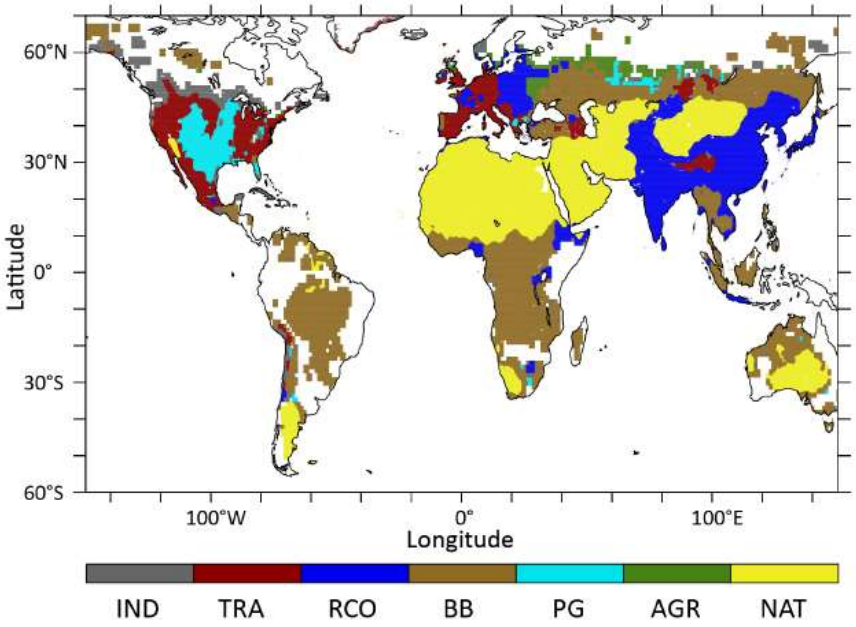
Air Quality

Introduction

Poor air quality is a public health issue, the burden of anthropogenic particulate matter (PM) air pollution in the UK in 2008 was estimated to have an effect on mortality equivalent to 29,000 deaths and associated loss of total population life of 340,000 life-years.[1]
There is no evidence of a safe level of exposure or a threshold below which no adverse health effects occur. More than 80% of the population in the WHO European Region lives in cities with levels of PM exceeding WHO Air Quality Guidelines.

In the UK, the main contributing factor for mortality linked to air pollution is land traffic.[2]



Extended Data Figure 1 | Source categories responsible for the largest impact on mortality linked to outdoor air pollution in 2010 from a sensitivity calculation with carbonaceous aerosol having a five times larger impact than inorganic and crustal compounds. IND, industry; TRA, land traffic; RCO, residential energy use (for example, heating, cooking); BB, biomass burning; PG, power generation; AGR, agriculture; and NAT, natural.

Figure 1 Source categories responsible for the largest impact on mortality linked to air pollution in 2010

Summary

- Air pollution affects health and well-being both in the short and long-term, by exacerbating respiratory conditions in people already suffering from them, and increasing the lifetime incidence of multiple diseases such as asthma, ischaemic heart disease or lung cancer.[3]
- Air pollution also impacts on the environment, being one of the biggest contributors to climate change.[4]
- Norfolk as a whole has seen an increasing trend in air pollution over the last few years, only recently stabilising and improving, although at a slower rate when compared to the rest of England.
- There is a variability between the local authority districts, when comparing the CO_2 emission estimates and Fraction of mortality attributable to air pollution.[5]

Headlines

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[1] COMEAP 2010. The Mortality Effects of Long-Term Exposure to Particulate Air Pollution in the United Kingdom. A report by the Committee on the Medical Effects of Air Pollutants.
[2] Lelieveld, Jos, et al. "The contribution of outdoor air pollution sources to premature mortality on a global scale." *Nature* 525.7569 (2015): 367-371.
[3] Atkinson, R. W., et al. "Epidemiological time series studies of PM2. 5 and daily mortality and hospital admissions: a systematic review and meta-analysis." *Thorax* (2014): thoraxjnl-2013.
[4] Patz, Jonathan A., et al. "Impact of regional climate change on human health." *Nature* 438.7066 (2005): 310-317.
[5] Public Health England, Public Health Outcomes Framework - http://www.phoutcomes.info/search/air%20pollution#page/4/gid/1/pat/6/par/nn-1-E10000020/ati/102/are/E10000020/iid/30101/age/230/sex/4

According to the Public Health Outcomes Framework data, the fraction of mortality attributable to particulate air pollution in Norfolk in 2015 was 5.0%, compared to the average across England of 4.7%.[6]

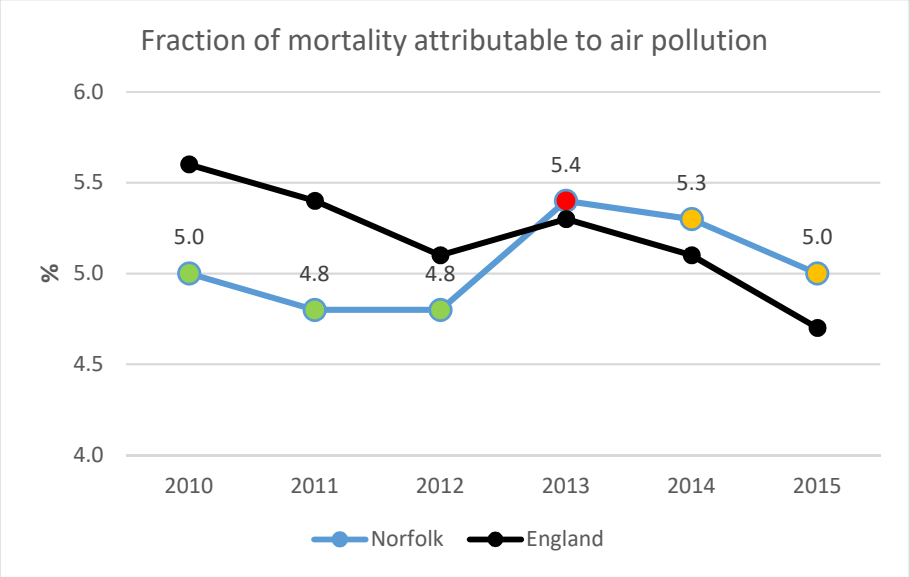


Figure 2: PHOF 3.01 - Fraction of mortality attributable to particulate air pollution.

While England on average has shown an improvement between 2010 and 2015 (from 5.6% to 4.7%), in mortality linked to air pollution, the Norfolk county index has been oscillating, with a significant increase in 2013 and only a small improvement in recent years.

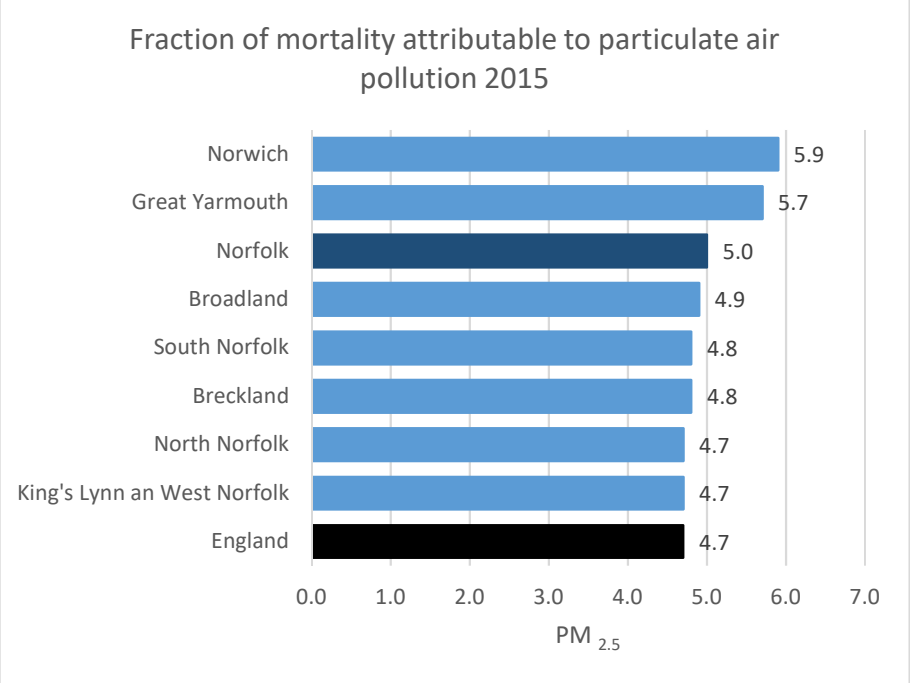
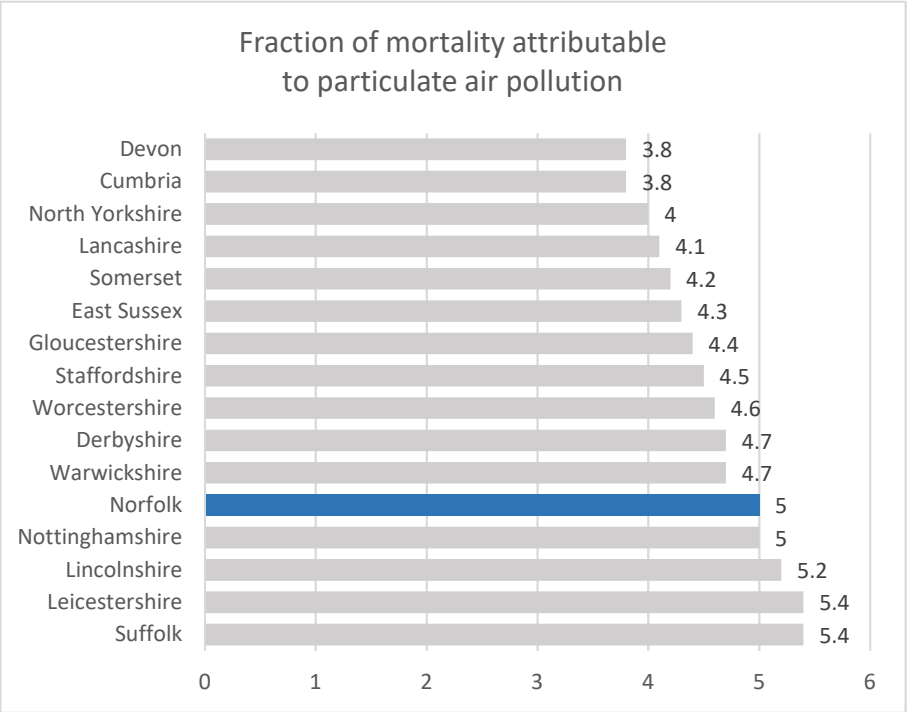


Figure 3; PHOF 3.01 - Fraction of mortality attributable to particulate air pollution 2015 by district including Norfolk and England for benchmarks

Across the county variation shows higher levels of mortality attributable to particulate air pollution in Norwich and Great Yarmouth.

[6] Public Health England, Public Health Outcomes Framework - http://www.phoutcomes.info/search/air%20pollution#page/4/gid/1/pat/6/par/nn-1-E10000020/ati/102/are/E10000020/iid/30101/age/230/sex/4



When comparing Norfolk to its CIPFA nearest neighbours the county was ranked 5th worst out of 16, in 2015 for fraction of mortality attributable to particulate air pollution.

Figure 4: PHOF 3.01 Norfolk compared to Norfolk's CIPFA nearest neighbours

Influences on Health and Wellbeing

There are health consequences of living in an environment with high air pollution. These can be due to exposure over the short term (hours, days) or long term (months, years), and can include:

- Aggravation of Asthma, Chronic Obstructive Pulmonary Disease (COPD) and Respiratory conditions with subsequent increase in hospital admissions for people already affected by respiratory diseases.
- Increased mortality from cardiovascular disease, in particular ischemic heart disease, with long term exposure to $PM_{2.5}$.[7]
- Increased long-term risk of developing COPD.[8]
- Increased mortality from lung cancer.[9]

Not directly related to population health, however a consequence air pollution has an impact on climate. The WHO estimates that the warming and precipitations trends due to anthropogenic climate change of the past 30 years already claim over 150,000 lives annually.[10]

Admissions to hospital for Asthma as well as emergency admissions for COPD and Respiratory conditions give an indication of the variation of related health conditions across the county. Measured in Directly Standardised rates per 100,000 for the period 2011/12 to 2015/16 removes the impact of fluctuation for seasons and years and compared for a population rate. Mapped to MSOA level and Quintile ranges this indicates the areas relative admission levels. Highest levels tend to be centred on the towns and cities, the districts of Norwich, West Norfolk and Great Yarmouth and Waveney. Lowest levels of admissions in North and South Norfolk.

[7] Hoek, Gerard, et al. "Long-term air pollution exposure and cardio-respiratory mortality: a review." *Environmental Health* 12.1 (2013): 43.
[8] Andersen, Zorana J., et al. "Chronic obstructive pulmonary disease and long-term exposure to traffic-related air pollution: a cohort study." *American journal of respiratory and critical care medicine* 183.4 (2011): 455-461.
[9] Raaschou-Nielsen, Ole, et al. "Air pollution and lung cancer incidence in 17 European cohorts: prospective analyses from the European Study of Cohorts for Air Pollution Effects (ESCAPE)." *The lancet oncology* 14.9 (2013): 813-822.
[10] Patz, Jonathan A., et al. "Impact of regional climate change on human health." *Nature* 438.7066 (2005): 310-317.

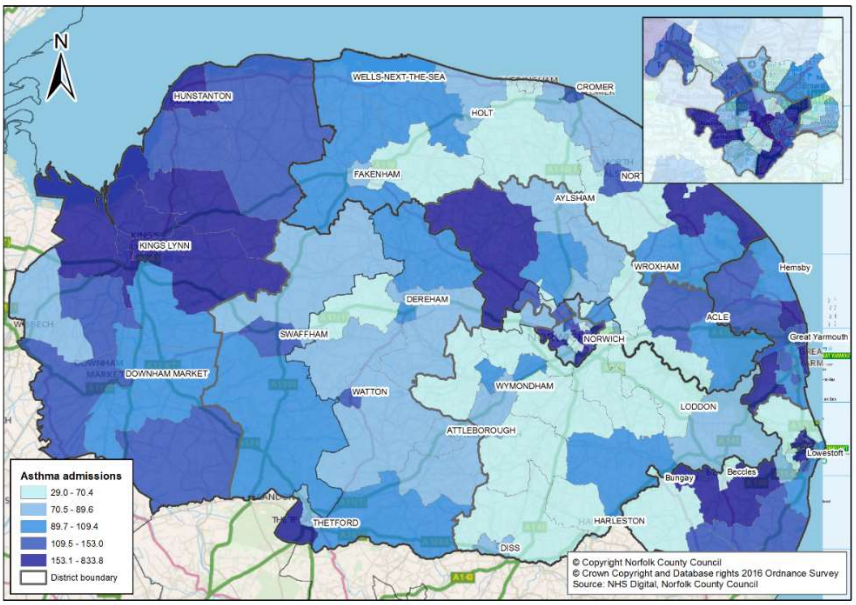


Figure 5; Asthma admissions to hospital DSR per 100,000 for the period 2011/12 to 2015/16[11]

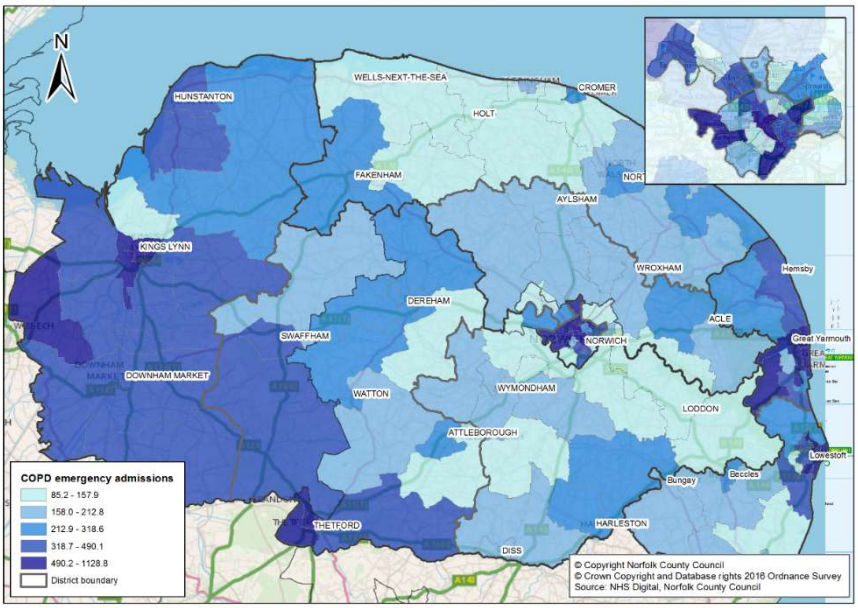


Figure 6; COPD emergency admissions to hospital DSR per 100,000 for the period 2011/12 to 2015/16[12]

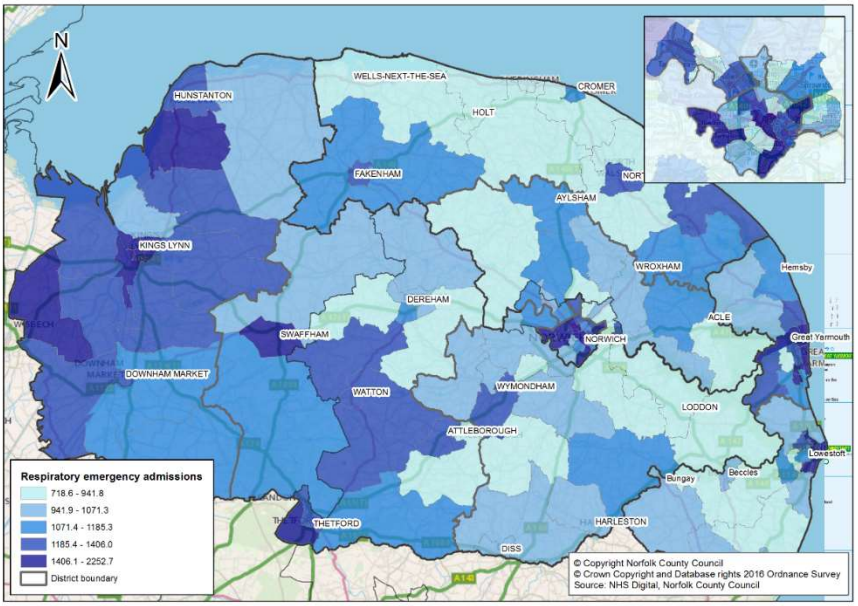


Figure 7; Respiratory emergency admissions to hospital DSR per 100,000 for the period 2011/12 to 2015/16[13]

[11] Hospital Episode Statistics, NHS Digital
[12] Hospital Episode Statistics, NHS Digital

Social, environmental, population context

A number of groups within the population have potentially increased vulnerability to the effect of exposure to air pollutant. Susceptible groups are those with pre-existing lung or heart disease, as well as elderly people and children. Exposure to PM affects lung development in children, including reversible deficit in lung function as well as chronically reduced lung growth rate and a deficit in long-term lung function.[13] Older people, even those with no pre-existing respiratory conditions, seem to be more affected by air pollution, with a significant trend of increasing risk of death according to age, most evident for individuals over 65 years old.[14]

Those exposed to unusually large amounts of air pollution, perhaps as a result of living near a main road or spending long hours outdoors, may be vulnerable as result of their high exposure.

Poor air quality is primarily concerned with pollutants such as nitrous oxide and particulates, however increased levels of CO2 and climate change could have an impact on public health.[15]

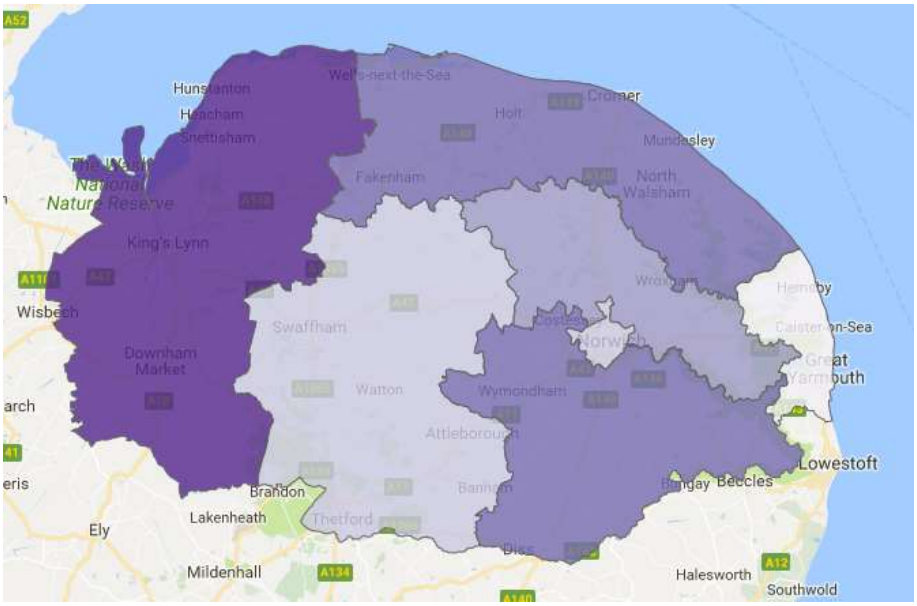


Figure 8; Total per capita Carbon dioxide emissions estimates (t CO2 per person)

King's Lynn and West Norfolk have the highest CO2 emissions per capita, compared to the other districts in Norfolk:

Total per capita emissions (t CO2 per person) Carbon dioxide emissions estimates
Source; Department for Business, Energy & Industrial Strategy

Burden of ill health and gaps in services

Air pollution carries a high burden of ill health, contributing to an increased risk of mortality in the UK of 29,000 deaths in 2008, and associated loss of total population survival of 340,000 years.

A COMEAP report[16] has concluded that in the unrealistic scenario where all human-made particulate air pollution ($PM_{2.5}$) is removed, 36.5 million life years could be saved across the UK population, over the next 106 years, corresponding in an increase in life expectancy at birth of 6 months.
A pollution reduction of just 1 µg/m3 of $PM_{2.5}$ would lead to an increased UK total survival of approximately 4 million life years.

Air pollution cost for society includes an increased number of admissions for exacerbation of respiratory related diseases and the higher incidence of morbidity in the population as a whole. As well as the impact on those suffering with respiratory issues, their lives, work and wellbeing.

Current services, local plans and strategies

[13] Gauderman, W. James, et al. "Association of improved air quality with lung development in children." *N Engl J Med* 2015.372 (2015): 905-913.
[14] Gouveia, Nelson, and Tony Fletcher. "Time series analysis of air pollution and mortality: effects by cause, age and socioeconomic status." *Journal of epidemiology and community health* 54.10 (2000): 750-755.
[15] https://www.gov.uk/government/publications/climate-change-health-effects-in-the-uk
[16] COMEAP 2010. The Mortality Effects of Long-Term Exposure to Particulate Air Pollution in the United Kingdom. A report by the Committee on the Medical Effects of Air Pollutants.

Several initiatives are being carried out to reduce air pollution, especially in areas most affected by the problem.

The Environment Act 1995 imposes a statutory duty on Local Authorities to review and assess the air quality in their districts to determine whether certain air pollutants are likely to meet prescribed government air quality objectives. If a Local Authority finds that air quality objects are not going to be met then an Air Quality Management Area (AQMA) must be declared. Each Local Authority then has to create a plan to improve air quality, this is known as an Air Quality Action Plan (AQAPs). Currently, the Borough Council of King's Lynn & West Norfolk and Norwich City Council both have AQAPs, these include measures specific to each area to help reduce pollution levels.

Norwich City Council's Air Quality Action Plan for example includes;

- Last year, Norfolk County Council secured £416,000 worth of funding, as part of the Department of Transport's Clean Bus Technology Fund, to equip buses with emission-reducing equipment.
- Newer areas of Norwich city centre have been pedestrianised, to divert traffic away from the area inside the inner ring road, which has been an AQMA since 2012.
- Street signs encouraging drivers to turn off engines when stationary have appeared.
- Parking permits are being priced according to vehicle size.
- Norwich City council car fleet now includes electric as well as petrol efficient cars.
- A travel plan officer has been employed by Norfolk County Council, to work on the Council travel plan and promote travel planning in key businesses.

Air Quality Information for local areas are available from;
Norwich City Council - https://www.norwich.gov.uk/info/20212/pollution/1483/air_quality
South Norfolk District Council – https://www.south-norfolk.gov.uk/air-quality
North Norfolk District Council – https://north-norfolk.gov.uk/info/environmental-protection/pollution/air-quality/
King's Lynn and West Norfolk – https://www.west-norfolk.gov.uk/info/20137/air_quality/169/air_quality_information
Broadland – https://www.broadland.gov.uk/downloads/download/124/air_quality_documents
Breckland – http://www.breckland.gov.uk/article/3244/Air-Pollution
Great Yarmouth - https://www.great-yarmouth.gov.uk/article/2110/Where-can-I-get-advice-on-local-air-quality

To increase transparency, updated indicators on air quality in Norfolk can be accessed in real time, on http://www.norfolkairquality.net/

At a national level, an Air Quality plan for nitrogen dioxide (NO2) in UK (2017) has been published in July 2017, with the aim to reduce nitrogen dioxide emissions in towns and cities.[17]

[17] Air Quality Plan for nitrogen dioxide (NO2) in UK (2017). https://www.gov.uk/government/publications/air-quality-plan-for-nitrogen-dioxide-no2-in-uk-2017 - accessed on 09/08/2017

Voice – the perspective from the public, service users, referrers and front line staff

According to a study undertaken by YouGov in 2017, commissioned by the environmental law organisation ClientEarth, 58% of the British public believe air pollution levels across the UK are damaging to their health, and almost two-thirds back proposals for a new Clean Air Act to tackle the issue.[18] Several organisations, such as the British Lung Foundation[19] and Sustrans[20] are calling for fresh legislation to reduce air pollution. Greenpeace has started a petition to cut toxic diesel emissions, by banning the sale of new diesel cars in the UK[21].

Considerations for Health and Wellbeing Board and commissioners

Exposure to air pollutants is largely beyond the control of individuals and requires action by public authorities at the national, regional and international levels.

In consideration of the high impact car traffic has on air pollution in the UK, many initiatives could be carried out to help contain the issue:

- Diversion of traffic from the more congested city areas, by improving the current infrastructure or building new projects.
- Review of traffic light times/synchronisation, to help reduce congestion patterns.
- Increasing the numbers of park and rides, and encouraging the use of public transportation.
- Increasing the size of pedestrianised areas in larger cities.
- Promoting the use of low environmental impact cars, by banning diesel cars in high pollution areas, and offering parking discount for smaller cars.
- Keep the population informed about the local pollution level, with particular regard for vulnerable individuals (children, elderly people or those with respiratory conditions), and give advices on how to minimise the risk associated with polluted air. This can include staying indoor, limiting physical exertion, and trying when possible to optimise the management of pre-existing respiratory conditions.[22]

References and information

Public Health England – Public Health Outcomes Framework - http://www.phoutcomes.info/ - accessed 31/05/2017
Committee on the Medical Effects of Air Pollutants (COMEAP) – Reports https://www.gov.uk/government/collections/comeap-reports - accessed 31/05/2017
Department for Environment, Food & Rural Affairs - https://www.gov.uk/government/organisations/department-for-environment-food-rural-affairs - accessed 31/05/2017

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[18] https://www.theguardian.com/cities/2017/feb/14/65-percent-british-public-want-clean-air-act-pollution-harmful-uk-survey - accessed 31/05/2017
[19] British Thoracic Society, Environment and the lung health - https://www.brit-thoracic.org.uk/document-library/audit-and-quality-improvement/environment-and-lung-health/the-environment-and-lung-health/ - accessed on 31/05/2017
[20] http://www.sustrans.org.uk/news/we%E2%80%99re-calling-clean-air-act-21st-century – accessed on 31/05/2017
[21] https://secure.greenpeace.org.uk/page/s/no-new-diesel-cars?source=wb&subsource=20170106apwb01 – accessed on 31/05/2017
[22] Laumbach, Robert, Qingyu Meng, and Howard Kipen. "What can individuals do to reduce personal health risks from air pollution?." *Journal of thoracic disease* 7.1 (2015): 96-107.