A Breath of Fresh Air

Addressing Climate Change and Air Pollution Together for Health

2016

UK Health Alliance on Climate Change

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The UK Health Alliance on Climate Change

The UK Health Alliance on Climate Change was launched in April 2016 to encourage better approaches to tackling climate change that protect and promote public health, whilst also reducing the burden on health services. The Alliance brings together the voices of doctors, nurses and allied health professionals across the UK to advocate for stronger solutions to climate change and to help realise the public health benefits that this will bring.

UK Health Alliance on Climate Change

THE LANCET

Visual Summary

The UK Health Alliance on Climate Change has recommended six strategies, which simultaneously address two major challenges: air pollution and climate change. We suggest that a joined up approach – tackling these threats together – can reap enormous benefits, particularly for the most vulnerable people in the UK.

1 Cross-departmental collaboration

Increase cross-departmental collaboration to promote a joined-up approach to tackling air pollution and climate change.

Health benefits – Medium

Reduce the number of health- focused policies which have an adverse effect on the environment.

- Promoting diesel cars
- Biomass
- Some conventional biofuels

Environmental benefits – Medium

Reduce the unintended adverse health effects of policies which only consider the environment.

- Flue gas desulphurisation
- 3-way catalysts (petrol)
- Particulate filters (diesel)

2 Phase out coal

The Alliance calls for a rapid coal phase out, by 2025, and the creation of a policy environment that supports clean energy sources.

Health benefits – High

A complete end to UK coal use would prevent:

- 1,600 Premature deaths
- 68,000 Additional days of medication
- 363,266 Working days lost
- 1m+ Incidents of lower respiratory symptoms
- Up to £3.1bn Costs incurred

Environmental benefits – High

Eliminating coal use would reduce the UK's greenhouse gas emissions by:

- 17% Carbon dioxide
- 22% Nitrogen oxides
- 44% Sulphur dioxide

3 Clean air zones

Expand clear air zones to urban centres beyond London. Strengthen them, to include private vehicles. Encourage cycling and walking.

Health benefits – Medium

Clean air zones → Reduced emissions: PM2.5, PM10, NO_2

Better urban planning → More walking and cycling → Less respiratory disease; Better health and quality of life

Environmental benefits – Medium

Clean air zones → Less polluting road transport

Better urban planning → More walking and cycling → Decreased CO_2 emissions

Lessened impact of climate change

4 Better monitoring

Place air quality monitors around schools, hospitals, and healthcare facilities, where vulnerable populations are concentrated.

Health benefits – Low

Vulnerable people are disproportionally affected by air pollution.

- Children
- Older people
- People with chronic health problems

Publically available, clearly communicated data on air quality could be used to make them aware of the risks.

Environmental benefits – Low

Increased engagement with air polluton can lead to a greater uptake of measures to tackle it.

- Cycling instead of driving
- Home insulation

Greater uptake of these measures will also benefit emissions reduction.

5 Retain standards from EU regulations

It is essential that the UK continues to work with the EU in responding to trans-boundary air pollution sources and reducing climate change.

Health benefits – Medium

EU regulations define limits for:

- CO Carbon monoxide
- NO_2 Nitrogen dioxide
- SO_2 Sulphur dioxide
- PM10, PM2.5 Particulate matter
- O_3 Ozone
- Pb Lead
- + Certain toxic heavy metals

Environmental benefits – Medium

Climate change can only be tackled through collective action, therefore we need to continue close collaboration with the EU.

6 Health Professionals taking action

We recommend health services and professionals:

- Switch to clean energy providers
- Use and promote cycling, walking, and LEVs[1]
- Provide more care in people's homes

Health benefits – Low

Health professionals can lead the way as advocates for more active and less polluting lifestyles.

- − Pollution near generation sites
- − Respiratory disease
- + Exercise
- + Quality of life

Environmental benefits – High

It is estimated that measures like these could reduce NHS carbon emissions by one million tonnes a year by 2020[2].

- − Greenhouse gasses from generation
- − Greenhouse gasses from transport
- − Need for travel to healthcare sites

[1] LEV = Low Emissions Vehicles (such as electric cars).

[2] *Securing Health Returns*, NHS England, 15 June 2016.

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Executive summary

Both air pollution and climate change present serious risks to public health, but a joined-up approach to tackling these threats can reap enormous benefits particularly for our most vulnerable, as well as cutting the health burden and costs to the NHS.

The Royal College of Physicians and the Royal College of Paediatrics and Child Health analysis published in February 2016 found that outdoor air pollution is attributable to an estimated 40,000 premature deaths each year in the UK.[1] This air pollution is largely the result of the burning of fossil fuels in cars, lorries and power stations. Pollution from coal plants alone costs the UK as much as £3.1 billion each year in human health impacts.[2]

In July of this year, the Committee on Climate Change, an official adviser to the Government, in its latest risk assessment evidence report found that the impacts of climate change, such as increased risk of flooding and heatwaves, pose a significant risk to health and health infrastructure in the UK.[3]

This report from the Alliance considers the ways in which integrated strategies to address air pollution and climate change will simultaneously lead to greater health benefits and cost-savings, than strategies which address them separately. It is clear that in order to protect health and wellbeing from the dangerous impacts of unmitigated climate change, the UK must work to decarbonise its economy as rapidly as possible, with the energy and transport sector representing two important first steps. In many cases, climate change and air pollution share a common driver: the combustion of fossil fuels.

This report outlines six key steps that the Government and health sector must take to improve air quality and tackle climate change in a coherent way:

1. Increase cross-departmental collaboration to promote a joined-up approach to tackling air pollution and climate change
2. Phase-out coal power stations by 2025
3. Expand existing clean air zones and extend their use to other cities
4. Better monitor air pollution in areas where vulnerable populations are concentrated
5. Retain or improve air quality standards that current EU regulations afforded us
6. Better inform and support health professionals to take local action and provide advice to patients.

1 Holegate S, Grigg J, Raymond A, Ashton J, Cullinan P, Exley K, Fishwick D, et al. *Every Breath We Take: The Lifelong Impact of Air Pollution*. Royal College of Physicians and Royal College of Paediatrics and Child Health. 2016

2 Huscher J, Jensen G. *What does coal cost health in the United Kingdom?* Health and Environment Alliance. 2013

3 Humphrey K, Johns D, Bell M, Di Mauro M, Thompson D, Style D, et al. *UK Climate Change Risk Assessment 2017*. Committee on Climate Change. 2016

Six key recommendations for action

1 Increase cross-departmental collaboration to promote a joined-up approach

High-level cross-departmental collaboration is urgently needed to address the many sources of air pollution in the UK. More coordinated action is needed to effectively tackle air pollution and climate change. This must bring together different bodies, including the Directorates of Economy, Health and Social Care, and Communities for Scotland; the Departments of Health, Business, Energy and Industrial Strategy (BEIS), Environment, Food, and Rural Affairs (Defra), Transport (DfT), and Communities and Local Government (DCLG) for England; the Departments of Agriculture, Environment and Rural Affairs, Infrastructure, and Health for Northern Ireland; and the Departments of Economy and Infrastructure, Environment and Rural Affairs, and Health, Wellbeing and Sport for Wales. This will require effective working between governmental departments within each part of the UK. It will also require ongoing dialogue between the four administrations to explore the impact of proposals and decisions made by one government or parliament on other parts of the UK. Only in doing this, can we be assured that individual departmental or national efforts to reduce climate change and its effects on citizens are not inadvertently misaligned, wasting effort or even worsening air quality and climate change across the UK and beyond.

Fully integrating policies on health, air pollution and climate change will ensure that they deliver maximum benefit to the health and wellbeing of people living in the UK. The challenge is that many different Government departments have a stake in the problem and its solutions but there is potential misalignment of the costs and benefits. For example, when the significant cost savings to the NHS from reducing air pollution are taken into account this should change investment decisions. When we consider the distribution of responsibilities across administrations and departments – each of the devolved nations administrations has some competence, each department of health addresses the health impacts of air and pollution and climate change, Defra oversees air pollution targets, BEIS carbon emissions, and DfT vehicle emissions, while town planning, which impacts upon encouraging active transport solutions, is spread across the devolved administrations and DCLG in England – it becomes evident that to effectively address air pollution and climate all of these bodies must co-operate in order to be effectively able to coordinate.

Indeed, neither air pollution nor climate change policies should be viewed in isolation, as they are closely linked to energy, health, trade, transport and agriculture polices. Measures to address climate change in isolation can lead to the worsening of air quality, and vice versa.

2 Phase-out coal power stations by 2025

Coal-fired power stations contribute significantly to air pollution in the UK. Their rapid phase-out is an imperative first step. Coal is the most carbon intensive source of power generation, and is a key focus for reducing the risks of climate change.

In the UK, burning coal is linked to 1,600 premature deaths, 68,000 additional days of medication, 363,266 working days lost and more than a million incidents of lower respiratory symptoms, costing as much as £3.1 billion each year.[4]

4 Huscher J, Jensen G. *What does coal cost health in the United Kingdom?* Health and Environment Alliance. 2013

In 2015, the Government recognised that "unabated coal is simply not sustainable in the long term", and has launched a consultation on when to close all coal-fired power plants.[6] The Alliance calls for the phase-out of coal to be legislated so that it no longer pollutes our air by 2025 at the latest. It is clear that the phase-out of coal must be coupled with a transition to cleaner, renewable energy. This must be a just transition ensuring that the 4000 employees of the coal industry are fully supported and retrained for the renewable sector, which currently employs 117,000 people across the UK,[7] or employed elsewhere.

3 Expand existing clean air zones and extend their use to other cities

Transport is a huge contributor to air pollution, accounting for 31% of nitrogen oxides (NO_x), 18% of particulate matter 10 (PM_{10}) and 19.5% of $PM_{2.5}$ emissions (particulate matter less than 2.5 micrometres in diameter) in the UK.[8]

Expanding and strengthening ultra-low emission zones, and implementing similar clean air zone measures across urban centres will reduce air pollution and tackle emissions that cause climate change.

This will promote a shift away from diesel engines which is an immediate priority. The UK has one of the most dieselized fleets in the world and diesel engines account for 40% of air pollution in urban centres.[9] Diesel cars now no longer produce significantly less CO_2 than their petrol counterparts, but do contribute substantially to air pollution through NO_x emissions. Ultra low emission vehicles, including electric vehicles and hybrids, should replace diesel cars.

The expansion and strengthening of clean air zones will encourage a transition towards active transport. Active travel can bring about major health benefits and an improved quality of life. Journeys by bicycle or on foot not only reduce emissions and improve air quality, but have the added advantages of improving health by helping reduce obesity, diabetes, coronary heart disease, stroke, road traffic accidents, and improving mental health.[10] This in turn reduces the cost burden on the NHS. Ultra-low emission zones, improved urban planning and investment in active transport infrastructure, such as cycle lanes, form part of a policy package designed to improve health, air quality and help us to meet our climate change targets.

4 Better monitor air pollution in areas where vulnerable populations are concentrated

It is essential that more targeted measures are employed to monitor air quality around hospitals, health clinics, and schools. This will ensure that those who are most vulnerable to the impacts of air pollution, notably children, the elderly and infirm, are protected. It is concerning that air pollution often remains an invisible threat to individuals worst impacted by it, despite the fact that they may live or work in a highly polluted area.

This new data should be made widely available and be used to conduct frequent assessments of the effectiveness of intervention strategies to better inform future approaches.

6 *Department for Energy and Climate Change.* New Direction for UK Energy Policy. Available from: https://www.gov.uk/government/news/new-direction-for-uk-energy-policy [accessed 10 June 2016]

7 *The Authoritative Report on the UK Renewable Energy Sector.* Renewable Energy Association. 2016

8 *Emissions of air pollutants in the UK, 1970 to 2014.* Department for Environment, Food and Rural Affairs. 2015.

9 *UK Automotive Sustainability Report.* The Society of Motor Manufactures and Traders Limited. 2016

10 *The case for action.* Active Transport for Healthy Living Coalition. 2013

5 Retain or improve air quality standards that current EU regulations afforded us

The role of the EU has been significant in driving measures to cut air pollutants and has provided a vital enforcement regime, allowing the UK to be held to account on meeting air quality targets. Leaving the EU poses a significant risk to the UK in terms of tackling air pollution, since trans-boundary sources can be frequently responsible for air pollution.[11]

We make the suggestions below to ensure that the regulations are maintained to continue to meet emission reduction targets and reduce air pollution:

- Retain current environmental standards and objectives whatever the final settlement reached in post-referendum discussions, including any international commitments and agreements held by the EU on the UK's behalf;
- Continue to work with the EU to ensure that action is coordinated with local and national measures.

6 Better inform and support health professionals to take local action and provide advice to patients

The health service must lead by example and reduce its emissions to cut air pollution. This offers three advantages: improved staff and patient health, a reduction in the burden of climate and poor air quality related illness and a significant saving for the NHS expenditure on energy costs and staff absence.

Health professionals are powerful messengers when advocating for interventions outside of the clinical setting which protect the health of their patients – the phase out of coal, expansion of clean air zones, and improved urban planning are three important areas here. By engaging with local energy, transport, and infrastructure decisions, we can ensure that policies which benefit both public health and the environment are implemented. We can encourage and support our patients and staff to walk or cycle to work or school and we can communicate messages about climate change.

11 Flisowska J, Gutmann K, Jones D, Urbaniak D, Azau S, Hushcher J. *Europe's Dark Cloud: How Coal-Burning Countries are Making their Neighbours Sick.* Environment and Health Alliance. 2016

Tackling air pollution: a triple win for health

Climate Change Legislation
The Paris Agreement

The international Paris Agreement deals with greenhouse gas emissions mitigation, adaption and finance starting in the year 2020. The agreement was negotiated by representatives of 195 countries and adopted on 12 December 2015.

Governments agree to:

- Hold the increase in the global average temperature to well below 2°C above pre-industrial levels and aim to limit the increase to 1.5°C above pre-industrial levels, since this would significantly reduce the risks and impacts of climate change;
- Increase the ability to adapt to the adverse impacts of climate change and foster climate resilience and low-carbon emissions development, in a manner that does not threaten food production;
- Make finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development;
- Aim to reach global peaking of greenhouse gas emissions as soon as possible, recognising that this will take longer for developing countries.

The Climate Change Act

The Climate Change Act was passed in 2008 and established a framework for emissions reduction. The Act includes:

- **2050 target** which commits the UK to reducing emissions by at least 80% in 2050 from 1990 levels.
- **Carbon Budgets** which are caps on the amount of greenhouse gases emitted in the UK over a five-year period. Five carbon budgets have been put into legislation and run up to 2032.
- **The Committee on Climate Change** which was set up to advise the Government on emissions targets, and report to Parliament on progress made in reducing greenhouse gas emissions.
- **A National Adaptation Plan** which requires the Government to assess the UK's risks from climate change, prepare a strategy to address them, and encourage critical organisations to do the same.

The Environment (Wales) Act 2016

The Act will:

- Place a duty on Welsh Ministers to ensure that they are at least 80% lower that the base lines for greenhouse gases.
- Put in place provision for interim emissions targets to be set for 2020, 2030 & 2040.
- Place a duty on Welsh Ministers to set five yearly carbon budgets.
- Place a duty on Welsh Ministers to publish a statement after each carbon budget measuring progress.
- The duty is on Welsh Ministers to prepare and publish a report for each budgetary period setting out their policies and proposals for that period.
- Establish a body to advise Government on latest scientific evidence and report progress being made against budgets targets.

The Climate Change (Scotland) Act 2009

- The Climate Change (Scotland) Act was passed in 2009, committing Scotland to a 42% reduction in emissions by 2020 and annual reductions between 2010 and 2050. The commitments represent the most stringent reduction targets in the UK.

- The country's emissions fell by nearly 46% between 1990 and 2014, surpassing the government's 2020 target of a 42%.

Greenhouse Gas Action Plan (Northern Ireland)

- Northern Ireland's target is to reduce emissions by 35% on 1990 levels by 2025. In 2010 Northern Ireland established a cross departmental working group on climate change. The Executive's Greenhouse Gas Action Plan was agreed and published in February 2011, outlining how each department in the Executive will contribute towards meeting the 2025 emission reduction target. Northern Ireland's Environment Minister is developing plans for a Northern Ireland Climate Change Act.

The combustion of fossil fuels is often a primary driver for both climate change and air pollution. Both air pollution and climate change are a threat to health in the UK, so tackling them with sensible approaches, such as the promotion of cycling and walking, can effectively create a triple health benefit for the UK.

When air pollution and climate change are tackled in isolation, they often lead to maladaptive side effects resulting in adverse health outcomes and ineffective policy interventions. The decision to base fuel tax on CO_2 only failed to account for the detrimental impact of air pollution, particularly from diesel engines.

Air pollution – the health effects

The effects of air pollution on health are particularly felt in our cities, and it is often those that are most vulnerable – our children, the sick and infirm, and the elderly – that suffer most from it. Air pollution is also a driver of health inequality, with the most polluted streets home to some of our poorest communities.[12] Outdoor air pollution kills 40,000 people in the UK every year.[13] The premature deaths are largely due to two key pollutants, fine particulates and the toxic gas nitrogen dioxide. Air pollution is now being referred to as the silent killer,[14] as it no longer comes from the belching smoke from chimneys but rather the invisible fumes from diesel exhausts. The Organisation for Economic Cooperation and Development estimates outdoor air pollution will cause as many as 9 million premature deaths a year around the world in the next four decades.[15] Negative health effects and environmental damage are caused by air pollutants such as particulate matter, ammonia (NH_3), nitrogen oxides (NO_2) and sulphur dioxide (SO_2). The air pollutants of greatest concern in the UK now are PM, NO_X, ozone (O_3) and NH_3, with strong evidence linking them to a wide range of cardiovascular and respiratory diseases.[16]

12 *Marmot, M. Fair Society Healthy Lives.* The Marmot Review. 2010

13 Holegate S, Grigg J, Raymond A, Ashton J, Cullinan P, Exley K, Fishwick D, et al. *Every Breath We Take: The Lifelong Impact of Air Pollution.* Royal College of Physicians and Royal College of Paediatrics and Child Health. 2016

14 *Sadiq Khan unveils action plan to battle London's toxic air.* London Assembly. 2016

15 *The Economic Consequences of Outdoor Air Pollution.* OECD. 2016

16 *Air Pollution: Action in a Changing Climate.* Department for Environment, Food and Rural Affairs. 2010

Emerging evidence suggests potential links with higher rates of stillbirth,[17] mental health issues in children[18], diabetes and obesity.[19] Children are especially vulnerable, and may suffer permanent health impacts from early exposure to air pollution. The elderly and those with underlying health conditions are similarly at increased risk of the adverse impacts of poor air quality.[20]

Coincidentally these at-risk groups are also most vulnerable to the impacts of climate change such as extreme heat.[21]

The latest United Nations Economic Commission for Europe's report on air pollution finds that air pollution control costs are generally significantly lower than the costs of damage to health and the environment.[22]

John's story

Professional photographer, John, has always suffered from coughs and colds. For many years and after countless GP visits, John was still suffering from an undiagnosed complaint. Chest examinations gave him the all clear. It was only two years ago that John was finally diagnosed with bronchiectasis.

John said

"Usually I continue as normal, but colds knock me back, I feel completely wrecked and it stops me in my tracks. We moved from central London to avoid the pollution and now live in North London, I still have a busy photography business, this often means going to the centre of London, and I find the air pollution really affects me."

Living in one of the most polluted cities in Europe, where pollution regularly breaches legal limits, is ultimately a challenge for John. He previously lived on Edgware road, a notoriously congested area, where he raised his young family. One of John's children suffers from asthma – again making leading a normal life no simple feat, as it does for so many other sufferers of respiratory problems across all UK cities.

With his busy photographic schedule, John must frequently travel to central London. This makes it practically impossible for him to avoid the pollution hotspots and central London can be one of the least desirable places for anyone with respiratory complaints.

John started driving around London in 1987 and has since noticed the rising volume of traffic. Driving in London often means sitting in queues with engines idling. The dramatic increase in diesel engines is noticeable and has considerably aggravated air quality.

John wants to campaign to improve air pollution; he is convinced this makes his coughing worse. He stresses that air pollution is a 'hidden killer'. John would leave London if he could, but with his business, family and home all based in London relocating isn't a viable option. The Government and local authorities taking stronger action on air pollution however is a viable option.

17 Nezeeba Siddika N, Balogun H, Amegah A, Jaakkola J. *Prenatal ambient air pollution exposure and the risk of stillbirth: systematic review and meta-analysis of the empirical evidence.* Occup Environ Med. 2016

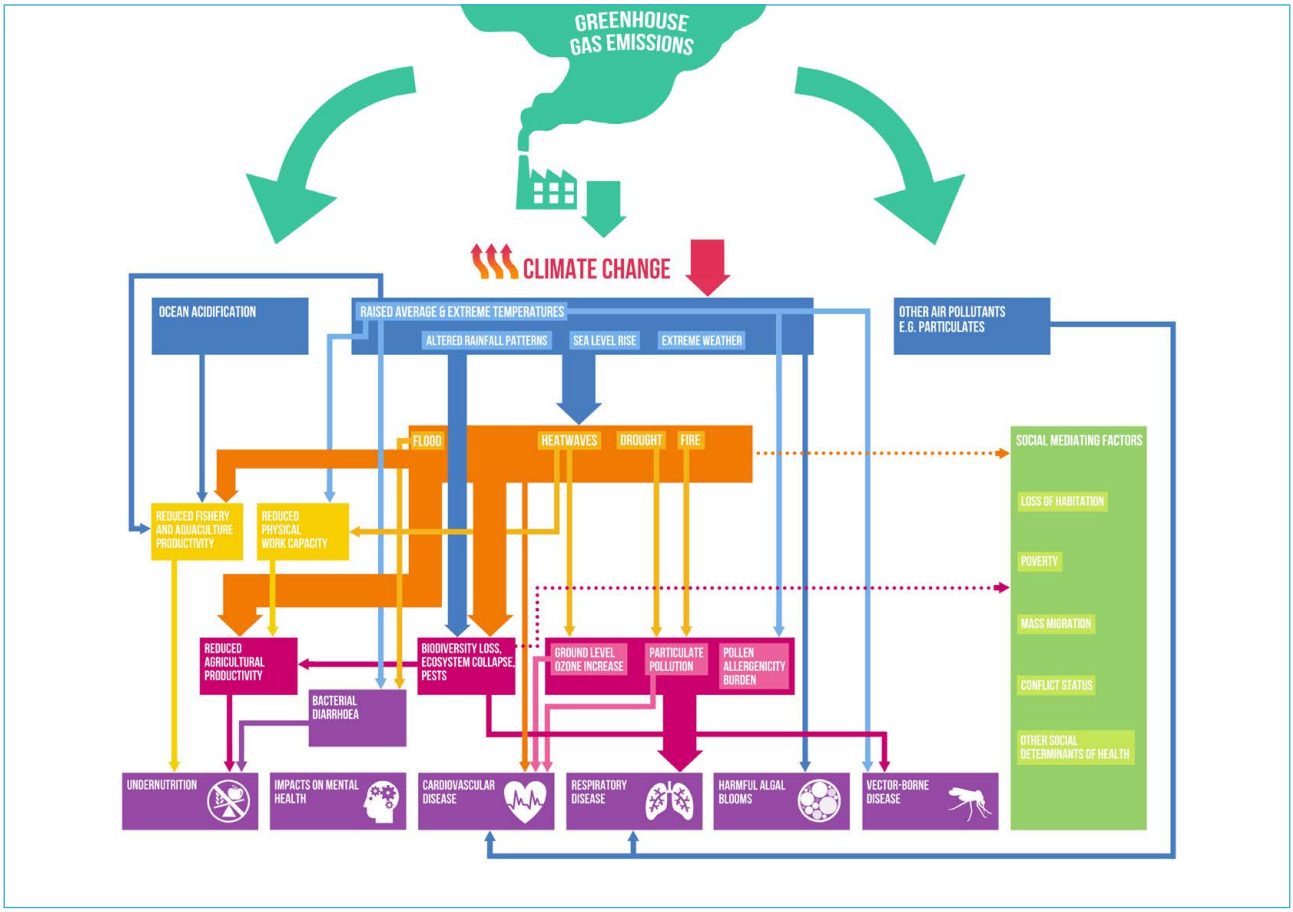
18 Oudin A, Braback L, Astrom D, Stromgren M, Forsberg B. Association between neighbourhood air pollution concentrations and dispensed medication for psychiatric disorders in a large longitudinal cohort of Swedish children and adolescents. *BMJ Open*. 2016

19 Holegate S, Grigg J, Raymond A, Ashton J, Cullinan P, Exley K, Fishwick D, et al. *Every Breath We Take: The Lifelong Impact of Air Pollution.* Royal College of Physicians and Royal College of Paediatrics and Child Health. 2016

20 As above.

21 Humphrey K, Ibitoye I, Mabbutt J, Thompson D, Townsend A, Vallejo L, et al. *Managing climate risks to well-being and the economy.* Adaption Sub-Committee Progress Report. 2014

22 Greenfelt, R. *Towards Cleaner Air Scientific Assessment Report 2016*. UNECE. 2016



Climate change – the health effects

Climate change threatens to undermine the last 50 years of gains in public health, both in the UK and across the world.[23] More frequent and severe flooding and heat waves are two critical impacts of climate change that have already begun to impact on health in the UK. The Government's independent advisory group – the Committee on Climate Change – expresses particular concern over a growing burden of mental health, with 2007 flood victims up to five times more likely to experience symptoms of stress and anxiety.[24] Climate change will also increase stress on an already over-burdened National Health Service, threatening to undermine vital health infrastructure and overwhelm its ability to respond to the needs of the public. Acting now to reduce emissions will lessen the impacts of climate change.

Tackling outdoor air pollution and climate change – the health opportunity

Acting on climate change presents an unprecedented opportunity to drive improvements in public health and wellbeing. Many of the actions needed to tackle climate change are sensible public health interventions in their own right, whether this is encouraging physical activity, healthier diets, or insulating homes.

Air pollution is an area where the health benefits of reducing emissions are seen directly and instantly. Obesity is a major health challenge in the UK, and by encouraging more active transport (cycling and walking) the risk of obesity can be reduced. This not only has huge benefits for health but also cuts the burden on the NHS reducing costs.

23 Watts N, Adger N, Agnolucci P, Blackstock J, Byass P, Cai W, et al. The Lancet Commission on Health and Climate Change. *The Lancet.* 2015; 386 (10006): 1861-1914

24 Humphrey K, Ibitoye I, Mabbutt J, Thompson D, Townsend A, Vallejo L, et al. *Managing climate risks to well-being and the economy.* Adaption Sub-Committee Progress Report. 2014

Recommendations

Recommendation

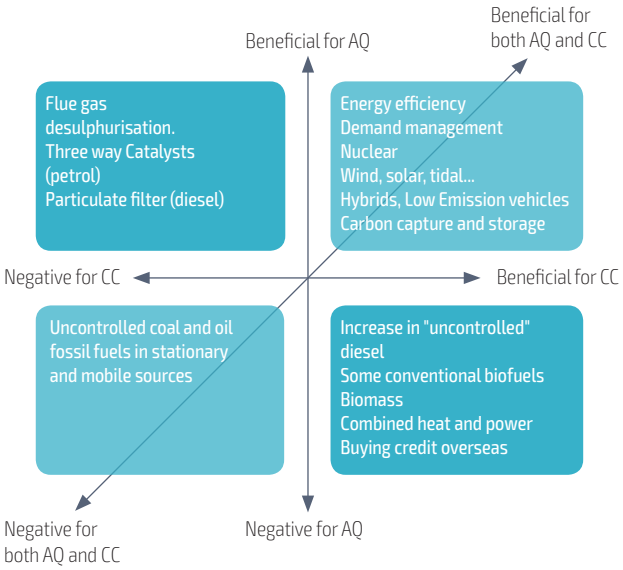
1 Increase cross-departmental collaboration to promote a joined-up approach

Integrating policies on health, climate change and air pollution will ensure that they deliver co-benefits to health and cut costs. Cross-departmental collaboration is needed in order to coordinate action across sectors, government departments, and at a local, national, and international level.

The challenge

The policy responses to both climate change and air pollution are inextricably linked to other parts of government and society, meaning that careful consideration of other sectors – energy, transport, health, agriculture, industry, and housing – is required. In exploring these links, it is apparent that many interventions to mitigate climate change will lead to improved air quality, and vice versa.

However, interventions aimed at tackling climate change or air pollution alone may result in maladaptive outcomes. The UK has witnessed this first hand, in policies that encouraged the use of diesel cars which inadvertently worsened air quality. Considering air pollution and climate change together can limit adverse health effects. The following axis graph demonstrates these potential trade-offs.



Policy map displaying air quality (AQ)/climate change (CC) interactions. Source: Defra (2010). Air pollution: Action in a changing climate. www.gov.uk/government/publications/air-pollution-action-in-achanging-climate.

The axis indicates how some strategies can be good for both air quality and climate change, for instance wind, solar and tidal energy. Acting on ones that are beneficial to both is advantageous to health. Indeed, joining up policies on health, air pollution and climate change can offset the costs of climate mitigation policies through the health benefits that they bring.

The solution

By engaging with other parts of government on climate change and air pollution, the Departments for Health can go a long way to achieving their goals of promoting the health and wellbeing of the public. To unlock these benefits, they should launch a formal process of engagement with other relevant Departments or Directorates to collaborate and effectively take action on climate change and air pollution. Intra-governmental work, as well as coordination across devolved nations, is essential for ensuring that action on climate change promotes and protects health. When creating energy policies, policymakers must consult on their health impacts.

Realising the benefits of addressing air pollution and climate change together will require synergistic policies, across departments and at a local, regional, national and international level.

The Alliance calls for:

- Greater collaboration between departments and the devolved nations to integrate policies and strategies on health, climate change and air pollution

Recommendation

2 Phase-out coal power stations by 2025

In November 2015, the UK Government announced the start of the process to the phase-out of coal power across the UK by 2025, noting that "coal is simply not sustainable in the long term".[25] In line with a key recommendation of the 2015 Lancet Commission on Health and Climate Change, The Alliance unreservedly believes that unabated coal power has no place in the future of UK's national energy mix. The ready availability of cheaper alternatives and the dual harms to human health – both from air pollution and climate change – leads the Alliance to call for a rapid coal phase out by 2025 and the creation of a policy environment that supports non-polluting and low-carbon energy sources.

Direct health impacts

Each year air pollution from coal power stations is responsible for 1,600 premature deaths, 68,000 additional days of medication, 363,266 working days lost and more than a million incidents of lower respiratory symptoms across the UK, and costs up to £3.1 billion.[26]

Burning coal produces a number of air pollutants that are harmful to health, including sulphur dioxide, nitrogen oxides and particulate matter. Sulphur and nitrogen oxides react further in ambient air forming secondary fine particulates , whilst nitrogen oxides also contribute indirectly to the formation of ozone. Heavy metals, such as mercury, and persistence organic pollutants, are also emitted from the smokestack of coal power plants.[27] Short and long-term exposure to these pollutants is strongly linked to a range of cardiovascular diseases, including ischaemic heart disease and cardiac arrhythmia, and chronic respiratory diseases such as chronic bronchitis, emphysema, and lung cancer.

Because pollutants from coal plants can travel over long distances and across borders, much of the coal air pollution in the UK comes from Europe and vice versa. Action on climate and air pollution has to be coordinated both within and between countries.[28]

Contribution to climate change

Coal also affects health indirectly through the greenhouse gas emissions it emits and its substantial contribution to driving climate change. In terms of greenhouse gas emissions, in 2014 coal power stations produced 17% of all the UK's carbon dioxide emissions, 22% of nitrogen oxides, and 44% of sulphur dioxide.[29, 30]

Ending the use of coal is a simple, no-regrets public health intervention. In May 2016 the UK had periods of running entirely without coal powering its electricity grid.[31] Phasing-out the burning of coal is part of a worldwide energy transition, with some nations, such as Norway[32] and Uruguay[33], on their way to achieving a 100% renewable energy. This is just scratching the surface of what is possible globally. The world is already investing more money in renewable energy than in fossil fuels, and in many places wind and solar power is now competitive with coal on cost.[34] Phasing-out coal in the UK is an important step to galvanize action internationally, setting an example for other nations to end their use of coal.

Phasing-out coal plants in favour of healthier, renewable sources of electricity generation reduces climate change, improves wellbeing, and has a key third benefit of being cost-effective.

The Alliance calls for:

- The phase-out of coal by 2025
- For coal to be replaced by clean energy

25 Department for Energy and Climate Change. New Direction for UK Energy Policy. Available from: https://www.gov.uk/government/news/new-direction-for-uk-energy-policy [accessed 10 June 2016]

26 Huscher J, Jensen G. *What does coal cost health in the United Kingdom?* Health and Environment Alliance. 2013

27 Huscher J, Smith D. *The unpaid health bill: how coal power plants make us sick.* Health and Environment Alliance. 2013

28 Flisowska J, Gutmann K, Jones D, Urbaniak D, Azau S, Hushcher J. Europe's Dark Cloud: *How Coal-Burning Countries are Making their Neighbours Sick.* Environment and Health Alliance. 2016

29 Jones D. *The Energy Bill and the coal phase-out.* Sandbag. 2016

30 The European Pollutant Release and Transfer Register. European Environment Agency. Available from: <http://prtr.ec.europa.eu/#/home > [accessed 15 June 2016]

31 Britain gets no power from coal. *Carbon Brief.* 2016

32 Survey of resource efficiency policies in EEA member and cooperating countries: Norway. *European Environment Agency.* 2011

33 Watts J. Uruguay makes dramatic shift to nearly 95% electricity from clean energy. *The Guardian.* 3 December 2015

34 McCrone, A. *Global trends in renewable energy investment 2016.* Frankfurt School and United Nations Environment Programme. 2016

Recommendation

3 Expand existing clean air zones and extend their use to other cities

UK cities that exceed the limit on air pollution

The WHO report shows that the following ten UK cities which are breaching their air quality standards for levels of PM_{10} particulate air pollution: Port Talbot, Stanford–le-Hope, Glasgow, Leeds, London, Scunthorpe, Eastbourne, Nottingham, Oxford and Southampton.[35]

Addressing road transport is one of the most significant opportunities to improve air quality. It is the largest contributor to NO_2, a pollutant that is regularly found to breach legal limits in built-up areas in the UK.[36] Measures to improve air quality by targeting road transport will also decrease CO_2 emissions and consequently lessen the impacts of climate change. A critical next step is increasing the boundaries of Clean Air Zones and expanding the number of cities that use them.

The challenge

Transport accounts for 31% of NO_2, 18% of PM_{10} and 19.5% of $PM_{2.5}$ emissions in the UK.[37] The other main pollutants from road traffic include SO_2, volatile organic compounds (VOCs) and O_3, which is formed by the interactions of VOCs and NO_X in the presence of sunlight and heat, therefore higher summer temperatures exacerbate the health effects of air pollution.[38] Road traffic frequently accounts for more than 64% of air pollution at urban monitoring sites.[39]

Despite improved engines standards, the increase of motorised traffic on the road has led to rising levels of air pollution. In 2012, road traffic in the UK was ten times higher than in 1949.[40] The Royal College of Physicians and of Paediatrics and Child Health's report from February 2016 states that a bias in favour of investment in road building and motorised transport has led to a 'windscreen perspective' – which views transport issues only from the driver's perspective.[41] The total distance walked each year declined by 30% between 1995 and 2013,[42] and the distance cycled in England and Wales in 2012 was just 20% of that in 1952.[43] This has profound and dangerous implications for the health of the nation, with the increase of motorised transport resulting in a reduction of physical activity, a rise in noise pollution and motor-vehicle accidents, a lowering of air quality, and a worsening of climate change. The health and environment benefits from a shift from motorised transport to walking and cycling brings cannot be ignored.

Diesel engines are largely responsible for air pollution from transport and they account for 40% of air pollution in urban centres in the UK.[44] Diesel cars tested in Norway produced four times the NO_X emissions than the average emission from the tested city buses and heavy vehicles with Euro VI engines – the European emission standards for passenger cars manufactured in 2014 and after.[45] Unhealthy concentrations of NO_2 are estimated to be responsible for 23,500

35 *WHO Global Urban Ambient Air Pollution Database.* WHO. Available from: http://www.who.int/phe/health_topics/outdoorair/databases/cities/en/ [accessed 11 July 2016]

36 East England towns and cities have illegal NO_2 levels. *BBC News.* 16 March 2016

37 *Air Pollution: Outdoor air quality and health.* NICE. 2016

38 *Air Pollution in the UK 2013*, Defra, September 2014 <https://uk-air.defra.gov.uk/assets/documents/annualreport/air_pollution_uk_2013_issue_1.pdf> [accessed 30 June 2016]

39 Sundvor I, Balaguer N, Guerreiro C, Querol X, C Reche C, Amato F, et al. *Road traffic's contribution to air quality in European cities.* The European Topic Centre on Air Pollution and Climate Change Mitigation. 2013

40 *Annual Road Traffic Estimate: Great Britain 2013.* Department for Transport. 2014

41 Holegate S, Grigg J, Raymond A, Ashton J, Cullinan P, Exley K, Fishwick D, et al. *Every Breath We Take: The Lifelong Impact of Air Pollution.* Royal College of Physicians and Royal College of Paediatrics and Child Health. 2016

42 *National travel survey: England 2013.* Department for Transport. 2014

43 *The Urban Environment.* Royal Commission on Environmental Pollution. Report number: 26. 2007

44 *Driving Away from Diesel.* London Assembly: Environment Committee. 2015

45 Hagman R, Weber C, Amundsen A. *Emissions from new vehicles – trustworthy?* Institute of Transport Economics. 2015

deaths annually in the UK.[46] The market for diesel cars was relatively niche in Europe until the mid-1990s. Following the Kyoto Protocol climate change agreement in 1997, rich nations were legally obliged to reduce CO_2 emissions by 8% over 15 years.[47] At the time diesel produced 15% less CO_2 than petrol, therefore switching from petrol to diesel became an attractive option for rapid emissions reduction.[48] Subsequently the European Commission 1998 Area agreement with all European car makers was introduced and Britain offered subsidies to persuade car makers and the public to buy diesel.[49]

Today, diesel cars no longer produce significantly less CO_2 than petrol cars, but do contribute substantially to air pollution, emitting four times more NO_2 and 22 times more particulates than petrol.[50] Whereas in the 1990s, there was a potential trade-off between health and climate change, this is no longer the case, which speaks to our first recommendation of joining up action on air pollution and climate change: as focusing only on CO_2 emissions can lead to the worsening of air pollution.

Rapidly ending the use of diesel cars is an immediate priority to bring dangerous concentrations of NO_x within legal limits. In considering a transition away from diesel, it is clear that the broader public health context necessitates both urgent climate change mitigation and enhanced efforts to tackle the UK's obesity epidemic. Wide-spread investment in active transport infrastructure promises the biggest advantages in terms of health, air pollution and climate change.

Clean Air Zones

Expanding and strengthening clear air zones, such that they are inclusive of private vehicles and expanded to urban centres beyond London, will reduce air pollution and tackle emissions that cause climate change. With air pollution levels regularly breaching legal limits, urgent scale-up of response is clearly required.[51] The air quality in London is among the worst in Europe, and has a larger impact on premature mortality rates than either obesity or alcohol.[52] Whilst Defra has begun to implement clean air zones in other major UK cities – for instance Glasgow, Cardiff, Leeds, Southampton, Nottingham and Derby – , greater ambition is needed. In London, the widening of Ultra Low Emission Zones (ULEZ) beyond its planned borders of the North and South circular, to the outer boroughs is needed. A number of other cities such as Glasgow, Oxford and Scunthorpe are currently breaching air quality standards recommended by WHO, and would greatly benefit from the implementation of a robust clean air zone.[53] In all cases, ULEZ must be kept under close scrutiny and continuously tightened, as lower-emission vehicles become more widely available. In other parts of the UK, current efforts to address emissions from buses, coaches, taxis, and lorries should be extended to private cars and vans.

It is up to local authorities to ensure that plans to reduce air pollution take effect as soon as possible. To this end, it is important that regular real-time testing of roadside pollution is conducted, to ensure the accuracy of industry-stated vehicle emissions, and to evaluate the predicted success of schemes such as ULEZ. Assessing vehicles in real driving conditions often finds larger NOx emissions than expected.[54]

46 Defra analysis using interim recommendations from COMEAP's working group on NO2. The working group made an interim recommendation for a coefficient to reflect the relationship between mortality and NO_2 concentrations (per $\mu g/m^3$). COMEAP has not yet made any estimates of the effects of NO_2 on mortality. Any analysis will be subject to change following further analysis by the working group and consultation with the full committee.

47 Kyoto Protocol to the United Nations Framework

48 Vidal, J. The rise of diesel in Europe: the impact on health and pollution. *The Guardian*. 22 September 2015

49 *Commission and ACEA agree on CO2 emissions from cars*. European Commission. 1998

50 *Road vehicle emissions factors*. Department for Transport. 2009

51 Birkett, S. *Oxford Street has already breached nitrogen dioxide hourly limit value for 2015*. Clean Air London. 2015

52 *Driving Away from Diesel*. London Assembly: Environment Committee. 2015

53 *Improving air quality in the UK*. Department for Environment, Food and Rural Affairs. 2015

54 Carrington, D. Revealed: nearly all new diesel cars exceed official pollution limits. *The Guardian*. 23 April 2016

Active transport, improving health

Providing clean air zones will encourage and make safe active transport, bringing major health benefits and an improved quality of life. Better urban planning is needed in the UK to support cycling and walking. Reduced local pollution rates combined with sound investment in active transport infrastructure will help encourage a more physically active population. Schemes like ULEZ offer a measure to tackle air pollution quickly and make cuts to the most significant contributor of heavily polluting vehicles. However, the central thrust remains making cycling and walking more accessible due to their considerable benefits to wellbeing and health.

To this end, it is well understood that individuals who are physically active reduce their risk of developing major chronic diseases such as coronary heart disease, stroke, type 2 diabetes, osteoporosis, depression, dementia and cancer by up to 50 per cent, and the risk of premature death by up to 30 per cent.[55] The estimated cost to the NHS for treating overweight and obesity, and related morbidity in England, is £4.2 billion in 2007.[56] It is estimated that increased walking and cycling in urban England and Wales could save the NHS £17bn over the next 20 years.[57] An analysis by Sustrans has shown that the average benefit-to-cost ratio of a traffic-free walking and cycling route is 26:1, with the majority of benefit coming from improved health.[58]

By convening various groups across the UK, including local voices, business representatives, active transport NGOs, city planners, and partners across Governments, such as the Departments for Health, Environment, Transport, and Infrastructure, cohesive strategies can be planned to improve options for active transport. Again, as outlined in the first recommendation, policies must be created synergistically in order to maximise advantages to health and tackle climate change

Summary

Considering that London regularly breaches its legal NO_2, limits quicker and stronger implementation of ULEZ is a matter of public health urgency. Under EU rules, sites are only allowed to breach hourly limits of 200 micrograms of NO_2 per cubic metre of air 18 times in a year, however this year Putney High Street breached this limit just one week into the year. Local authorities across the UK need to implement clean air plans as rapidly as possible, with ULEZ as an exemplary starting point for action. Yet, it is the shift away from motorised transport to an active based one that must ultimately underpin action, as walking and cycling offer unparalleled advantages to health and wellbeing, as well as making our streets safer and more desirable.

The Alliance calls for:

- Rapidly tackling emissions from motorised vehicles through the implementation of robust clean air zones that extend to private vehicles across the UK
- Greater investment and urban planning to encourage walking and cycling

55 Ellinas, T. *Healthy Transport = Healthy Lives*. British Medical Association. 2012

56 Butland B, Jebb S, Kopelman P, McPherson K, Thomas S, Mardell J, et al. *Tackling obesities: future choices – project report*. Government Office for Science. 2007

57 Jarret J, Woodcock J, Griffiths U, Chalabi Z, Edwards P, Robers I, Hains A. Effect of increasing active travel in urban England and Wales on costs to the National Health Service. *The Lancet*. 2012; 370 (9832)

58 *The National Cycle Network Route User Monitoring Report*. Sustrans. 2008

Recommendation

4 Better monitor air pollution in areas where vulnerable populations are concentrated

Air pollution is an invisible threat, often worst affecting our most vulnerable populations, children, the elderly, and those with pre-existing cardiopulmonary conditions. Air quality monitors should be sited around our schools, hospitals, and healthcare facilities where these populations are concentrated.

The challenge

Children, older people, and those with chronic health problems are among those most vulnerable to air pollution. A 2012 study found that 433 of London's 1,777 primary schools were located in areas where pollution breached the EU limits for NO_2. Of those, 83% were considered 'deprived schools', defined as schools where more than 40% pupils receiving free school meals.[59] Improved measurement of air quality around schools and hospitals and healthcare facilities – areas where vulnerable groups may be at most risk – is needed.

The Marmot Review highlights that lower socio-economic communities suffer greater burdens from air pollution related death and sickness.[60] This is, in part, due to a higher baseline prevalence of cardio-pulmonary disease, coupled with greater hazard exposure levels from a higher proportion of homes being situated nearer to busy congested roads and with fewer green spaces.[61] Recent research from the British Lung Foundation has shown that people living in London's most deprived areas are twice as likely to die from respiratory conditions as those in high socio-economic areas.[62] Improving access to green spaces and opportunities for active transport is required to reduce exposure and vulnerability to air pollution and the impacts of climate change. Measuring air pollution in deprived areas, where vulnerability to it is higher, is important and there is a greater urgency to combat it in these areas.

The solution

Once the measurement equipment is in place the data must then be made publicly available and clearly communicated, so that people are aware of the risks particularly to vulnerable people - exacerbations of chronic respiratory conditions like chronic obstructive pulmonary disease and asthma, and life-long impacts on children and infants. Monitoring air pollution provides an important means of engaging the public with the issue. With increased engagement and awareness, comes greater understanding of the need for measures to tackle air pollution and demand for further action.

The Alliance calls for:

- Greater monitoring of air pollution around schools and hospitals
- Improved communication of the health risks associated with air pollution, particularly to vulnerable people

59 King K, Healey S. *Analysing Air Pollution Exposure in London.* Aether. 2013
60 Marmot, M. *Fair Society Healthy Lives.* The Marmot Review. 2010
61 Ellinas, T. *Healthy Transport = Healthy Lives.* British Medical Association. 2012
62 *Lung disease in the UK – big picture statistics.* British Lung Foundation. 2016

Recommendation

5 Retain or improve air quality standards that current EU regulations afforded us

The EU has played a significant role in driving measures to cut air pollutants and has provided a vital enforcement regime, allowing the UK to be held to account on meeting air quality targets. Leaving the EU poses a significant risk to the UK in terms of tackling air pollution.

Given the important role that trans-boundary sources play in local air pollution, it is essential that the UK continues to work with the EU in responding to the joint challenges of climate change and air pollution. Without such cooperation, many of our most populated areas may be unable to meet the World Health Organization's air pollution standards through local action alone. Therefore, coordinated action at a local, national, and European Union level is needed.

We make the suggestions below to ensure that the regulations are maintained to continue to meet emission reduction targets and reduce air pollution:

- Retain current environmental standards and objectives whatever the final settlement reached in post-referendum discussions, including any international commitments and agreements held by the EU on the UK's behalf;
- Continue to work with the EU to ensure that action is coordinated with local and national measures.

Ambient Air Quality Directive (2008/50/EC)

More stringent environmental standards from the EU have seen significant health and environmental benefits in the UK. Notably, there has been dramatic improvement to air quality. This, in part, has been owing to the Ambient Air Quality Directive (2008). This Directive sets legally binding limits for concentrations of major air pollutants that impact public health. These include limit values for lead, nitrogen dioxide (NO_2), particulate matter (PM_{10} and $PM_{2.5}$), sulphur dioxide (SO_2), benzene, carbon monoxide (CO), certain toxic heavy metals (arsenic, cadmium, nickel and benzo(a)pyrene) and polycyclic aromatic hydrocarbons (PAH) and ozone (O_3).

This Directive requires Member States to monitor and assess air quality, report to the Commission and the public on the results of this monitoring and assessment, and prepare and implement air quality plans containing measures to achieve the stated objectives.

2005 World Health Organizations Air Quality Guidelines

The 2005 "WHO Air Quality Guidelines" offer global guidance on thresholds and limits for key air pollutants that pose health risks.

Particulate matter

Guideline limits

$PM_{2.5}$

10 µg/m^3 annual mean

25 µg/m^3 24-hour mean

PM_{10}

20 µg/m^3 annual mean

50 µg/m^3 24-hour mean

Health effects

The most health-damaging particles are those with a diameter of 10 microns or less, ($\leq PM_{10}$), which can penetrate and lodge deep inside the lungs. Chronic exposure to particles contributes to the risk of developing cardiovascular and respiratory diseases, including lung cancer.

Ozone (O_3)

Guideline limits

100 µg/m^3 8-hour mean

Health effects

Excessive ozone in the air can have a marked effect on human health. It can cause breathing problems, trigger asthma, reduce lung function and cause lung diseases. In Europe it is currently one of the air pollutants of most concern. Several European studies have reported that the daily mortality rises by 0.3% and that for heart diseases by 0.4%, per 10 µg/m^3 increase in ozone exposure.

Nitrogen dioxide (NO_2)

Guideline limits

40 µg/m^3 annual mean

200 µg/m^3 1-hour mean

Health effects

Epidemiological studies have shown that symptoms of bronchitis in asthmatic children increase in association with long-term exposure to NO_2. Reduced lung function growth is also linked to NO_2 at concentrations currently measured (or observed) in cities of Europe and North America.

Sulphur dioxide (SO_2)

Guideline limits

20 µg/m^3 24-hour mean

500 µg/m^3 10-minute mean

Health effects

SO_2 can affect the respiratory system and the functions of the lungs, and causes irritation of the eyes. Inflammation of the respiratory tract causes coughing, mucus secretion, aggravation of asthma and chronic bronchitis and makes people more prone to infections of the respiratory tract. Hospital admissions for cardiac disease and mortality increase on days with higher SO_2 levels.

Recommendation

6 Better inform health professionals to take local action and provide advice for patients

Health professionals have an important role to play, both in leading by example in tackling air pollution and climate change and in advising their patients on ways that they can play a role in improving their own health.

The challenge

The NHS carbon footprint in England is 22.8 million tonnes of carbon dioxide equivalents (MtCO2e). Through the positive impact of the work led by the Sustainable Development Unit, between 2007 and 2016 the carbon footprint has reduced by 11%.[63] The NHS employs more than 1.5 million people, putting it in the top five of the world's largest workforces, together with the US Department of Defence, McDonalds, Walmart and the Chinese People's Liberation Army. With this in consideration, the actions and advocacy measures adopted by health workers, for instance opting to commute to work via bicycle, would have a substantial impact on tackling climate change and air pollution.[64] Health professionals also play a role in ensuring their workplace is more carbon efficient through local advocacy.

The solution

Recent national strategies to reduce the impact of the NHS on climate change have been shown to result in improved quality of patient care, and reduced operational costs for the service. A recent report from the Sustainable Development Unit has found the measures to reduce emissions could save NHS England more than £400m, reducing carbon emissions by one million tonnes each year by 2020 and providing health benefits to patients.[65]

Switching to a clean energy provider and fuelling homes, surgeries, and hospitals with renewable energy, as well as transitioning its fleet to zero-emission vehicles are among some of the options for the health sector and health professionals. Health professionals need to be advocates of active travel, particularly ensuring that pedestrians and cyclists are prioritised over motorists, and choosing low-carbon options to travel to work themselves. Promoting cycling and walking as an option should be integrated as part of a regular practice in advice from health professionals. Healthcare organisations and professionals will need to work with local authorities and policy makers to ensure that transport, infrastructure, and energy policies all deliver on health. Promoting the advantages to health from options that are low-carbon must be part of the normalised practice.

63 *Carbon Footprint Update for NHS in England 2015.* Sustainable Development Unit. 2016
64 *About the National Health Service.* NHS England. 2016
65 *Securing Health Returns.* NHS England. 2016

Afterword

In recent years we have seen some momentous achievements in united action to tackle climate change, from the Sustainable Development Goals to the 2015 Paris Agreement, where countries committed to keeping warming well below 2°C. As countries now ratify the Paris Agreement, it is essential that the UK seeks to increase its level of ambition over the coming decades.

These policies provide an important opportunity to lay out a vision for a new model of health and wellbeing in the UK, designing cities, energy systems, communities and transport networks for improved health. Action on climate change leads to cleaner air and healthier lives. As we have seen nations unite to combat climate change, it is all the more vital that we continue to work closely with the EU in improving air quality and reducing emissions. It is only through coordinated action that we can effectively tackle climate change.

Burning fossil fuels to power our cars, homes and businesses has been the central cause of climate change and has largely contributed to air pollution. By focusing on improving air quality through climate change we will substantially improve the health of our communities. This will also benefit the NHS through fewer admissions from air quality related illness, climate change related incidences, and fewer absentee days from staff. Yet, so far air quality and climate change have not been adequately addressed as the related issues that they are, and continue to be viewed in isolation. We now need to see climate policies which optimise on the co-benefits to health and clean air.

Acknowledgments

Authors

Dr Sophia David
The UK Health Alliance on Climate Change

Dr Nick Watts
The UK Health Alliance on Climate Change

Working Group

Royal College of Anaesthetists
Mehdi Juma

British Medical Association
Eloise Henderson
Gemma Hopkins
Professor Vivienne Nathanson
George Roycroft
Holly Weldin

British Medical Journal
Dr Will Stahl-Timmins

Climate and Health Council
Professor Sue Atkinson
Dr Robin Stott

Royal College of Emergency Medicine
Zöe Moulton

Royal College of General Practitioners
Dr Tim Ballard

The Lancet
Tamara Lucas

Royal Society of Medicine
Rosalind Dewar

Royal College of Nursing
Mark Platt

Royal College of Obstetricans and Gynaecologists
Emma Gilgunn-Jone
Karina Russell

Royal College of Paediatrics and Child Health
Emily Arkell
Margaret Donnellan
Professor Jonathan Grigg
Dr Simon Lenton

Royal College of Physicians
Alex Callaghan
Methela Haque

Faculty of Public Health
Professor Patrick Saunders
Mark Weiss

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Louise Banks
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Sepi Golzari-Munro
Professor Stephen Holgate
Dave Jones
Bryn Kewey
Tom Lafford
Chris Littlecott
George Smeeton

Contact

Email: info@ukhealthalliance.org

Website: ukhealthalliance.org

Twitter: @UKHealthclimate

Notes

Design: guyjackson.co.uk

UK Health Alliance on Climate Change

UK Health Alliance on Climate Change
c/o BMJ Publishing Group
Tavistock Square
London
WC1H 9JR

Email: info@ukhealthalliance.org

Website: ukhealthalliance.org

Twitter: @UKHealthclimate