

Clear the air

Improving air quality to protect future generations and level up our communities



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Forewords

It's a national scandal

Our new paper finds that air pollution is putting thousands of children at risk from the moment they take their first breath, holding them back from reaching their full potential and reducing their chances of a happy, healthy life.

At Asthma UK and the British Lung Foundation we're fighting for a world where everyone can breathe clean air with healthy lungs. Just as no one should have to drink dirty water, no one should be forced to breathe dirty air. Not only is the evidence base now very clear that air pollution is a health emergency, it is also a major issue for our supporters – with 88% of people with a lung condition telling us that toxic air is affecting their health and wellbeing.

It is now vital for us to ensure that we are properly tackling toxic air. The evidence of its dangers is overwhelming, and people's lives are being put at risk every day. This paper shines a light on the stark way air pollution is driving disparities and fuelling inequality across different communities within the UK. Without urgent action, these trends are only likely to get worse. Safeguarding those most at-risk from air pollution and integrating clean air planning across all levels of government must be a priority.

COP26 provides a landmark opportunity for UK Governments to protect the nation's lungs, accelerate action to prevent climate breakdown and

build back better from the COVID-19 crisis. Together, with the right level of political ambition, we can solve this health and climate emergency.



A handwritten signature in black ink, appearing to read 'Sarah Woolnough'.

Sarah Woolnough
Chief Executive, Asthma UK-British
Lung Foundation

Air pollution drives inequality from the cradle to the grave

No parent will ever forget the first scream of their newborn baby. But, for some babies, the gulp that comes before that wail is their first exposure to the greatest external threat to human health: air pollution.

This means that, right from the beginning of its life, a child is exposed to a cruel example of inequality, because poorer people in less well-off neighbourhoods are carrying the burden of toxic air.

This unfair distribution of air pollution, a public health crisis, will follow a child throughout its life. Those who can't afford to own a car are the same people whose health is most hit by the toxic fumes from traffic congestion. People who feel trapped in their homes by air pollution are more likely to live in social housing while homeowners move to the leafy suburbs.

This report offers us two different visions of the future: the first is one in which newborn babies continue to be exposed to dangerous levels of air pollution and poorer babies in poorer places breathe poorer air. The alternative is following the recommendations in this report, including making sure that improving air quality is an integral part of the Government's levelling up agenda.

By taking that action now, we can give every parent confidence that their baby has equal access to safe air and a healthy life, from its very first breath.



A stylized, handwritten signature in black ink, consisting of a large, flowing 'A' followed by a smaller 'R' and a trailing flourish.

Andy Ratcliffe
Executive Director of Programmes,
Impact on Urban Health

Opening remarks – Sir Michael Marmot

Levelling up requires cleaner air

My recent report into health equity unveiled the shocking truth: our nation is faltering. Over the last decade, the rate of improvement in life expectancy in England slowed dramatically and just about ground to a halt – a marked change from the experience of the last 100 years. The gap between richest and poorest widened and people are spending more time in ill health.

Put simply, if health has stopped improving then it is a sign that society has stopped improving. When society flourishes, health flourishes. Health is a strong measure of progress. Health is not just about the way we treat disease or fund our health services, it is closely linked to the conditions in which people are born, grow, live, work and age.

There is now strong evidence that the environment we live in and the air we breathe are two key examples contributing to inequalities in health. Some of our poorest communities are being held back by breathing the worst air quality in the UK and their lungs have also been hit hardest by the worst effects of the COVID-19 pandemic.

When we talk about climate change and clean air, health inequalities are often forgotten. Action to improve health equity can be consistent with measures to tackle both. But this requires careful consideration of who benefits and who pays for different policy measures: the costs must not be unfairly borne by people on low incomes, who bear least responsibility for the emissions that caused these problems. This cannot hold back progress though given they are also the communities that will benefit the most from action.

The direct and indirect impacts of climate change will likely widen existing health inequalities in the UK. If health equity isn't considered when developing policies to reduce carbon emissions, there is a risk that their benefits to health, such as cleaner air, healthier average diets and lower home energy bills, will be unequally distributed.

To avoid this, health equity must be an explicit policy goal for net zero and clean air strategies. COP26 is a major opportunity to demonstrate our global leadership in safeguarding those who are most vulnerable and to start not just measuring the green recovery on economic success but also on wellbeing, equal and fair access to health.



A handwritten signature in black ink that reads "Michael Marmot".

Sir. Michael Marmot
Professor of Epidemiology at University
College London (UCL), Director of the UCL
Institute of Health Equity, and Past President
of the World Medical Association

Executive summary and recommendations

Air pollution is a health and climate emergency. There is no safe level to breathe yet millions of people living in towns and cities across the UK are forced to breathe toxic air every day. Much of this harmful pollution stems from vehicle emissions which are also fuelling the UK's contribution to climate breakdown. Climate change itself is already affecting people's lives and will have wide-reaching ramifications for health and inequality for years to come.

While we all share the same air, air pollution is hitting some communities the hardest: pregnant women, infants and children, older people, those on the lowest incomes and those living with lung conditions.

Building on our previous research in *The Invisible Threat*, this paper sets out new analysis showing high levels of pollution around maternity units across England, with dangerous, dirty air where pregnant women should feel most safe and babies breathe their first breaths. These high levels of pollution increase chances of premature birth and low birth weight, and stunt children's lung growth as they grow older in these polluted areas.

Concerningly, our new analysis also shows that over 40% of babies are born every year into heavily polluted areas of the UK, where levels of PM_{2.5} are higher than the 2005 World Health Organization (WHO) recommendations. This equates to over a quarter of a million babies every year, or one born every two minutes. What is more, we found pollution levels around maternity units are highest in the most deprived areas,

worsening the systemic disparities that babies born in the poorest parts of the UK must contend with.

The UK has some of the highest rates of income inequality in Europe¹, life expectancy has stalled, and years of ill-health have increased, particularly for those in the most deprived areas. Air pollution is a stark health inequality that challenges the UK as a fair and healthy society. If the UK Government is determined to level up across the UK, then overcoming income inequality must be intertwined with improving health for all. Breathing clean air and living a healthy lifestyle should not be dependent on where we live. Every baby deserves to be raised in an environment that helps them reach their full potential.

This paper examines the evidence around climate breakdown and clean air, finding they must be tackled in tandem to ensure maximum benefit for people's health. Cutting pollution from transport through the promotion of cleaner travel alternatives, and incentives to switch away from the most polluting vehicles, offers the opportunity to do just that.

Ahead of the COP26 climate change talks in Glasgow, Asthma UK and British Lung Foundation (AUK-BLF), together with Impact on Urban Health, are calling on the UK's governments to lead the way in tackling the dual threats of air pollution and climate breakdown. Protecting the people who are most susceptible to the health effects of air pollution is an opportunity to make the UK a healthier, happier, greener and fairer place to live. The solutions are within our grasp, what we need now is action.

Our recommendations:

- **The UK Government's levelling up agenda must ensure all can breathe clean air** and this should be reflected in the expected levelling up white paper. In addition, all levelling up policies designed to redistribute economic and social prosperity across the UK should be stress-tested against the Government's clean air strategy to ensure equal access to clean air regardless of where children are born, live or play. Levelling up must be judged against its net benefit to the economy, climate and our health.
- **National UK leaders should set out bolder clean air laws** that include stronger legally binding clean air targets in all four nations. Currently, Scotland is the only nation where the WHO's 2005 recommendations for particulate matter (PM_{2.5}) are in law. We need the Environment Bill, the proposed Clean Air (Wales) Bill and future Northern Ireland legislation to include these recommendations in law, and for these targets to be met by 2030 at the very latest. Alongside this, leaders should commit to ongoing improvements in air quality, in light of the newly revised WHO guidelines.
- **Local authorities should ensure clean air is prioritised in transport decarbonisation strategies** and integrated with the expansion of the UK's clean air and low emission zones. These zones have been shown to be hugely effective ways to reduce pollution in urban areas as well as carbon emissions. Existing zones should be expanded to cover wider areas and all zones should charge the most polluting vehicles from entering to maximise the benefits for people's health.
- **UK governments should ramp up annual funding for public transport, walking and cycling** to enable car users to shift to cleaner modes of transport and accelerate the pathway to net zero while cutting pollution from road transport. While the roll out of electric vehicles will be integral to reaching net zero carbon emissions by 2050, overall car miles urgently need to reduce to tackle air pollution. Annual additional funding commitments should include £2.2 billion for buses and cycling in England, £1 billion for trams in England, and £4.4 billion for trains across the UK.
- **UK governments and local authorities should focus on inclusive walking and cycling** schemes through financial incentives to support those with long-term health conditions to switch to cleaner travel. This should include the extension of safe cycling paths, the banning of pavement parking and financial support for e-bike purchase.
- **UK health bodies should ensure that air pollution exposure reduction is included in all training** for health care professionals, and is integrated in all care pathways, including for maternity health professionals. Good progress has been made integrating air pollution advice into clinical guidelines; this now needs to be rolled out to all training for health care professionals to ensure at-risk communities are given the advice they need to protect themselves from harm.
- **Public health agencies should deliver a national public health campaign** to set out clear health advice for at-risk groups to protect themselves from air pollution as well as guidance on how to reduce their own contribution.

Decision-makers should fund research into:

- **Evaluations of different policy interventions and the public health outcomes** they deliver. This knowledge should be scaled up and shared as best practice to help local areas design impactful and sustainable clean air schemes.
- **Developing an exposure indicator for groups vulnerable** to the effects of air pollution, so that we can better understand their exposure and monitor progress.
- **Exploring air pollution's contribution to health inequalities** to better mitigate its effects. Specifically, we need to learn more about links with gender, and the relationship between ethnicity, social deprivation, and air pollution.
- **The intersect between air pollution and climate change policies,** and how to reduce both in tandem with the maximum effect for levelling up public health, and climate breakdown.

More recommendations by AUK-BLF can be found in *The Invisible Threat*.²

I Introduction

The quality of the air in urban areas across the UK is at highly toxic and harmful levels. The UK has been breaching EU legal limits since 2010 despite several court cases challenging this and a widespread understanding that there is no safe level of air pollution to breathe in.³ Air pollution is having a significant effect on all our health and is the largest environmental risk to public health in the UK.⁴

Every year, air pollution is linked with up to 36,000 premature deaths.⁵ It reduces life expectancy – increasing our chances of lung cancer, cardiovascular disease and stunted lung growth in children. Shorter-term high air pollution episodes can be a fatal trigger for people with lung conditions such as asthma or chronic obstructive pulmonary disease (COPD). This was sadly shown in the untimely death of seven-year old Ella Kissi-Debrah, who became the first person in the UK, and probably the world, to have air pollution on her death certificate due to the role it played in triggering her last asthma attack.⁶

Every day, new evidence is emerging showing the harm that these pollutants can do across our bodies, with studies linking it to type 2 diabetes, dementia and even poor mental health. For decades policymakers have known about these harms, and as we learn even more, it is critical that radical changes are put in place as soon as possible to safeguard us all.⁷

Health effects of air pollution

Short-term:

- inflammation and irritation of the lining of the airways, which can cause symptoms such as coughing and difficulty breathing
- asthma attacks, heart attacks or COPD flare-ups for people with existing conditions, resulting in increased hospitalisations

Long-term:

- reduced life expectancy, due to lung cancer, respiratory and cardiovascular disease
- damage to developing lungs and brains during pregnancy
- increased chance of low birth weight and premature birth
- likely to cause new cases of asthma
- stunted and smaller lungs in children, increased lung infections and likelihood of future lung problems
- potentially increased risk of type 2 diabetes and dementia.

Even though we all share the same air, the health burden from air pollution isn't falling fairly across our communities. Some people are far more susceptible than others due to their underlying health and resilience, including:

- Pregnant women
- Babies and children
- Older people
- People with lung conditions
- Those living in the poorest areas, and in ethnically diverse communities^{10,11}

These are also many of the very same groups who have been hit hardest by the COVID-19 pandemic. Evidence shows that the risk of severe symptoms is higher in people with weakened immune systems, including older people and people with long-term lung conditions.¹² Poorer households have also been disproportionately impacted by the pandemic, with the exposure to the virus unequal across the country. For example, people working in manual jobs which cannot be done at home, or those living in overcrowded, poor quality housing in densely populated areas are often at increased risk of exposure to COVID-19.¹³

These groups are also likely to be most affected by changing temperatures as a result of climate change, due to increased levels of air pollution and the associated risks of respiratory illness, all of which are predicted as a result of our changing climate.

Air pollution has been having a detrimental impact on all our health for decades. Combined with climate change, it threatens to undermine any gains made in public health over the past fifty years by having a cross-cutting and pervasive impact on food, air, water and shelter,¹⁴ as well as widening the gap between our richest and poorest communities.

Everyone has the right to breathe clean air with healthy lungs, wherever we live. Ambitious and joined up action to tackle air pollution and climate change, to make our cities cleaner and greener, is critical to protect the nation's lungs. Failure to do so will continue to put the most vulnerable at risk, holding back any chances we have at levelling up the UK.

2 New analysis: 2 in 5 babies are born every year in toxic air

Air pollution puts babies at risk of lung damage and future lung conditions, compromising their chance of a happy and healthy future. Our new analysis found that a shocking 260,000 babies are born in areas with high levels of air pollution – over levels recommended by the WHO in their 2005 Air Quality Guidelines. In September 2021, the WHO significantly reduced the recommended levels in these guidelines to reflect the evidence of the harms of air pollution even at low levels of exposure.

Breathing their first breath in polluted air

Our analysis shows the dangerous levels of air pollution in the UK, particularly around maternity units. **Over a third (35%) of all maternity units in England exceed the WHO's 2005 Air Quality Guidelines** for PM_{2.5}. When compared to the new guideline, this figure reaches almost 95%.

In cities where pollution levels are significantly higher, birth rates are also higher. Taking this into account, **over two-fifths (41%)** of babies in the UK were born into an area over the WHO recommended levels for PM_{2.5} in 2019. Birmingham for example has the highest rate of birth in the country and is the second most polluted city in the country when accounting for

PM_{2.5} and NO₂. In 2019, 15,483 babies were born in Birmingham, where air pollution exceeded the 2005 WHO guidelines.¹⁵

Table 1: local authorities with the highest birth rate compared to annual pollution levels, 2019

	Local Authority	Live Births	PM _{2.5}	Most polluted road, NO ₂
1	Birmingham	15,483	10.8453	52.488
2	Leeds	9,272	9.262	47.663
3	Bradford	7,270	8.7265	39.270
4	Manchester	7,229	9.7127	43.594
5	Sheffield	5,923	9.3057	44.180
6	Liverpool	5,574	9.2571	47.210
7	Newham	5,492	12.9918	56.953
8	Croydon	5,304	11.118	42.423
9	Barnet	4,973	11.7119	60.015
10	Brent	4,919	11.9668	62.121

[Note: Table 1 shows the local authorities with the highest birth rates in the country, and the annual mean concentrations of PM_{2.5} and NO₂ in the corresponding area. Highlighted numbers show where PM_{2.5} exceeds the WHO 2005 Air Quality Guidelines and where NO₂ exceeds the annual legal limit according to the Department for Environment, Food and Rural Affairs (Defra).]

How does air pollution affect pregnant women and babies?

Research has shown that developing organs are at particular risk, with air pollution affecting us from our earliest stage of development in the womb throughout our lives.¹⁶ Air pollution particles have been shown to reach the foetal side of the placenta, and lower birth weight and preterm birth both have been linked with underdeveloped lung growth. Such organ damage from the womb, and its health effects, may be sustained throughout a person's lifetime.¹⁷

We should be protecting those most at-risk

For city regions, where pollution levels and younger populations are at the highest risk, action should be prioritised. Given that road transport makes up 80% of toxic air at the roadside¹⁸, measures should be targeted at vehicle emissions. You can read more about the changes needed for transport in chapter four of this report.

Action to tackle emissions is critical, but it will take time. We urgently need to safeguard those most at risk from harm now, including pregnant women and babies. The inquest into Ella Kissi-Debrah's death found that numerous times her family weren't given the advice or data they needed to reduce Ella's exposure to air pollution, including from health care professionals. There was found to be a stark gap in the health system when it comes to air pollution health advice.

Yet medical professionals do not currently have the resources and training they need to speak to patients about the risks of air pollution and ways they can reduce their exposure.¹⁹ As trusted voices who have a strong

relationship with their patients, they should play a key role in sharing this information. There is also a major opportunity to ensure that people with health conditions, such as asthma or COPD, are able to effectively self-manage their condition and reduce their admittances into hospital. As we've seen from smoking, public health campaigns can be effective in increasing awareness and driving change.²⁰

Current clean air laws aren't fit for purpose

The WHO Air Quality Guidelines act as a global target for national, regional and local governments to work towards, improving their citizens' health by reducing air pollution. Yet UK legal limits are more than double the WHO's 2005 recommendations and a third of places still aren't meeting those recommendations.²¹ In September 2021, these guidelines were revised in light of overwhelming evidence of the continued harm being caused by air pollution to people's health even at low levels.

Research shows that meeting the 2005 guidelines would prevent an estimated 17,000 deaths every year whilst adding £1.6 billion to the economy annually.²² A one microgram per cubic metre ($\mu\text{g}/\text{m}^3$) reduction alone in fine particulate air pollution in England could prevent 9,300 cases of asthma and 4,200 lung cancers over an 18-year period.²³ Additionally, there is clear evidence now that the 2005 targets are achievable with the right level of political will and ambition, although the UK has continuously failed to meet these.²⁴

Currently only Scotland has set the 2005 WHO guidelines on $\text{PM}_{2.5}$ in law. England and Wales have set out national strategies for clean air, whilst a draft strategy was consulted on in Northern Ireland. These have led to a greater awareness that we need to tackle air pollution across politics with

some policy interventions designed to target toxic air. These include the ban on the sale of petrol and diesel vehicles by 2030, and the roll out of clean air and low emission zones in some of the most polluted town and cities.^{25,26} Whilst these are welcome, we need more comprehensive and legally binding targets if we are to see the holistic reductions in air pollution required to meet WHO guidelines across the whole of the UK.

The upcoming Environment Bill provides an opportunity for the Government to commit to meeting the WHO 2005 recommended guidelines by 2030 for England, while the proposed Clean Air (Wales) Bill and future Northern Ireland legislation should do the same. The revised 2021 guidelines should be the long-term aim for all clean air policies, reflecting the urgent need for continuous improvement towards zero emissions in order to mitigate the health effects of toxic air.

Table 2: current legal limits for air pollutants in the UK compared to WHO recommendations

Pollutant	Current UK law	WHO 2005 recommended guidelines	WHO 2021 recommended guidelines
Annual average for NO ₂	40 µg/m ³	40 µg/m ³	10 µg/m ³
Annual average for PM _{2.5}	25 µg/m ³	10 µg/m ³	5 µg/m ³

[Note: Table 2 shows the current annual legal limits for NO₂ and PM_{2.5} in the UK, compared to the WHO 2005 recommended guidelines and the newer WHO 2021 recommendations; µg/m³ refers to micrograms per cubic metre of air]

Recommendations

1. **National UK leaders should set out bolder clean air laws** that include stronger legally-binding clean air targets in all four nations. Currently, Scotland is the only nation where the WHO's 2005 recommendations for particulate matter (PM_{2.5}) are in law. We need the Environment Bill, the proposed Clean Air (Wales) Bill and future Northern Ireland legislation to include these recommendations in law, and for these targets to be met by 2030 at the very latest. Alongside this, leaders should commit to ongoing improvements in air quality, in light of the newly revised WHO guidelines.
2. **UK health bodies should ensure that air pollution exposure reduction is included in all training** for health care professionals, and is integrated in all care pathways, including for maternity health professionals. Good progress has been made integrating air pollution advice into clinical guidelines; this now needs to be rolled out to all training for health care professionals to ensure at-risk communities are given the advice they need to protect themselves from harm.
3. **Public health agencies should deliver a national public health campaign** to set out clear health advice for at-risk groups to protect themselves from air pollution as well as guidance on how to reduce their own contribution.

Decision-makers should fund research into:

4. **Evaluations of different policy interventions and the public health outcomes** they deliver. This knowledge should be scaled up and shared as best practice to help local areas design impactful and sustainable clean air schemes.
5. **Developing an exposure indicator for groups vulnerable** to the effects of air pollution, so that we can better understand their exposure and monitor progress.
6. **Exploring air pollution's contribution to health inequalities** to better mitigate its effects. Specifically, we need to learn more about links with gender, and the relationship between ethnicity, social deprivation, and air pollution.

3 Levelling up our communities

The health impacts of toxic air are not equally distributed across society – pregnant women, babies, children, those with lung conditions and those on the lowest incomes are being hit hardest. As outlined by Sir Professor Michael Marmot, life expectancy in the UK has stalled in the last ten years, inequality has widened, and years of ill-health have increased. Air pollution is playing a significant role in fuelling this health inequity, holding communities back and preventing them from reaching their full potential.

Toxic concentrations in deprived areas

In the UK, NO₂ concentrations are particularly high in cities near major transport corridors where lower income communities and ethnic minorities are over-represented.²⁷ 85% of people living in areas with illegal levels of NO₂ make up the poorest 20% of the UK population.²⁸ Birmingham, Liverpool and Manchester rank among the top ten areas with the highest proportion of deprived neighbourhoods in England²⁹ and all of these cities have main roads which breach legal NO₂ limits.

Contribute the least, harmed the most

Not only are those on the lowest incomes the most burdened by the health impacts of air pollution but they are also less likely to own a car.³⁰ In 2019, just over half of those on the lowest incomes had access to a car or van in their household, compared to almost 90% for those on the highest incomes.³¹

Likewise, adults from Black communities are twice as likely not to own a car compared to the national average, with white people consistently more likely to live in a household with access to a car or van than any other ethnic group.³² Car ownership does vary within ethnic groups, but the data shows the extent of this social injustice and the critical need for Government to examine this further.

Increased susceptibility to harm

As outlined by the Chief Medical Officer for England, deprived communities face a “triple jeopardy” of higher exposure to pollution, increased likelihood of being affected and increased likelihood of poor health making them susceptible to harm.³³ In terms of greater susceptibility to toxic air, lung disease continues to be a major factor in health inequalities. Someone from the most deprived communities is two-and-a-half times more likely to have COPD, and nearly twice as likely to develop lung cancer as someone from the least deprived section of society.³⁴ In 2012, incidence rates of asthma were 36% higher in the most deprived communities than in the least deprived.³⁵

COVID-19 has shaken up existing societal and economic structures, while exposing the harsh realities of health inequality across the UK. Communities living with multiple indicators of deprivation are not only exposed to the highest levels of air pollution³⁶ but have also been disproportionately impacted by the pandemic,³⁷ on top of the multitude of other health and social impacts they may face.

Building back better requires cleaner air

The Prime Minister made clear that levelling up is about “unleashing potential” right across the country and has vowed to ensure that its gains are “greatest among the poorest groups”.^{38,39} If this is to become a reality, levelling up must explicitly acknowledge the disproportionate impact that toxic air has on our most vulnerable residents. A failure to tackle air pollution would be the antithesis of levelling up, holding back thousands of young families, children and babies purely because of where they are born, live and work.

Furthermore, current levelling up plans, which have focused primarily on investing in physical infrastructure projects in towns and cities, risk worsening the air quality in some places. For example, £25 billion has been allocated for investment into roads and motorways. Whilst improvements to some roads may be necessary, cutting pollution levels requires a radical reduction in the number of cars on the road; something that will not happen if more roads are continually built.^{40,41}

The UK Government needs to ensure that new roads, as well as other potentially polluting projects, do not bring more cars, vans and lorries into already polluted places. Our towns and cities should be hubs for business and innovation, but children’s lungs shouldn’t pay the price for this. If communities across the country are to see a sustained impact from levelling up, then it must benefit the economy, the environment and the health of all residents.

To do this, the UK and devolved Governments must ensure that plans to regenerate communities and encourage economic development are in keeping with clean air plans and strategies, at a minimum. Projects should be

funded on a health first approach, prioritising areas with the highest levels of air pollution as well as highest levels of deprivation. Failure to meet these recommendations will mean babies continue to be born in toxically polluted areas and the most harmful effects of air pollution will continue to be offset onto those most at risk.

Recommendations

1. **The UK Government’s levelling up agenda must ensure all can breathe clean air** and this should be reflected in the expected levelling up white paper. In addition, all levelling up policies designed to redistribute economic and social prosperity across the UK should be stress-tested against the Government’s clean air strategy to ensure equal access to clean air regardless of where children are born, live or play. Levelling up must be judged against its net benefit to the economy, climate and our health.

Decision-makers should fund research into:

2. **The intersect between air pollution and climate change policies**, how to reduce both in tandem with the maximum effect for levelling up public health, and climate breakdown.

4 The climate crisis is a health crisis

Climate change and air pollution are complexly interlinked. They are caused by many of the same sources, and climate change is likely to increase air pollution through changing weather patterns. Ambitious action to reach net zero carbon emissions by 2050 will therefore be critical for protecting the public from harm. However, for this to happen in the most effective way for public health, planning must be joined up across governments to ensure net zero doesn't create unintended consequences for clean air or widen the gap across our communities.

Tackling the climate crisis will improve air quality

Action to tackle both air pollution and the climate crisis can provide mutual benefits given that many of the same sources are fuelling both.⁴² During fossil fuel combustion, air pollutants are emitted alongside carbon dioxide, meaning reductions in fossil fuels and carbon dioxide will also lead to improvements in air quality. For instance, black carbon, produced by inefficient combustion from sources such as diesel engines, is the second greatest contributor to global warming, yet also contributes significantly to PM_{2.5}.⁴³

Changing climate patterns will affect respiratory health

Increased concentrations of greenhouse gases (GHG), especially carbon dioxide, in the atmosphere have already substantially warmed the planet, causing a number of changes to weather patterns, all of which put respiratory health at risk. These include:

- more severe and prolonged heat waves,
- extreme temperature variability,
- increased length and severity of the pollen season,
- air pollution,
- forest fires,
- droughts, and
- heavy precipitation events and floods.⁴⁴

Among the weather and climate-related effects on respiratory, high heat and humidity can be a trigger for asthma, while extreme cold weather could increase overall respiratory infections in individuals with underlying COPD.⁴⁵ Significant health effects are likely to be felt given concentrations of air

pollutants are expected to increase with the rising temperatures predicted in the UK.⁴⁶

According to a recent Climate Change Committee report, people in the UK with pre-existing respiratory conditions are already at a higher risk of illness and death from high temperatures. By 2050 the number of heat-related deaths could more than triple in the absence of adaptation; from 2,000 per year to around 7,000.⁴⁷ As a result of these health effects, combined with an ageing population⁴⁸, climate change will place a huge and potentially unprecedented burden on the NHS due to increased hospitalisation rates.^{49,50}

Decarbonising the UK transport system will protect public health

Surface transport made up almost a quarter of the UK's total GHG emissions in 2019, with cars accounting for almost two-thirds. This makes surface transport the UK's highest emitting sector.⁵¹ From 1990 to 2018, road traffic increased by 29%, with total car miles increasing from 255 billion in 1990 to 328 billion in 2018, while GHG emissions rose by 6%.⁵²

As discussed, road transport is also one of the biggest contributors to air pollution in the UK, with cities particularly affected. Of the 11% of roads in the UK which breach legal limits for NO₂, 95% of these are in the UK's cities. Similarly, PM_{2.5} levels are above the WHO's 2005 guidelines on all monitored roads across 19 cities in the UK.⁵³

Switching to more sustainable modes of transport will also have added benefits for public health due to an increase in physical activity. Research

shows that using public transport increases walking by between 8 and 33 minutes per day. Similarly, if daily walking increased by 1km, and cycling by 3km in urban England and Wales, reaching the same levels seen in Copenhagen, the NHS would save £17 billion over a 20-year period as a result of increased physical activity.⁵⁴

Net zero commitments aren't enough to deliver clean air now

While the UK Government has pledged to reach net zero carbon emissions by 2050, this target won't be enough to safeguard local populations from harm now. An evaluation of the impact of net zero on air quality in the UK revealed net zero will lead to immediate improvements in certain air quality parameters. But it also found that large reductions in some pollutants may not be realised until towards the end of the transition, demonstrating the urgent need to still take more radical action now.⁵⁵

In addition, beyond national targets, the specific location of air pollutants has a large impact on local populations with the effects of poor air quality being immediate and costly. The societal and health impacts of air pollution are more localised than the effects of the GHGs the nation emits. For example, major low-carbon infrastructure projects have the potential to create localised air quality problems during their development. Governments must take these effects into account when considering the pollution generated on the pathway to 2050 by ensuring all planning is both ambitious and integrated with clean air strategies.

Electric vehicles alone aren't the answer

In order to meet its net zero commitment, the UK government has banned the sale of petrol and diesel vehicles in the UK from 2030, and its recent Transport Decarbonisation Plan, and other strategies to improve public transport and active travel, are positive first steps to shift towards a greener and cleaner transport system.

But protecting public health from toxic air will not only require newer vehicles on the road, but also fewer. Modelling by the UK's Climate Change Committee suggests that total car miles can reduce by 9% by 2035 for the UK to stay on track for net zero by 2050, rising to 17% by 2050 through more people shifting to greener modes of transport and increased home working.

To date, only Scotland has set a target to reduce overall miles driven by cars, committing to a 20% reduction by 2030.⁵⁶

This is significant for reducing air pollution as only a fraction of the most harmful pollutants originate from the tailpipes of vehicles. Tyres and brakes are a major source of the UK's particulate matter emissions from road transport. They currently make up almost half of the UK's overall PM₁₀ emissions, a proportion which is expected to rise as exhaust emissions decrease.^{57,58} Particulate emissions will remain an undesirable consequence of road transport even in 2050 under fully decarbonised scenarios.⁵⁹ Switching to electric vehicles will be vital for the UK to meet its net zero target, but more consideration must be made around the pollutants originating from tyres and brakes.

Table 3: Current funding for transport vs. funding needed⁶⁰

Transport	Current funding pledge	Funding gap	Reason
Bus and cycle infrastructure	£1 billion per year	Additional £2.2 billion per year	This would raise spending on cycling to £25-£35 per capita per year, in line with countries like the Netherlands where active travel is higher. It would also restore previously cut bus routes and add new routes where local authorities deem this is necessary. This is particularly important to open up necessary routes that provide vital lifelines for people in more isolated communities. Electrifying the bus and coach networks.
Trams	N/A	£1 billion per year	In 1927 there were 14,000 trams in operation across the UK, yet today very few cities benefit.
Trains	Multiple local settlements	Additional £4.4 billion	Enhance the UK's railway network, with works to improve north-south mainlines, extend electrification, reopen lines and create new routes.

[Note: Table 3 shows the current funding pledged by the Government for public transport and active travel, compared to the additional funding needed to get the UK on track to reach net zero carbon emissions by 2050. Funding for bus, cycling and trams apply to England only, and funding for trains applies to the whole of the UK]

Life-saving clean air and low emission zones

London's Ultra-Low Emission Zone (ULEZ), Birmingham's clean air zone (CAZ) and low emission zones (LEZs) throughout Europe have demonstrated the success that could be delivered for transport decarbonisation and clean air by charging the most polluting vehicles to access the centre of towns and cities.⁶¹

Between 2016 and 2019 in London there was an average reduction of over 20% across the zone for NO₂, while annual particulate matter levels reduced by 9%. Some areas of the cities saw significantly higher reductions for both pollutants. Similarly, CO₂ emissions from road transport reduced by 13%, highlighting that ULEZ has had a net climate and health benefit for Londoners.⁶² Likewise, Birmingham's CAZ launched in June 2021 with charges for all of the most polluting vehicles. Already, levels have fallen below legal limits for the first time.⁶³

The impact of CAZs isn't just felt within the areas themselves. Analysis by the Environmental Defense Fund found that vehicles which passed through London's ULEZ went on to drive through 95% of the major towns and cities in England and Wales, with a combined population of 18 million people.⁶⁴

CAZs will also benefit those on the lowest incomes, by cutting pollution on main roads where there is a higher proportion of lower income households. As discussed, these households are also the least likely to own a car and therefore contribute the least to the problem. When rolled out alongside wider improvements to public transport to ensure residents have alternative modes of transport, and when financial support is given to support the switch to cleaner vehicles, CAZs offer an opportunity for residents to switch to more sustainable modes of transport while reducing pollution and protecting the most vulnerable.⁶⁵

Yet, throughout 2020 and 2021, we saw numerous delays to local clean air policies and in some areas, plans have even been scrapped. To date, only four areas in the UK have a CAZ in place, and only two of them cover polluting private cars. And where CAZs or LEZs have been established, we have seen a reluctance to continue to strengthen and improve the zones, for example by reaching 2005 WHO guidelines and beyond.

This progress is not enough. Every day that action is delayed is a day that lives are being unnecessarily put at risk. Our analysis found that of the 62 local authorities named in the UK Government's 2017 clean air zone plan⁶⁶:

- **68% still have roads that breach legal limits** for NO₂ in 2019
- **33% dispute national data saying they have a problem** and haven't produced plans – despite seven of these local authorities still breaching legal limits in 2019
- **Four delayed their plans due to COVID-19** including Newcastle, Gateshead, Bristol, and Oxford councils
- **Three scrapped these life-saving schemes** – Leicester, Leeds and Sheffield CAZ plans have now been scrapped or put on long-term hold. This is despite national data showing that all three places continued to breach legal limits in 2019.
- **Only seven more CAZs are planned** despite being the most effective way to tackle the problem. The planned CAZs are expected in 2021 and 2022 and many of these are facing growing uncertainty of their future.

A fair transition

Transitioning towards cleaner transport is critical for reaching net zero and cleaner air, but a key challenge for policymakers is ensuring that the solutions do not lead to negative consequences for people living in deprivation or with existing health conditions.

An AUK-BLF survey found there is a risk that many people living with lung conditions who identify as having a disability that limits their mobility (nearly 40%) could be left behind if they were unable to use their cars. Analysis from the Department for Transport found that getting to hospitals is particularly difficult for people without a car or those who are living in places with inadequate public transport options. An estimated 10% of hospital outpatient appointments are missed due to transport problems and around a third (7.8 million) of older people cannot reach a hospital within 30 minutes by public transport.⁶⁷

A study among people living in disadvantaged suburban neighbourhoods in Glasgow found that car ownership was not always a matter of choice. Limited public transport services meant that forced car ownership was a growing phenomenon in deprived parts of the city where people, especially those with children, faced particular challenges. These included the complexity of their overall household mobility demands, as well as the added costs of travelling with children.⁶⁸

Additionally, diesel vehicles are now flooding the used car market given they are the most economically viable choice for many. Interest in used diesel cars surged by nearly a quarter during 2020 as people sought an economical and COVID-safe alternative to public transport.⁶⁹ If these trends continue, this could lead to an increase in health harms for poorer communities.

In order to lower emissions as much as possible, we will all need to be part of the solution and choose cleaner travel options at every opportunity. However, some people will require extra support to do this. Alternative travel options need to be made far more inclusive and accessible. People who need it should be financially supported by governments to access cleaner electric vehicles, public transport or accessible active travel options, such as e-bikes.

Recommendations

1. **UK governments should ramp up annual funding for public transport, walking and cycling** to enable car users to shift to cleaner modes of transport and accelerate the pathway to net zero while cutting pollution from road transport. While the roll out of electric vehicles will be integral to reaching net zero carbon emissions by 2050, overall car miles urgently need to reduce to tackle air pollution. Annual additional funding commitments should include £2.2 billion for buses and cycling in England, £1 billion for trams in England, and £4.4 billion for trains across the UK.
2. **Local authorities should ensure clean air is prioritised in transport decarbonisation strategies** and integrated with the expansion of the UK's clean air and low emission zones. These zones have been shown to be hugely effective ways to reduce pollution in urban areas as well as carbon emissions. Existing zones should be expanded to cover wider areas and all zones should charge the most polluting vehicles from entering to maximise the benefits for people's health.
3. **UK governments and local authorities should focus on inclusive walking and cycling** schemes through financial incentives to support those with long-term health conditions to switch to cleaner travel. This should include the extension of safe cycling paths, the banning of pavement parking and financial support for e-bike purchase.

5 Concluding remarks

This report outlines the huge burden air pollution is having on our poorest communities, the role it is playing in widening the gap between richest and poorest, and the way it is worsening health equity in the UK. As the case of Ella Kissi-Debrah showed, air pollution kills. Weakened and growing lungs are most at risk, with air pollution hitting pregnant women, children, older people, those living with a lung condition and those on the lowest incomes the hardest.

COVID-19 has changed the playing field

COVID-19 has brought to light the health inequalities across the UK and is a stark reminder of the urgent need to level up public health. We have seen some significant shifts in how people move during the pandemic. There was a welcome increase in people walking and cycling and working from home has become an option for some. But these have been temporary, and more long-term, permanent action is urgently needed. Confidence in the safety of public transport has wavered, and initial data suggests that levels of private car usage have rocketed. Concerningly, many people have turned towards cheaper diesel cars, which are highly polluting, and are likely to see them circulate in the market far beyond phase out dates set by UK political leaders.

Further, there are now even more demands on the public purse and for households. In order to transition towards net zero, people are going to need financial support to upgrade their vehicles. Additionally, far more money needs to be invested in cleaner alternatives and disincentives should be put in place for polluting travel. This will require political leadership to deliver, but the gains will be huge: lives saved and damage to the planet reduced.

Building back better, fairer, healthier and greener

As this report shows, tackling air pollution can reap rewards for achieving the UK's net zero goals but net zero alone won't be enough to protect those most at-risk and prevent further unnecessary deaths from toxic air. By integrating health equity, net zero and clean air policy across governments, and ensuring that they are interwoven with the levelling up agenda, there is a major opportunity to make the UK fairer, safer, cleaner and more prosperous.

Making the changes outlined in this report will do this in the quickest time possible and ensure levelling up policies benefit those who need it most.

Methodology – babies born in polluted air analysis

- The purpose of this analysis was to understand the proportion of births in England which take place in hospitals located in areas where air pollution levels exceed safe limits recommended by the 2005 WHO regulations.
- To do this we drew on Office for National Statistics (ONS) data for birth rates by local authorities in 2019⁷⁰ and Defra data on population-weighted annual mean PM_{2.5} by local authority.⁷¹ From there we were able to produce the share of births in England that took place in local authorities with levels of air pollution exceeding of WHO recommendations.
- We then mapped the birth rates data⁷² from the ONS against data produced by AUK and BLF on PM_{2.5} levels near hospitals, and the share of the hospitals with levels of air pollution exceeding WHO 2005 guidelines which have maternity units. By mapping both datasets, we were able to work out how many babies are born in maternity units were exposed to unsafe levels of air pollution.
- AUK-BLF commissioned Cambridge Environmental Research Consultants (CERC) to examine how many schools, colleges, hospitals, GP surgeries and care homes are in areas above the WHO's guidelines for PM_{2.5}. This analysis used existing modelled PM_{2.5} data published by the UK Government as part of their responsibilities under the Environment Act 1995. CERC used predicted annual average PM_{2.5} data for 2019 taken from Defra.
- We found the number of maternity units using “Find Maternity services”⁷³ on the NHS website and the postcodes of hospitals from the CERC research commissioned by AUK-BLF.

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If you have a lung condition and are concerned about anything in this report, or would like talk to one of our specialist advisors, please call one of our helplines:

Asthma UK Helpline: 0300 222 5800

**British Lung Foundation Helpline:
03000 030 555**

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