UK Health Alliance on Climate Change

LANCET COUNTDOWN: TRACKING PROGRESS ON HEALTH AND CLIMATE CHANGE

The Air Pollution and Health Benefits of the UK Climate Change Act

Briefing for Policymakers

Lancet Countdown

The Lancet Countdown: Tracking Progress on Health and Climate Change is a global, interdisciplinary research collaboration between 24 academic institutions and inter-governmental organisations. It monitors progress on the relationships between health and climate, and their implications for national governments, reporting annually.

UK Health Alliance on Climate Change

The UK Health Alliance on Climate Change brings together doctors, nurses and other health professionals to advocate for responses to climate change that protect and promote public health. Its membership comprises many Medical and Nursing Royal Colleges, Faculties of Health, the British Medical Association, the British Medical Journal and the Lancet.

This brief was prepared by the UK Health Alliance on Climate Change.

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Introduction

This briefing paper summarises the results of a major study into the improvements to UK air quality from meeting the Climate Change Act commitments. These results quantify the significant opportunities that exist for improving public health through the co-ordination of policies to mitigate climate change and address air pollution simultaneously. In summarising, this briefing first sets out the context in which the case study was undertaken, presents its method and results, and finishes by briefly discussing policy implications.

Case study source: Williams M. L. et al. [2018] 'The Air Pollution and Health Benefits of the UK Climate Change Act', *Lancet Planetary Health.*

Context

Climate change poses an unacceptable risk to the health of populations in the UK and around the world, undermining the environmental and social determinants of health.[1] Within this context, the UK's Climate Change Act (CCA) is an important piece of legislation with far-reaching public health implications, requiring at least an 80% reduction in carbon dioxide equivalent emissions by 2050 compared to 1990 levels.

The *Lancet Countdown: Tracking Progress on Health and Climate Change* is undertaking country-specific case studies to better understand the ancillary health benefits of the carbon mitigation policies outlined in the Climate Change Act. Improvements in air quality are an important example of these co-benefits and so this UK case study seeks to presents a quantification of the health benefits of meeting the CCA commitments, particularly focussing on the air pollution implications from fine particulate matter ($PM_{2.5}$) and nitrogen dioxide (NO_2). Poor air quality in the UK has been associated with significant effects on health, with an estimated loss of 340,000 life-years equivalent to about 29,000 attributable deaths from $PM_{2.5}$ in 2008.[2] Globally, air pollution contributes to some 6.5 million attributable deaths.[3]

Method

The case study presents a quantification of the health impacts of four scenarios to 2050:

1. **2011:** 2011 air pollutant concentrations remain constant
2. **Baseline:** CCA targets are unmet, with no mitigation beyond that already achieved
3. **LGHG (low greenhouse gas scenario):** CCA targets are met, but with no constraint on nuclear build, only technical and economic feasibility considerations
4. **NRPO (nuclear replacement scenario):** CCA targets are met, with nuclear generation capacity limited to current levels

The UK's energy consumption in 2050 under these scenarios is presented on the following page.

[1] Watts N, Adger WN, Ayeb-Karlsso S, Bai Y, Byass P, Campbell-Lendrum D, Colbourn T, Cox P, Davies M, Depledge M and Depoux A [2017] 'The Lancet Countdown: tracking progress on health and climate change', The Lancet, 389 (10074), pp.1151-1164.

[2] COMEAP (Committee on the Medical Effects of Air Pollutants) [2010] *The mortality effects of long-term exposure to particulate matter air pollution in the UK*, London UK.

[3] GBD [2015] 'Mortality and Causes of Death Collaborators, Global, regional, and national life expectancy, all-cause mortality, and cause-specific mortality for 249 causes of death, 1980–2015: a systematic analysis for the Global Burden of Disease Study 2015'. Lancet 2016; 388: 1459–544.

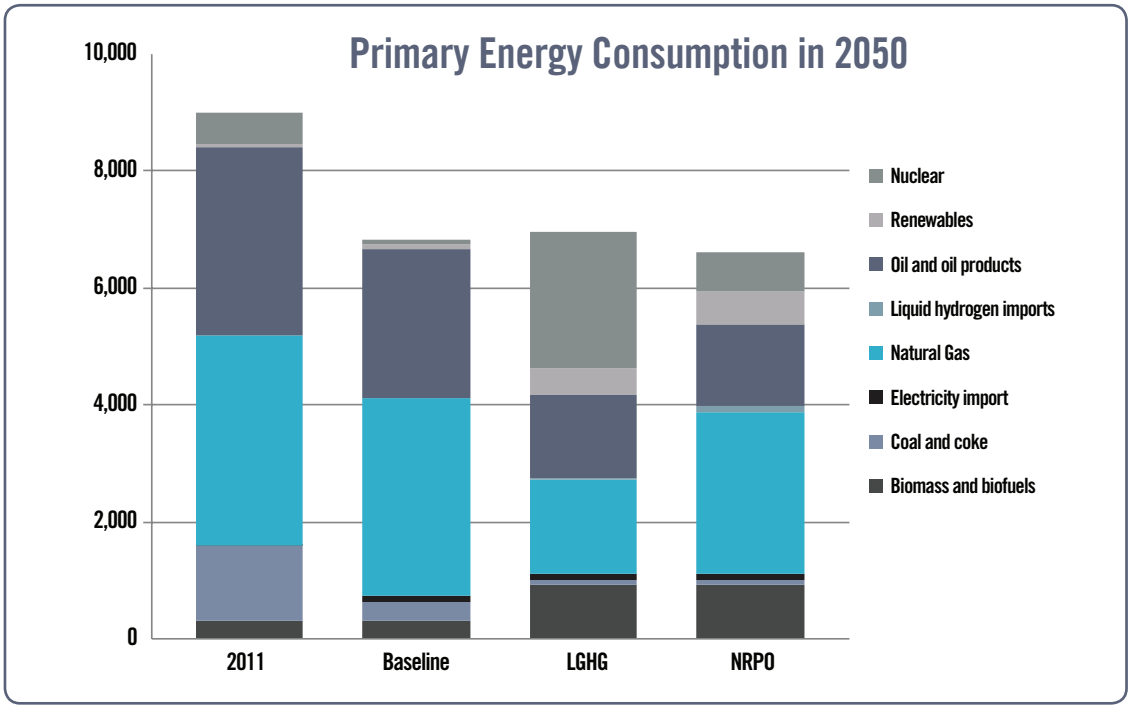


Figure 1. Primary energy consumption in the four scenarios in petajoules. Only the LGHG and NRPO scenarios meet the Act target. Source: Williams et al. [2018].

Results

In all scenarios where enhanced climate change mitigation was taken, air pollution concentrations up to 2050 were reduced. Specifically, to 2050:

- **NO_2 concentrations decline significantly:** population weighted concentrations of NO_2 decrease by 22% if the CCA targets are not met, and 51% and 60% for the NRPO and LGHG scenarios respectively, in which CCA targets are met. Many urban centres see more significant reductions.
- **$PM_{2.5}$ concentrations decrease:** population weighted mean anthropogenic $PM_{2.5}$ concentrations reduce by 38% in the baseline and 42% and 44% for the NRPO and LGHG scenarios respectively.
- **More $PM_{2.5}$ from domestic burning:** both LGHG and NRPO scenarios showed very large increases in domestic biomass burning and large increases in primary $PM_{2.5}$ (75,000 tonnes per year) compared with the baseline scenario (500 tonnes per year). This has important implications for public health, as discussed below.
- **Non-exhaust vehicle emissions increase:** Large projected increases in car and road freight mobility demand, accompanied with an assumed lack of regulatory control of non-exhaust vehicle PM emissions, leads to increased non-exhaust $PM_{2.5}$ and PM_{10} emissions. Consequently, non-exhaust emissions are likely to be the dominant source of primary PM from vehicles in future.

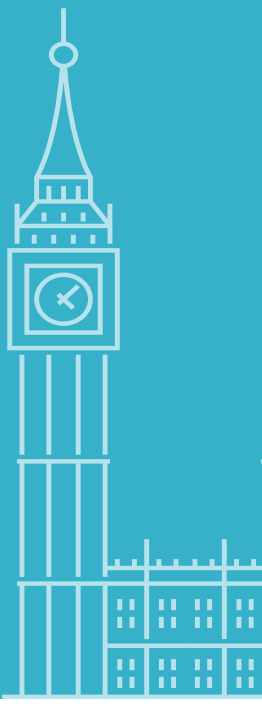
Health and socio-economic impacts:

- **NO_2 reductions lead to 4,892,000 to 7,178,000 life-years saved** between 2011 and 2054 across the LGHG and NRPO scenarios respectively.
- **Cumulative life-years lost from $PM_{2.5}$ are expected to increase,** with 422,000 and 1,122,000 more cumulative life-years lost from long-term exposures to $PM_{2.5}$ in the LGHG and NRPO scenarios compared with the baseline, representing an important lost opportunity for improving health.This mainly arises as a result of the projected increases in domestic wood burning $PM_{2.5}$ and non-exhaust emissions from road vehicles.
- **Socio-economically deprived groups remain the most at risk.** Despite significant reductions in NO_2, and modest reductions in $PM_{2.5}$, the most socio-economically deprived are still exposed to higher concentrations in 2050 in all scenarios – with these groups experiencing the greatest risks to health of air pollution exposure.[4]

[4] Davies S C et al. [2018] Annual Report of the Chief Medical Officer 2017, Health Impacts of All Pollution – what do we know? HM Government.

Policy discussion

The CCA represents one of the most ambitious legislative instruments driving climate change mitigation anywhere in the world. Attaining the targets under the CCA could provide large reductions in air pollution emissions. Therefore, climate change mitigation policies have the potential to make dramatic improvements in public health through their parallel improvements in air quality. It may be that enshrining net-zero decarbonisation into the Act could lead to even greater health benefits. However, in order to maximise the health benefits of the CCA, supporting policies need to be carefully designed to avoid undue increases in harmful air pollution emissions. Specific areas for policy consideration include:



Non-exhaust road vehicle emissions:

non-exhaust emissions are likely to be the dominant source of primary PM from vehicles in future, and so continue to impose a large health burden. As such, the accelerated penetration of ultra-low emission vehicles should be complemented by a modal shift away from private vehicle use and toward public, active and shared transport and more efficient optimisation of transport systems, including through use of digital technology and new mobility services. Furthermore, such a modal shift is likely to realise large health co-benefits through increases in physical activity, among other factors. Specific policies could include:

- Expand existing clean air zones and extend their use to other cities
- Consider bringing forward the 2040 target of no sales of new petrol and diesel cars
- Implement a long-term investment strategy for walking and cycling infrastructure, which maximises the health co-benefits of physical activity
- Retain or improve air quality standards previously afforded by EU regulations.

Domestic biomass burning:

the potential use of biomass in poorly controlled technologies to meet CCA commitments would represent an important 'missed opportunity' for health. Policies are needed to ensure domestic burning and the use of biomass under decarbonisation is properly controlled to limit air pollution impacts.

Impacts on deprived groups:

Differences in exposure between the most and least deprived populations remain in all future scenarios and for all pollutants. Addressing the drivers of socio-economic inequality must be a core component of climate change and air pollution policies, if they are to maximise their potential for long-term public health benefits. Furthermore, better air pollution monitoring in areas with vulnerable populations is required.

The value of modelling:

The model created as part of this study can help future researchers explore a wider range of climate policy scenarios. Furthermore, it is easily adaptable to local, European and global scenarios, as well as analysis of other co-benefits of climate change policies such as reductions in noise or increases in physical activity. Modelling studies are needed to assess the public health impacts of climate change interventions and to inform decisions on optimal policy choices.

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