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# The impact of poor air quality on health

## Summary Report

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### Key messages

- There is good international evidence to demonstrate the link between air pollution and certain health outcomes. This provides scientific arguments for taking decisive actions to improve air quality.
- There is also evidence to suggest that measures to improve air quality will benefit a number of health and wellbeing indicators, and can bring about benefits for the economy, environment, and climate change adaptation and mitigation.
- Understanding the impacts of air pollution on health outcomes for the Bath and North East Somerset population is difficult, and extensive academic research would be required to gain more detail than is currently available.

### Purpose of this report

This report summarises work completed by Public Health and Research & Intelligence to provide information on the health implications of poor air quality. The report briefly summarises the international evidence base on the health impacts of poor air quality. It also highlights recent work to explore the health impacts of poor air quality in Bath & North East Somerset.

### Background

Air pollution is defined as a chemical, physical (e.g. particulate matter), or biological agent that modifies the natural characteristics of the atmosphere. It is a serious issue, with exposure to manmade particulate matter (PM) alone estimated to reduce life expectancy of UK residents by approximately 6 months<sup>i</sup>.

Air pollution affects the more vulnerable members of society the most – the old and young and those suffering from asthma and heart and lung diseases. It also tends to be worse in heavily congested areas, where it exacerbates a poorer quality of life, increased social deprivation and decreased life expectancy.

Local authorities have a statutory duty to work towards meeting national objectives for reducing air pollution. If a local authority finds areas where the objectives are not likely to be achieved, it must declare it an Air Quality Management Area (AQMA), and develop an action plan to improve the air quality in these areas. There are currently three Air Quality Management Areas in B&NES; one in central Bath, one in Keynsham, and one in Salford. An Air Quality Action Plan is in place, which sets out the measures that are being used to reduce pollutant levels.

B&NES is not exceeding government air quality objectives for most pollutants. However, levels of nitrogen dioxide (NO<sub>2</sub>) in B&NES are not decreasing at the same rate as they are nationally. In areas where the national air quality objectives for NO<sub>2</sub> are exceeded in B&NES, there needs to be a reduction of between 4.9% and 73.3% in emissions in order to meet the objectives<sup>ii</sup>. Road traffic in B&NES contributes up to 92% of the total nitrogen dioxide (NO<sub>2</sub>) concentration<sup>iii</sup>.

## Known impacts of poor air quality on health

There is a large body of international evidence on the effects of outdoor air pollution on health. According to the World Health Organisation thousands of new scientific papers have been published on this topic in the last few years. To help the scientific community “make sense” of the evidence base, and inform policy and guidelines on air pollution, a number of large reviews of the evidence base have taken place in the last ten to fifteen years. These conclude that air pollution contributes to poor health, and provide scientific arguments for taking decisive actions to improve air quality.

The evidence base highlights the following:

Premature deaths: While air pollution is never the single cause of death, it is a factor which can exacerbate underlying health problems, including respiratory illnesses like asthma or chronic obstructive pulmonary disease (COPD), as well as cardiovascular conditions.

Poor air quality contributes to poor health and reduces life expectancy. It is estimated that 24,000 people in the UK have their lives shortened every year as a result of short-term exposure to air pollution<sup>iv</sup>. If new evidence was taken into account it is possible that this figure could now be as much as 35,000 per year<sup>v</sup>.

Short and long-term exposure impacts: National evidence also suggests that air pollution can have an impact on the respiratory system, can increase medication use and increase in hospital admissions. Long-term exposure can lead to permanent reductions in lung development and function, and a subsequent reduction in life expectancy. Air pollution is also linked to conditions such as asthma exacerbation, chronic bronchitis, heart and circulatory disease, and cancer<sup>vi</sup>.

The short and long term effects of exposure to air pollutants are set out in **Annex A**.

Inequalities: The impact of poor air quality on health is unequal with greater effects on unborn and very young children, older people, those with pre-existing heart and lung disease, the most economically deprived, and those exposed to relatively high levels of pollution due to where they live.

Wider impacts and costs: Poor air quality also contributes to higher hospital admissions, emergency visits, medication use, and associated service costs at the national level. A report by the Cabinet Office estimates that the wider cost of air pollution from transport (in urban areas) alone is between £4.5 and £10.6 billion. This compares with the costs associated with lost time through excess delays (£10.9b), accidents (£8.7b), physical inactivity (£9.8b), noise (£1.2-3.7b), and greenhouse gas emissions (£3-5b) from transport<sup>vii</sup>.

Measures to improve air quality will benefit a number of health and wellbeing indicators, and can bring about benefits for the economy, environment, and climate change adaptation and mitigation. The co-benefits of improving air quality are highlighted at **Annex B**.

## Actions taken in B&NES to improve air quality to date

Action is being taken across the Council to reduce poor air quality, including through the following Plans and Strategies:

- Air Quality Action Plan, 2011
- B&NES Environmental Sustainability Partnership’s Strategy, 2012-2015
- B&NES Sustainable Community Strategy, 2009 - 2026
- West of England Joint Local Transport Plan, 2011-2026

## **Local exploratory work on air quality and health in B&NES**

Public Health and Research & Intelligence have completed some exploratory work on air quality and health, focussing on the areas within and around the Air Quality Management Areas (AQMA) in B&NES. This includes the following two pieces of work:

### Groups that may be more vulnerable to the negative impacts of poor air quality:

The analysis identifies which of the areas within and surrounding the AQMAs have higher than (B&NES) average levels of people that fall into one or more of the following five groups. These are groups of people that (according to the evidence base) are known to be more vulnerable to the negative impacts of poor air quality:

- Unborn and very young children
- Older people
- Those with pre-existing heart and lung disease
- The most economically deprived
- Those exposed to relatively high levels of pollution due to where they live.

However, a major limitation of this analysis is that the study areas used are large and include households that do not live in close proximity to a major road and so are not necessarily exposed to relatively high levels of air pollution.

### Hospital admissions within a 100 metre buffer of the AQMAs

Within this analysis the study area has been reduced to include (only) those households within a 100 metre buffer of the Air Quality Management Areas. This identified that there are specific concentrations of the following population types:

- Older People
- Lower income residents
- Young and transient renters

In addition to the resident population, there are also an estimated 26,500 employees within this zone.

A combination of these demographic factors means that it is impossible to draw meaningful conclusions as to the local relationship between poor air quality and recorded health outcomes such as hospital admissions in Bath and North East Somerset. An area with predominantly older people will always have more admissions to hospital than a much younger area for example. It is only by accounting for these age differences first, that we can explore the impact of other factors such as air pollution. However, this has not been possible.

Gaining a more detailed statistical understanding of the impacts of local air pollution on health outcomes for the local population is very complex and requires a lot of resource and expertise. Such research projects are only usually tackled by Universities where they have specialist expertise and resource, and even then there can be limitations around the robustness of the findings.

### Future exploratory work

In view of this situation, and as there is a good body of international evidence to demonstrate the link between air pollution and certain health outcomes (as described earlier), it is recommended that the council accepts the position that air pollution does contribute to poor health rather than further investing in proving a direct local relationship. If this is accepted, future exploratory work could include the following:

- Identify the most effective methods of reducing air pollution (e.g. through a literature review).
- Identify whether there are any physical locations within the 100 metres buffer of the AQMAs where people that are more vulnerable to the negative effects of poor air quality may congregate (e.g. care homes, sheltered housing, nurseries/pre-school, general practices), and work with them to look at how they can reduce their exposure to poor air quality.

**Annex A: The short and long term effects of exposure to air pollutants (source WHO, 2004)<sup>viii</sup>:**

Pollutant	Effects related to short term exposure	Effects related to long term exposure
<b>Nitrogen Dioxide</b>	<ul style="list-style-type: none"> <li>• Effects on pulmonary function, particularly in asthmatics</li> <li>• Increase in airway allergic inflammatory reactions</li> <li>• Increase in hospital admissions</li> <li>• Increase in mortality</li> </ul>	<ul style="list-style-type: none"> <li>• Reduction in lung function</li> <li>• Increased probability of respiratory symptoms</li> </ul>
<b>Particulate matter (PM10)</b>	<ul style="list-style-type: none"> <li>• Lung inflammatory reactions</li> <li>• Respiratory symptoms</li> <li>• Adverse effects on the cardiovascular system</li> <li>• Increase in medication usage</li> <li>• Increase in hospital admissions</li> <li>• Increase in mortality</li> </ul>	<ul style="list-style-type: none"> <li>• Increase in lower respiratory symptoms</li> <li>• Reduction in lung function in children and adults</li> <li>• Increase in chronic obstructive pulmonary disease</li> <li>• Reduction in life expectancy, due to cardiopulmonary mortality and probably lung cancer</li> </ul> <p>WHO (2013) have also made the following observations:</p> <ul style="list-style-type: none"> <li>• Long term exposure is a cause of cardiovascular mortality and morbidity.</li> <li>• Additional studies linking long-term exposure to several new health outcomes, including atherosclerosis, adverse birth outcomes and childhood respiratory disease.</li> <li>• Emerging evidence that suggests possible links between long-term exposure and neurodevelopment and cognitive function, as well as other chronic disease conditions, such as diabetes.</li> </ul>
<b>Ozone</b>	<ul style="list-style-type: none"> <li>• Adverse effects on pulmonary function</li> <li>• Lung inflammatory reactions</li> <li>• Adverse effects on respiratory symptoms</li> <li>• Increase in medication usage</li> <li>• Increase in hospital admissions</li> <li>• Increase in mortality</li> <li>• New epidemiological and experimental data, suggest an effect on cognitive development and reproductive health, including preterm birth (WHO, 2009).</li> </ul>	<ul style="list-style-type: none"> <li>• Reduction in lung function development</li> </ul>

## **Annex B: Co-benefits in improving air quality**

The Greater London Authority (2012) highlight the range of potential benefits of measures to improve air quality, not only for the improvement of health and the reduction of health inequalities, but also for the economy, environment, climate change adaptation and mitigation<sup>ix</sup>.

**Biodiversity:** Long term exposure to pollutants can restrict the growth of plants and trees so improving air quality reduces costs to local authorities in replacing urban greenery as well as benefitting the environment.

**Economic benefits:** Improving air quality reduces the costs to local authorities of building maintenance and cleaning. The costs to the economy of the health impacts of poor air quality are significant.

**Climate Change:** Ozone, which is caused by pollutants such as NO<sub>x</sub> and volatile organic compounds (VOCs) reacting in sunlight are powerful greenhouse gases which contribute to global warming directly. Also black carbon (which is part of the particulate emissions from diesel engines) contributes to climate change.

### **Maximising the health benefits from improving air quality:**

Certain measures to improve air quality have significant co-benefits for health. These are listed below.

Motor traffic is responsible for air pollution and so measures that encourage people to use sustainable transport, such as walking and cycling would have the following benefits:

- Create an environment that is more pleasant to walk and cycle, hence increasing physical activity levels.
- Reduce risks of injury and death from road traffic collisions.
- Reduce community severance, increase community cohesion and social interactions.
- Reduce noise pollution.
- Contribute to reducing the urban heat island effect.

Greater number of trees and vegetation:

- Reduce risks from localised flooding.
- Contribute to urban cooling and help to contribute to reducing the urban heat island effect.
- Provide shade to enable people to keep cool and out of direct sunlight in sunny weather.
- Improve mental health and wellbeing.
- Improve resilience to climate change.

Improving the energy efficiency of homes would reduce emissions from heating systems, which would have the additional benefits of:

- Reducing fuel bills, thus reducing fuel poverty (which is the situation where households are required to spend more than 10% of their income to heat their homes to an appropriate temperature).
- Reduces likelihood of damp and mould occurring, which aggravate respiratory disease.
- Reduce the number of falls in the home (falls are more likely to occur in cold homes due to poor blood circulation).

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- <sup>i</sup> Defra (2010) *Air Pollution: Action in a Changing Climate*.  
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- <sup>ii</sup> Bath & North East Somerset Council (2013). *Air Quality Progress Report for Bath & North East Somerset Council*.
- <sup>iii</sup> Bath & North East Somerset Council (2014) Joint Strategic Needs Assessment  
<http://www.bathnes.gov.uk/services/your-council-and-democracy/local-research-and-statistics/wiki/about-jsna>
- <sup>iv</sup> COMEAP (1998) referenced in Parliamentary Environmental Audit Committee (2010). *Environmental Audit Committee - Fifth Report: Air Quality*  
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- <sup>viii</sup> World Health Organisation (2004). *Systematic review of health aspects of air pollution in Europe* <http://www.euro.who.int/document/E83080.pdf>
- <sup>ix</sup> Greater London Authority (2012). *Air Quality in Greenwich: A Guide for Public Health Professionals*.  
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