EFRA Select Committee Inquiry on Air Quality: Submission from the British Heart Foundation

Executive summary

- Air pollution is the largest environmental risk factor for health and is known to have damaging effects across the life-course, with well-established links to heart and circulatory diseases.

- As the largest independent funder of medical research into heart and circulatory diseases in the UK, the BHF has funded over £5.8 million of research exploring the impact of air pollution on heart and circulatory health since the early 2000s. BHF-funded research has elucidated many ways that air pollutants, particularly fine particulate matter ($PM_{2.5}$), can damage the heart and circulatory system[1], increasing the risk of a heart attack or stroke in people with vascular disease[2].

- We believe that the commitments made in the Clean Air Strategy to tackle health harmful pollutants, set a new legal limit for $PM_{2.5}$, improve air quality monitoring and modelling and better communicate the effects of poor air quality, all have significant potential to deliver improvements to our toxic air and reduce the enormous health burden constituted by air pollution.

- However, delivery of these commitments has been lacking in both pace and ambition. We are particularly concerned that the Environment Bill does not set out a legal framework for setting air quality targets that are sufficiently cognisant of health. We urge the Government to adopt the World Health Organization's guideline limit for fine particulate matter ($PM_{2.5}$), in order to adequately protect health. This, and additional, health-focused air quality targets must be set in place as soon as possible, rather than by 2022 as set out by the Bill, to reflect the urgency of this issue.

- Setting ambitious, health-based targets will drive the necessary action to reduce air pollution levels across the UK. This action must be joined up across all levels and departments of government and designed to address all sources of air pollution holistically to reduce population-level exposure and the resultant adverse health impacts, rather than to comply with arbitrary, technical legal limits

- During the pandemic, heart and circulatory conditions, such as coronary (ischaemic) heart disease, have been found to increase a person's risk of severe outcomes if they contract Covid-19. However, research examining the impact of poor air quality on health since the start of the Covid-19 pandemic is still emerging, with numerous papers awaiting validation by peer review. It will take time and further research examining comorbidities and air pollution at an individual level to determine whether there is direct causality between air pollution exposure and severe outcomes from Covid-19.

[1] Aung N, et al Association between ambient air pollution and cardiac morpho-functional phenotypes: Insights from the UK Biobank population imaging study. *Circulation*. 2018 Nov; 138:2175-2186

[2] Mills NL, et al. Ischemic and Thrombotic Effects of Dilute Diesel-Exhaust Inhalation in Men with Coronary Heart Disease, *N Engl J Med*. 2007; 357:1075—1082; Miller MR, et al. Inhaled nanoparticles accumulate at sites of vascular disease, *ACS Nano* 2017; 11(5):4542—4552

- Further research is also needed to determine the extent to which long-term exposure to air pollution affects health outcomes from Covid-19. Long-term exposure to air pollution can contribute to the development of or exacerbate heart and circulatory conditions such as coronary heart disease, which represents a risk factor for severe Covid-19 outcomes. Therefore, it is key that health is a central consideration for future air pollution policy responses. Health inequalities must be appropriately addressed in the target setting process outlined in the Environment Bill.

- The health impacts of air pollution constitute an enormous economic burden, with reduced productivity and increased NHS expenditure costing the UK an estimated £20 billion per year from health issues that can be associated with and exacerbated by air pollution.[3] As we look beyond the Covid-19 pandemic, addressing poor air quality must be built into plans and strategies for economic recovery and growth.

About the BHF

The British Heart Foundation (BHF) is the largest independent funder of medical research into heart and circulatory diseases in the UK, and our research has helped halve the number of people dying from these conditions since the 1960s. Today, there are more than 7 million people living with heart and circulatory diseases in the UK and these conditions still cause more than a quarter of all UK deaths. Healthcare costs relating to heart and circulatory diseases are estimated at £9bn each year. We have a particular interest in air quality, having funded over £5.8 million of research exploring the impact of air pollution on heart and circulatory health since the early 2000s. Our ambition is to beat heartbreak forever and poor air quality remains an obstacle to achieving our goal.

Introduction

1. The BHF welcomes this inquiry by the EFRA Select Committee examining whether the Government's 2019 Clean Air Strategy and the Environment Bill will deliver the national leadership needed to urgently tackle the UK's poor air quality.

2. Air pollution is the largest environmental risk factor for health and is known to have damaging effects across the life-course, with well-established links to adverse respiratory and cardiovascular outcomes and evidence pointing to an association with additional conditions such as diabetes and obesity.[4] As the largest independent funder of medical research into heart and circulatory diseases in the UK, the BHF has funded over £5.8 million of research exploring the impact of air pollution on heart and circulatory health since the early 2000s. BHF-funded research has elucidated many ways that air pollutants, particularly fine particulate matter ($PM_{2.5}$), can damage the heart and circulatory system[5], contributing to the development of heart and circulatory diseases and increasing the risk of a heart attack or stroke in people with vascular disease[6]. Exposure to high levels of air pollution has also been

[3] Royal College of Physicians, *Every breath we take: the lifelong impact of air pollution*. Report of a working party. London: RCP, 2016.
[4] Royal College of Physicians, Every breath we take: the lifelong impact of air pollution. Report of a working party. London: RCP 2016.
[5] Aung N, et al Association between ambient air pollution and cardiac morpho-functional phenotypes: Insights from the UK Biobank population imaging study. *Circulation*. 2018 Nov; 138:2175–2186
[6] Mills NL, et al. Ischemic and Thrombotic Effects of Dilute Diesel-Exhaust Inhalation in Men with Coronary Heart Disease, *N Engl J Med*. 2007; 357:1075—1082; Miller MR, et al. Inhaled nanoparticles accumulate at sites of vascular disease, *ACS Nano* 2017; 11(5):4542—4552

shown to lead to a rise in heart failure hospitalisations and deaths.[7] Our research has helped to show the many ways air pollution, particularly fine particulate matter ($PM_{2.5}$), can cause damage to the heart and circulatory system, including:

- damaging the inside walls of arteries, causing them to become narrower and harder;
- increasing blood pressure and adding strain on the heart;
- making blood more likely to clot and block blood vessels; all of which can contribute to an increased risk of a variety of heart and circulatory diseases, including heart attack and stroke.

3. This research is part of a vast body of international evidence on the damage to health caused by ambient air pollution. The BHF welcomes the opportunity to submit evidence to this inquiry on the actions required to address the risk to public health posed by air pollution.

Did the UK Government's 2019 Air Quality Strategy set out an effective and deliverable strategy to tackle the UK's poor air quality and address the issues raised in our 2018 report? Has the UK Government put in place the necessary structures and resources to deliver its strategy?

4. The BHF believes that, whilst the UK Government's 2019 Clean Air Strategy did pick up on some of the concerns and recommendations raised in the EFRA Select Committee's 2018 joint air quality inquiry report, it regrettably fell some way short of providing an effective strategy for tackling the impact of air pollution on public health.

5. The EFRA Select Committee's 2018 report rightly highlighted the need for Government to move towards a holistic approach to tackling air pollution which prioritises health and environmental benefit. The BHF welcomed the Committee's recommendations that the Government strengthen the air quality legislative and governance framework to ensure it protects health; improve public awareness of the risk air pollution poses to health; support the implementation of charging clean air zones and co-ordinate cross-departmental action on policy development, legislation, taxation and spending. These recommendations incorporated some of the evidence-based calls made in the BHF's submission to the 2018 inquiry and, collectively, outlined a robust and sustainable approach to addressing the harm caused by air pollution to heart and circulatory health.

6. The Government's 2019 Clean Air Strategy made some commitments to address the above issues highlighted by the Committee. The strategy's acknowledgement of the impact of air pollution on health marked an important shift from the Government's previous narrow focus on compliance with the EU's arbitrary legal limits, as recommended by the Committee. The BHF welcomed the commitments to: set a new, ambitious long-term target to reduce people's exposure to $PM_{2.5}$; halve the number of people living in locations above the World Health Organization (WHO) guideline level for this pollutant by 2025 and publish evidence in early 2019 examining what action would be needed to meet the WHO annual mean guideline limit for $PM_{2.5}$ of 10 $\mu g/m^3$. Other promising commitments in the strategy in response to the Committee's recommendations included pledges to help individuals and organisations understand how they could reduce their contribution to air pollution and increase investment in air quality modelling; action to reduce emissions of the five major pollutants from transport, agriculture, domestic sources and industry and bringing together local and national air quality data to improve accessibility and engagement. However, whilst these commitments marked a positive step in the right direction towards protecting the nation's health, not all have been backed up with adequate resources to ensure their timely delivery.

[7] Shah A, et al Global association of air pollution and heart failure: a systematic review and meta-analysis, *Lancet* 2013 Sept; 382(9897):1039–1048

7. The Clean Air Strategy committed to work with health professionals to ensure that they can take an active role in ensuring the quality and coverage of health advice on air pollution. Defra has in recent years supported Clean Air Day[8] – a national day of action and awareness-raising coordinated by the charity Global Action Plan – as well as the Clean Air Hub, a website bringing together information on the sources, local levels and health impacts of air pollution.[9] However, Government has not yet delivered any subsequent awareness-raising activity or associated campaign. As such, the necessary structures and resources have not yet been put in place to deliver its pledge to improve health information on air pollution and public awareness of the issue.

8. Progress towards the Government's stated aims on monitoring has also been slow, and some key issues did not feature prominently enough in the strategy. While national Government is required by EU law to monitor $PM_{2.5}$, local authorities are not mandated to monitor this pollutant. Despite increased awareness of the damage caused to health by exposure to $PM_{2.5}$, the funding that has been provided by Government to date has not resulted in the urgently needed, widespread monitoring of this pollutant at local level, potentially due to the lack of a requirement on local authorities to perform this monitoring and the expense of doing so (in 2016, an analysis performed for the Scottish Government found that the 10-year cost of monitoring $PM_{2.5}$ would be between £35,000 and £120,000 per site[10]).

9. The UK also appears to have insufficient monitoring data to fully understand the health impacts of air pollution: there are only around 80 monitors in Defra's nationwide Automatic Urban & Rural Monitoring Network measuring $PM_{2.5}$, the data from which are used to generate modelled estimates for the entire country . Both the Chief Medical Officer's annual report[11] and the Committee's previous report on *Improving air quality*[12] highlighted the need for better air quality monitoring and surveillance and the disparity between local and national air quality data, which the Clean Air Strategy pledged to address. The lack of structure and support for local authorities around strengthening the UK's monitoring network is likely to be impeding the delivery of this important commitment.

10. These issues indicate that some of the key commitments in the Clean Air Strategy, whilst deliverable in principle, are not being supported with the resources required to ensure their implementation. This is not the only failing of the Clean Air Strategy: there are a number of key recommendations from the Committee's 2018 report which were not incorporated into the Government's Clean Air Plan that would have resulted in an effective overall strategy for protecting public health from the damaging effects of air pollution. This included "adopting World Health Organization (WHO) targets into UK statute" and "supporting local authorities with implementing charging clean air zones where these are identified as the most effective form of mitigation." These are some of the measures that would drive reductions in levels of $PM_{2.5}$ at the pace and scale needed to deliver on the Government's ambition to leave the environment in a better state than it was inherited and improve the quality of the air we all breathe. However, implementation of several charging clean air zones, including those in Birmingham and Leeds, has been delayed.

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[8] *Global Action Plan, Clean Air Day https://www.globalactionplan.org.uk/clean-air/clean-air-day*

[9] *The Clean Air Hub, available at: https://www.globalactionplan.org.uk/clean-airhub.*

[10] Ricardo Energy &Environment, PM2.5 Network in Scotland, Report for the Scottish Government, March 2016

[11] HM Government, Annual Report of the Chief Medical Officer 2017 Health Impacts of All Pollution – what do we know?, March 2018.

[12] House of Commons Environment, Food and Rural Affairs, Environmental Audit, Health and Social Care, and Transport Committees, *Improving Air Quality: Government response*, June 2018.

11. While current delays are due to the Covid-19 crisis, technical issues with Government vehicle-checking software led to delays in these cities in 2019.[13] Furthermore, schemes proposed for Oxford, Bath and Manchester have also been delayed while a number of other cities are still undertaking consultation processes to outline action that they will take[14], despite directions to finalise plans as far back as 2018.

12. These delays and the omission of these commitments from the Clean Air Strategy represent a significant missed opportunity to accelerate reductions in people's exposure to health harmful pollutants including $PM_{2.5}$ which will save lives and improve the quality of life for all current and future generations, not just the 50% of the population who will benefit from the Government's targeted efforts to reduce $PM_{2.5}$ to WHO-approved levels by 2025.

Will the Environment Bill provide England with a robust legal framework to define and enforce air quality limits?

13. The Environment Bill has the potential to provide a robust air quality framework which protects public health. This will only be achieved, however, if the Environment Bill goes beyond simply creating a framework for legal compliance and adopts the ambitious targets and robust enforcement mechanisms that are needed to deliver the Government's ambition to tackle the pollution in the UK's air that claims so many lives.

14. BHF analysis has shown that under our existing air quality legal framework, UK heart and circulatory disease deaths attributable to toxic air could exceed 160,000 over the next decade if the Government fails to deliver an overall reduction in exposure to air pollution across the UK. However, as mentioned, the 2019 Clean Air Strategy only commits to halving the number of people across the UK living in locations above the WHO's guideline level of $PM_{2.5}$ by 2025. The BHF believes that, in order to reduce the risk air pollution poses to the whole country, the Environment Bill must adopt as a national target the binding WHO guideline limit for $PM_{2.5}$, which sets an annual average concentration of 10 $\mu g/m^3$ - the level at which the WHO states that harms to health can be minimised. The WHO has led the way in defining health-based recommended limits for air pollutants based on global scientific evidence. Moreover, analysis commissioned by Defra and published in 2019 found that reaching the WHO guideline level of $PM_{2.5}$ is "technically feasible" across most of the UK.[15] The WHO's air quality guidelines therefore provide the best basis for new air pollution targets in the Environment Bill to address the public health emergency it constitutes.

15. Efforts have been made to secure this important commitment in the Environment Bill. In January 2020, the BHF launched its *Toxic air: you're full of it* campaign, to highlight the link between heart and circulatory disease deaths and air pollution. Our report[16], published in February, recommended that Government must go further and faster to protect people from the damage air pollution can cause to heart and circulatory health by transposing the WHO's guideline limits for air pollution into UK law, to be met by 2030. As a partner member of the Healthy Air Campaign and alongside other health charities, the BHF supported a number of amendments to the Environment Bill at Public Bill Committee (PBC) stage, including one tabled by the EFRA Select Committee's Chair, Neil Parish MP, which intended "to set

[13] https://www.bbc.com/news/uk-england-48679008

[14] https://www.patrol-uk.info/charging-clean-air-zones-status-update/

[15] Department for Environment, Food and Rural Affairs (Defra), *Assessing progress towards WHO guideline levels of PM2.5 in the UK*, July 2019.

[16] https://www.bhf.org.uk/-/media/files/publications/bhf_08_ap_ireport_final.pdf?la=en

parameters on the face of the Bill to ensure that the $PM_{2.5}$ target will be at least as strict as the 2005 WHO guidelines, with an attainment deadline of 2030 at the latest". Although this amendment was unfortunately defeated at PBC, we continue to urge Government to commit to WHO limits for $PM_{2.5}$ within the Bill and will be supporting any further amendments on this as it progresses through Parliament.

16. Adopting the WHO's limits for air pollution is essential as it will also provide a catalyst for the development and implementation of bold plans that support the Government's ambition to help people live well for longer, including the millions of people living with heart and circulatory conditions in the UK.

17. Equally important is the timeframe for implementing new targets. The Environment Bill specifies that the targets must be set in secondary legislation before 31 October 2022, leaving up to two and half years before action to meet them will commence. As it stands, this does not ensure that action to tackle air pollution will be taken with sufficient urgency. The Bill must set new air pollution targets including the target for $PM_{2.5}$ before 2022 to truly protect the nation's health. To allow a delay in the introduction of targets would undermine the Government's stated commitment to take bold action and lead the world in tackling poor air quality. These limits must be health-based and met by 2030 in order to reflect the Government's ambition to rapidly drive down human exposure to $PM_{2.5}$ to deliver positive health benefits.

18. While a new legal limit for $PM_{2.5}$ as specified in the Environment Bill is a hugely important aspect of addressing poor air quality, additional air quality targets are also vital to creating the best possible legal framework to protect health. These include:

a. Ambient 24-hour mean concentrations of PM_{10} and $PM_{2.5}$, for which WHO guidelines exist[17], should be followed. As with long-term exposure to particulate matter, BHF-funded research has shown adverse effects on the heart and circulatory system within 24 hours of exposure to high levels of $PM_{2.5}$, including an increased risk of heart failure hospitalisation and death[18].

b. Exposure reduction targets for $PM_{2.5}$ and PM_{10}. These targets drive a reduction in overall average exposure to health-harmful pollutants and ensure that a majority of the population benefits from improved air quality, as opposed to focusing exclusively on hotspots and compliance with legal limits[19].

c. Annual emissions of nitrogen oxides (NO_x), ammonia, $PM_{2.5,}$ PM_{10}, sulphur dioxide (SO_2) and non-methane volatile organic compounds (NMVOCs), all of which are covered by the Government's Clean Air Strategy. Public Health England states that targeting emissions at source is the most effective intervention for mitigating the health impacts of air pollution[20]. Therefore, emissions reduction targets must be set in place as complementary to the $PM_{2.5}$ target and consistent with the objective to improve health and wellbeing.

19. The mechanism by which new air quality targets will be enforced, which the Bill states will be via the creation of the Office for Environmental Protection (OEP), must also be fit for purpose. The BHF has previously contributed to an inquiry led by the EFRA Select Committee on the

[17] World Health Organization, *Air quality guidelines for particulate matter, ozone, nitrogen dioxide and sulfur dioxide, Global update 2005*, published 2006.
[18] Mills et al. (2013) *'Global association of air pollution and heart failure: a systematic review and meta-analysis.' Lancet* 382: 1039-1048.
[19] Brown, RJC and Woods, PT, *Comparison of averaging techniques for the calculation of the 'European average exposure indicator' for particulate matter*, J Environ Monit, 2012, 14 165.
[20] Public Health England, Review of interventions to improve outdoor air quality and public health, published 11th March 2019.

topic of Environmental Principles and Governance where we set out that, in order to properly carry out its enforcement function, the OEP must be truly independent from Government and given the resources and powers necessary to enable it to be fully able to hold all public authorities to account. Correspondingly, the Environment Bill must set out who has responsibility for ensuring that the environmental objectives outlined in the Government's Environmental Improvement Plans are achieved. This requires a proper responsibility framework, with a duty on all levels of government and public bodies to act compatibly with and, where appropriate, contribute to the achievement of environmental targets and implementation of environmental improvement plans.

20. Only with the introduction and robust enforcement of health-based legal limits and targets for air pollution can the Government set the pace to go further and faster to provide a healthier, more prosperous future free from heartbreak for everyone.

What progress had the UK Government made on reducing air pollution and enforcing legal pollution limits before the Covid-19 pandemic?

21. In 2015, the UK Government was ordered by the Supreme Court to develop a Clean Air Plan to bring NO_2 emissions within legal limits.[21] Since that time, levels of air pollutants in the UK have broadly plateaued, including levels of concentrations of $PM_{2.5}$, the pollutant that BHF-funded research has found to have the strongest link to an increased risk of many types of heart and circulatory diseases.[22] In 2018, the population-weighted annual mean $PM_{2.5}$ concentration across the UK as a whole was below the UK's current legal limit, at 8.6 µg/m^3.[23] This means that levels of $PM_{2.5}$ were compliant with the existing, arbitrary legal limits in force in the UK which are not health-based and were close to the WHO's health-based guideline limit for this pollutant.

22. It is also worth pointing out that the 2018 average for $PM_{2.5}$ does not provide the full picture and BHF analysis has shown that in 2019 around 15 million people in the UK were living in council areas where average air pollution levels exceeded the WHO's evidence-based guideline limits, which reduce the harm to health that we know exists.

23. Furthermore, 2019 saw a rise in the mean number of hours of 'moderate' or higher $PM_{2.5}$ air pollution, which increased from 93 in 2018 to 162 per roadside monitoring site and from 62 to 165 per urban background site.[24] As with long-term exposure to particulate matter, BHF-funded research has shown adverse effects on the heart and circulatory system within 24 hours of exposure to high levels of $PM_{2.5}$, including an increased risk of heart failure hospitalisation and death.[25]

24. Reductions in air pollution levels are important to achieving enormous health benefits: in 2018, Public Health England published an analysis showing that a reduction of just 1 µg/m^3 in

[21] Defra, National Statistics, Air quality statistics in the UK, 1987 to 2019 , updated April 2020

[22] *Ibid*.

[23] Department for Environment Food & Rural Affairs (DEFRA) (2019). UK Air Information Resource, https://uk-air.defra.gov.uk/data/pcm-data

[24] *Ibid*.

[25] Mills et al. (2013) '*Global association of air pollution and heart failure: a systematic review and meta-analysis.' Lancet* 382: 1039-1048.

$PM_{2.5}$ levels across the whole of the UK in 2017 would have avoided over 50,000 cases of coronary heart disease by 2035.[26]

25. We know that, each year in the UK, there are an estimated 11,000 deaths from heart and circulatory diseases attributed to particulate matter[27]. Whilst, therefore, the Government made some promising plans to reduce air pollution and better enforce legal pollution limits before the Covid-19 pandemic, further reductions in $PM_{2.5}$ to levels that are safer for health is needed.

What does the early evidence from the COVID-19 pandemic say about the impact of poor air quality on health, and health inequalities for disadvantaged communities and other at-risk groups, and possible policy responses?

Evidence from the COVID-19 pandemic about the impact of poor air quality on health

26. During the coronavirus pandemic, heart and circulatory conditions, such as coronary (ischaemic) heart disease, have been found to increase a person's risk of severe outcomes if they contract Covid-19. Official data shows that around 10% of people who died in hospital with Covid-19 had coronary heart disease[28] and many of the most common underlying health conditions in those who die from Covid-19 in the UK are cardiovascular diseases - 45% of Covid-19 deaths where a condition is mentioned referenced cardiovascular disease as a comorbidity.[29]

27. Research examining the impact of poor air quality on health since the start of the Covid-19 pandemic is still emerging; most studies thus far have not evaluated the impact of Covid-19 on heart and circulatory health specifically. There are a number of studies which indicate a possible link between air quality and increased likelihood of severe Covid-19 outcomes. Conticini et al. (2020) found that pollutant concentrations were a likely contributor to the high Covid-19 death rates experienced in Northern Italy.[30] Another peer-reviewed study found a positive relationship between long-term exposure to high levels of air pollution, particularly $PM_{2.5}$ concentrations, and Covid-19 cases, hospital admissions and deaths in the Netherlands.[31] Other studies that have yet to be peer-reviewed suggest that particulate matter could increase infectivity at an individual level (using data from the UK),[32] contribute to an increased death rate from Covid-19 in some areas[33] and may have resulted in an increased number of COVID-19 cases across 324 Chinese cities.[34]

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[26] Public Health England, Estimation of costs to the NHS and social care due to the health impacts of air pollution, May 2018.

[27] BHF analysis using 2017 data from Global Health Data Exchange, Global Burden of Disease Results Tool.

[28] https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/bulletins/deathsinvolvingcovid19englandandwales/previousReleases

[29] Public Health England, Disparities in the risk and outcomes from COVID-19, June 2020, 63

[30] Conticini E. et al, 'Can atmospheric pollution be considered a co-factor in extremely high level of SARS-CoV-2 lethality in Northern Italy?', *Environmental Pollution*, 261, June 2020

[31] Cole, M.A., Ozgen, C. & Strobl, E., 'Air Pollution Exposure and Covid-19 in Dutch Municipalities'. Environ Resource Econ (2020)

[32] Travaglio M. et al, 'Links between air pollution and COVID-19 in England', (pre-print)

[33] Wu X. et al, 'Exposure to air pollution and COVID-19 mortality in the United States: A nationwide cross-sectional study,' (pre-print)

[34] Tian H. et al, 'Risk of COVID-19 is associated with long-term exposure to air pollution', (pre-print)

28. As most research is still at an early stage, with numerous papers awaiting validation by peer review, it will take time and further research examining comorbidities and air pollution at an individual level to determine whether there is direct causality between air pollution exposure and severe outcomes from Covid-19.[35] Disentangling the impact of air pollution from the impact of other confounding factors, such as population density and patterns of social interaction, as well as determining whether air pollution and Covid-19 are affecting the same vulnerable groups, will be challenging. It may not be possible to completely isolate these factors given the extra influence of lockdown. As the Committee on the Medical Effects of Air Pollutants recently concluded, there isn't yet clear evidence 'that exposure to air pollutants increases the likelihood or severity of COVID-19 infection', although 'knowledge of the impacts of air pollution on health suggests that this is likely.'[36]

29. Based on the strong evidence supporting an increased risk of coronary heart disease associated with air pollution and the emerging research on air pollution's potential role in Covid-19, it is clear that the Environment Bill must seize the opportunity to enshrine the WHO's evidenced, health-based air quality targets to truly protect public health.

Health inequalities

30. Inequalities exist in people's exposure to air pollution, with the most socioeconomically disadvantaged disproportionately suffering the most from its health effects. Furthermore, some groups, such as children, older people and those with an existing cardiovascular or respiratory condition, are more vulnerable to air pollution's adverse impact.[37] Pollution sources and higher concentrations of ambient pollution are typically found in more socioeconomically disadvantaged areas.[38] *The Marmot Review: 10 Years On* report noted that pollution levels are, on average, worse in areas of highest deprivation compared with areas of lowest deprivation, with the highest air pollution levels occurring in ethnically diverse neighbourhoods (defined as those where more than 20% of the population are non-White).[39] This connection remains even after allowing for the fact that some of these neighbourhoods are more deprived. The causes for this remain unclear.[40] Evidence from 'polluter pays' analyses (i.e. those exploring the need for industry and those creating the pollution to pay for its remediation) show that those at highest risk of health impacts from pollution are generally much less involved in its production.[41] Further research is needed to determine the impact of Covid-19 on air pollution and health inequalities.

31. Further research is also needed to determine the extent to which long-term exposure to air pollution affects health outcomes from Covid-19. Long-term exposure to air pollution can contribute to the development of or exacerbate heart and circulatory conditions such as coronary heart disease, which represents a risk factor for severe Covid-19 outcomes. Therefore, it is key that health is a central consideration for future air pollution policy

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[35] Committee on the Medical Effects of Air Pollutants, Statement on COMEAP's on-going work on air pollution and COVID-19, 2020

[36] *Ibid.*

[37] Public Health England, Health Matters: Air pollution- sources, impacts and actions, 14th November 2018

[38] Annual Report of the Chief Medical Officer, 'Health Impacts of All Pollution – what do we know?', 2017, ch.6, p.2

[39] Marmot, M. et al, The Marmot Review: 10 Years On, 2020, 103

[40] *Ibid.*

[41] Rivas I, Kumar P, Hagen-Zanker A., 'Exposure to air pollutants during commuting in London: are there inequalities among different socio-economic groups?' *Environment International.* 2017; 101:143-57; Mitchell G, Dorling D. 'An environmental justice analysis of British air quality', *Environment and Planning,* A. 2003;35(5):909-29; Barnes J, Chatterton T., 'An environmental justice analysis of exposure to traffic-related pollutants in England and Wales', *WIT Transactions on Ecology and the* Environment, 2017;210(12): 431-42

responses. Health inequalities must be appropriately addressed in the target setting process outlined in the Environment Bill to ensure that the legal framework set out mandates action to reduce inequalities in exposure to air pollution. One way of implementing targeting is the identification of 'pollution-poverty' hotspots.[42] Local authorities need to be supported to reduce air pollution and reduce the exposure of those who are disproportionately affected by air pollution.

What are the current and emerging risks and opportunities for air quality posed by:

a) **Short-term policy and societal changes in response to the pandemic, for example changes to transport to reduce the risk of transmission**

32. Short-term societal and policy changes in response to Covid-19, especially the reduction in road traffic driven by the uptake of working from home and changes to transport, has resulted in some improvements to outdoor air quality during the pandemic. The opportunity now exists to maintain this shift in behaviour, which would yield benefits for heart and circulatory health. The BHF welcomed the Prime Minister's announcement of £2 billion new funding for active travel and we were pleased to see the strategy released in July outlining how this will be spent. Commitments to transforming infrastructure through building more protected cycle routes in towns and cities, as well as improving air quality and reducing traffic by creating more low traffic neighbourhoods to reduce rat running are promising and will help support good heart and circulatory health. This must be accompanied by long-term investment in sustainable transport and a review of all sectors and sources of air pollution to ensure a joined-up, impactful approach to reducing emissions.

33. It must be noted that while the above changes in short-term policy and societal behaviour have produced some benefits, like a reduction in road transport at the beginning of lockdown leading to a marked decrease in road transport emissions of NOx, exhaust PM and non-exhaust PM in NO_2 levels, absolute $PM_{2.5}$ levels were not reduced in this period according to a report from the Government's Air Quality Expert Group exploring the impact of lockdown on air quality using data collected in the period to 30th April. Levels of $PM_{2.5}$ in the UK during lockdown were exacerbated by meteorological phenomena[43], which contributed to higher levels than those recorded during equivalent calendar periods in previous years, although analysis has found that levels were lower than would have been expected under business as usual conditions. Transboundary influences will also have been a factor, with $PM_{2.5}$ pollution being carried over from Europe, although the data for this is not currently available.[44] It is also important to note that as of the end of May, traffic levels started to increase again due to the easing of lockdown restrictions.

34. The higher than expected levels of $PM_{2.5}$ levels during the pandemic could be in part due to the high proportion of particulate matter emissions that come from burning wood and coal in domestic open fires and solid fuel stoves, which represent 38% of primary particulate matter emissions in the UK.[45] There is evidence that solid fuel combustion in domestic fires and stoves went up initially after lockdown. Nuisance reports linked to bonfires and burning of garden waste have also risen since the lockdown began, despite discouragement and even

[42] Annual Report of the Chief Medical Officer, 'Health Impacts of All Pollution – what do we know?', 2017, ch.6, 12

[43] Air Quality Expert Group, Estimation of changes in air pollution emissions, concentrations and exposure during the COVID-19 outbreak in the UK. Rapid evidence review, June 2020, 13

[44] *Ibid.*, 8

[45] Department for Environment, Food & Rural Affairs, Clean Air Strategy 2019, 10

banning by some local authorities, such as in Edinburgh.[46] Evidence associated with the detection of certain markers of particulate matter from wood burning at monitoring sites in Manchester and London has also demonstrated an increase in particulate matter emissions from domestic combustion.[47] However, further research is required to fully understand any changes to the contribution of various sources of particulate matter during lockdown. Nonetheless, without action, fine particulate matter pollution from domestic combustion will continue to place people's health at risk. We therefore support the measures outlined in the Government's response to their consultation on domestic burning of solid fuels, namely 1. the introduction of regulations to limit the sale of wet wood, a key source of $PM_{2.5}$ emissions, 2. the phase out of domestic burning of coal and 3. the introduction of sulphur and smoke emission limits for manufactured solid fuels. It is important that local authorities are given adequate resource and training to enforce these regulations properly. Those responsible for enforcement and the wider public must also be given general and targeted information to enable thorough understanding of the health impacts of domestic burning and appropriate support to change to safer alternatives.

35. The agricultural industry also contributes to air pollution by producing $PM_{2.5}$ from machinery and ammonia, which can react with other elements in the atmosphere to produce secondary particulate matter. Agricultural output statistics are not yet available for 2020, but lockdown is likely to have had less impact on the agriculture sector, leaving agricultural emissions largely the same.[48]

36. International reductions in emissions can have substantial effects on the UK, particularly for longer-lived pollutants such as $PM_{2.5}$ that are subject to transboundary transport. As such, it is imperative for the UK to take international leadership on air pollution by implementing world-leading air quality targets to reduce population-level exposure to pollutants that harm health, including $PM_{2.5}$. Adopting WHO recommended limits on $PM_{2.5}$ will supporting our international partners to follow suit.

37. Given the variety of sources for $PM_{2.5}$ pollution, it is therefore crucial that medium- and long-term policy responses consider the full complexity of the picture regarding particulate matter emissions. Longer-term policy change will need to take a holistic, cross-Government approach to reducing population level-exposure to this pollutant, encompassing measures to reduce domestic combustion and ammonia use in agriculture and intensive livestock farming, as well as reducing road traffic, as outlined in the Clean Air Strategy.

b) Medium and long-term actions to promote economic recovery

38. The health impacts of air pollution constitute an enormous economic burden, with reduced productivity and increased NHS expenditure costing the UK an estimated £20 billion per year from health issues that can be associated with and exacerbated by air pollution.[49] Medium and long-term actions to promote economic recovery must prioritise a 'green recovery'

[46] Air Quality Expert Group, Estimation of changes in air pollution emissions, concentrations and exposure during the COVID-19 outbreak in the UK. Rapid evidence review, June 2020, 15

[47] *Ibid*., 16

[48] *Ibid*., 18

[49] Royal College of Physicians, *Every breath we take: the lifelong impact of air pollution*. Report of a working party. London: RCP, 2016.

across all sectors to ensure a cleaner and greener future for all, as envisaged by the Government. The Industrial Strategy's focus on clean growth could be a vehicle for the delivery of this 'green recovery,' which must constitute an opportunity to drive forward the Government's ambitions to tackle air pollution, as articulated in the Government's 2019 Clean Air Strategy.[50]

39. The BHF recognises that there is no silver bullet to tackling air pollution. However, making air quality a priority across all levels and departments of Government, and joining up activity with the Treasury and departments with responsibility for the environment, health, transport, energy and industry, is essential when considering medium and long-term actions to promote economic recovery. To drive this action, we must also see an ambitious and far-reaching commitment from Government in the form of adopting the WHO limit for $PM_{2.5}$. This would then lead to action focused on reducing population-level exposure to air pollution, and all interventions should be developed and evaluated based on the impact on health. It is key that interventions are evaluated at a local level, with local authorities being given the appropriate resource and support to conduct these.

40. The negative impact that medium and long-term actions to promote economic recovery could have on air quality should also be considered by Government. There is overall consensus that the lockdown caused by the pandemic reduced activities and therefore emissions from construction combustion and processes in industry and power generation, although we are still waiting on the underlying statistical data for these areas.[51] Across England, construction activity was estimated to be down by about 25% in April.[52] This will have had some impact on levels of PM_{10} pollution nationwide. For example, the construction sector is estimated to normally account for 35% of the PM_{10} emissions in London as a whole.[53] As such, any proposed acceleration of infrastructure building as part of economic recovery could present a risk to air quality, negating potential improvements to air quality made during lockdown through a reduction in some construction activities. This again speaks to the need for the impact of air pollution on health to be a key consideration for departments across national and local government, such that decisions are taken that protect public health whilst enabling clean growth and a green recovery.

[50] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/770715/clean-air-strategy-2019.pdf

[51] Air Quality Expert Group, Estimation of changes in air pollution emissions, concentrations and exposure during the COVID-19 outbreak in the UK. Rapid evidence review, June 2020, 12

[52] *Ibid.*, 15

[53] *Ibid.*