



Editorial

It seems implausible that it is almost two years since the world was gripped by the CV19 pandemic and saved by the vaccine.

My editorial is brief and brings good tidings. A student section has been created and an editor appointed. The PubMed application has been submitted; fingers crossed for its success! The completion of the form was made possible by the efforts of our new, enthusiastic Student Editor Gui. The journal website itself has been updated and your comments / suggestions would be most appreciated. This issue has been published in a dyslexia friendly font and so shall future issues.

This issue includes a timely guest editorial on climate change and a future green NHS. We all wait for COP26 outcomes on global warming with much interest. This MBMJ issue is fully recyclable. In keeping with a green NHS theme and to contribute to a reduced carbon footprint this issue has been produced without a laminated cover. This does mean the spine of the issue is more fragile.

As always case reports, a historical perspective on the NHS, the A&E series and an innovative pictorial article on mental health complement this publication. Actually this issue includes the broadest range of articles; yet published in any MBMJ. Please note that any article that has been accepted should be included in the future issues.

Please contact me to join the Editorial Board or for involvement as a peer reviewer. For peer reviewers a two hour CME certificate can be provided. The vacancy for a patient representative persists.

My personal gratitude includes all the authors, peer reviewers, Joanne and Bryan Harper. This issue is testament to everyone's diligence. The MBMJ team and I wish your family and you good health, a wonderful festive season and a *toujours perdrix* 2022 😊

THANHS for reading,

Shadaba Ahmed, Editor

GUEST EDITORIAL

Climate Change and the Role of the NHS

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INTRODUCTION

The evidence is now conclusive - the world is warming, largely due to human activity. Without significant changes to the way we live, the world is predicted to warm to dangerous levels with disastrous consequences. We now have the knowledge and technology to limit climate change but the process of adaptation has been slow. Given the intricate link between climate change and human health, health care institutions have a responsibility to act. As one of the largest employers in the world, the National Health Service (NHS) in particular has the power to influence change.

THE PROBLEM

Climate change is largely driven by increasing levels of greenhouse gases in the atmosphere. These act as a blanket around the earth, absorbing infra-red photons and causing warming. Carbon dioxide (CO₂) is the prime culprit, comprising 78% of global greenhouse gases emissions in 2010,¹ and

remains in the atmosphere for thousands of years. Levels are on the rise predominantly due to burning of fossil fuels and deforestation. Other greenhouse gases include methane (10%), nitrous oxide (7%) and fluorinated gases (3%).

CO₂ levels historically have been relatively stable but show a significant rise over the last 50-100 years. (Figures 1 and 2). Evidence from multiple different sources has also shown a rise in average global surface temperatures of approximately 1°C since c1960.^{2, 3, 4, 5}

Projected data from May 2021 suggests that if the current global policies are adhered to, we can expect an average global temperature rise of 2.7-3.1°C by 2100 (Figure 3). Even if the most optimistic of net zero targets are met, we can expect a 2°C rise. The difference between these may seem minimal and irrelevant to most casual observers, but the effects on the world would be huge. These small differences are worth fighting for.

In 2015, an international agreement was finally reached in Paris between the vast majority of our world's nations.⁶ The

Carbon dioxide over 800,000 years

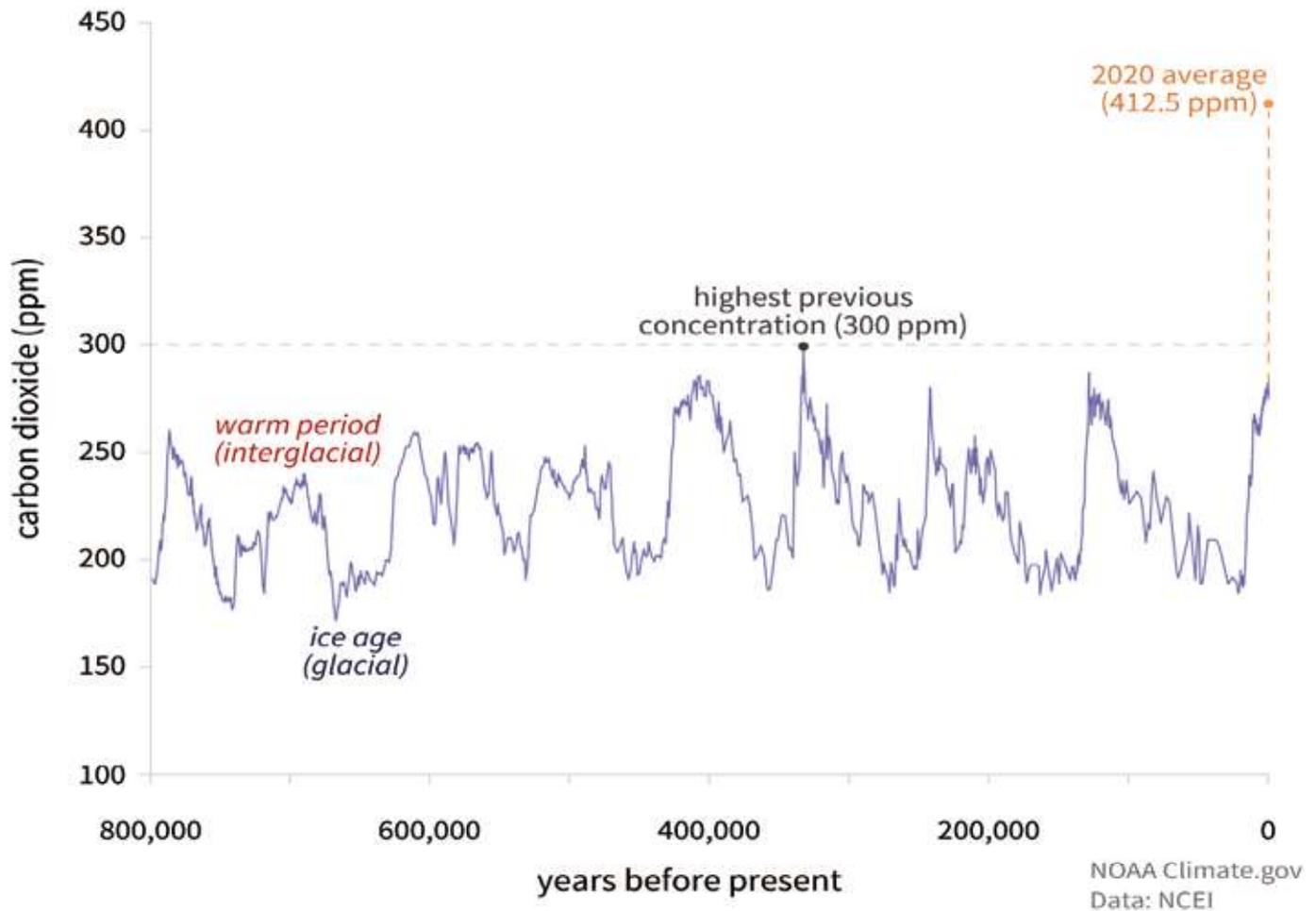


Figure 1: NOAA Climate.gov, Data NCEI.²⁰

Carbon dioxide emissions and atmospheric concentration (1750-2020)

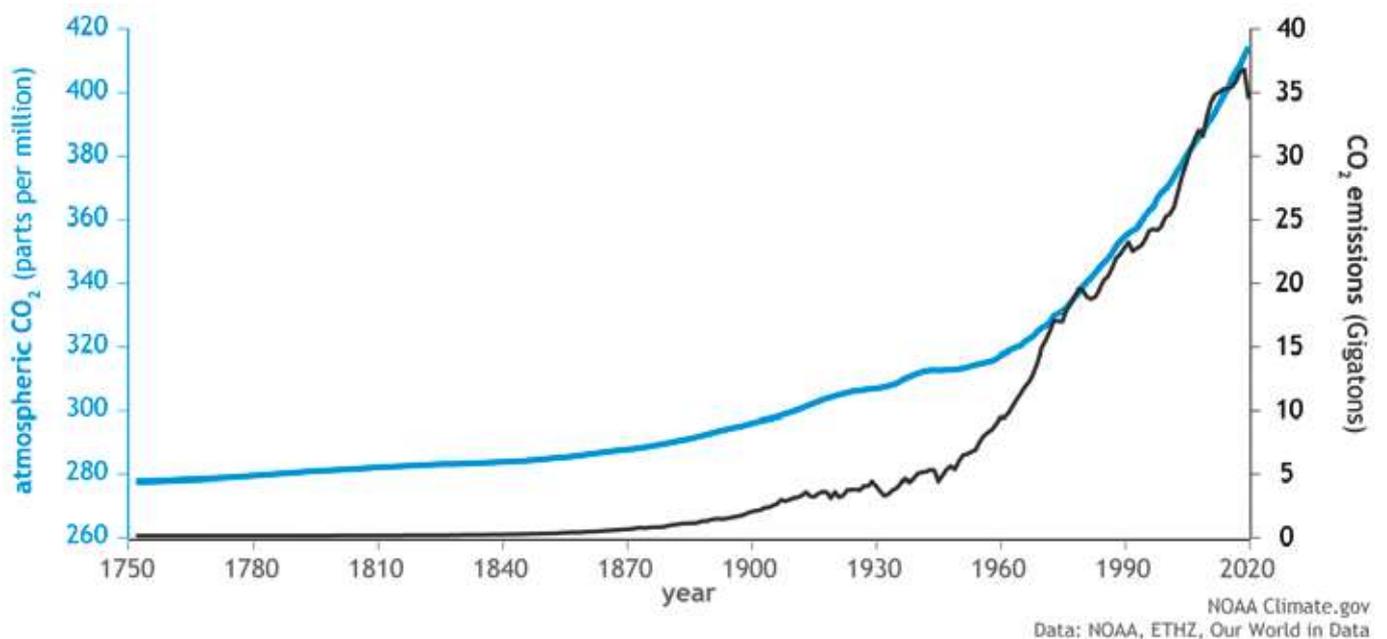


Figure 2: NOAA Climate.gov, Data NOAA, ETHZ, Our World in Data.²⁰

2100 Warming projections

Emissions and expected warming based on pledges and current policies

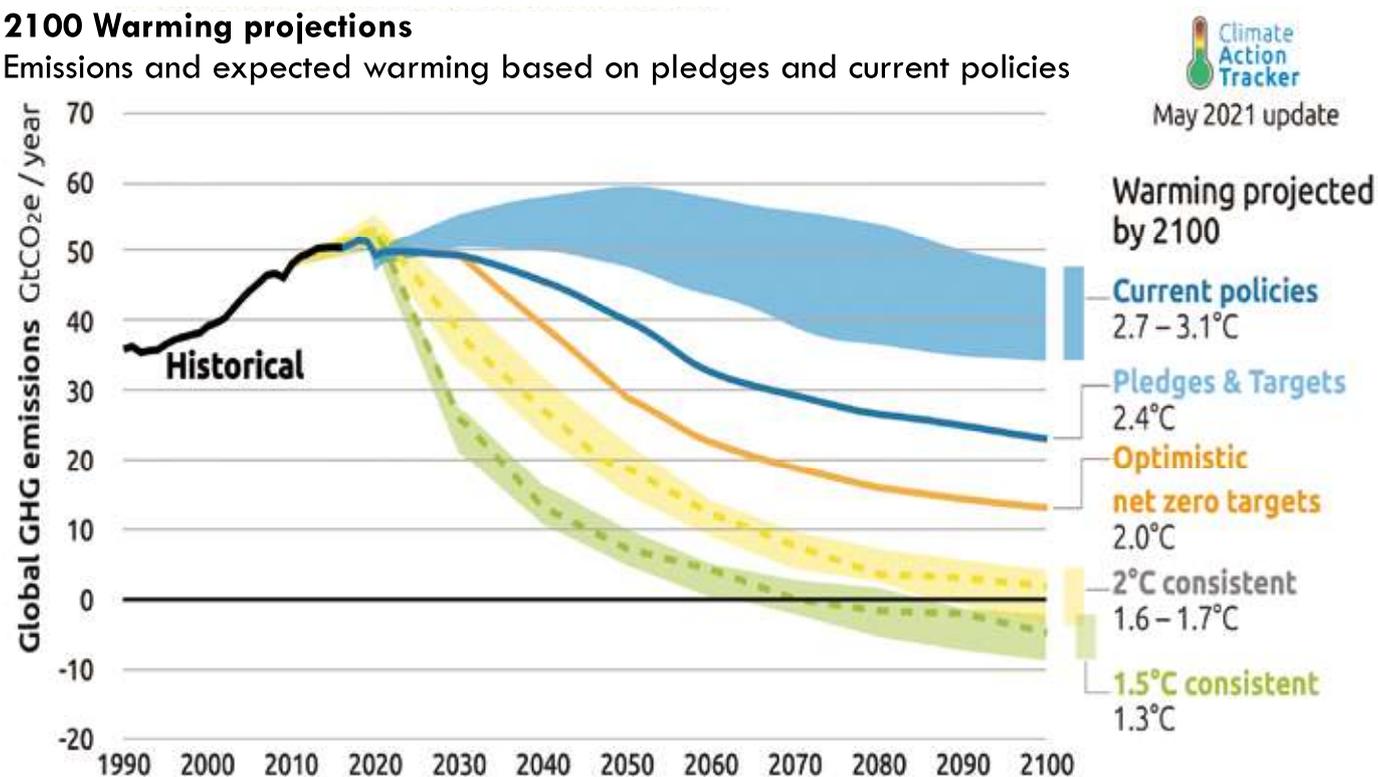


Figure 3: Copyright ©2009-2021 by Climatic Analytics and NewClimate Institute.²¹

agreed target was to limit global warming to less than 2°C by 2050, and ideally to 1.5°C. In order to achieve this, it was noted that there must be at least a 50% reduction in carbon emissions by 2030. Clearly figure 3 shows that we are not currently on target in what can be considered to be the critical decade.

Understanding the reasoning for the targets is critical to harnessing motivation for change. Climate change is not linear and there are certain 'tipping points' which will serve to accelerate the problem rapidly and irreversibly should they be affected. The Intergovernmental Panel on Climate Change (IPCC) models predict that these tipping points, or 'climatic impact-drivers', would be much more affected at 2°C than 1.5°C.⁷ Lower temperature rises will lead to melting of Arctic summer sea ice, causing sea levels to rise. The West Antarctic sea ice sheet and Alpine glaciers will see similar effects. Loss of such ice will reduce the earth's capacity to reflect the sun's heat, exacerbating the problem. Rising sea temperatures will have huge implications for marine biodiversity, causing bleaching of coral reefs and harming reproductive capacity of marine life. It is estimated that 99% of coral reefs would be lost if global temperatures rise by 2°C.⁸

Higher temperature rises will cause adverse effects on the world's forests due to wild fires, adding further CO₂ into the atmosphere whilst simultaneously reducing the earth's capacity to store it. Ensuing hotter drier conditions would cause further dieback of forest and affect biodiversity. Changes to the African and Indian monsoons would be expected and may cause ecosystem changes and agricultural damage. Arctic winter ice and permafrost will be affected with still higher temperature rises. Melting of permafrost will lead to an abrupt increase in CO₂ and methane emissions as carbon rich soil thaws.

THE IMPACT

The impact of climate change will be widespread. Rising sea levels will displace people from their homes. Adverse weather events will be more frequent, including storms, tornados, flooding, wildfires and droughts. Higher levels of greenhouse gases in the atmosphere could affect air quality and even cause acid rain, damaging soil and water sources. Some areas will be affected by famine and extreme water shortages. Rising sea temperatures will affect reproduction of marine life and, together with the dying coral reefs, significantly impact marine biodiversity. With agricultural land also adversely affected, food costs worldwide are likely to significantly rise. International trade will decline and there is expected to be a significant rise in refugees from the worst affected areas. International conflict may increase.

Whilst everyone the world over will feel the effects of climate change, unfortunately, it will be most detrimental to the most vulnerable. Those living in third world countries where healthcare provision and living conditions are basic will likely be significantly affected. People living in coastal areas, flood zones and areas prone to adverse weather events such as heatwaves, tsunamis or hurricanes are likely to suffer. Generally, the elderly, the young, people with chronic health problems and those of a lower socioeconomic status are likely to be worse affected. The irony and unfairness being that the more affluent in society have generally contributed more to climate change, whether measured on an individual or national scale.

PLANETARY HEALTH

Planetary health is a relatively recent concept which recognises the intricate link between the health of the environment, animal

health and human health.⁹ Over recent years the human population has been healthier than ever with increased life expectancy and reduced poverty. However this has come at the cost of exploiting the earth's natural resources which in turn has led to climate change. In 2015, a Rockefeller Foundation-Lancet commission concluded; "the continuing degradation of natural systems threatens to reverse the health gains seen over the last century. In short, we have mortgaged the health of future generations to realise economic and development gains in the present. Focus on human health."⁹

The commission described several metrics to define the state of planetary health and, whilst global temperature change is only one of these, it has the potential to impact on all the others.

The World Health Association anticipates climate change to cause approximately 250,000 additional deaths per year between 2030 and 2050, from malnutrition, malaria, diarrhoea and heat stress alone.¹⁰ It is important to note this does not acknowledge other causes of morbidity and mortality, for example through respiratory and cardiovascular disease exacerbated by air pollution, injuries and fatalities from extreme weather events, forced migration, civil conflict and mental health impacts.

HEALTHCARE IN THE UNITED KINGDOM

The clear links between climate change and human health are slowly driving change in healthcare provision in the UK. In a positive move, the General Medical Council (GMC) introduced sustainability into the 'expected graduate outcomes' for medical students in 2018, stating;

*"Newly qualified doctors must be able to apply the principles, methods and knowledge of population health and the improvement of health and sustainable healthcare to medical practice."*¹¹

Sustainability links with planetary health, referring to the ability of a society to make choices which are beneficial to long term survival. Further the NHS has recognised the emergency, publishing a report in 2020 entitled "Delivering a 'Net Zero' National Health Service",¹² with stated targets to reduce

- 'the emissions we control directly (the NHS Carbon Footprint), to net zero by 2040, with an ambition to reach an 80% reduction by 2028 to 2032'
- 'the emissions we can influence (our NHS Carbon Footprint Plus), net zero by 2045, with an ambition to reach an 80% reduction by 2036 to 2039'

As part of the strategy, individual hospital trusts are required

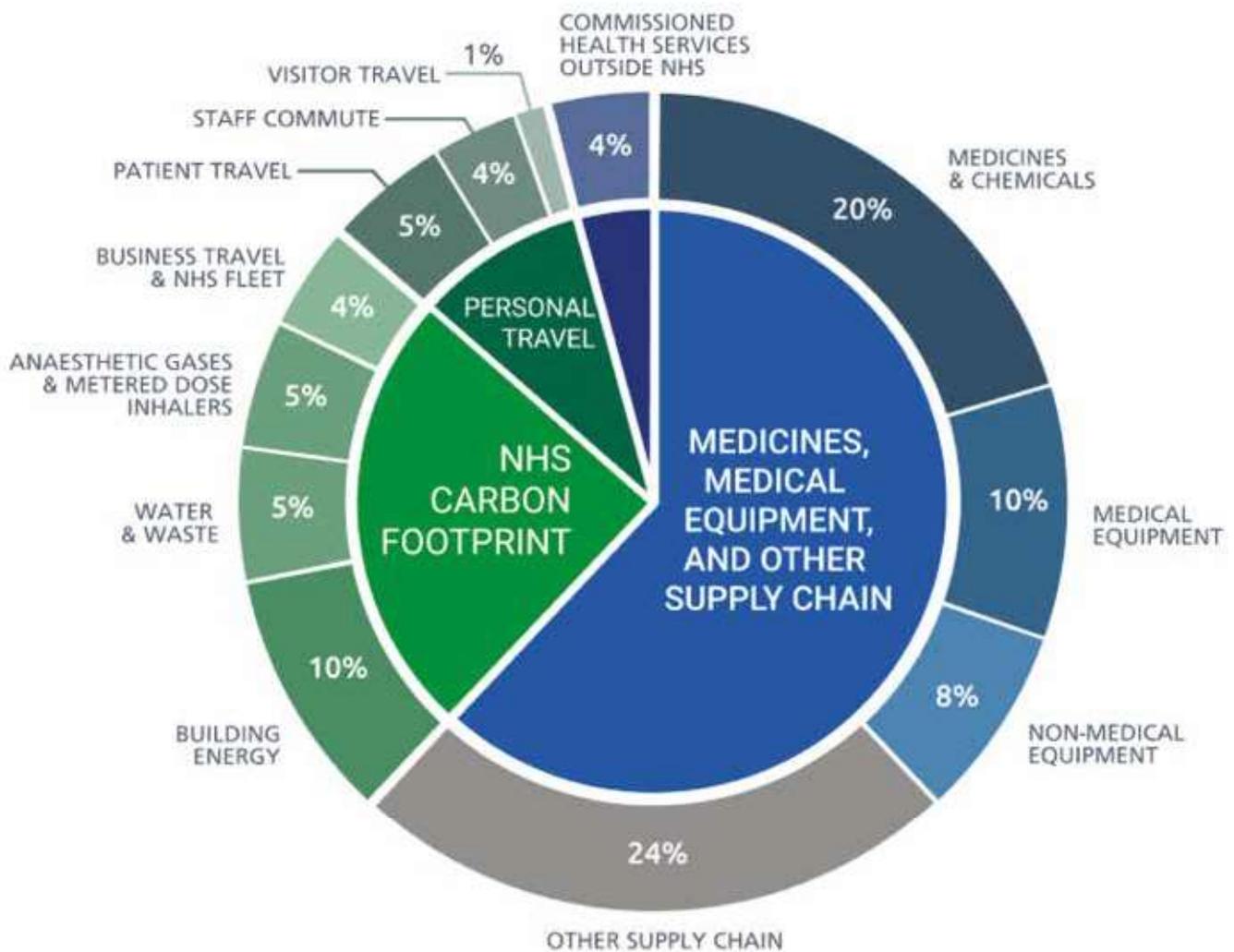


Figure 4: Image from 'Delivering a 'Net-Zero' National Health Service'.¹²

to develop their own 'Green Plan' to detail their own approaches to reducing carbon emissions. Delivering this plan requires knowledge of current emissions and embracing new technologies and ways of working. Whilst some changes can be regarded as 'easy wins', others will be more challenging, sometimes involving difficult ethical decisions or financial costs.

The NHS derived a 'long term plan' in 2019¹³ which is wide ranging but does incorporate efforts to decarbonise, with targets to reduce hospital presentations, reduced staff and patient mileage, reduced bed days, fewer pharmaceuticals prescribed and less intensive procedures. The government has also pledged to build 40 new hospitals by 2030 with sustainability a key component of the design and locations.¹⁴ Nevertheless, we are currently in the 'critical decade' with targets to meet before 2030 and there is no time to wait for new infrastructure.

The majority of NHS emissions are from medicines, medical equipment and other supply chain products (Figure 4).¹² In order to influence this, procurement needs to prioritise sustainability in decision making and pool purchasing power to enable sustainable procurement across the entire NHS. Using supplies efficiently is also key. One such example is from Great Ormond Street Hospital where a campaign was launched to reduce the use of non-sterile plastic gloves and in doing so saved 21 tonnes of plastic and £90,000 over just 12 months.¹⁵

Water and waste causes around 5% of NHS emissions.¹² A key feature of sustainability is moving towards a 'circular economy' rather than the 'linear economy' which currently predominates. The linear model involves a production process where valuable natural resources are extracted from the

earth to make a product which by its very design can only be disposed of at the end of its life. Non-sterile plastic gloves are an example of this. The extraction, production and disposal processes all cause environmental damage. In a circular economy (Figure 5), design and production allows for the product to be re-used in another guise, refurbished or recycled. Waste materials can be used as components in other products, to make energy or to regenerate nature for example through composting. Some NHS trusts have been very successful already in reducing waste, Newcastle Hospitals reporting that they have sent no waste to landfill since 2011.

Energy used to power buildings is the biggest source of emissions within the NHS own carbon footprint.¹² Tackling this will require financial investment to upgrade buildings and a shift to renewable energy and heat generation, ideally on site. Artificial intelligence offers promise in terms of optimising energy use, for example switching machinery off when not in use.

Business travel, the NHS fleet and staff/patient travel makes up another substantial proportion of emissions.¹² Moving towards more electric vehicles is a key component and some NHS trusts have already banned the use of fleet diesel cars. Promoting car sharing, walking and cycling for staff commutes is better still at reducing emissions whilst also benefiting personal health. In doing so, workplaces will need to provide adequate changing facilities, showers and safe cycle storage for example. Incentivising staff with priority car parking for car sharers and celebrating active travel with rewards may help. The COVID pandemic has also accelerated home working, remote consultations and remote meetings both in primary and secondary care which has potential to reduce travel emissions further.

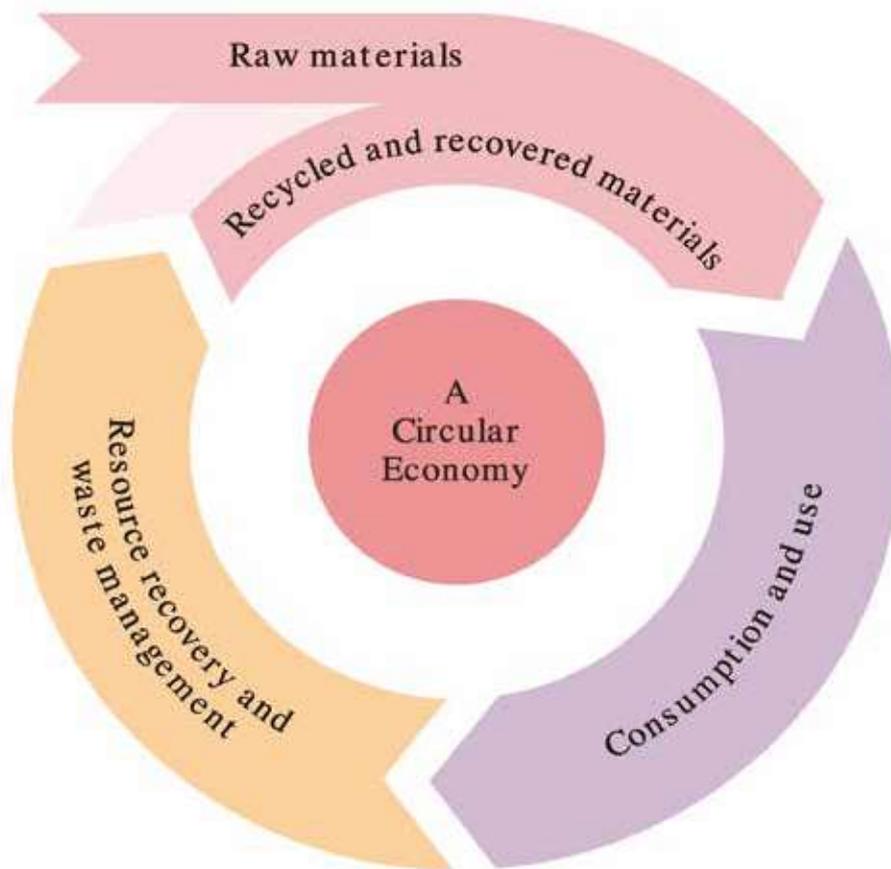


Figure 5: Image from 'Resources and waste strategy: at a glance'.²²

Medicines account for 25% of emissions overall in the NHS.¹² Within hospitals, anaesthetic gases are a significant contributor to emissions as fluorinated gases. Some however are far bigger offenders than others and the NHS Standard Contract 2020/21 makes reference to this, recommending reducing use of desflurane in particular.¹⁶ Changing long standing clinical practice can sometimes prove difficult however. Devices designed to capture anaesthetic gases and nitrous oxide are now being marketed. Several NHS trusts have shown considerable commitment to improving in this area in offering anaesthetic sustainability fellowship roles.

Inhalers are another area to target both in primary and secondary care. Reducing the use of metered dose inhalers is estimated to have one of the biggest impacts in reducing carbon emissions from medicines, with clinicians being encouraged to transfer their patients to lower carbon inhalers such as dry powder inhalers where possible.¹²

The NHS estimates 6% of total emissions to come from food and catering.¹² Buying local seasonal food should be a high priority and NHS trusts should demand sustainable production and transportation from suppliers. Reducing waste is also critical. Some NHS trusts have already moved to address some of the issues, Newcastle Hospitals again a good example having won several sustainable food and catering awards, some of their efforts including

- 'Meat-free days' in restaurants
- Energy efficient refrigeration with around 50% energy and carbon savings
- Using anaerobic digesters for plate waste reducing the use of macerators with significant water savings
- Procurement of local, seasonal produce

Making changes within healthcare institutions can be more complex than in other workplaces. The 'triple bottom line' is a concept where decisions are made after considering the

financial, social and environmental impacts (Figure 6). Where there is benefit to all three areas, changes can usually be made swiftly. Some examples within the NHS might include prescribing oral medications over liquid forms, reducing use of desflurane as an anaesthetic, turning off lights and equipment after use, using the correct bin or ensuring that blood or radiological tests are requested as necessary and not simply to 'tick a box'.

When the proposed change does not satisfy all criteria however, decisions can be more complex. There may occasionally be ethical dilemmas where financial, social and/or environmental effects are at odds with one another. The Centre for Sustainable Healthcare is a particularly good resource which offers ideas and support for implementing more sustainable practice.¹⁷

INDIVIDUAL ACTIONS ARE ALSO VITAL

There are many emotions described by different people when discussing climate change, some of which might include anger, despair, guilt, grief, anxiety, depression and denial to name but a few. One frequent barrier to change is the feeling of helplessness leading people to be dismissive about the impact their own seemingly diminutive actions can have on a problem of such a vast scale. Overcoming negative feelings can be achieved however by action and a sense of purpose, creating meaningfulness and empowerment. All positive actions, however small, contribute to fighting climate change. Recognising the achievements of yourself and others and creating a green culture within the workplace and communities will reap huge rewards.

The NHS employs 1.3 million people within England alone.¹⁸ As a collective, that is a huge number. If every member of the NHS were to make just a few small changes, for example

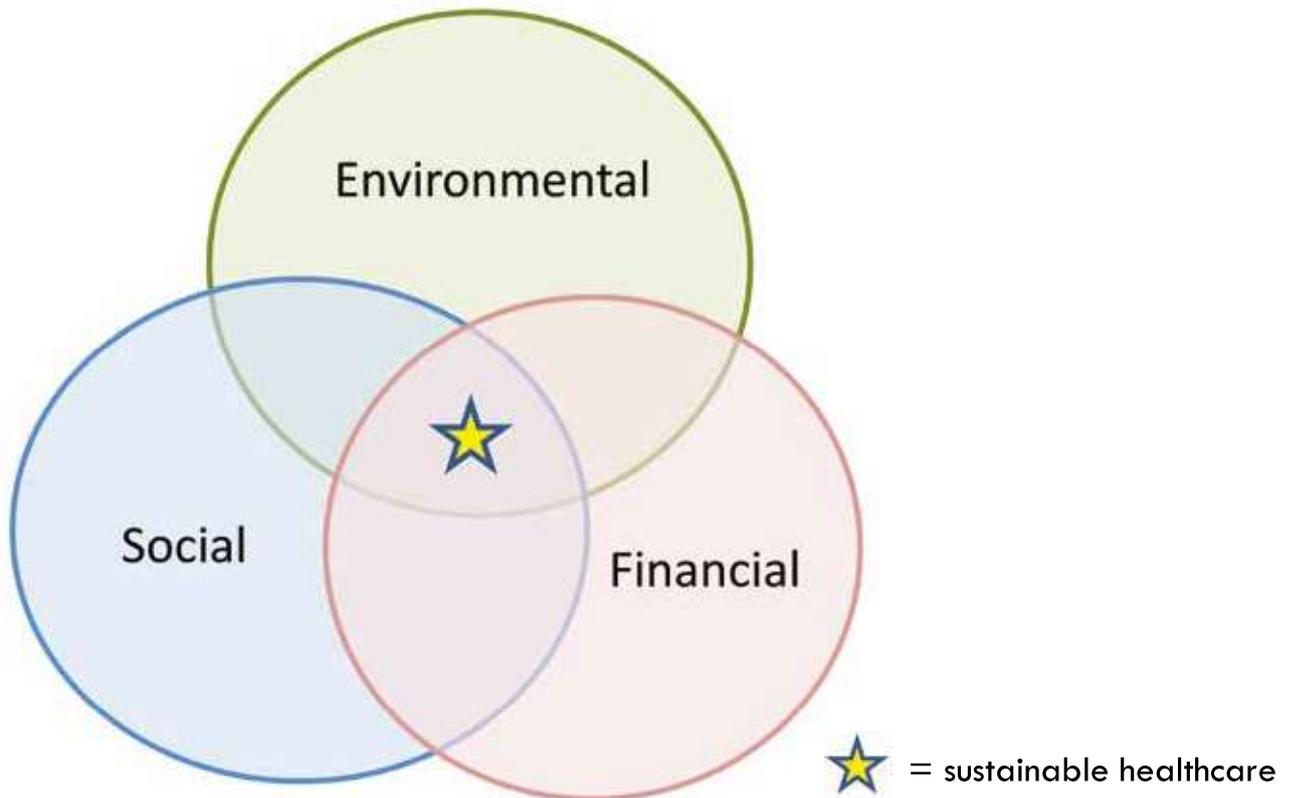


Figure 6

having one extra meat free day per week, refraining from commuting by car for one extra day per week or planting one tree each the collective impact would be significant. Carbon emissions for most individuals derive from the following areas:

- Energy to power homes
- Diet
- Travel
- Textiles
- Waste

There are some 'easy wins' here. Changing your electricity supply to 100% renewable is unlikely to impact your bills much, if at all, yet will reduce use of fossil fuels without a need to change lifestyle. Simple daily tasks such as boiling only the water you need, filling the washing machine/dishwasher fully and switching off lights when not required may seem small and inconsequential, but if the entire NHS workforce were to adopt these measures the impact would be considerable.

Walking and cycling more will not only lead to a healthier lifestyle but also save money and reduce emissions. Car sharing, public transport, park and ride facilities and electric vehicles can further reduce emissions. Reducing aviation is another area to target.

The textile industry is a huge contributor to climate change, perhaps unbeknown to many consumers. The consumer lifestyle we have adopted has led to fast fashion with little regard for sustainability and huge volumes of waste – a very obvious example of a linear economy. It is estimated that the textiles industry contributes 2-8% of global emissions per year, more than aviation and shipping combined.¹⁹ Furthermore, textile dyes are the second largest polluter of water worldwide and account for around 9% of microplastics in the ocean.¹⁹ The water consumption particularly for cotton is huge – it reportedly takes 9000 litres to make a pair of jeans.¹⁹ As consumers we can make choices to influence change. The most effective is to reduce consumption – do you really need a new pair of jeans? Buying second hand is another option. Failing that, explore sustainable choices. There are businesses manufacturing clothes using recycled plastics, others offering free lifelong repairs on garments, others using organic processes rather than fertilisers.

SUMMARY

Climate change is already happening; we still have some time to limit the effects but we need to act now. The knowledge and technology is available and we are increasingly seeing sustainability factoring into decision making. But the pace of change is too slow. The health impacts will be massive and it is the responsibility of all healthcare institutions and healthcare workers to commit to the fight.

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REFERENCES

1. Intergovernmental Panel on Climate Change. AR5 climate change 2014: Mitigation of climate change. Available from: <https://www.ipcc.ch/report/ar5/wg3/> (accessed 20 October 2021)
2. National Aeronautics and Space Administration (NASA), Goddard Institute for Space Studies (GISS) Surface Temperature Analysis (GISTEMP v4). Available from: <https://data.giss.nasa.gov/> (accessed 20 October 2021)
3. Berkeley Earth. Global temperature report for 2020. Available from: <http://berkeleyearth.org/> (accessed 20 October 2021)
4. Osborn TJ, Jones PD, Lister DH et al. Land surface air temperature variations across the globe updated to 2019: the CRUTEM5 dataset. *JGR Atmospheres*. 2020;126, e2019JD032352. Available from: <https://doi.org/10.1029/2019JD032352>
5. NOAA National Centres for Environmental Information, State of the climate: Global climate report for 2020. Available from: <https://www.ncdc.noaa.gov/sotc/global/202013> (accessed 20 October 2021)
6. United Nations Climate Change. Paris Agreement. Available from: <https://unfccc.int> (accessed 20 October 2021)
7. Intergovernmental Panel on Climate Change (IPCC). Sixth Assessment Report (AR6) Climate change 2021. Available from: <https://www.ipcc.ch/report/sixth-assessment-report-cycle/> (accessed 20 October 2021)
8. Intergovernmental Panel on Climate Change (IPCC). Global warming of 1.5°C. 2018. Available from: <https://www.ipcc.ch/sr15/> (accessed 20 October 2021)
9. Whitmee S, Haines A, Beyrer C, et al. Safeguarding human health in the Anthropocene epoch: report of The Rockefeller Foundation – Lancet Commission on planetary health. *Lancet* 2015; 386:1973-2028. Available from: [https://doi.org/10.1016/S0140-6736\(15\)60901-1](https://doi.org/10.1016/S0140-6736(15)60901-1)
10. World Health Organisation. Climate change. Available from: https://www.who.int/health-topics/climate-change#tab=tab_1 (accessed 20 October 2021)
11. General Medical Council. Outcomes for Graduates. 2020. Available from: <https://www.gmc-uk.org/education/standards-guidance-and-curricula/standards-and-outcomes/outcomes-for-graduates> (accessed 20 October 2021)
12. NHS England. Delivering a 'Net-Zero' National Health Service. 2020. Available from: <https://www.england.nhs.uk/greenernhs/a-net-zero-nhs/> (accessed 20 October 2021)
13. The NHS Long Term Plan. 2019. Available from: <https://www.longtermplan.nhs.uk> (accessed 20 October 2021)
14. Department of Health and Social Care. Health Infrastructure Plan. 2019. Available from: <https://www.gov.uk/government/publications/health-infrastructure-plan> (accessed 20 October 2021)
15. Great Ormond Street Hospital for Children. The gloves are off! 2019. Available from: www.gosh.nhs.uk/news/gloves-are-off/ (accessed 20 October 2021)
16. 2020/21 NHS Standard Contract. Available from: <https://www.england.nhs.uk/nhs-standard-contract/> (accessed 20 October 2021)
17. Centre for Sustainable Healthcare. Website available at: <https://sustainablehealthcare.org.uk> (accessed 25 October 2021)
18. NHS Digital. NHS workforce statistics June 2021. Available from: <https://digital.nhs.uk/data-and-information/areas-of-interest/workforce> (accessed 20 October 2021)
19. United Nations Environment Programme. Putting the brakes on fast fashion. 2018. Available from: <https://www.unep.org/news-and-stories/story/putting-brakes-fast-fashion> (accessed 20 October 2021)
20. Climate.gov. Climate change: atmospheric carbon dioxide. Available from: <https://www.climate.gov/news-features/understanding-climate/climate-change-atmospheric-carbon-dioxide> (accessed 25 October 2021)
21. Climateactiontracker.org. Climate summit momentum: Paris commitments improved warming estimate to 2.4°C. Available from: https://climateactiontracker.org/documents/853/CAT_2021-05-04_Briefing_Global-Update_Climate-Summit-Momentum.pdf (accessed 25 October 2021)
22. Department for Environment, Food & Rural Affairs. Resources and waste strategy: at a glance. 2018. Available from: <https://www.gov.uk/government/publications/resources-and-waste-strategy-for-england/resources-and-waste-strategy-at-a-glance> (accessed 25 October 2021)