td>
<td>3035</td>
<td>2593</td>
</tr>
<tr>
<td>69</td>
<td>0</td>
<td>0</td>
<td>25</td>
<td>29</td>
<td>123</td>
<td>180</td>
<td>199</td>
</tr>
</tbody>
</table>

Table 6-12 Estimated population within average summer night (2300-0700) contours

<table>
<thead>
<tr>
<th>dB(A)</th>
<th>2006</th>
<th>2012 ext</th>
<th>2012 no ext</th>
<th>2022 ext</th>
<th>2022 no ext</th>
<th>2030 ext</th>
<th>2030 no ext</th>
</tr>
</thead>
<tbody>
<tr>
<td>48</td>
<td>22484</td>
<td>39358</td>
<td>37768</td>
<td>42909</td>
<td>39631</td>
<td>49672</td>
<td>44059</td>
</tr>
<tr>
<td>51</td>
<td>16918</td>
<td>22112</td>
<td>20674</td>
<td>21832</td>
<td>20803</td>
<td>23844</td>
<td>25171</td>
</tr>
<tr>
<td>54</td>
<td>8209</td>
<td>11801</td>
<td>11589</td>
<td>12189</td>
<td>11409</td>
<td>15142</td>
<td>14427</td>
</tr>
<tr>
<td>57</td>
<td>4264</td>
<td>4862</td>
<td>5071</td>
<td>5272</td>
<td>5409</td>
<td>7073</td>
<td>7115</td>
</tr>
<tr>
<td>60</td>
<td>774</td>
<td>555</td>
<td>1329</td>
<td>885</td>
<td>1647</td>
<td>1900</td>
<td>2444</td>
</tr>
<tr>
<td>63</td>
<td>83</td>
<td>0</td>
<td>29</td>
<td>0</td>
<td>29</td>
<td>38</td>
<td>167</td>
</tr>
</tbody>
</table>

Evidence from the Literature and key informants

6.128 The 6th European Environmental Action Programme has as an objective to substantially reduce the number of people regularly affected by long-term average levels of noise (European Parliament & European Council 2002). These objectives should take “into account relevant World Health Organisation (WHO) standards, guidelines and programmes” (European Parliament & European Council 2002). The WHO guidelines on noise were published in 1999. The guidelines specify values as a function of specific locations and activities in order to prevent health damage (WHO 1999).

6.129 On 25 June 2002 the European Parliament and Council adopted Directive 2002/49/EC relating to the assessment and management of environmental noise. The aim of this directive is to provide a common approach intended to avoid, prevent or reduce on a prioritised basis the harmful effects, including annoyance, due to exposure to environmental noise (European Parliament 2002).
6.130 The directive requires the following actions to be implemented progressively; monitoring, informing and consulting the public and producing local noise action plans. The Environmental Noise Directive requires Member States to make Strategic Noise Maps for major agglomerations along major roads, major railways and major airports within their territories. By December 2007 countries have to send noise maps including major airports to the commission. Harmonised noise indicators. Lden (day-evening-night level) and Lnight (night level) are to be used (see Table 6-13).

6.131 The Government White Paper, 'The Future of Air Transport' sets out a “strategic framework for the development of airport capacity in the United Kingdom over the next 30 years” (DfT 2003). The White Paper highlights the conflict between airports economic and social benefits and negative impacts on the environment and health. At local level decisions about airports have to take into account environmental concerns requiring that “adverse impacts should be controlled, mitigated and, where relevant, made the subject of suitable compensation”. Local controls should operate so that “noise impacts are limited, and where possible reduced over time”.(DfT 2003).

6.132 Government planning guidance advises that planning permission for housing should normally be refused in areas exposed to noise from any source louder than 66dB(A) Leq during the day (and 57dB(A) Leq at night). At noise levels between 57 and 66dB(A) Leq mitigation measures should be a condition on planning permission, but noise below 57dB(A) Leq need not be considered (Department for Communities and Local Government 1994). Planning guidance does not reflect the current evidence about the levels at which noise harm health and causes annoyance (e.g. WHO guidelines).

<table>
<thead>
<tr>
<th>Table 6-13 Noise measurements</th>
</tr>
</thead>
<tbody>
<tr>
<td>dB(A)</td>
</tr>
<tr>
<td>L_{Aeq,T}</td>
</tr>
<tr>
<td>L_{day}</td>
</tr>
<tr>
<td>L_{evening}</td>
</tr>
<tr>
<td>L_{night}</td>
</tr>
<tr>
<td>L_{Aeq,16h}</td>
</tr>
<tr>
<td>L_{den}</td>
</tr>
</tbody>
</table>

(Defra 2006)
6.133 The UK Government considers noise to have the potential for the onset of significant community annoyance above a level of 57dB(A), but recognises that some people are annoyed at lower levels (Parliamentary Office of Science and Technology 2003). The 57dB(A) limit is based on social surveys carried out in the early 1980s (ANIS) and is unlikely to represent current annoyance levels (key informant, van Kempen & van Kamp 2005) (Guski 2004; Schreckenberg & Meis 2006) (Babisch et al. 2007).

6.134 A review of literature was carried out. In addition to this an interview with a key informant on the potential health impacts of airport noise provided further evidence. The key informant supported the use of WHO produced guidance and research on noise as well as the models used to calculate health impacts.

6.135 The human ear is not equally sensitive to sounds of different frequencies. To take this into account sound is often expressed as dB(A) where A is a spectral sensitivity weighting factor (van Kempen et al. 2002). The main physical characteristics to describe sound are:
- Sound pressure level;
- Sound frequency;
- Type of sound; and
- Variation in time (Berglund & Lindvall 1995)

6.136 Noise can be defined as “unwanted sound” (Berglund & Lindvall 1995). The same sound might be experienced in different ways at different times of the day, in different situations, different seasons, during different activities etc (MTIS 1985). The WHO noise guidelines state that equal levels of different noises can cause different magnitudes of annoyance (WHO 1999). For example, airport noise is considered to be more annoying than traffic (Miedema & Oudshoorn 2001). Because noise is such a subjective experience, it is a difficult area to research and health effects are often hard to quantify (Berglund & Lindvall 1995).

6.137 Health outcomes due to noise exposure are generally divided into two groups – direct and indirect outcomes of noise exposure. The link between noise exposure and direct (auditory) outcomes is well established whereas the link between indirect or secondary health effects is less clear. Impacts from exposure to aviation noise are likely to be indirect. 6.136 In a review of research on noise and health Passchier and Passchier concluded that there was sufficient evidence that “exposure to noise constitutes a health risk” (Passchier-Vermeer & Passchier-Vermier 2000). The main health risks of noise identified by the World Health Organisation are:

- pain and hearing fatigue;
- hearing impairment including tinnitus;
- annoyance;
- interferences with social behaviour (aggressiveness, protest and helplessness);
- interference with speech communication;
- sleep disturbance and all its consequences on a long and short term basis;
- cardiovascular effects;
- hormonal responses (stress hormones) and their possible consequences on human metabolism (nutrition) and immune system;
6.138 The evidence base for the impact of noise and health has strengthened considerable since Passchier and Passchier carried out their review. New research and meta analysis of existing research have contributed to this (e.g. Babisch 2006; Franssen et al. 2004; Michaud et al. 2007; Ohrstrom et al. 2006; van Kempen, Kruize, Boshuizen, Ameling, Staatsen, & Hollander 2002; van Kempen et al. 2006; van Kempen, Staatsen, & van Kamp 2005). In a recent review of research on noise and health annoyance, sleep disturbance and cardiovascular disease were considered to have a strong enough evidence base for inclusion in health impact assessments (van Kempen, Staatsen, & van Kamp 2005). The evidence around noise impacts on children’s cognition was also considered robust but difficult to apply at population level. The following relationships were recommended for health impact assessment purposes:

- the relationships for the association between noise from road, rail and air traffic and annoyance derived by Miedema and Oudshoorn (2001);
- the relationships for the association between noise from road, rail and air traffic and sleep disturbance derived by Miedema (2003 and 2004); and
- the relationships describing the effects of noise on the cardiovascular system derived by Van Kempen (2002).

6.139 The WHO noise guidelines provide an overview of noise levels above which health is negatively impacted on.
### Table 6-14 WHO noise guidelines

<table>
<thead>
<tr>
<th>Specific environment</th>
<th>Critical health effect(s)</th>
<th>LAeq [dB]</th>
<th>Time base [hours]</th>
<th>LAmx fast [dB]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outdoor living area</td>
<td>Serious annoyance, daytime and evening</td>
<td>55</td>
<td>16</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Moderate annoyance, daytime and evening</td>
<td>50</td>
<td>16</td>
<td>-</td>
</tr>
<tr>
<td>Dwelling, indoors</td>
<td>Speech intelligibility and moderate annoyance, daytime and evening</td>
<td>35</td>
<td>16</td>
<td>-</td>
</tr>
<tr>
<td>Inside bedrooms</td>
<td>Sleep disturbance, night-time</td>
<td>30</td>
<td>8</td>
<td>45</td>
</tr>
<tr>
<td>Outside bedrooms</td>
<td>Sleep disturbance, window open (outdoor values)</td>
<td>45</td>
<td>8</td>
<td>60</td>
</tr>
<tr>
<td>School class rooms and pre-schools, indoors</td>
<td>Speech intelligibility, disturbance of information extraction, message communication</td>
<td>35</td>
<td>during class</td>
<td>-</td>
</tr>
<tr>
<td>Pre-school Bedrooms, indoors</td>
<td>Sleep disturbance</td>
<td>30</td>
<td>sleeping-time</td>
<td>45</td>
</tr>
<tr>
<td>School, playground outdoor</td>
<td>Annoyance (external source)</td>
<td>55</td>
<td>during play</td>
<td>-</td>
</tr>
<tr>
<td>Outdoors in parkland and conservation areas</td>
<td>Disruption of tranquility</td>
<td>#</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

# existing quiet outdoor areas should be preserved and the ratio of intruding noise to natural background sound should be kept low.

**Conceptual framework**

6.140 Noise is considered to be a non-specific biological stressor which results in a response that prepares the body for action (fight or flight) (Moeller 2006). Figure 6-5 illustrates a causal web for noise exposure
6.141 The severity of noise impacts can also be illustrated in a model. Figure 6-6 also shows the relationship between the number of people exposed and health outcomes. **Figure 6-6 Severity of effect**
Aviation noise and sleep disturbance

6.142 There is a strong evidence base that aviation noise causes sleep disturbance (European Commission Working Group on Health and Socio Economic Aspects 2004; Michaud, Fidell, Pearsons, Campbell, & Keith 2007; Miedema & Vos 2007; Ohrstrom, Hadzibajramovic, Holmes, & Svensson 2006). However the relationship between aircraft noise and health is complicated by “individual differences among subjects, methodological and analytic differences among studies, and predictive relationships that account for only a small fraction of the variance in the relationship between noise exposure and sleep disturbance” (Michaud, Fidell, Pearsons, Campbell, & Keith 2007).

6.143 Health effects of noise induced sleep disturbance include physiological effects and also subjectively experienced sleep quality. Sleep quality may be adversely affected by;

- changes in the cardiovascular system;
- changes in sleep pattern such as increased sleep latency time and reduced sleep time because of premature awakening;
- changes in sleep stages from deeper to less-deep sleep;
- increases in motility during the sleep period;
- increases in number of awakenings during the sleep period;
- changes in subjectively experienced sleep quality; and
- changes in the hormonal and immune systems (Passchier-Vermeer & Passchier-Vermier 2000).

6.144 It has been found that sleep disturbances occur more often during later than earlier parts of the night (Michaud, Fidell, Pearsons, Campbell, & Keith 2007).

6.145 Studies on the relationship between the use of medication or purchase of drugs and community noise support the general hypothesis of an increase in sleep disturbance and cardiovascular risk in noise-exposed subjects (Babisch 2006). In a study of impact of aircraft noise on prescription of cardiovascular drugs in the vicinity of a Cologne Bonn airport in Germany it was found that night-time aircraft noise increases the prevalence of prescriptions for antihypertensive and cardiovascular drugs (Greiser, Greiser, & Jahnsen 2007). This effect was found to be significant for some groups from as low as 40-43 Leq.

6.146 An average noise measurement Lnight is used to calculate sleep disturbance. Event measures such as Lmax and SEL (Sound Exposure Level) can be used for estimating sleep motility and number of awakenings (Night noise guidelines). But when it comes to long-term protection, the number of events is equally important. The possibility of predicting after-effects like sleepiness, reaction time, sleeping pill use and health complaints in particular require a combination of number of events and their level instead of just the average Lmax or average SEL (European Commission Working Group on Health and Socio Economic Aspects 2004). The night noise position paper recommends A value for an arbitrary single night will, except in extreme cases, bear no relationship to an individual’s health, whereas a sustained high level over a long period
clearly will (European Commission Working Group on Health and Socio Economic Aspects 2004).

6.147 “For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB LAmax more than 10–15 times per night (Vallet & Vernet 1991), and most studies show an increase in the percentage of awakenings at SEL values of 55–60 dBA (Passchier-Vermeer 1993; Finegold et al. 1994; Pearsons et al. 1995). For intermittent events that approximate aircraft noise, with an effective duration of 10–30 s, SEL values of 55–60 dBA correspond to a LAmax value of 45 dB. Ten to 15 of these events during an eight-hour night-time implies an LAeq,8h of 20–25 dB. This is 5–10 dB below the LAeq,8h of 30 dB for continuous night-time noise exposure, and shows that the intermittent character of noise has to be taken into account when setting night-time limits for noise exposure. For example, this can be achieved by considering the number of noise events and the difference between the maximum sound pressure level and the background level of these events.” (European Commission Working Group on Health and Socio Economic Aspects 2004)

6.148 The modelling based on the scenarios indicates that both with and without the runway extension there will be a significant increase in the number of people experiencing highly disturbed sleep. The runway extension could lead to an additional approximate 3696 people with highly disturbed sleep in 2030 (See Table 6-15 and Figure 6-7). Without the runway extension an additional 3457 people could potentially experience highly disturbed sleep. There is a difference in 2030 of 239 people between with and without the extension.

<table>
<thead>
<tr>
<th></th>
<th>2006</th>
<th>2012</th>
<th>2022</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>ext</td>
<td>4507</td>
<td>6512</td>
<td>6874</td>
<td>8203</td>
</tr>
<tr>
<td>no ext</td>
<td>4507</td>
<td>6405</td>
<td>6616</td>
<td>7964</td>
</tr>
<tr>
<td>difference</td>
<td>0</td>
<td>107</td>
<td>258</td>
<td>239</td>
</tr>
</tbody>
</table>
Aviation noise and children

6.149 The scientific community agrees that there is sufficient and consistent research evidence to show that chronic exposure to environmental noise leads to impaired cognitive function and health in children (WHO 2007) (for example see Clark et al. 2006; Hygge, Evans, & Bullinger 2002; Stansfeld et al.; Stansfeld et al.; van Kempen, van Kamp, Fischer, Davies, Houthuijs, Stellato, Clark, & Stansfeld 2006). Studies on the effects of chronic exposure to aircraft noise on children have found:

- consistent evidence that noise exposure harms cognitive performance;
- consistent association with impaired wellbeing and motivation, but to a slightly more limited extent;
- moderate evidence of effects on blood pressure and catecholamine hormone secretion (adrenaline and noradrenaline); and
- little evidence of effects on child mental health, cortisol secretion and sleep disturbance.

6.150 There is strong evidence that noise exposure affects learning in children. The extent of these effects is still being investigated but studies such as the RANCH study and the Munich Airport study have clearly shown a relationship between aircraft noise exposure and learning.

6.151 The modeling based on the scenarios indicates that both with and without the runway extension there will be a significant increase in the number of schools exposed to noise levels above 54dB(A). Currently 14 schools are exposed. This could increase to 31 schools with the runway extension and 27 without in 2030 (see Table 6-16 and Figure 6-8). This is a difference of 4 schools.
Table 6-16 Estimated number of schools within 54dB(A) daytime noise contour with and without runway extension

<table>
<thead>
<tr>
<th></th>
<th>2006</th>
<th>2012</th>
<th>2022</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>no ext</td>
<td>14</td>
<td>17</td>
<td>20</td>
<td>27</td>
</tr>
<tr>
<td>ext</td>
<td>14</td>
<td>19</td>
<td>27</td>
<td>31</td>
</tr>
<tr>
<td>difference</td>
<td>0</td>
<td>2</td>
<td>7</td>
<td>4</td>
</tr>
</tbody>
</table>

Figure 6-8 Estimated number of schools within 54dB(A) daytime noise contour with and without runway extension

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**Ranch**

The RANCH study was a cross-national, cross-sectional study of 2844 of 3207 children aged 9–10 years who were attending 89 schools of 77 approached in the Netherlands, 27 in Spain, and 30 in the UK located in local authority areas around three major airports. The average exposure of children was 52 dB(A) (range 32-71). Exposure to chronic aircraft noise was associated with a significant impairment in reading comprehension. Each 5 dB difference in aircraft noise above 40dB(A) was equivalent to a 2-month reading delay in the UK. It was also found that increasing exposure to both aircraft noise and road traffic noise was associated with increasing annoyance responses in children.

“Our findings indicate that a chronic environmental stressor—aircraft noise—could impair cognitive development in children, specifically reading comprehension. Schools exposed to high levels of aircraft noise are not healthy educational environments.” (Clark, Martin, van Kempen, Alfred, Head, Davies, Haines, Barrio, Matheson, & Stansfeld 2006)
The Munich Airport Study

Munich Airport was shifted from an urban area of the city to a new rural location on the outskirts of the City. This provided an unique opportunity for researchers to carry out a prospective study of how the closure of the existing airport impacted on children living near the old airport and how the new airport impacts on children previously not exposed to aircraft noise. Children near both sites were recruited into aircraft-noise groups (aircraft noise at present or pending) and control groups with no aircraft noise (closely matched for socioeconomic status). Three waves of data collection took place; one before and two after the change in airport location.

Children at the old airport site had impaired reading, long term memory. There was weaker evidence that the children also suffered noise-induced deficiencies in speech perception and short-term memory. After the airport moved the long term memory and reading effects disappeared but re-emerged in the children at the new airport location. The children’s reading worsened with cumulative noise exposure at the new airport. (Hygge, Evans, & Bullinger 2002)

Aviation noise and annoyance

6.152 Annoyance is a subjective measure. Studies have shown that annoyance is influenced by issues such as noise policies(Broer 2007), perceived control, beliefs about value of airport, fear of catastrophic potential, decisional freedom regarding exposure and general noise sensitivity (Stallen 1999).

6.153 Over time people are becoming annoyed at lower levels of noise (key informant, van Kempen & van Kamp 2005) (Guski 2004;Schreckenberg & Meis 2006) (Babisch, Houthuijs, Pershagen, Cadum, Velonakis, Katsouyanni, & Jarup 2007). This means that annoyance levels based on older studies are not necessarily applicable to the present day situation. The recently release ANASE report found “a modelled mean annoyance of 50 (moderately annoyed) is at 63 dB in ANIS and at 55 dB in ANASE, a difference of 8 dB” (MVA Consultancy 2007).

The evidence in ANASE indicates, in my view, that it is highly probable that concern (or annoyance) with a particular level of aircraft noise is higher than found in the ANIS study in the early 1980s. This finding is in line with the emerging findings from the European Commission’s HYENA Study. It is also consistent with the more general finding that peoples’ valuations of environmental impacts tend to increase over time as average incomes (or GDP) grows, a finding which is reflected in DfT’s approach to the valuation of noise impacts from road and rail.

5.155 However, a peer review of the ANASE study recommends that the detailed results from ANASE should not be used for the development of Government Policy.

6.156 The WHO guidelines specify 50 dB(A) as the guideline value for moderate annoyance during the daytime and 45 dB(A) for during the night. 55dB(A) is identified as the level for serious annoyance during the daytime and evening. The percentage of highly annoyed persons in a population start to increase at an Ldn value of 42 dBA, and the percentage of moderately annoyed persons at an Ldn value of 37 dBA.
Research also shows that aircraft noise produced a stronger annoyance response than road traffic, for the same Ldn exposure (WHO Guidelines)

6.157 We are unable to quantify the potential number of people potentially annoyed by aircraft noise. However the noise contours developed for the noise assessment section of the Environmental Statement indicate that people exposed to noise during an average summer day will increase by 2.5 times with the extension and 2.2 times without the extension by 2030. This provides an estimate of the potential magnitude of the change in numbers of people annoyed by aircraft noise.

Evidence from Stakeholders

6.158 Issues with noise associated with the airport were consistently raised by community stakeholders in each of the four workshops held in September; the consensus building workshop in November raised noise impacts as one of their top three priorities. All stakeholders shared the view that noise will become significantly worse with the runway extension. Engine testing was consistently identified as a significant cause of noise disturbance - in particular night-time testing

6.159 Noise related impacts identified included;

- Sleep disturbance
- Annoyance
- Feelings of helplessness/ lack of control
- Interference with communication
- Concern that it impacts on physical health in the long term
- Loss of tranquility due to noise and affects ability to use open space/ green space
- There was strong concern that children’s’ learning is affected by noise while they are at school.
  - There were reports that not all schools have adequate noise insulation
  - An example was provided of school teachers have to use a whistle rather than a bell to call children back to class because of noise, and
  - Teachers having to pause during lessons to allow planes to fly over.

6.160 There was also concern that noise measurement used (Leq) does not reflect frequency and peak noise levels and therefore fails to capture their experience.

6.161 Stakeholders often commented that noise insulation does not solve the problem.
  - Often only part of the house
  - Not effective if windows are open
  - “You can’t double glaze a garden”

There was also a strong view that rather than providing remedies such as noise insulation there should rather be a reduction in noise levels.

6.162 Some stakeholders would like to be provided with more informations about noise levels, how noise can affect their health and what options are available to them to reduce their noise exposure.
Differential impacts

6.163 Groups vulnerable to noise impacts include:

- Foetuses, infants and young children
- People with decreased personal abilities (old, ill or living with mental illness)
- People dealing with complex cognitive tasks
- People who are blind or have hearing impairment

6.164 Stakeholders identified the following groups as being disproportionately affected by airport noise:

- Those living directly under flight path
- Children
- Shift workers
- Airport workers
- Construction workers

Climate change

Evidence from other impact assessments

6.165 The Draft ES (Ove Arup & Partners Ltd, 2007a) identifies that carbon dioxide is the principal greenhouse gas. It identifies a range of activities relating to the proposal that will, if unmitigated, produce a 37% increase in carbon dioxide emissions in 2030 above those expected in 2030 with the current airport configuration. These activities include the flights themselves, ground support, heating and lighting of buildings and surface access. The ES identifies that CO2 emissions contribute to global warming - climate change.

Evidence from the Literature and key informants

6.166 The World Health Organisation (2003), the United Nation’s Intergovernmental Panel on Climate Change (2001) and the UK Department of Health and Health Protection Agency (2007) have identified a number of current and predicted health impacts of climate change.

6.167 According to the WHO (2003) ‘milder winters would reduce the seasonal winter-time peak in deaths that occurs in temperate countries, while in currently hot regions a further increase in temperatures might reduce the viability of disease-transmitting mosquito populations. However, scientists consider that most of the health impacts of climate change would be adverse.

6.168 The World Health Organisation (2002) estimated that ‘climate change was estimated to be responsible in 2000 for approximately 2.4% of worldwide diarrhoea, and 6% of malaria in some middle-income countries.'
WHO (2003) and IPCC (2001) identify the following potential impacts of climate change:

- Temperature-related illness and death (e.g. heat stroke and heat exhaustion);
- Extreme weather-related health effects (e.g. deaths and injury from flooding);
- Air pollution-related health effects (e.g. respiratory illness);
- Water and food-borne diseases (e.g. cryptosporidiosis and salmonellosis);
- Vector-borne diseases (e.g. malaria and dengue fever);
- Effects of food and water shortages (e.g. reduced food production and quality);
- Mental, nutritional, infectious and other health effects.

According to the IPCC (2001) ‘The actual health impacts will be strongly influenced by local environmental conditions and socio-economic circumstances, and by the range of social, institutional, technological, and behavioural adaptations taken to reduce the full range of threats to health’.

The pathways by which climate change affects human health are illustrated in Figure 6-9.

**Figure 6-9 Pathways by Which Climate Change Affects Human Health**

(Source: Adapted by WHO 2003 from Patz et al, 2000)
Evidence from Stakeholders

6.172 Climate change was identified as having an impact on health by a number of stakeholders. They identified that aircraft emissions contribute to climate change. They also identified that it could impact on everyone’s health globally, but that people in poorer countries would be most affected.

Differential impacts

6.173 According to WHO (2003) and the IPCC (2001) ‘Overall, climate change is projected to increase threats to human health, particularly in lower income populations, predominantly within tropical/subtropical countries.’

6.174 Watson (1998) state that ‘For each potential impact of climate change, certain groups will be particularly vulnerable to disease and injury. The vulnerability of a population depends on factors such as population density, level of economic development, food availability, income level and distribution, local environmental conditions, pre-existing health status, and the quality and availability of public health care.’ Examples of vulnerable populations include the elderly, infants and children, those living on the current margins of vector borne diseases such as Malaria, the chronically ill, population without effective primary care, coastal populations, the socially isolated and the poor.

Other impacts

Air travel (non-infectious disease)

6.175 According to the World Health Organisation (2007) ‘air travel, in particular over long distances, exposes passengers to a number of factors that may have an effect on their health and well-being’. Factors identified by the World Health Organisation (2007), the British Medical Association (2004) and the House of Lords Select Committee on Science and Technology (2000) are listed below:

- Cabin air pressure
- Oxygen levels and hypoxia
- Gas expansion
- Cabin humidity and dehydration
- Ozone
- Cosmic radiation
- Motion sickness
- Immobility, circulatory problems and deep vein thrombosis (DVT)
- Jet lag
- Psychological aspects and fear of flying
- Transmission of communicable diseases
- Divers and decompression illness

6.176 Increases in the number and distance of long-haul flights, and associated increases in flight times and altitudes, resulting from the runway expansion may increase the number of passengers who are vulnerable to the negative health impacts of air travel, and also the nature and severity of impacts.

6.177 Although the House of Lords Select Committee (2000) found ‘no significant impact of air travel on health for the vast majority of travellers’ they recognised that, for
some individuals, health risks were significant. Individuals that are more vulnerable to the health impacts of air travel include:

- Some frequent flyers;
- Some long-haul flyers;
- Infants;
- Travellers with cardiovascular conditions;
- Travellers with respiratory conditions;
- Travellers with ear nose and throat disorders;
- Travellers recovering from recent surgery or trauma, particularly to the abdomen, pelvic region or legs;
- The elderly;
- Divers and tunnel workers;
- Travellers with psychiatric conditions;
- Travellers with diabetes;
- The obese;
- Travellers with cancer;
- Pregnant women;
- Travellers with a history or close family history of DVT or pulmonary embolism;
- Travellers with pre-existing illness;
- Travellers with a fear of flying.

**Air travel (infectious disease)**

6.178 Worldwide travel increases the risk of existing and emerging infectious disease spread e.g., malaria, shigellosis, Typhoid Fever and SARS, from one country to another. The main risk is to air travellers and people they have close contact with; the risk to the population in the airport’s vicinity is negligible (Health Council of the Netherlands, 1999). There is a slight risk of infection from vectors imported via aircrafts (secondary cases) but epidemics are unlikely. Secondary cases for malaria have been reported; ‘airport malaria’ occurs when mosquitoes infected with *Plasmodium falciparum*, originating from airports in regions where malaria transmission occurs, contaminate people around airports and elsewhere. Contamination can take place among airport and airline personnel, among people living in the vicinity of the airport, and among people farther away after a secondary transport of vectors and by vectors transported in luggage. Over 60 cases of airport malaria have been reported in Western Europe in 30 years. The National Travel Health Network and Centre is monitoring infectious disease associated with travel in England in conjunction with the Port health authorities, providing good assurance that these risks are minimised (HPA, 2006).

**Health & emergency services**

6.179 There is evidence of the importance of emergency services preparedness in reducing the impacts on fatalities from an accident. In addition, key informants stressed the value of rehearsals as part of major incident planning including engaging potentially affected communities.

6.180 Little evidence on the direct impacts of airport operations on health services has been accessed. However, airport workers are likely to experience occupational injuries and ill health related to airport operations and may place demand on health services.
Particular airport-related occupational hazards include noise, vibrations, chemicals, fatigue and job stress and ergonomic factors. Published data on actual exposure levels are limited (Health Council of the Netherlands, 1999).
7 Impact Analysis

Introduction

7.1 This section brings together the evidence from all the data collected from different sources and using different methods; the report section that evidence is drawn from will be identified in the text. It identifies and characterises the potential impacts:

- **Health impacts** – the health determinants affected and the subsequent effect on health outcomes;
- **Direction of change** – health gain (+) or health loss (-);
- **Scale** – the severity (mortality, morbidity and well-being) and magnitude (size/proportion of the population affected);
- **Likelihood of impact** – definite, probable, possible or speculative based on the strength of the evidence and the number of sources;
- **Latency** – when the impact will occur.

7.2 For the purpose of this HIA a hierarchy of evidence from level I to V was defined; this includes evidence from the literature, key informants and stakeholders. Level I provides the strongest evidence of effect and refers to evidence from ‘reviews of reviews’ or meta analyses, level II refers to systematic reviews or reviews of several HIAs; level III refers to single studies or HIAs, level IV evidence is from expert witnesses (key informants), level V evidence from stakeholders. The definition of the likelihood of the impacts from the runway extension proposal will be mainly in the following qualitative terms. The likelihood of the impact is based on the assessed strength of evidence. For clarity throughout the section the potential impacts are in bold and the likelihood of an impact is underlined.

**Speculative** = may or may not happen; no direct evidence to support (level V);
**Possible** = more likely to happen than not; direct evidence but from limited sources (level IV);
**Probable** = very likely to happen; direct strong evidence from a range of data sources collected using different methods (level II/III);
**Definite** = will happen; overwhelming, strong evidence from a range of data sources collected using different methods (level I).

7.3 Where appropriate the geographical level of impact, e.g., the wards most affected, and/or particular groups that may be affected will described. The analysis will describe the potential impacts on the following prioritised health determinants and their subsequent impact on health outcomes:

- Noise,
- Air quality,
- Transport,
- Social Capital;
- Employment and the economy
**Assumptions**

7.4 It is assumed that:

- For all scenarios the population remains constant and there are no significant changes in population socio-economic and health status;
- The socio-demographic and health status of the population will remain broadly the same;
- The populations within the noise contours are accurate;
- As the HIA has drawn on the EIA, the forecasts from the air quality, noise and other assessments related to the runway extension are correct;
- For the assessment of transport impacts worst case scenario maximum ATM/passenger forecasts have been used.
Health impact model

Runway Extension

- transport
- air quality
- noise
- social capital
- employment economy

- accidents
- climate change
- pollutants
- annoyance/sleep disturbance
- social support, control, participation
- jobs

- injury
- weather-related health impacts
- exposure and susceptibility to air pollutants
- stress reaction
- bonding, bridging, linking
- physical environment, work life balance, income

- Mortality/morbidity/mental wellbeing
- learning
# Potential health impacts of the runway extension

Table 7-1 Summary of the potential health impacts of the proposed runway extension

<table>
<thead>
<tr>
<th>Health Impact</th>
<th>Direction</th>
<th>Likelihood</th>
<th>Latency</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Noise</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Increase in noise levels with &amp; without the proposed runway extension;</td>
<td>-</td>
<td>Probable</td>
<td>Immediate</td>
</tr>
<tr>
<td>• Increased noise levels impacts on:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>➢ Annoyance</td>
<td></td>
<td>Probable</td>
<td>Immediate/long term</td>
</tr>
<tr>
<td>➢ Sleep disturbance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>➢ Children’s learning;</td>
<td></td>
<td>Possible</td>
<td>Medium/long term</td>
</tr>
<tr>
<td>• Increased noise levels impacts on coronary (heart) health.</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Air quality</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Negligible increase in air pollution with &amp; without the proposed runway extension;</td>
<td>-</td>
<td>Probable</td>
<td>Immediate</td>
</tr>
<tr>
<td>• Negligible increases in air pollution → negligible negative impacts on health;</td>
<td>-</td>
<td>Probable</td>
<td>Immediate</td>
</tr>
<tr>
<td>• Greater exposure of airport ground staff to air pollutants.</td>
<td>-</td>
<td>Possible</td>
<td></td>
</tr>
<tr>
<td><strong>Transport</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Road traffic will increase with and without the proposed runway extension;</td>
<td>+/-</td>
<td>Probable</td>
<td>Immediate/Long</td>
</tr>
<tr>
<td>• Equivalent road traffic accident (RTAs) rates to any busy highway;</td>
<td>-</td>
<td>Speculative</td>
<td></td>
</tr>
<tr>
<td>• Increase in number of RTAs with additional volume of traffic, but negligible effect from proposed runway extension is speculated to be negligible;</td>
<td>-</td>
<td>Speculative</td>
<td></td>
</tr>
<tr>
<td>• Air traffic movements (ATMs) will increase with and without the proposed runway extension;</td>
<td>+/-</td>
<td>Probable</td>
<td>Immediate/Long</td>
</tr>
<tr>
<td>• Negligible increase of risk of aircraft accidents with the proposed runway extension;</td>
<td>-</td>
<td>Probable</td>
<td>Immediate/Long</td>
</tr>
<tr>
<td>• Negligible increase of third party casualties associated with aircraft accidents with the proposed runway extension.</td>
<td>-</td>
<td>Probable</td>
<td>Immediate/Long</td>
</tr>
<tr>
<td><strong>Social capital</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Increase in accessibility to people and places in the US and far east with the proposed runway extension</td>
<td>+</td>
<td>Probable</td>
<td>Immediate</td>
</tr>
<tr>
<td>• Increase in accessibility will benefit people on high income most, exacerbating inequalities;</td>
<td>-</td>
<td>Probable</td>
<td>Medium/long term</td>
</tr>
<tr>
<td>• Increased employment associated with the runway extension will facilitate positive mental health linked to new positive social networks for those moving from unemployment into employment;</td>
<td>+</td>
<td>Probable</td>
<td>Medium</td>
</tr>
<tr>
<td>• Increased employment opportunities benefit people with low skills the least, exacerbating inequalities;</td>
<td>-</td>
<td>Probable</td>
<td>Medium/long term</td>
</tr>
<tr>
<td>• Increase in noise and traffic with and without the runway extension development will reduce opportunities for social interactions and networking within affected communities;</td>
<td>-</td>
<td>Probable</td>
<td>Medium/long term</td>
</tr>
<tr>
<td>• The runway extension itself will affect opportunities for</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
social interactions for the residents of Bickenhill village with the removal of some facilities and amenities.

<table>
<thead>
<tr>
<th>Economy &amp; employment</th>
<th>-</th>
<th>Definite</th>
<th>Immediate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increases in employment opportunities in Solihull, Birmingham and West Midlands associated with the runway extension will lead to potential health gains;</td>
<td>+</td>
<td>Probable</td>
<td>Medium/long term</td>
</tr>
<tr>
<td>A proportion of jobs may be low paid poor quality jobs which will lead to poor health (equivalent to unemployment)</td>
<td>-</td>
<td>Probable</td>
<td></td>
</tr>
<tr>
<td>Some these employment opportunities may benefit people currently resident in West Midlands;</td>
<td>+</td>
<td>Possible</td>
<td></td>
</tr>
<tr>
<td>Some of these jobs will also be filled by people from outside West Midlands;</td>
<td>-</td>
<td>Speculated</td>
<td></td>
</tr>
<tr>
<td>Some population groups, e.g., people with low skills, people with disabilities, ethnic minority groups, may be less able to take up or benefit from the 'high tech' employment opportunities the economic 'connectivity' the runway extension affords;</td>
<td>-</td>
<td>Speculated</td>
<td></td>
</tr>
<tr>
<td>Increase in economic growth attributed to the runway extension will result in improved health outcomes for the region;</td>
<td>+</td>
<td>Probable</td>
<td>Lag</td>
</tr>
<tr>
<td>Health gains will be experienced by those with increased per capita income;</td>
<td>+</td>
<td>Probable</td>
<td></td>
</tr>
<tr>
<td>Vulnerable groups in the labour market will benefit least from income growth in the region.</td>
<td>-</td>
<td>Speculated</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Climate change</th>
<th>-</th>
<th>Probable</th>
<th>Immediate/medium/long term</th>
</tr>
</thead>
<tbody>
<tr>
<td>The proposed runway extension will contribute to climate change;</td>
<td>-</td>
<td>Possible</td>
<td>Medium/long term</td>
</tr>
<tr>
<td>Climate change will contribute to a number of current and predicted negative health impacts on vulnerable populations.</td>
<td>-</td>
<td>Probable</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Health inequalities</th>
<th>-</th>
<th>Probable</th>
<th>Immediate/medium/long term</th>
</tr>
</thead>
<tbody>
<tr>
<td>The proposed runway extension's impacts:</td>
<td>-</td>
<td>Probable</td>
<td></td>
</tr>
<tr>
<td>- the increase in noise levels,</td>
<td>-</td>
<td>Probable</td>
<td></td>
</tr>
<tr>
<td>- the increase (negligible) in risk of accidents (road and third party),</td>
<td>-</td>
<td>Probable</td>
<td></td>
</tr>
<tr>
<td>- the increase (negligible) in exposure to air pollutants,</td>
<td>-</td>
<td>Probable</td>
<td></td>
</tr>
<tr>
<td>- the reduction in social networking (and support),</td>
<td>-</td>
<td>Probable</td>
<td></td>
</tr>
<tr>
<td>- the decrease in personal control,</td>
<td>-</td>
<td>Probable</td>
<td></td>
</tr>
<tr>
<td>- the increase in perceived risks</td>
<td>-</td>
<td>Probable</td>
<td></td>
</tr>
<tr>
<td>will be disproportionately, and in some case cumulatively, experienced by children and people living or working close to the airport, people on low incomes or economically inactive, older people, people with poor mental health and people with an existing circulatory or respiratory condition.</td>
<td>-</td>
<td>Probable</td>
<td></td>
</tr>
</tbody>
</table>
Noise
7.5 There is strong evidence that exposure to high noise levels (above 55 dB (A)) **definitely negatively impacts on morbidity and mortality.**

7.6 In particular there is strong evidence that noise impacts on:

- Foetuses, infants and young children
- People with decreased personal abilities (old, ill or living with mental illness)
- People dealing with complex cognitive tasks (e.g., school children)
- People who are blind or have hearing impairment

7.7 In addition certain groups such as unemployed, elderly and children are likely to have higher exposures due to increased proportion of time spent exposed to aircraft noise.

7.8 Some wards most exposed to noise also have relatively high proportions of children under the age of 15 (Shard End, Stechford and Yardley North, Hodge Hill, Fordbridge and Kinghurst).

7.9 It is **probable** that noise levels will increase with and without the runway extension compared to current situation.

7.10 There is strong evidence of a **probable negative impact on health.** In particular, there are probably negative impacts on:

- **Annoyance**
- **Sleep disturbance**
  It is estimated that people experiencing highly disturbed sleep will increase from approximately 4200 to 7700 by 2030 with the runway extension and from approximately 4200 to 7400 without the extension. The overall difference between with and without the airport extension is 220 people.(see Error! Reference source not found.)
- **Children’s learning**
  It is estimated that primary schools within the 54dB(A) daytime noise contour will increase from 14 to 31 by 2030 with the runway extension and from 14 to 27 without the extension. The overall difference between with and without the runway extension in 2030 is 14% (4 schools) (see Table 6-16).

7.11 There are **possible negative impacts on coronary health.**

Air quality
7.12 There is strong evidence that air pollution **definitely negatively impacts on health.** In particular there is strong evidence that air pollution particular impacts on:

- children,
- older people and
- people with already existing conditions (respiratory, cardiovascular)

7.13 There is a **probable** but negligible increase in air pollution with and without runway extension compared to current situation.

7.14 There is evidence of a corresponding negative impact on health however, the scale of this impact is **probably** negligible.
7.15 There is evidence of a possible negative impact on airport ground workers.

**Transport**

7.16 Aircraft accidents are risk factors specific to airport operations. There is strong evidence that the probability of an aircraft accident at any large airport is very low (1-2 per decade); the probability of an accident occurring at a particular airport is determined by a number of risk factors. It is probable that an aircraft accident will lead to on board fatalities and injuries. It is also possible that an aircraft accident at an airport will lead to third party (external) fatalities (5 per decade). The level of individual third party risk is higher closer to an airport’s perimeter.

7.17 With the increase in ATMs with and without the runway extension, there is a probable increase in the risk of aircraft accidents. Crude estimates on the additional number of accidents with the runway extension compared with accidents expected without are assessed as low (0.06 additional accidents per annum at 2030 with the runway extension compared to 0.05 additional accidents without). This does not consider any advances in aircraft and operating systems safety (reduce accident risk) or changes in the aircraft fleet (increased risk with larger aircraft). An associated additional risk of third party casualties (in the vicinity of the airport) is possible but the additional number is assessed to be negligible.

7.18 There are other accident risk factors associated with airport operations, including the storage and movement of fuel; however the evidence for this was limited to stakeholder concerns and expert evidence. As such the likelihood of additional non-aircraft accidents and casualties resulting from the development of the runway extension is assessed as speculative. However, in line with a precautionary approach it is recommended that this be analysed in more detail once the fuel depot location is determined.

7.19 There is strong evidence to show that in relation to accidents and casualties per 100 million person km, road transport is the most hazardous form of transport. There is some weak evidence which speculates that the road traffic accident rates around airports are at the same rate as any busy road.

7.20 There will be significant increases in background road traffic up to 2022. There will be additional road traffic associated with the additional air passenger traffic both with and without the runway extension; however, the additional vehicles on the road network approaching the airport due to the runway extension are said to be low. It is speculated that there will be increases in the number of road traffic accidents and casualties around the airport after 2022 as the impact of traffic volume outweighs advances in accident prevention technologies and measures. However, the impact of additional road vehicles due to the runway extension on the number of accidents and casualties is speculated to be low.

7.21 There is strong evidence to suggest that people from poorer neighbourhoods are disproportionately affected by road traffic accidents, particularly children. It is probable that accidents that do occur will be overrepresented by people from these groups.

**Social capital**

7.22 There is strong evidence that strong personal relationships and feeling in control of ones life are positive health factors; it is probable that a population with high levels of these positive health factors will have better mental and physical health outcomes. In addition there is strong evidence
that social support, including individual and community networks, acts as a protective factor against ill health as well as supporting positive emotional health; it is probable that populations with high levels of social support will be protected against poor mental and physical health.

7.23 There is some evidence that the perception of public health risk is amplified when there is a lack of trust in institutions or involvement in decision-making; this is particularly so when the decisions are associated with potentially catastrophic consequences (‘dread’). It is possible that feelings of low control, low involvement in decision-making focused on ‘dread’ issues will heighten the perceptions of public health risk.

7.24 It is possible that there will be some increase in accessibility or ‘connectivity’ to family and friends in the far east and the US as a result of the runway extension, facilitating positive relationships and protecting health; it is probable that those on high incomes will benefit most from these opportunities. Similarly, some increased employment associated with the runway extension will probably facilitate positive mental health associated with new positive social networks for those moving from unemployment into employment. It is probable that people with low skills will benefit least from these employment opportunities.

7.25 It is probable that the increase in noise and traffic with and without the runway extension development will reduce opportunities for social interactions and networking within the community, with a negative impact on health and well being. This will particularly affect communities proximal to the airport where traffic density and noise is worse, including children, people on low incomes and people confined to their home. The runway extension itself will definitely affect opportunities for social interactions for the residents of Bickenhill village with the removal of some facilities and amenities.

7.26 It is speculated that the process by which communities proximal to the airport have been engaged about the runway extension proposal has contributed to their perception of increased and in some cases unacceptable risks associated with the development. In addition to the immediate distress experienced by some people, particularly those already under psychosocial stress, there are probable longer term negative health effects associated with feelings of low control.

**Employment and the economy**

7.27 There is strong evidence of the positive effects of employment on physical and mental health. Higher levels of employment in a population will probably be associated with lower mortality rates; however, employment which is low paid, poor quality and insecure will probably be associated with poor health equivalent to unemployed health scores.

7.28 It is probable that the runway extension will lead to employment opportunities in Solihull, Birmingham and West Midlands; however, it was not possible to analyse the assumptions underpinning these employment forecasts and the variations of these. It is possible that there will be some employment gains for people currently resident in West Midlands; but it is speculated that an unknown proportion of these jobs will also be filled by people from outside West Midlands. In addition the employment forecasts did not determine what proportion of the jobs filled by local people may move from unemployment into employment, whether this will involve an increase in household income, what type of jobs are being created and the type of contracts they may have.

7.29 Based on employment trends, it is possible that a proportion of those jobs created and obtained by unemployed local people will be poor quality, low paid, fixed term and/or part-time, and may involve
hazardous work. For those people it is probable that if their household income is lower than when they were unemployed, there will be negative long term health effects. It should be noted that there will also be negative health consequences to the whole family in these circumstances.

7.30 Although educational attainment across Birmingham and Solihull is improving, the skill levels of populations in the more deprived areas particularly those with higher proportions of ethnic minority groups (there are however variations between BME groups) are not improving at the same rate and it is speculated that they may be less able to take up the ‘high tech’ employment opportunities the economic ‘connectivity’ of the runway extension affords.

7.31 Other population groups currently disproportionately affected by labour market inequalities and who it is possible may not benefit as much as the working population as a whole from the employment opportunities generated by the runway extension are, people with disabilities, women, and people from ethnic minorities.

7.32 There is evidence of economic growth in the UK, but less so for the West Midlands; however there is also evidence of increasing income inequalities across the UK, including across the West Midlands. Countries with low levels of GDP but with low levels of income inequalities have similar health status to richer countries. In the long term economic growth associated with an increase in per capita income will result in reductions in mortality and other benefits to population health. In the short term health benefits from economic development may lag behind and morbidity and mortality may even worsen with economic upturn.

7.33 It is probable that the economic growth attributed to the runway extension will result in improved health outcomes for the region. It is also probable that the health gains will be experienced by those with increased per capita income. It is speculated that vulnerable groups in the labour market will benefit least from income growth in the region.

Climate change
7.34 It is possible that the proposal will contribute to climate change. It is also possible that this will contribute to a number of current and predicted negative health impacts on vulnerable populations.

Health inequalities
7.35 While there are both positive and negative health impacts associated with the runway proposal, it is probable that the negative impacts:

- the increase in noise levels,
- the increase (negligible) in risk of accidents (road and third party),
- the increase (negligible) in exposure to air pollutants,
- the reduction in social networking (and support),
- the decrease in personal control,
- the increase in perceived risks.

7.36 will be disproportionately, and in some case cumulatively, experienced by children and people living or working close to the airport, people on low incomes or economically inactive, older people, people with poor mental health and people with an existing circulatory or respiratory condition. In addition, many of these vulnerable groups have less choice and/or capacity to change their situation, either by finding coping mechanisms or choosing to move house.
7.37 Many of these groups will be particularly vulnerable to exposure to these health risk factors and conditions. In addition, many of these groups will already be experiencing multiple deprivation, e.g., on low income, above average exposure to noise and air pollutants, and related to this poorer health than national and regional averages.

7.38 Conversely, there was insufficient evidence to indicate how many of these disadvantaged groups would particularly benefit from the potential positive impacts of the runway extension, that is, high quality jobs.
8 Conclusion and Recommendations

Conclusion

8.1 The conclusion summarises the evidence and impacts identified in this rapid HIA. All studies have limitations and this one is no exception. In particular, there has been a necessary compromise between brevity and rigour; e.g., within the resource constraints it has not been possible to quantify some impacts, undertake sensitivity analyses of noise-related forecasts or undertake wide-ranging participatory approaches. However, in spite of these limitations it is possible to draw the following conclusions.

8.2 The BIA runway extension is a potentially major infrastructure development. It purports that when operational the runway extension will facilitate direct, indirect and induced employment opportunities associated with the airport but even wider employment benefits from the increased ‘connectivity’ long haul flights will bring to emerging business markets.

8.3 The profile indicates that the West Midlands is seriously lagging behind national levels of employment and economic output; southeast Birmingham and north Solihull are particularly badly affected. Poor mental and physical health status reflects the levels of income deprivation in these areas.

8.4 The proposed runway extension fit well with the current national policy context particularly in relation to aviation and economic policy. However, the difficulty in assessing the full environmental, social and health costs associated with the development as recommended in the Eddington report on sustainable transport for sustainable growth is noted. At a regional level, there is clear synergy with ‘Delivering Advantage’; similarly the West Midlands transport strategy links well with BIA developments although the phasing of the various road network developments is unclear.

8.5 Although there may be net employment gains for the region resulting from the airport’s development, there are a number of issues. This relates to the sensitivity of the employment/income forecasts, the lack of forecast data for the wider employment/income benefits, the lack of forecast data for full environmental, social and health costs, and whether economic activity and income per capita will increase in those areas or groups currently experiencing below the regional average employment or income levels.

8.6 If there is an increase in employment associated with an increase in per capita income in the region, it is probable that there will be positive impacts on population health, physical and mental. If there is an increase in employment in those areas or population groups currently experiencing below the regional average employment or income levels, it is probable that there will be a reduction in health inequalities. Similarly, if there are improvements in the local economy, there are also likely to be long term health gains, although there may be a significant lag in when these health improvements occur.

8.7 The construction phase of the development will involve creating employment opportunities in occupations with particular work hazards but with no greater level of risk than would be expected for similar construction projects. Those jobs that are created as a result of the airport’s development will include some high paid, high quality jobs as well as a proportion of low paid, low skill jobs. ‘Job quality’ is associated with productivity and performance; it is unclear at a national level if job quality is improving. Poor ‘job quality’ is associated with poor health; low paid, poor quality and precarious jobs have similar health scores to the unemployed.
8.8 The proposed runway extension will have both positive and negative impacts on social capital (social support/control). At the construction phase, in the absence of any transport forecasts, it is assumed that road congestion will be exacerbated as a consequence of these developments and that the effects on social networks will be predominantly negative. However, when operational there will probably be positive impacts for those people able to use air travel as a result of the enhanced 'connectivity' the runway affords, but negative impacts for those affected by additional traffic, noise and the loss of community facilities. Enhancing social networks and support protects against poor mental and physical health.

8.9 There is some evidence from a number of residents proximal to the airport who attended the HIA workshops that they do not feel they have been engaged in the development of the proposed runway extension. In this group there was evidence of an amplified perception of the risks associated with the runway extension; people with low control beliefs and who currently experience psychosocial stress will be particularly affected. In addition to heightened risk perceptions, low control and low involvement in decision-making is associated with negative physical and mental health impacts.

8.10 There is a very low probability of an aircraft accident with or without the runway extension. Although a very low probability, if an aircraft accident occurred it is possible that there would be some third party fatalities. New Public Safety Zones (PSZs) have been developed to the north and south of the runway for the proposed runway extension. Government policy is that there should be no increase in the number of people living, working or congregating in the PSZs based on the 1 in 100,000 ($10^{-5}$) individual risk contour of death or injury to people on the ground. There are more stringent requirements based on 1 in 10,000 ($10^{-4}$) individual risk contour preventing new or replacement developments; although there are no such applicable properties it is unclear the number of residential or commercial properties within the new PSZs. Once completed, the tunnelling of the A45 represents a potential positive improvement to third party risk. The risk level of other accident hazards at the airport, such as the fuel farm, remains low; however it would be appropriate to review this as well as emergency services preparedness. Although there is a low probability of an aircraft accident, for some residents the perception of the risk of an aircraft or other accident is greater than the actual risk, contributing to anxiety and their perceptions of other risks associated with the runway extension.

8.11 Road traffic volume and congestion on the surrounding highways and road networks is likely to be only marginally affected by the proposed runway extension when it is operational. There is a perception that the Airport contributes more extensively to existing traffic congestion than it actually does. Annoyance about the predicted increase in background traffic volumes may also be directed at BIA. It is unclear what the effects of the construction phase will be, or how this could be phased with the other transport infrastructure developments. Road traffic accidents (RTAs) may increase with the increase in road traffic volume, but the proposed runway extension’s contribution to this is likely to be very low; however, it is likely that children and people living in deprived areas will be most adversely affected by these RTAs.

8.12 Exposure to noise will definitely increase with and without the runway extension. This will increase the proportion of the population annoyed by aircraft noise and sleep disturbed. In addition, it will increase the proportion of children whose learning is detrimentally affected by noise. The increase in noise will particularly affect people who are already vulnerable, e.g., older people or people with an existing condition. However, in the long term it could potentially disadvantage those children whose educational attainment may be affected by noise.

8.13 Air quality will probably reduce slightly with and without the proposed runway extension. This will have a corresponding negative impact on health although this is also assessed to be a marginal effect.
However, airport ground workers will have a greater exposure to some pollutants and may be more adversely affected than the population as a whole.

8.14 The proposed runway extension is likely to contribute to CO$_2$ and other carbon emissions and as a consequence climate change and its negative effects on health.

8.15 While there are both positive and negative health impacts associated with the proposed runway extension, it is probable that the negative impacts, e.g., the increase in noise levels, will be disproportionately experienced by children and people living or working close to the airport, people on low incomes or economically inactive, older people, people with poor mental health and people with an existing circulatory or respiratory condition. Many of these people will be multi-deprived, e.g., on low income and living close to the airport, and already experience poorer health than national and regional averages, and are less able to change their situation. Conversely, there was insufficient evidence to indicate how these disadvantaged groups would particularly benefit from the potential positive impacts of the runway extension, that is, high quality jobs. However this is not inevitable; lessons can be learned from other areas including within the region concerning targeting employment and training opportunities in disadvantaged neighbourhoods and removing barriers to this such as transport.

8.16 There is general support for BIA’s runway extension proposal – not going ahead with the proposal would potentially disadvantage the West Midlands’ economic growth and development. Furthermore the notable impacts will occur with and without the runway extension. However, a precautionary approach must be applied; action at local and national levels is needed to address the issues raised, particularly the potential that already disadvantaged areas and groups will be further detrimentally affected, exacerbating health inequalities even further, in the short and long term.
**Recommendations**

**Approach/Principles**

**Noise**

It is recommended that the approach taken to manage and reduce noise emission and exposure should focus in the following order on:

1. avoiding or reducing noise at its source (“noise which is not generated cannot lead to noise exposure”).
2. reducing noise in its propagation (measures as close to the source as possible should be preferred, because such measures protect the highest number of people).
3. reducing noise at the receiver (these measures should only be used, if other measures are not sufficiently efficient and effective).

(CALM II Network 2007)

Take an integrated approach to noise emissions. For example, noise mapping and action plans for the airport, local authorities, highways agency and railway companies should be considered together.

Identify examples of best practice and where appropriate adapt to the local context (see text box).

- Schiphol uses a sophisticated combination of measurements that include 2 zones. In the highest protection zone, the sound exposure is based on maximum sound pressure levels and the number of events. In the second lower protection zone, the sound exposure is the night average equivalent sound pressure level. The inside sound exposure level should not exceed $L_{Aeq}= 26$ dB(A). The requirements are based on reduction of sleep disturbance and are applied only for bedrooms. The required sound insulation also depends on outside sound exposure and varies from 20 to 27 dB(A).
- the French standard demarcates areas affected by aircraft noise exceeding 65 dB more than a hundred times per day,
- Frankfurt provides noise insulation for houses affected by noise levels exceeding 75 dB more than six times a night.
- London City Airport uses $57$ Leq.

**Air quality**

Although airport is not the major contributor to air pollution in the area it should reduce its impact as much as possible because of the strong evidence that air quality impacts on health significantly. In particular BIAL and their partners should continue to investigate ways of minimising air pollution from the different sources including; airplanes (how they take off, how they move on runway, engine standards etc), ground vehicles, road traffic to and from airport, other activities such as engine testing, power raising plant, fugitive emissions.

**Transport**

As a major transport provider, BIAL has an obligation to reduce the negative effects of air traffic adopting the ‘polluter pays’ principle. In addition BIA has a role to contribute to the reduction in road traffic associated with its activities.

**Social capital**

As a large institution whose activities impact on the health and quality of life of local residents, BIAL has a role as a good neighbour to foster positive community relations and to actively support communities.
Employment/Economy
As a major employer, land lord and commissioner, BIAL has a role to actively promote good working and procurement practices, including developing high quality jobs and local employment. As a community ambassador and good neighbour, BIAL has a role to actively support local communities maximise their employment potential, including skills and entrepreneurial developments.

Climate change
Although the impact the runway extension will have on climate change is small on a global scale, as a contributor to climate change BIAL has an obligation to demonstrate an ongoing commitment to good practice in this area.

Health inequalities
BIAL must ensure its actions do not increase health inequalities and work towards reducing existing inequalities in the communities impacted on by the airport. This should involve evidence based appraisal of how the airport’s activities impact on inequalities.
### Specific recommendations

#### IMPACTS (section 6 & 7)

<table>
<thead>
<tr>
<th>Noise</th>
<th>Current action</th>
<th>Future action</th>
<th>Recommendations for additional action*</th>
<th>Responsible agencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>• High levels (above 55 dB (A)) of noise impact negatively on morbidity &amp; mortality;</td>
<td>SMBC, Section 106 agreement; BIAL, Noise policy; BIAL, Night flying policy; BIAL, Noise preferential routes (NPRs); BIAL, Engine ground running controls; BIAL, Noise and track-keeping system; BIAL, Sound insulation scheme; BIAL, Community Trust Fund; BIAL, Aircraft Complaints Policy;</td>
<td>BIAL, Planning Statement, December 2007 - additional 800 properties eligible for noise insulation with runway extension. <strong>In particular:</strong> Make noise and track information publicly available through the ‘webtrak’ system. Work with airlines to encourage further improvements in noise reduction and track-keeping, with a 95% ‘on-track’ target. Conduct noise monitoring studies using the portable noise monitor. Work with National Air Traffic Services to</td>
<td>Mitigation When deciding the boundaries of the sound insulation scheme decisions should be based on the minimisation of negative health impacts: • In order to take into account insulation scheme when calculating sleep disturbance convert Lnight inside to Lnight outside using methods recommended by the night noise position paper (European Commission Working Group on Health and Socio Economic Aspects 2004); • It is recognised that international standards and guidelines vary. Until such time that these are incorporated into national policy guidelines, identify examples of best practice consistent with UK policy and where appropriate adapt to the local context (see example Schipol airport); • Future developments including schools and health care facilities should not take place within the 50 dB (A) day time contour. Monitoring Monitoring of noise should be carried out in such a way that allows for identification and monitoring of potential</td>
<td>BIAL</td>
</tr>
<tr>
<td>BIAL, Communicating adverse impacts on local Communities Policy.</td>
<td>Implement Continuous Descent Approaches.</td>
<td>Revise the noise information booklet. Prepare revised biennial noise contours for 2008 based on actual traffic.</td>
<td>Implement the next phases of the Sound Insulation Scheme.</td>
<td>Implement the next phase of the Schools Environment Improvement Programme.</td>
</tr>
</tbody>
</table>
should not be planned close to existing airports, where noise exposure exceeds the WHO (2000) recommended levels for school playgrounds. It is advised that measures need to be taken to reduce noise in existing schools, where noise exposure is excessive.

- Children exposed to adverse environmental conditions, such as aircraft and road traffic noise should have quiet relaxing areas at or near home, e.g., schools, for psychological restoration.

### Communication and risk perception

- Provide an accessible overview (written in plain English) of the relationship between noise and health;
- Include an assessment of potential health impacts with noise reporting so that public can understand and assess risk for themselves.

| **Air quality** | BCC, Air quality action plan; SMBC, Air quality policy; BIAL, Air quality strategy including | Raise awareness of air quality issues among partner organisations on the Airport site. Conduct a tyre smoke study. | Mitigation
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<tbody>
<tr>
<td>- Air pollution has a negative affect on respiratory and circulatory morbidity and mortality; - Population groups particularly affected include unborn babies, infants &amp; children, pregnant women,</td>
<td></td>
<td>The HIA supports the ES recommendations that: 2 “Careful consideration to control dust raising activities is recommended through the Construction Environmental Management Plan proposed by BIAL for the construction phase”</td>
<td>BIAL</td>
</tr>
<tr>
<td>Access to historical air quality data via the internet, monitoring and sharing of wide range of emissions data</td>
<td>Investigating air quality impacts with Manchester Metropolitan University. Conduct a biennial Nitrogen Dioxide Study.</td>
<td>Measures to reduce the incidence of odour nuisance will be identified and assessed as part of the odour study to be conducted. <strong>Monitoring</strong>&lt;br&gt;Include the measurement and monitoring of PM$_{2.5}$ as part of routine air quality monitoring. <strong>Communication and risk perception.</strong>&lt;br&gt;Provide an accessible overview (written in plain English) of the relationship between air quality and health; Include an assessment of potential health impacts with air quality reporting so that public can understand and assess risk for themselves.</td>
<td><strong>Transport</strong>&lt;br&gt;Road transport has positive and negative impacts on health:&lt;br&gt;Major determinant of air pollution,&lt;br&gt;Associated with road traffic accidents - injuries and fatalities, especially affecting people from poorer neighbourhoods and children;&lt;br&gt;Enables access to people, places;&lt;br&gt;Road traffic will increase with and without the proposed runway extension;</td>
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</tbody>
</table>
- Road traffic accident (RTAs) rates from the increased in road traffic are speculated to be equivalent to that of any busy highway;
- The number of RTAs are speculated to increase with the additional volume of traffic, but the contribution of the proposed runway extension is speculated to be negligible;
- Air transport also has positive and negative impacts on health:
  - Aircraft accidents - very low risk, but high impact of passenger and third party casualties;
  - Determinant of noise and air pollution (above);
  - ‘Connectivity’;
- Air traffic movements (ATMs) will increase with and without the proposed runway extension;
- The additional risk of aircraft accidents with the proposed runway extension is probably negligible;
- The additional risk of third party casualties associated with aircraft accidents with the proposed runway extension is probably negligible.

<table>
<thead>
<tr>
<th>BIA Employers, Travelwise; BIAL, Public Safety Zones.</th>
<th>Produce revised Access, Bus and Rail Guides, where appropriate. Investigate the feasibility of extending real time rail and road information to further locations within the passenger terminals. Complete improvements for cyclists and pedestrians under and near to the Bickenhill Lane bridge. Work with Warwickshire County Council to promote the new journey opportunities created by the new Coleshill Parkway rail station and associated new bus services. Work with DfT and new franchises to develop the potential</th>
</tr>
</thead>
</table>

**Communication and risk perception**
- Monitor and publish the CMM and traffic information during the construction phase;
- Contact transport authorities to request dissemination to both developers and the public of the various transport infrastructure developments close to BIA, e.g., M42, NEC and the likely timing of these.

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negligible.

<table>
<thead>
<tr>
<th>Social capital</th>
<th>Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>• High levels of social support will protect against poor mental and physical health;</td>
<td>• Include a requirement to adopt the ‘Considerate Contractors Scheme’ standards in the proposed runway extension constructor contracts and the Code of Construction Practice.</td>
</tr>
<tr>
<td>• Low control, low involvement in decision-making focused on ‘dread’ issues is associated with heightened perceptions of public health risk;</td>
<td>• Review formal, e.g., BIA Consultative Committee (CC), and informal mechanisms to engage with local residents and communities;</td>
</tr>
<tr>
<td>• Some community stakeholders do not feel engaged with the proposed runway extension and this is possibly contributing to their perception of risks;</td>
<td>• Establish a Health Forum linked to the BIA CC which receives regular reports on health impact data related to the airport’s activities;</td>
</tr>
<tr>
<td>• It is probable that there will be an increase in accessibility to people and places in the US and far east with the proposed runway extension, however people on high incomes will probably benefit from this most;</td>
<td>• Support local residents and communities in targeted areas (complementing/liasing with existing resources);</td>
</tr>
<tr>
<td>• It is probable that employment associated with the runway extension will facilitate positive mental health linked to new positive social networks for those moving from unemployment into employment; however people with low skills will probably benefit least from</td>
<td>• Incorporate ‘the development of community enterprise’ as a criterion for the Community Trust Fund.</td>
</tr>
</tbody>
</table>

| BCC, Statement of Community Involvement in Planning; | Local Government & Public Involvement in Health Act, October 2007. |
| SMBC, Statement of Community Involvement in Planning; | **BIAL** |
| BIAL, Community and Environment Action Plans, 2007-8; | **BIAL** |
| BIAL, Consultative Committee. | **BIAL/SCT/BENPCT** |

**BIAL** specific action:

- Maintain an active programme of educational visits and opportunities.

Data and monitoring:

- Collect data in targeted areas on social capital (social support, integration, networks, control beliefs, involvement in decision-making) mental health and perceived health risks and monitor.

Communication and risk perception:

- Review and implement BIAL’s Community involvement and communications strategy;
- Promote the development of local Community involvement and communications strategies.
<table>
<thead>
<tr>
<th>Economy &amp; employment</th>
<th>BIAL specific action:</th>
<th>Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Higher levels of employment in a population are associated with lower mortality rates; however, employment which is low paid, poor quality and insecure is associated with poor health equivalent to unemployed health scores; It is probable that the runway extension will lead to employment opportunities in Solihull, Birmingham and West Midlands; It is possible that some of</td>
<td>Incorporate the new NVQ in Aviation into staff training programmes.</td>
<td>Include the requirement for ‘Local Labour Agreements’ in the constructors’ tender specification and contracts the proposed runway extension; Include the requirement for best practice standards for construction worker health and safety, e.g., IOSH ‘Global Best Practice in Contractor Safety’, HSE ‘Working Well Together’, in the constructors’ tender specification and contracts for the proposed runway extension including the Code of Construction Practice. Highlight concerns that vulnerable communities may fail to benefit from</td>
</tr>
<tr>
<td>shareholder groups are kept informed of developments through the Community Alerting System.</td>
<td>BIAL/SMBC/BCC/BENPCT/SCT</td>
<td>BIAL</td>
</tr>
</tbody>
</table>
these employment opportunities may benefit people currently resident in West Midlands;
- It is speculated that an unknown proportion of these jobs will also be filled by people from outside West Midlands;
- It is possible that a proportion of those jobs created and obtained by unemployed local people will be poor quality, low paid, fixed term and/or part-time, and may involve hazardous work; if their household income is below that of when they were unemployed it is probable that there will be negative long term health effects;
- It is speculated that some population groups, e.g., people with low skills, people with disabilities, ethnic minority groups, may be less able to take up or benefit from the 'high tech' employment opportunities the economic 'connectivity' the runway extension affords;
- It is probable that the economic growth attributed to the runway extension will result in improved health

| 2030; |
| BIA Job Centre, |
| BIAL, Job Junction; |
| BIAL, 'Moving Forward'; |
| BIAL, Engineering apprenticeships through Engineering Employers Federation; |
| SMBC, North Solihull Strategic Framework; |
| SMBC, Access to Employment; |
| SMBC, Construction Employment Alliance; |
| BCC, Regeneration Services Business Plan; |
| Connexions, Local Learning Clubs; |
| Solihull College, Routes to work; |

regional and international economic 'connectivity' in high tech fields without targeted support and interventions;
- Promote the need for interventions in targeted local schools, colleges and training providers to promote the development of skills and innovation linked to emerging high technology businesses and occupations;
- Promote the need for interventions in targeted communities to develop local entrepreneurs including Airport related service providers;
- Define targeted areas and groups, e.g., the unemployed and those on Employment Support Allowance, less able to take up the employment opportunities from the airport’s development.

Data and monitoring
- Undertake sensitivity analysis on the direct/indirect/induced employment and income forecasts;
- Consider undertaking quantitative modelling with sensitivity analyses to develop forecasts for the wider employment/ income benefits attributed to increased ‘connectivity’;
- Consider the full environmental, social and health costs associated with the proposed runway extension by undertaking more detailed modelling with sensitivity analyses;
- Monitor Local Labour Agreements through the Section 106 agreement;
- Audit and monitor the relative

| BIAL/SMBC/ |
| BCC to AWM |

| BIAL/SMBC/ |
| BCC to Airport employers, AWM |

| BIAL/SMBC/ |
| BCC/AWM |

| BIAL |

| BIAL |

| BIAL |
| **outcomes for the region;**
| • It is probable that the health gains will be experienced by those with increased per capita income;
| • It is speculated that vulnerable groups in the labour market will benefit least from income growth in the region. | Groundwork, Environment projects/employment;
AWM, Workwise. | high/low quality jobs associated with airport operations;
• Develop strategies to promote ‘job quality’ across occupations in the airport context. |
| **Communication**
• As part of an overall Community communications strategy, promote awareness of the work the airport is undertaking to support local employment and improve the quality of all jobs. | | SMBC/Job Junction partnership
Regional observatory
BIAL/Airport employers
BIAL |

| **Climate change**
• It is possible that the proposal will contribute to climate change;
• It is also possible that this will contribute to a number of current and predicted negative health impacts on vulnerable populations. | BIAL, Action Energy programme;
BCC, Sustainability Strategy & Action Plan;
‘See Transport’ | SMBC, Draft Sustainable Community Strategy, January 2008;
BIAL commitment to Sustainable Aviation Strategy (with airlines, airports and aircraft manufacturers) www.sustainableaviation.co.uk and ‘aviation industry’ action to counter climate change and improve local |
| **Mitigation**
• Support the development of BIAL’s Climate Change Strategy | | BIAL |
**Health inequalities**

- It is probable that the negative impacts:
  - the increase in noise levels,
  - the increase (negligible) in risk of accidents (road and third party),
  - the increase (negligible) in exposure to air pollutants,
  - the reduction in social networking (and support),
  - the decrease in personal control,
  - the increase in perceived risks

will be disproportionately, and in some case cumulatively, experienced by children and people living or working close to the airport, people on low incomes or economically inactive, older people, people with poor mental health and people with an existing circulatory or respiratory condition. In addition, many of these vulnerable groups have less choice and/or capacity to

<table>
<thead>
<tr>
<th>Environmental impacts.</th>
<th>Recommendations to reduce health inequalities by targeting action have been integrated into the above sections.</th>
</tr>
</thead>
<tbody>
<tr>
<td>WMSHA, Single Equality Scheme (SES); BEN PCT, Local Delivery Plan (LDP); BEN, SES; SCT, LDP; SCT, SES; SMBC, A Place for People: a Community Strategy for Solihull.</td>
<td>BCC, Draft Birmingham 2026, April 2008.</td>
</tr>
</tbody>
</table>
change their situation, either by finding coping mechanisms or choosing to move house.

- Many of these groups will be particularly vulnerable to exposure to these health risk factors and conditions:
- Many of these groups will already be experiencing multiple deprivation, e.g., on low income, above average exposure to noise and air pollutants, and related to this poorer health than national and regional averages.
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## 9 Appendices

### Stakeholder map

<table>
<thead>
<tr>
<th>Stakeholder/Key informant Category</th>
<th>Stakeholders/Key Informants</th>
<th>Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Community - populations proximal to development</td>
<td>Households in following 4 SMBC wards: Bickenhill, Elmdon, Meriden, Knowle</td>
<td>Households/Groups in wards via: BIA Consultative Committee Solihull Community &amp; Economic Regeneration Team, Solihull CVS, Solihull Ward councilors</td>
</tr>
<tr>
<td>2. Community - populations adjacent to airport/flight paths</td>
<td>Households in following 9 SMBC wards: Bickenhill, Elmdon, Meriden, Knowle, Chelmsley wood, Fordbridge, Kingshurst, Smith’s Wood, Silhill</td>
<td>Households/Groups in wards via: BIA Consultative Committee Solihull Community &amp; Economic Regeneration Team, Solihull CVS, Solihull Ward councilors</td>
</tr>
<tr>
<td></td>
<td>Households in following 10 BCC wards: Shard End, Hodge Hill, South Yardley, Acock’s Green, Tyburn, Sutton New Hall, Stetchford &amp; Yardley North, Washwood Heath, Bordesley Green, Sheldon</td>
<td>Households/Groups in wards via: BIA Consultative Committee Birmingham Community Services (Central/local teams), Birmingham VSC, Birmingham ward councilors</td>
</tr>
</tbody>
</table>
### Potential groups identified:
- Masterplan consultation attendees, Community Associations, Neighbourhood Forums, Tenants Groups (W)
- Prince’s Trust, Learning & Job Shop, Eastside Jobs Team, Solihull College, Birmingham & Solihull Learning & Skills Council, Work Directions (W)
- Sure Start Groups, Primary Schools in affected areas (W)
- West Midlands Age Concern, Crowning Years Lunch Club, Solihull, Princess Royal Trust for Carers (W)
- Phab Group, Knowle (W)
- The Lung Foundation – Birmingham South Breathe Easy Support Group (W)
- Stroke Association (Solihull), Stroke Club (Solihull), Solihull Heart Support (W)
- MIND Solihull, Positive Mental Health Group (W)
- Heart of England Way Association, Ramblers’ Association, West Midlands Walking Group, Yardley & District Rambling Association, Friends of Knowle Park, Solihull

<table>
<thead>
<tr>
<th>No.</th>
<th>Community – people of working age</th>
<th>Employed, e.g., construction workers, health workers, others Economically inactive, e.g., long term unemployed, IB claimants People with low skills</th>
<th>Prince’s Trust, Learning &amp; Job Shop, Eastside Jobs Team, Solihull College, Birmingham &amp; Solihull Learning &amp; Skills Council, Work Directions (W)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.</td>
<td>Community – children</td>
<td>Year 6, Parents, Teachers, School Governors</td>
<td>Sure Start Groups, Primary Schools in affected areas (W)</td>
</tr>
<tr>
<td>4.</td>
<td>Community – older people</td>
<td>Older People, Carers</td>
<td>West Midlands Age Concern, Crowning Years Lunch Club, Solihull, Princess Royal Trust for Carers (W)</td>
</tr>
<tr>
<td>5.</td>
<td>Community – people with disabilities</td>
<td>Physical Disabilities, Learning Difficulties</td>
<td>Phab Group, Knowle (W)</td>
</tr>
<tr>
<td>6.</td>
<td>Community – people with respiratory conditions</td>
<td>Asthma, Bronchitis, COPD…</td>
<td>The Lung Foundation – Birmingham South Breathe Easy Support Group (W)</td>
</tr>
<tr>
<td>7.</td>
<td>Community – people with cardiovascular conditions</td>
<td>Heart disease, Stroke</td>
<td>Stroke Association (Solihull), Stroke Club (Solihull), Solihull Heart Support (W)</td>
</tr>
<tr>
<td>8.</td>
<td>Community – people with poor mental health</td>
<td>Mild mental health problems (anxiety, mild depression)</td>
<td>MIND Solihull, Positive Mental Health Group (W)</td>
</tr>
<tr>
<td>12. Community – Transport</td>
<td>Airport users/staff, A45 road users, Public transport users</td>
<td>Airport staff forums, union representatives, Transport 2000, Ring &amp; Ride (Solihull) (W)</td>
<td></td>
</tr>
<tr>
<td>13. Organisation - BIA</td>
<td>Policy proponents/commissioners, EIA consultants</td>
<td>BIA representative, Arup (FG)</td>
<td></td>
</tr>
<tr>
<td>15. Organisation – Transport</td>
<td>Transport planners, Public Transport Authority</td>
<td>West Midlands LTP planners, WM Passenger Transport Authority (W)</td>
<td></td>
</tr>
<tr>
<td>16. Organisation – Social capital</td>
<td>Community services</td>
<td>Solihull Community &amp; Regeneration Team, Birmingham Community Services (W)</td>
<td></td>
</tr>
<tr>
<td>17. Organisation - health/ emergency services</td>
<td></td>
<td>Emergency Planning representative, West Midlands Emergency Preparedness Network, WMAS, A&amp;E staff, Health &amp; Safety Executive, GPs (in affected areas) (I)</td>
<td></td>
</tr>
<tr>
<td>18. Key Informant – Airport HIAs</td>
<td>HIA practitioners of earlier Airport developments</td>
<td>Manchester, Finningley, Berlin (I)</td>
<td></td>
</tr>
<tr>
<td>19. Key Informant – noise/health</td>
<td></td>
<td>ECEH Bonn (noise and health programme), Noise Research Network, UCL, Queen Mary (children) (I)</td>
<td></td>
</tr>
<tr>
<td>20. Key Informant – air quality/health</td>
<td></td>
<td>ECEH Bonn (air quality programme) WHO Centre (I) (I)</td>
<td></td>
</tr>
<tr>
<td>21. Key Informant – aviation</td>
<td>Aviation, air quality, noise, economy, employment, social capital</td>
<td>ECEH Bonn (air quality programme) WHO Centre (I) (I)</td>
<td></td>
</tr>
<tr>
<td>22. Key Informant – employment/ health</td>
<td>Employment, health</td>
<td>ECEH Bonn (air quality programme) WHO Centre (I) (I)</td>
<td></td>
</tr>
<tr>
<td>23. Key Informant – social capital/health</td>
<td>Social capital, health</td>
<td>ECEH Bonn (air quality programme) WHO Centre (I) (I)</td>
<td></td>
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<tr>
<td>24. Key Informant –</td>
<td></td>
<td>HSE, IOSH (I)</td>
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<tr>
<th>Occupational health</th>
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<tbody>
<tr>
<td>25. Key Informant – climate change/health</td>
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Stakeholder workshops

AIMS OF THE WORKSHOP (1)

The workshop aims to provide information about the Health Impact Assessment (HIA) of Birmingham International Airport’s (BIA) proposals for a Runway Extension. In addition, the workshop will offer communities the opportunity to consider, and share, views on the potential impacts of the proposed Runway Extension on their health and well-being.

This will be achieved by:

- Providing briefings on BIA’s proposals for a Runway Extension and the HIA Project;
- Facilitating focus group discussions considering:
  - The potential effects of the proposed Runway Extension on health and well-being;
  - How those effects could be managed to ensure that opportunities to improve health and well-being are maximised, and how any potential risks to health and well-being could be minimised;
- The involvement of stakeholders in the Project.

What is this workshop for?

The data collected from the workshop will be used as part of the evidence for the HIA. Evidence from the workshop will be included in the final HIA report submitted to BIA and the HIA Steering Group, and ultimately would inform a planning application for the proposed runway extension.

WORKSHOP PROGRAMME

Registration and light refreshments

12.15/6.15 Welcome and purpose of the workshop
Debbie Abrahams, Director, IMPACT+, University of Liverpool

12.25/6.25 What is Health Impact Assessment?
What is involved in the HIA of BIAL’s Proposed Runway Extension?
Debbie Abrahams

12.40/6.40 Overview of Birmingham International Airport’s Runway Extension proposals
Fiona Haigh, Senior Researcher, IMPACT+, University of Liverpool

1.00/7.00 Questions and answers
**AIMS OF THE CONSENSUS BUILDING WORKSHOP (2)**

The workshop aims to develop consensus or agreement between stakeholders who may potentially be affected by the proposed runway extension development on the priority health impacts. In addition the workshop seeks to agree recommendations that should be reported to the HIA Steering Group and BIAL Board.

**WORKSHOP PROGRAMME**

**Registration and light refreshments**

12.15 Welcome and introduction to the workshop  
*Debbie Abrahams, Director, IMPACT+, University of Liverpool*

12.25 Findings from the HIA of BIAL’s Proposed Runway Extension  
*Debbie Abrahams*  
*Fiona Haigh, Senior Researcher, IMPACT+, University of Liverpool*

12.55 Group work – reaching consensus on impacts

1.35 Group work – prioritisation of impacts

**Tea break**

2.15 Group work - developing recommendations
2.45 Group feedback

3.00 Evaluation of the day

End

**Additional profile data**

**Examples of Ethnic Health Inequalities**

**Cardio-vascular disease (CVD)**

Men born in South Asia are 50% more likely to have a heart attack or angina than men in the general population. Bangladeshis have the highest rates, followed by Pakistanis, then Indians and other South Asians. By contrast, men born in the Caribbean are 50% more likely to die of stroke than the general population, but they have much lower mortality to coronary heart disease. Classical risk factors like smoking, blood pressure, obesity and cholesterol fail to account for all these ethnic variations, and there is debate about how much they can be explained by socio-economic factors. Many researchers think that there are biological differences between ethnic groups, and a lot of research has been carried out on the potential mechanisms.

**Cancer**

Overall, cancer rates tend to be lower in BME groups. For lung cancer, mortality rates are lower in people from South Asia, the Caribbean and Africa, which relates to lower levels of smoking. The highest mortality is found in people from Ireland and Scotland. Mortality from breast cancer is lower for migrant women than for women born in England and Wales. Researchers think this reflects the fact that it takes time to acquire the detrimental lifestyle and other risk factors associated with living in this country.

**Mental health**

Ethnic differences in mental health are controversial. Most of the data are based on treatment rates, which show that BME people are much more likely to receive a diagnosis of mental illness than the White British. Studies show up to 7 times higher rates of new diagnosis of psychosis among Black Caribbean people than among the White British. However, surveys on the prevalence of mental illness in the community show smaller ethnic differences. There is evidence of ethnic differences in risk factors that operate before a patient comes into contact with the health services, such as discrimination, social exclusion and urban living. There is also evidence of differences in treatment. For example, Black Caribbean and African people are more likely to enter psychiatric care through the criminal justice system than through contact with the health services. Some researchers suggest that psychiatrists diagnose potential symptoms of mental illness differently depending on the ethnicity of the patient (POST, 2007).
Age and Sex Structure

The population of England has become older in the last three decades, and is predicted to become older still in the next three decades. Levels of immigration have partly offset population ageing. Between 2001 and 2004, almost two thirds of the increase in population in England was due to net immigration; this is a continuing trend (ONS, 2007b)

More boys than girls are born each year within England. However, there are more women than men within the population predominantly as a result of shorter life expectancies/higher mortality rates for men. The gap between the number of women and men widens with age.

Ethnicity and Health Inequalities

Large-scale surveys like the Health Survey for England show that BME groups as a whole are more likely to report ill-health, and that ill-health among BME people starts at a younger age than in the White British. There is more variation in the rates of some diseases by ethnicity than by other socio-economic factors (Bhopal, 2007). However, patterns of ethnic variation in health are extremely diverse, and inter-link with many overlapping factors:

- Some BME groups experience worse health than others. For example, surveys commonly show that Pakistani, Bangladeshi and Black-Caribbean people report the poorest health, with Indian, East African Asian and Black African people reporting the same health as White British, and Chinese people reporting better health;
- Patterns of ethnic inequalities in health vary from one health condition to the next. For example, BME groups tend to have higher rates of cardio-vascular disease than White British people, but lower rates of many cancers. Further examples of ethnic health inequalities are included within section ** of appendix **;
- Ethnic differences in health vary across age groups, so that the greatest variation by ethnicity is seen among the elderly;
- Ethnic differences in health vary between men and women, as well as between geographic areas;
- Ethnic differences in health may vary between generations. For example, in some BME groups, rates of ill-health are worse among those born in the UK than in first generation migrants (POST, 2007).
Figure 9-1 Gender Structure by Ward and Comparative Areas (Census 2001)

Table 9-1 Ranked Age Structure by Ward and Comparative Areas (Census 2001)

<table>
<thead>
<tr>
<th>Rank</th>
<th>Ward</th>
<th>Age (0-15)</th>
<th>Age (16-24)</th>
<th>Age (25-44)</th>
<th>Age (45-64)</th>
<th>Age (65+)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Elmdon</td>
<td>16.5%</td>
<td>7.9%</td>
<td>22.4%</td>
<td>14.0%</td>
<td>10.0%</td>
</tr>
<tr>
<td>2</td>
<td>Silhill</td>
<td>18.1%</td>
<td>8.3%</td>
<td>25.6%</td>
<td>16.4%</td>
<td>10.4%</td>
</tr>
<tr>
<td>3</td>
<td>Knowle</td>
<td>18.6%</td>
<td>8.4%</td>
<td>25.8%</td>
<td>19.0%</td>
<td>11.2%</td>
</tr>
<tr>
<td>4</td>
<td>Meriden</td>
<td>19.6%</td>
<td>8.7%</td>
<td>26.2%</td>
<td>20.2%</td>
<td>11.7%</td>
</tr>
<tr>
<td>5</td>
<td>Sutton New Hall</td>
<td>20.2%</td>
<td>8.8%</td>
<td>27.0%</td>
<td>20.2%</td>
<td>12.7%</td>
</tr>
<tr>
<td>6</td>
<td>England</td>
<td>20.2%</td>
<td>9.0%</td>
<td>27.0%</td>
<td>20.3%</td>
<td>13.2%</td>
</tr>
<tr>
<td>7</td>
<td>Bickenhill</td>
<td>20.4%</td>
<td>9.2%</td>
<td>27.3%</td>
<td>20.4%</td>
<td>13.2%</td>
</tr>
<tr>
<td>8</td>
<td>Sheldon</td>
<td>20.9%</td>
<td>9.6%</td>
<td>27.0%</td>
<td>20.3%</td>
<td>14.0%</td>
</tr>
<tr>
<td>Rank</td>
<td>Area</td>
<td>Population</td>
<td>Growth</td>
<td>Economic Growth</td>
<td>Education Growth</td>
<td>Health Growth</td>
</tr>
<tr>
<td>------</td>
<td>-------------------------------</td>
<td>------------</td>
<td>--------</td>
<td>-----------------</td>
<td>------------------</td>
<td>--------------</td>
</tr>
<tr>
<td>1</td>
<td>Birmingham</td>
<td>23.8%</td>
<td>5.6%</td>
<td>28.0%</td>
<td>22.8%</td>
<td>22.8%</td>
</tr>
<tr>
<td>2</td>
<td>Solihull</td>
<td>21.0%</td>
<td>5.0%</td>
<td>27.8%</td>
<td>22.0%</td>
<td>22.0%</td>
</tr>
<tr>
<td>3</td>
<td>Acocks Green</td>
<td>22.2%</td>
<td>5.2%</td>
<td>28.0%</td>
<td>22.2%</td>
<td>22.2%</td>
</tr>
<tr>
<td>4</td>
<td>Kingshurst and Fordbridge</td>
<td>23.4%</td>
<td>5.6%</td>
<td>28.0%</td>
<td>22.4%</td>
<td>22.4%</td>
</tr>
<tr>
<td>5</td>
<td>Shard End</td>
<td>23.5%</td>
<td>5.7%</td>
<td>28.3%</td>
<td>22.5%</td>
<td>22.5%</td>
</tr>
<tr>
<td>6</td>
<td>Stechford and Yardley North</td>
<td>23.7%</td>
<td>5.9%</td>
<td>28.3%</td>
<td>22.7%</td>
<td>22.7%</td>
</tr>
<tr>
<td>7</td>
<td>Hodge Hill</td>
<td>24.0%</td>
<td>6.0%</td>
<td>28.6%</td>
<td>22.0%</td>
<td>22.0%</td>
</tr>
<tr>
<td>8</td>
<td>Tyburn</td>
<td>24.1%</td>
<td>6.1%</td>
<td>28.7%</td>
<td>22.1%</td>
<td>22.1%</td>
</tr>
<tr>
<td>9</td>
<td>South Yardley</td>
<td>25.4%</td>
<td>6.4%</td>
<td>28.8%</td>
<td>22.4%</td>
<td>22.4%</td>
</tr>
<tr>
<td>10</td>
<td>Chelmsley Wood</td>
<td>26.4%</td>
<td>5.5%</td>
<td>28.9%</td>
<td>22.4%</td>
<td>22.4%</td>
</tr>
<tr>
<td>11</td>
<td>Smith's Wood</td>
<td>26.6%</td>
<td>5.6%</td>
<td>29.0%</td>
<td>22.6%</td>
<td>22.6%</td>
</tr>
<tr>
<td>12</td>
<td>Kingshurst and Fordbridge</td>
<td>26.9%</td>
<td>6.0%</td>
<td>29.3%</td>
<td>22.9%</td>
<td>22.9%</td>
</tr>
<tr>
<td>13</td>
<td>Washwood Heath</td>
<td>30.7%</td>
<td>6.9%</td>
<td>30.9%</td>
<td>24.7%</td>
<td>24.7%</td>
</tr>
<tr>
<td>14</td>
<td>Bordesley Green</td>
<td>33.4%</td>
<td>3.3%</td>
<td>31.8%</td>
<td>26.4%</td>
<td>26.4%</td>
</tr>
</tbody>
</table>
Mortality data

Table 9-2 Mortality from All Causes, All Ages, Directly Age-Standardised Rates (DSR) 2003-05 (Pooled). Deaths per 100,000 European Standard Population.

<table>
<thead>
<tr>
<th></th>
<th>MALES</th>
<th>FEMALES</th>
<th>ALL PERSONS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OBS</td>
<td>DSR</td>
<td>OBS</td>
</tr>
<tr>
<td>Birmingham</td>
<td>13804</td>
<td>878.83</td>
<td>14249</td>
</tr>
<tr>
<td>Solihull</td>
<td>2570</td>
<td>665.64</td>
<td>2856</td>
</tr>
<tr>
<td>West Midlands</td>
<td>77871</td>
<td>799.29</td>
<td>83366</td>
</tr>
<tr>
<td>England</td>
<td>694694</td>
<td>759.67</td>
<td>769828</td>
</tr>
</tbody>
</table>

(Source: NCHOD, 2006)

Table 9-3 Mortality from CHD, All Ages, Directly Age-Standardised Rates (DSR) 2003-05 (Pooled). Deaths per 100,000 European Standard Population.

<table>
<thead>
<tr>
<th></th>
<th>MALES</th>
<th>FEMALES</th>
<th>PERSONS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OBS</td>
<td>DSR</td>
<td>OBS</td>
</tr>
<tr>
<td>ENGLAND</td>
<td>144485</td>
<td>155.67</td>
<td>116329</td>
</tr>
<tr>
<td>WEST MIDLANDS</td>
<td>15922</td>
<td>160.97</td>
<td>12236</td>
</tr>
<tr>
<td>Birmingham MCD</td>
<td>2904</td>
<td>186.19</td>
<td>2181</td>
</tr>
<tr>
<td>Solihull MCD</td>
<td>555</td>
<td>143.88</td>
<td>416</td>
</tr>
</tbody>
</table>

(Source: NCHOD, 2006)
Table 9-4 Percentage of People Reporting at Least One Limiting Long-term Illness (2001)

<table>
<thead>
<tr>
<th>RANK</th>
<th>Ward</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Shard End</td>
<td>24.76</td>
</tr>
<tr>
<td>2</td>
<td>Sheldon</td>
<td>21.24</td>
</tr>
<tr>
<td>3</td>
<td>Chelmsley Wood</td>
<td>20.84</td>
</tr>
<tr>
<td>4</td>
<td>Hodge Hill</td>
<td>20.83</td>
</tr>
<tr>
<td>5</td>
<td>Elmdon</td>
<td>20.42</td>
</tr>
<tr>
<td>6</td>
<td>Washwood Heath</td>
<td>20.28</td>
</tr>
<tr>
<td>7</td>
<td>Smith's Wood</td>
<td>20.11</td>
</tr>
<tr>
<td>8</td>
<td>Acocks Green</td>
<td>20.03</td>
</tr>
<tr>
<td>9</td>
<td>Sutton New Hall</td>
<td>19.65</td>
</tr>
<tr>
<td>10</td>
<td>Birmingham</td>
<td>19.65</td>
</tr>
<tr>
<td>11</td>
<td>West Midlands</td>
<td>18.86</td>
</tr>
<tr>
<td>12</td>
<td>England</td>
<td>17.93</td>
</tr>
<tr>
<td>13</td>
<td>Silhill</td>
<td>17.43</td>
</tr>
<tr>
<td>14</td>
<td>Solihull</td>
<td>16.33</td>
</tr>
<tr>
<td>15</td>
<td>Bickenhill</td>
<td>15.87</td>
</tr>
<tr>
<td>16</td>
<td>Meriden</td>
<td>13.76</td>
</tr>
<tr>
<td>17</td>
<td>Knowle</td>
<td>13.63</td>
</tr>
</tbody>
</table>

(Source: ONS, Census 2001)

Deprivation

Deprivation

‘Deprivation’ is a term that refers to a variety of social conditions experienced by people who lack certain resources in relation to others in the community, thereby making them ‘deprived’ compared to others in the population. It is frequently used as a comparative measure of socioeconomic position (SEP). Numerous studies have reported an association between social and material deprivation and poor health outcomes (Shaw et al, 2007). The Indices of Multiple Deprivation (IMD 2004) is a deprivation index at the small area level*, created by the British Department for Communities and Local
Government (DCLG). It is based on distinct dimensions of deprivation which are measured separately and then combined into a single overall measure. The Index is made up of seven distinct dimensions of deprivation called Domain Indices. These include income, employment, health and disability, education and skills/training, barriers to housing services, living environment and crime.

*The Indices of deprivation 2004 are measured at the Lower Layer Super Output Area level (SOAs). SOAs were developed by the Office for National Statistics from the Census 2001 Output Areas. There are 32,482 Lower Layer SOAs in England. Lower Layer SOAs are areas smaller than wards and contain a minimum of 1,000 people and 400 households with a mean population of 1,500 people.

Table 9-5 Areas that are in the Most and Least Deprived in England - Birmingham

<table>
<thead>
<tr>
<th>Index of Multiple Deprivation 2004 (Overall Index)</th>
<th>Residents (2001 Census)</th>
<th>Percentage of ward population in Super Output Areas that are in the most deprived x% in England</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004 Ward</td>
<td>Population Living in Super Output Areas that are in the most deprived x% in England</td>
<td></td>
</tr>
<tr>
<td>All Super Output Areas*</td>
<td>26635</td>
<td>10% most deprived</td>
</tr>
<tr>
<td>10% most deprived</td>
<td>7785</td>
<td>10 to 25% most deprived</td>
</tr>
<tr>
<td>10 to 25% most deprived</td>
<td>15114</td>
<td>25 to 50% most deprived</td>
</tr>
<tr>
<td>25 to 50% most deprived</td>
<td>2253</td>
<td>50% least deprived</td>
</tr>
<tr>
<td>50% least deprived</td>
<td>1483</td>
<td>10% most deprived</td>
</tr>
<tr>
<td>10% most deprived</td>
<td>29.2</td>
<td>10 to 25% most deprived</td>
</tr>
<tr>
<td>10 to 25% most deprived</td>
<td>56.7</td>
<td>25 to 50% most deprived</td>
</tr>
<tr>
<td>25 to 50% most deprived</td>
<td>8.5</td>
<td>50% least deprived</td>
</tr>
<tr>
<td>50% least deprived</td>
<td>5.6</td>
<td>10% most deprived</td>
</tr>
<tr>
<td>ACOCKS GREEN</td>
<td>31343</td>
<td>10 to 25% most deprived</td>
</tr>
<tr>
<td>BORDESLEY GREEN</td>
<td>24114</td>
<td>25 to 50% most deprived</td>
</tr>
<tr>
<td>HODGE HILL</td>
<td>25310</td>
<td>50% least deprived</td>
</tr>
<tr>
<td>SHARD END</td>
<td>20911</td>
<td>10% most deprived</td>
</tr>
<tr>
<td>SHELTON</td>
<td>25310</td>
<td>10 to 25% most deprived</td>
</tr>
<tr>
<td>SOUTH YARDLEY</td>
<td>20911</td>
<td>25 to 50% most deprived</td>
</tr>
<tr>
<td>STECHFORD AND YARDLEY NORTH</td>
<td>27620</td>
<td>50% least deprived</td>
</tr>
<tr>
<td>SUTTON NEW HALL</td>
<td>27620</td>
<td>10% most deprived</td>
</tr>
<tr>
<td>TYBURN</td>
<td>27620</td>
<td>10 to 25% most deprived</td>
</tr>
<tr>
<td>WASHWOOD HEATH</td>
<td>27620</td>
<td>25 to 50% most deprived</td>
</tr>
<tr>
<td>Birmingham</td>
<td>27620</td>
<td>50% least deprived</td>
</tr>
<tr>
<td>* Population is approximate and derived from National Statistics Look-Up Table of Census Output Areas to 2004 Wards</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 9-6 Households with Number of Cars or Vans (percentages)

<table>
<thead>
<tr>
<th>households with number of cars or vans (percentages)</th>
<th>None</th>
<th>One</th>
<th>Two</th>
<th>Three</th>
<th>Four or more</th>
</tr>
</thead>
<tbody>
<tr>
<td>Washwood Heath</td>
<td>47.44</td>
<td>43.47</td>
<td>7.89</td>
<td>0.90</td>
<td>0.30</td>
</tr>
<tr>
<td>Shard End</td>
<td>46.41</td>
<td>40.53</td>
<td>11.14</td>
<td>1.54</td>
<td>0.38</td>
</tr>
<tr>
<td>Bordesley Green</td>
<td>44.79</td>
<td>44.14</td>
<td>9.64</td>
<td>1.20</td>
<td>0.24</td>
</tr>
<tr>
<td>Tyburn</td>
<td>43.45</td>
<td>42.92</td>
<td>11.56</td>
<td>1.68</td>
<td>0.39</td>
</tr>
<tr>
<td>Acocks Green</td>
<td>40.81</td>
<td>43.55</td>
<td>13.24</td>
<td>1.84</td>
<td>0.56</td>
</tr>
<tr>
<td>South Yardley</td>
<td>40.21</td>
<td>43.88</td>
<td>13.44</td>
<td>1.93</td>
<td>0.54</td>
</tr>
<tr>
<td>Stetchford and Yardley North</td>
<td>38.15</td>
<td>42.78</td>
<td>15.90</td>
<td>2.55</td>
<td>0.63</td>
</tr>
<tr>
<td>Hodge Hill</td>
<td>37.73</td>
<td>43.07</td>
<td>15.76</td>
<td>2.70</td>
<td>0.74</td>
</tr>
<tr>
<td>Sheldon</td>
<td>33.23</td>
<td>44.72</td>
<td>18.82</td>
<td>2.51</td>
<td>0.72</td>
</tr>
<tr>
<td>Sutton New Hall</td>
<td>16.46</td>
<td>39.61</td>
<td>35.76</td>
<td>6.54</td>
<td>1.63</td>
</tr>
<tr>
<td>Chelmsley Wood</td>
<td>44.94%</td>
<td>40.36%</td>
<td>12.65%</td>
<td>1.63%</td>
<td>0.42%</td>
</tr>
<tr>
<td>Smith's Wood</td>
<td>41.02%</td>
<td>42.83%</td>
<td>13.38%</td>
<td>2.15%</td>
<td>0.62%</td>
</tr>
<tr>
<td>Kinghurst &amp; Fordbridge</td>
<td>40.53%</td>
<td>43.49%</td>
<td>13.79%</td>
<td>1.81%</td>
<td>0.37%</td>
</tr>
<tr>
<td>Bickenhill</td>
<td>19.81%</td>
<td>41.63%</td>
<td>29.79%</td>
<td>6.25%</td>
<td>2.52%</td>
</tr>
<tr>
<td>Elmdon</td>
<td>19.25%</td>
<td>47.20%</td>
<td>27.11%</td>
<td>5.20%</td>
<td>1.23%</td>
</tr>
<tr>
<td>Silhill</td>
<td>16.83%</td>
<td>40.50%</td>
<td>33.24%</td>
<td>7.24%</td>
<td>2.19%</td>
</tr>
</tbody>
</table>

(Source: ONS, Neighbourhood Statistics 2007)
<table>
<thead>
<tr>
<th>Location</th>
<th>Entry Level 2</th>
<th>Entry Level 3</th>
<th>Level 1</th>
<th>Level 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowle</td>
<td>10.51%</td>
<td>35.02%</td>
<td>40.76%</td>
<td>9.83%</td>
</tr>
<tr>
<td>Meriden</td>
<td>10.02%</td>
<td>33.21%</td>
<td>42.67%</td>
<td>10.20%</td>
</tr>
<tr>
<td>Birmingham</td>
<td>38.49</td>
<td>41.71</td>
<td>16.31%</td>
<td>2.73%</td>
</tr>
<tr>
<td>Solihull</td>
<td>20.55%</td>
<td>40.97%</td>
<td>30.52%</td>
<td>5.97%</td>
</tr>
<tr>
<td>West Midlands Region</td>
<td>26.77</td>
<td>42.89</td>
<td>24.21%</td>
<td>4.69%</td>
</tr>
<tr>
<td>England</td>
<td>26.84</td>
<td>43.69</td>
<td>23.56%</td>
<td>4.52%</td>
</tr>
</tbody>
</table>

(Source: ONS, Census 2001)

**Skills**

**Table 9-7 Literacy Skills by Area of Residence (2002) Percentages**

<table>
<thead>
<tr>
<th>Level</th>
<th>Total</th>
<th>High need areas</th>
<th>Other areas</th>
<th>Total</th>
<th>High need areas</th>
<th>Other areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birmingham</td>
<td></td>
<td></td>
<td></td>
<td>Solihull</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Entry level 2</td>
<td>92</td>
<td>87</td>
<td>94</td>
<td>97</td>
<td>93</td>
<td>98</td>
</tr>
<tr>
<td>Entry level 3</td>
<td>86</td>
<td>79</td>
<td>88</td>
<td>94</td>
<td>88</td>
<td>95</td>
</tr>
<tr>
<td>Level 1</td>
<td>83</td>
<td>76</td>
<td>86</td>
<td>92</td>
<td>87</td>
<td>93</td>
</tr>
<tr>
<td>Level 2</td>
<td>80</td>
<td>74</td>
<td>82</td>
<td>90</td>
<td>83</td>
<td>92</td>
</tr>
</tbody>
</table>

(Source: Learning and Skills Council for Birmingham and Solihull, 2003)

**Table 9-8 Literacy Skills by Ethnicity (2002) Percentages**

<table>
<thead>
<tr>
<th>Level</th>
<th>White</th>
<th>Asian</th>
<th>African Caribbean</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entry level 2</td>
<td>95</td>
<td>87</td>
<td>88</td>
<td>89</td>
</tr>
<tr>
<td>Entry level 3</td>
<td>90</td>
<td>79</td>
<td>81</td>
<td>78</td>
</tr>
<tr>
<td>Level 1</td>
<td>87</td>
<td>75</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>Level 2</td>
<td>85</td>
<td>72</td>
<td>73</td>
<td>63</td>
</tr>
</tbody>
</table>

(Source: Learning and Skills Council for Birmingham and Solihull, 2003)

**Table 9-9 Numeracy Skills by Area of Residence (2002) Percentages**

<table>
<thead>
<tr>
<th>Level</th>
<th>Total</th>
<th>High need areas</th>
<th>Other areas</th>
<th>Total</th>
<th>High need areas</th>
<th>Other areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birmingham</td>
<td></td>
<td></td>
<td></td>
<td>Solihull</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Entry level 2</td>
<td>89</td>
<td>81</td>
<td>92</td>
<td>97</td>
<td>91</td>
<td>99</td>
</tr>
<tr>
<td>Entry level 3</td>
<td>79</td>
<td>68</td>
<td>83</td>
<td>90</td>
<td>75</td>
<td>94</td>
</tr>
<tr>
<td>Level 1</td>
<td>59</td>
<td>49</td>
<td>62</td>
<td>78</td>
<td>57</td>
<td>84</td>
</tr>
<tr>
<td>Level 2</td>
<td>47</td>
<td>36</td>
<td>51</td>
<td>62</td>
<td>41</td>
<td>67</td>
</tr>
</tbody>
</table>

(Source: Learning and Skills Council for Birmingham and Solihull, 2003)
<table>
<thead>
<tr>
<th>Level</th>
<th>Full time</th>
<th>Part time</th>
<th>Retired</th>
<th>Student*</th>
<th>Unemployed</th>
<th>Housewife</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entry level 2</td>
<td>96</td>
<td>97</td>
<td>93</td>
<td>96</td>
<td>80</td>
<td>87</td>
</tr>
<tr>
<td>Entry level 3</td>
<td>89</td>
<td>86</td>
<td>83</td>
<td>87</td>
<td>65</td>
<td>71</td>
</tr>
<tr>
<td>Level 1</td>
<td>72</td>
<td>68</td>
<td>60</td>
<td>75</td>
<td>45</td>
<td>51</td>
</tr>
<tr>
<td>Level 2</td>
<td>58</td>
<td>53</td>
<td>58</td>
<td>63</td>
<td>33</td>
<td>35</td>
</tr>
</tbody>
</table>

*Other than university students temporarily resident in the area

(Source: Learning and Skills Council for Birmingham and Solihull, 2003)
Self-reported Acute Sickness
The Health Survey for England 2003 included data on self-reported acute sickness. Acute sickness was defined as having to cut down, in the two weeks preceding the interview, on usual activities (in the house, at school, at work or in free time) due to illness or injury. In order to assess its severity, those who reported having acute sickness were asked on how many days in the past two weeks had they been affected.

Mental Health
According to national surveys of mental ill health:

- 16.4% of adults aged 16-74 living in private households have a mental health problem at any one time. 80% of these people are experiencing anxiety and/or depression (ONS, 2000).
- 9.6% of children aged 5 – 16 have a diagnosable mental health disorder (ONS, 2004)
- Depression is the most common mental health problem among older people (Audit Commission, 2000).

In 1999 the Government therefore adopted the suicide rate as a ‘proxy’ or representative target for mental health. The reasons for this were the availability of reliable data, and the fact that policies to promote good mental health should lead to a reduction in suicides (DoH, 1999). Suicide data is therefore shown in table **. However, other indicators of mental ill health do exist and data on the following are included:

- Self-reported psychosocial health questions in the Health Survey for England 2003. The general health questionnaire (GHQ) was used as an indicator of possible mental health problems. This questionnaire consists of 12 questions concerning happiness, depression, anxiety, sleep disturbance, and ability to cope. A score of 4 or more was used as the threshold to identify respondents with possible psychiatric disorder, and is referred to as a ‘high GHQ score’. The GHQ score is also known as the GHQ 12 score (HSE, 2003b).

- The IMD 2004 measured seven ‘Domains’ or aspects of deprivation, which are weighted to arrive at an Overall measure of deprivation. One of the seven domains is ‘Health and Disability’, which in turn comprises four sub-domains. One of these sub-domains is ‘Adults under 60 suffering from mood or anxiety disorders’ (a measure of Mental Health problems). The measure takes account of suicides, anti-depressant prescribing, hospital admissions for mental health problems, and incapacity benefit claims with a mental health diagnosis.

- The DoH Community Health Profiles (2007) now use the Rate Claimants of Benefits/Allowances for Mental or Behavioural Disorders as a measure of mental ill health at local authority level.

Self-reported Psychosocial Health, by Age and Sex (England)
According to the Health Survey for England (2003), women were more likely than men to have a high (above 4) GHQ score (15% versus 11%). Figure 9-4 shows the proportion of people in England with a high GHQ score by age and sex in 2003.
Self-reported Psychosocial Health by Income

According to the HSE 2003, the prevalence of high GHQ scores increased as equivalised household income decreased, from 8% of men and 13% of women in the highest income quintile to 20% of men and 19% of women in the lowest equivalised income quintile. After age standardisation the effect of equivalised household income was more marked (HSE, 2003b).

IMD Sub-domain - Adults Under 60 Suffering from Mood or Anxiety Disorders

This is one of the indicators from the ‘Health Deprivation and Disability Domain’ of the Indices of Deprivation 2004. This underlying indicator is the proportion of adults under 60 suffering from mood or anxiety disorders in each area. This is a composite indicator that includes; prescription data, secondary care data, health related benefits and suicide. The data presented is a derived score rather than actual rates. The value 0 is approximately the average proportion across all Super Output Areas (SOAs) in England. Figure 5-17 shows the range of values for the SOAs within each ward.
Road Traffic Accident Casualties

Figure 9-5 Road Casualties – Slight (2005 & 2006)

(Source: Mott MacDonald, 2005-2007)
### Table 9-11 Deadlines relating to the Implementation of the Directive 2002/49/EC

<table>
<thead>
<tr>
<th>Deadlines</th>
<th>Obligations</th>
</tr>
</thead>
<tbody>
<tr>
<td>18 January 2004</td>
<td>Art. 10-1: EC report to EP and Council on noise sources</td>
</tr>
<tr>
<td></td>
<td>The Commission must submit to the European Parliament and the Council a</td>
</tr>
<tr>
<td></td>
<td>report containing a review of existing Community measures relating to</td>
</tr>
<tr>
<td></td>
<td>sources of environmental noise</td>
</tr>
<tr>
<td>18 July 2004</td>
<td>Art. 14: transposition</td>
</tr>
<tr>
<td></td>
<td>Member States must bring into force laws, regulations, and administrative</td>
</tr>
<tr>
<td></td>
<td>provisions necessary to comply with the END.</td>
</tr>
<tr>
<td>30 June 2005</td>
<td>Art. 7-1: report to EC on areas covered by 1st noise maps &amp; action plans</td>
</tr>
<tr>
<td></td>
<td>Member States must inform the Commission of agglomerations with more than</td>
</tr>
<tr>
<td></td>
<td>250 000 inhabitants, major roads which have more than six million vehicle</td>
</tr>
<tr>
<td></td>
<td>passages per year, major railways which have more than 60 000 train</td>
</tr>
<tr>
<td></td>
<td>passages per year and major airports within their territories.</td>
</tr>
<tr>
<td>18 July 2005</td>
<td>Art. 4: report to EC on competent authorities designated by MS</td>
</tr>
<tr>
<td></td>
<td>Member States must make available to the Commission and the public</td>
</tr>
<tr>
<td></td>
<td>information on bodies and authorities responsible for strategic noise maps,</td>
</tr>
<tr>
<td></td>
<td>action plans and related data collection.</td>
</tr>
<tr>
<td></td>
<td>Art. 5-4: report to EC on limit values</td>
</tr>
<tr>
<td></td>
<td>Member States must communicate to the Commission information on any</td>
</tr>
<tr>
<td></td>
<td>relevant limit values (in force or under preparation) of noise emitted by</td>
</tr>
<tr>
<td></td>
<td>road traffic, rail traffic, air traffic around airports and industrial</td>
</tr>
<tr>
<td></td>
<td>activity sites as well as explanation about their implementation.</td>
</tr>
<tr>
<td></td>
<td>The Commission shall submit to the European Parliament and the Council</td>
</tr>
<tr>
<td></td>
<td>appropriate legislative proposals on noise reduction of main sources of</td>
</tr>
<tr>
<td></td>
<td>environmental noise (road, rail, aircraft etc.).</td>
</tr>
<tr>
<td>30 June 2007</td>
<td>Art. 7-1: 1st round of noise maps (*)</td>
</tr>
<tr>
<td></td>
<td>Member States must ensure that strategic noise maps showing the situation</td>
</tr>
<tr>
<td></td>
<td>in the preceding calendar year have been made and, where relevant,</td>
</tr>
<tr>
<td></td>
<td>approved by the competent authorities, for all agglomerations with more</td>
</tr>
<tr>
<td></td>
<td>than 250 000 inhabitants and for all major roads which have more than six</td>
</tr>
<tr>
<td></td>
<td>million vehicle passages per year, major railways which have more than 60</td>
</tr>
<tr>
<td></td>
<td>000 train passages per year and major airports within their territories.</td>
</tr>
<tr>
<td>30 December 2007</td>
<td>(then every 5 years) Art. 10-2: report to EC on 1st noise maps</td>
</tr>
<tr>
<td></td>
<td>Member States must ensure that information from strategic noise maps as</td>
</tr>
<tr>
<td></td>
<td>referred in annex VI of the are sent to the Commission.</td>
</tr>
<tr>
<td>18 July 2008</td>
<td>Art. 8-1: 1st round of action plans (*)</td>
</tr>
<tr>
<td></td>
<td>Member States must ensure that the competent authorities have drawn up</td>
</tr>
<tr>
<td></td>
<td>action plans for (a) places near the major roads which have more than six</td>
</tr>
<tr>
<td></td>
<td>million vehicle passages a year, major railways which have more than 60 000</td>
</tr>
<tr>
<td></td>
<td>train passages per year and major airports; (b) agglomerations with</td>
</tr>
<tr>
<td></td>
<td>more than 250 000 inhabitants.</td>
</tr>
<tr>
<td>31 December 2008</td>
<td>Art. 7-2: report to EC on areas covered by the</td>
</tr>
<tr>
<td></td>
<td>Member States must inform the Commission of all agglomerations, major</td>
</tr>
<tr>
<td></td>
<td>roads, major railways and major airports falling under the scope of the.</td>
</tr>
</tbody>
</table>
18 January 2009 (then every 5 years)

Art. 10-2: report to EC on 1st round of action plans
Member States must ensure that the information from summaries of action plans as referred in annex VI are sent to the Commission.

18 July 2009 (then every 5 years)

Art. 10-4 and 11: EC report to EP and Council on implementation
The Commission must submit to the European Parliament and the Council a report on implementation of the END, summarizing reported data on strategic noise maps and action plans, assessing the need for further Community actions and proposing if appropriate further Community implementing strategies and measures.

30 June 2012 (then every 5 years)

Art. 7-2: 2nd round of noise maps (*)
Member States must ensure strategic noise maps showing the situation in the preceding calendar year have been made and, where relevant, approved by the competent authorities for all agglomerations and for all major roads and major railways within their territories.

18 July 2013

Art. 8-2: 2nd round of action plans (*)
Member States must ensure that competent authorities have drawn up action plans for all agglomerations and for all major roads and major railways within their territories.