TheMK GreenPlan

NHS
Milton Keynes University Hospital
NHS Foundation Trust

There is no planet B

#MKUHGreenerFuture

We do not inherit the earth from our ancestors, we borrow it from our children

Are you concerned about Climate change?

Do you wish to know about the progress MKUH is making on sustainability and reducing waste?

This booklet gives an overview of the staff survey results from Winter 2021 and what topics staff wished they had more information about to make informed choices.

A small group, consisting of medical students and trainee doctors, in paediatrics designed a staff survey to explore the attitudes of healthcare workers from MKUH towards climate change and sustainability.

The NHS net zero plan can be found here: Greener NHS » Delivering a net zero NHS (england.nhs.uk).

We designed a 24-point questionnaire that was distributed to all MKUH staff over two months in Winter 2021. We received 101 responses, from a range of professions including medical students, Doctors, Nurses, Allied Health Professionals, and administrative staff. Demographics showed F:M=72:25 and age ranges between 20-70 years.

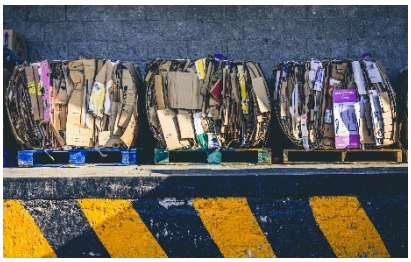
Dr Victoria Holloway
Dr Neha Chaudhary
Dr Jacqueline Mbabazi
Dr Rosie Anderson
Ms Victoria Khakua, UBMS Student
Ms Aamena Patel, UBMS Student

Results

Climate Change

90% of staff are concerned about climate change. 85% make choices based on climate change daily or weekly. 82% felt NHS contributes to climate change but only 22% felt the NHS was proactively trying to reduce carbon emissions and only 13% said NHS helped them make greener choices.

NHS Waste



63% felt that the NHS is wasteful in its resources and 32% were unsure. The five biggest factors causing emissions for the NHS were named as: energy supply, pharmaceuticals, waste disposal, staff and patient travel, and procurement of goods. NHS wastage made staff feel frustrated, sad, guilty, and angry.

When asked to name any NHS initiatives, staff mentioned cycle to work schemes, solar panels, and recycling. 25% of staff were unaware of any NHS initiatives.

Education on Climate change

82% of staff said they did not have enough training on carbon emissions and 85% would like more information on climate change. 79% said they would be more conscious of the environment if they had more information on climate change.

When asked the different ways information could be delivered, the preferred options were at induction, mandatory training, elearning modules, posters/emails and having a designated climate change champion in each department.

The survey results demonstrate that most MKUH staff are concerned about climate change and NHS waste. Many staff are unaware of NHS initiatives and feel less empowered to make greener choices at work.

Following the survey, our team has written this booklet on the five topics staff wished to have more information on:

1. How to calculate carbon footprint
2. Waste in the NHS
3. Pharmaceuticals in the NHS
4. Energy efficiency
5. Transport

If you wish to have a copy of the detailed results or if you have any suggestions please contact Dr Jyothi Srinivas, Paediatric Consultant by email jyothi.srinivas@mkuh.nhs.uk

TheMK GreenPlan

NHS
Milton Keynes University Hospital
NHS Foundation Trust

Renewable energy

#MKUHGreenerFuture

Pros

The International Renewable Energy Agency (IRENA) calculated that renewable energy, coupled with energy efficient gains, can provide 90% of the CO_2 emissions reductions needed by 2050.

Renewable energy refers to energy that occurs naturally and repeatedly in the environment. It can be from harvesting natural energy sources such as waves, wind, solar energy, or geothermal heat from the ground. Bioenergy is another renewable energy that refers to energy from organic material such as wood, straw, dedicated energy crops, sewage sludge and animal litter. It can be Biomass which can be used to make biofuel from plants, or pellets to burn for heat generation.

Organic fuel sources can also be found in by-products from manufacturing and other processes. Combusting biomass fuels such as wood, straw, or energy crops (for example, willow coppice or specific types of grasses) to raise heat or steam for space or process heating is currently one of the most cost-effective applications for biomass from a cost-of-carbon point of view.

Anaerobic Digestion (AD) is another method for converting biomass. It is a process in which bacteria break down organic material to produce a methane-rich biogas, which can be combusted to generate electricity and heat. The organic material used may include industrial wastewater, manure, garden waste and organic food residues such as vegetable peelings. AD brings multiple benefits and is increasingly being used to generate renewable energy from waste. In addition to biogas, the by-product of AD is a material called digestate. This can be used as fertiliser, and therefore also has a value (Trust, 2018). It is anticipated that may be able to form a mechanism of carbon capture in the future, although this has not been proven.

Nuclear energy is a carbon free energy source, which although isn’t renewable, is seen as a green energy source.

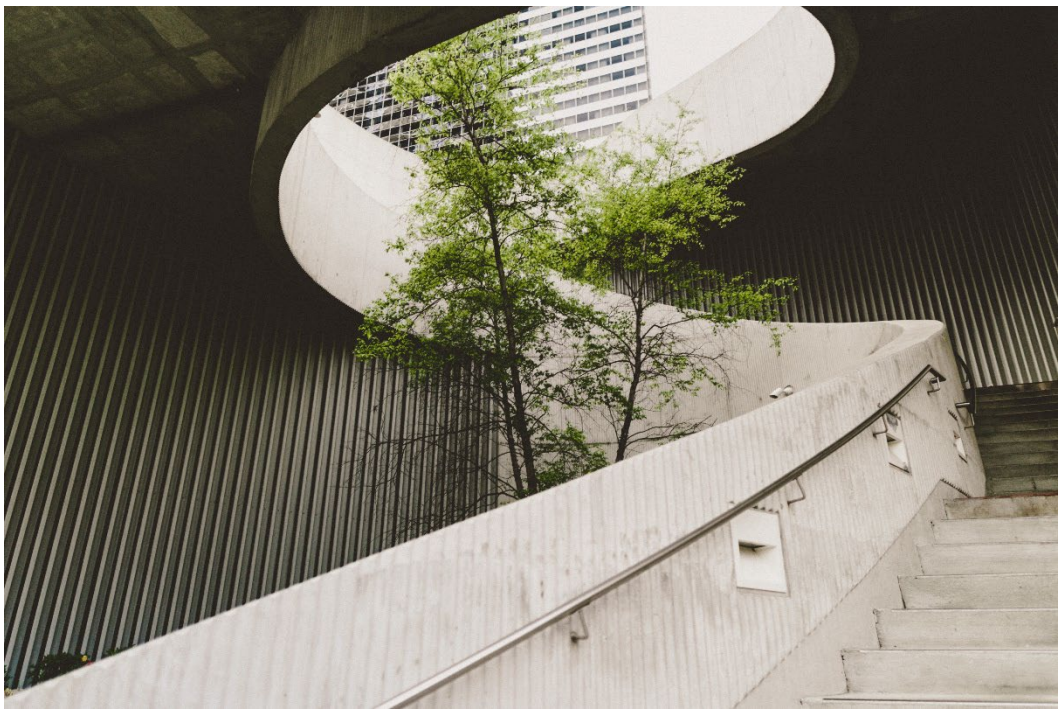
Cons

There has been the argument that the energy needed to construct renewable energy plants negates the benefits, for example Chinese factories making solar panels are often coal powered. However, fossil fuel energy production is also consuming energy through extraction, transport, and methane leaks. The indirect energy uses of renewable technologies will shift over time through advances in manufacturing, logistics and the evolution of global electricity supplies.

A recent paper published in Nature calculated the “carbon debt” of production of energy versus its output. It found that 11% of the energy generated by coal-fired power stations is offset by the energy to build the plant and supply the fuel. Nuclear energy offsets only 5% of its production, wind 2% and solar 4% of its energy generated. (al., 2017)

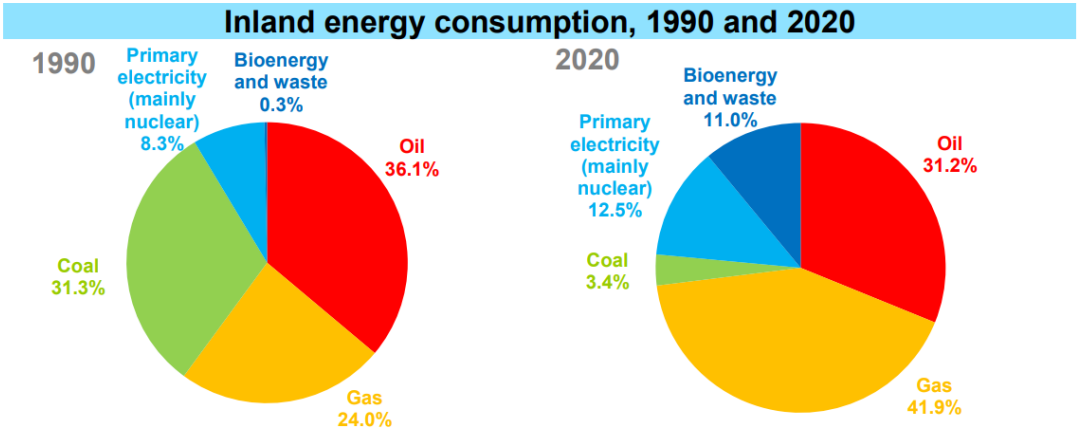
Biomass fuels are replaceable and while they liberate CO_2 when they are burnt, this is generally the same amount of CO_2 that was taken up when the biomass grew, so they are carbon neutral. There is, however, an emissions factor assigned to biomass, accounting for CO_2 expended in production and transportation (Trust, 2018).

While bioenergy can be sourced from wastes at a low scale (Pour et al., 2018), large-scale deployment of BECCS (bioenergy with carbon capture and storage) usually relies on second-generation energy crops and wood from managed forestry. We find the impact on agricultural commodity prices from the land use impacts of BECCS, which has been the largest concern about BECCS, to in fact be quite limited. Compared to the BAU scenario, meeting a 2°C or 1.5°C policy with BECCS only increases global food, livestock, and crop prices by less than 5% by 2100.



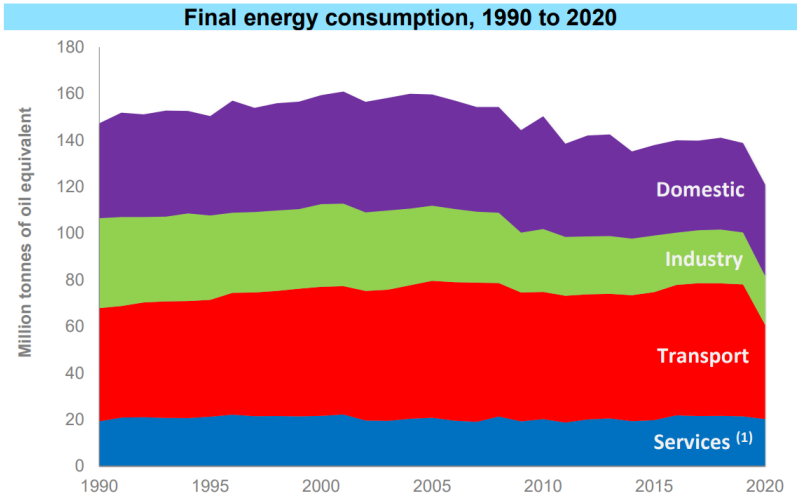
Energy Consumption in the UK

The energy consumed has changed its profile over the last 30 years with increasing low carbon and renewable energy sources:

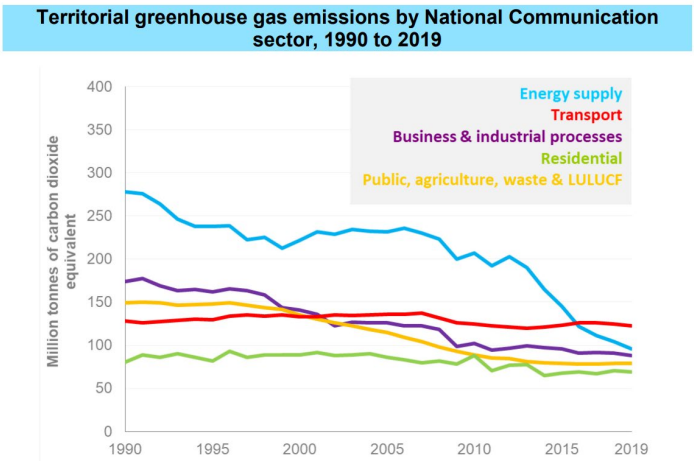


Between April and June 2020, there was a record 67-day period with no coal used in Great Britain, the longest since the 19th century. There was no coal fired electricity on the GB grid for a further 55 days from 18 June.

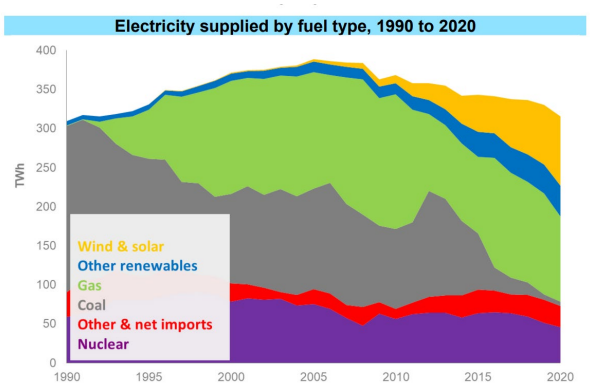
Energy is used by different sectors by varying amounts:



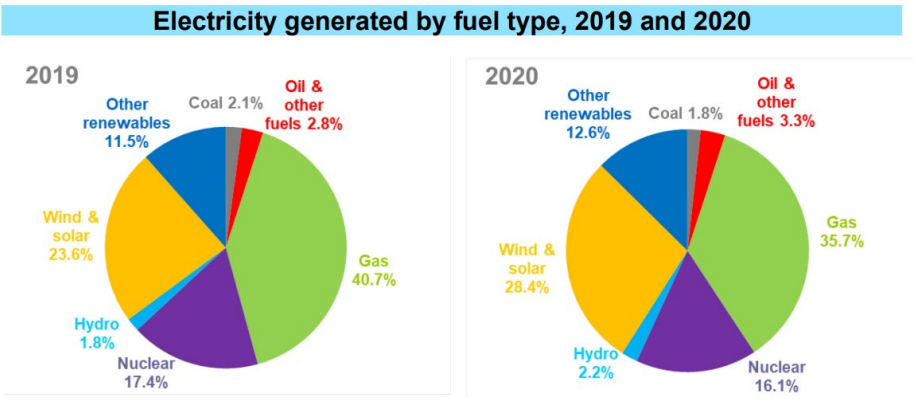
The greater reduction in energy consumption in 2020 was due to the pandemic restrictions. As covered in the carbon footprint chapter, differing energies produce differing carbon and greenhouse gases, thus it stands to reason that not only the amount of energy consumed but also the type of energy consumed affects the final contribution of polutants per sector:



Energy supply has dramatically reduced its emissions by changing the sources of energy:



Renewable electricity accounted for a record 43.1% of electricity generated in the UK during 2020, more than 6 percentage points higher than in 2019.



Energy consumption by the NHS

NHS England uses £500 million worth of energy a year. The energy used by the NHS in the UK produces four million tonnes of CO_2 and accounts for 22% of the NHS's carbon footprint. 2.31 million tonnes of this CO_2 is through electricity and the remainder through space and hot water heating. BRE Group Services calculates that we could reduce this by 25% using more efficient design of the NHS estate.

The general principles outlined are:

1. Be lean - turn things off, turn down thermostats, reduce the amount of energy needed by insulation. 30% of energy is used for ventilation and 25% for lighting.
2. Be green - source renewable energy.
3. Be keen - measure, record and analyse energy use to continuously learn. (Group, n.d.)

The Department of Health has published a thorough memorandum on how to achieve this as part of EnCO_2de 2015. It explains that electricity demand by the NHS has increased due to growth in use of IT, medical equipment, and air conditioning.

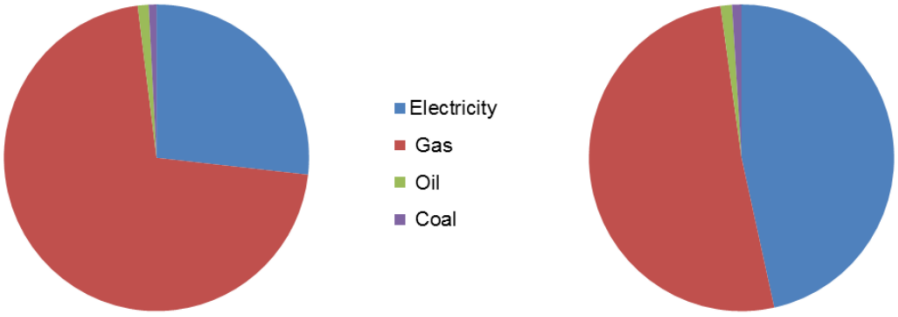


Figure 6 The pie chart on the left presents the total energy consumption for healthcare facilities in England in 2012/13, by fuel type, based on utility bills; the pie chart on the right presents the total carbon emissions from healthcare facilities in England in 2012/13, by fuel type. The 2013 conversion factors for carbon emission are taken from the Carbon Trust.

The energy consumption is greatest in acute hospitals, operating theatres and in laboratories.

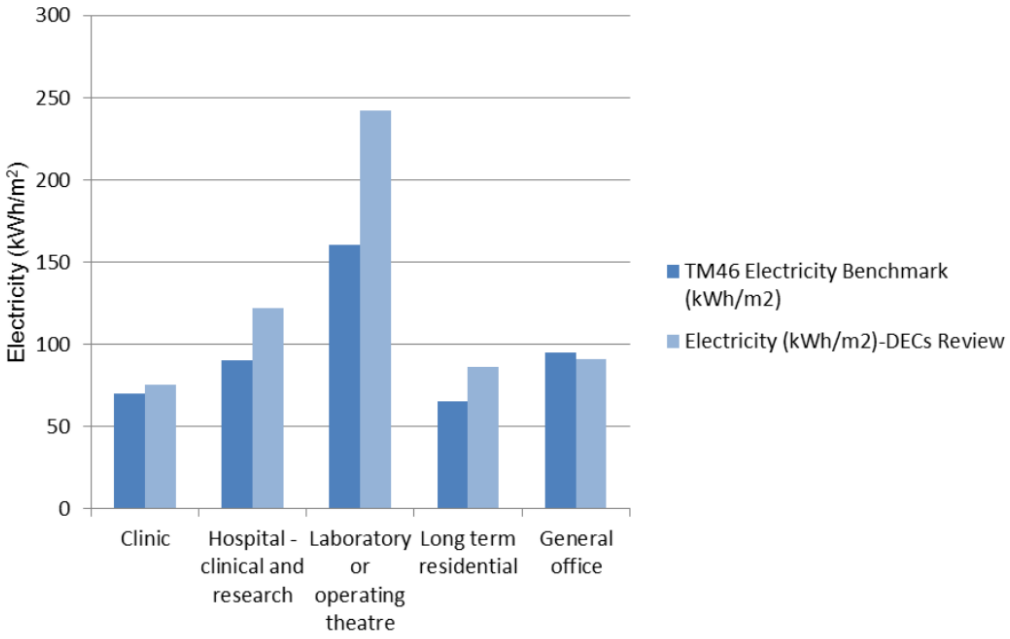


Figure 11 Comparison between theTM46 electricity benchmarks and the average of the medians for buildings in the healthcare sector according to DECs review. Figures based on CIBSE TM46 and An Analysis of Display Energy Certificates for Public Buildings, 2008 to 2012

This is similar to the heating requirement, except that long term residential consumes significantly more heat energy rather than electricity.

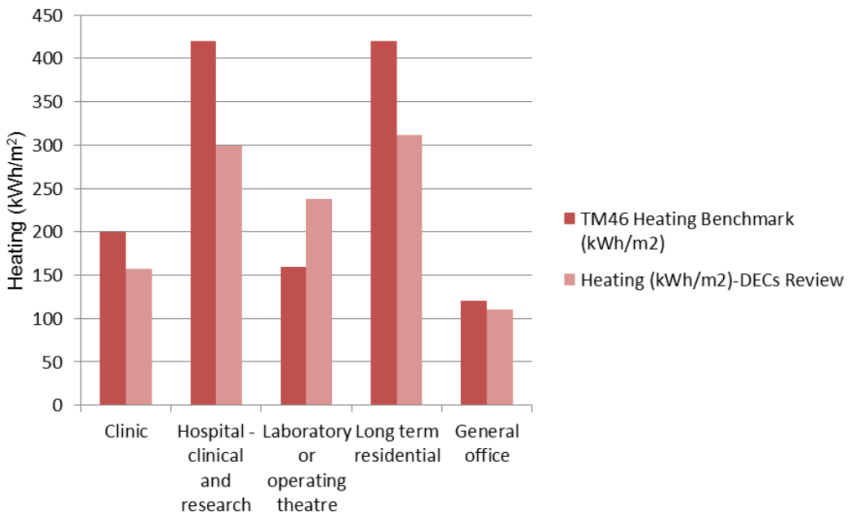


Figure 12 Comparison between theTM46 heating benchmarks and the average of the medians for buildings in the healthcare sector according to DECs review. Figures based on CIBSE TM46 and An Analysis of Display Energy Certificates for Public Buildings, 2008 to 2012

Some of the suggested efficiencies are summarised below:

1. Procurement (60% NHS carbon footprint) practices using systems that have evaluated environmental costs such as the Clinical Commissioning Group.

2. Maintenance contracts that ensure annual rigorous checks of systems and timings.

3. Instead of like-for-like replacements, new and more sustainable alternatives should be purchased.

4. Altering the building fabric to reduce excessive heat loss in the winter and overheating in the summer.

5. Optimising heating strategies and minimising losses.

6. Combined heat and power generators that produce electricity and then recover the waste heat from the generation process for use in space or water heating. Although these often use natural gas, this has a lower carbon intensity than mains electricity currently.

7. Upgrade lighting to reduce the energy use and internal heat gains, therefore also reducing the need for mechanical cooling during the summer months. The aims of energy efficient lighting are to maximise natural daylight, to avoid excessive illuminance, to incorporate efficient luminaires and components and to use effective lighting controls.

8. Upgrade controls to allow greater flexibility in the systems of operations, temperature control, fault reporting.

9. Installing renewable and low carbon energy technologies.

Energy consumption by Milton Keynes University Hospital

Initiatives by MKUH to become more energy efficient:

1. Two Combined Heat and Power (CHP) plants.
2. Biomass boiler serving Ward 22.
3. Electric tea boilers in kitchenettes.
4. Air source heat pump serving the Cancer Centre and air handling units are fitted with heating and chiller coils to provide heating and cooling.
5. Changed / changing fluorescent lights for LEDs.
6. Replaced most of the roofs on-site, with new insulation installed beneath to retain heat.
7. Replaced windows where possible with new double-glazed units.
8. Gas low temperature hot water boilers serving heating and hot water.
9. Solar energy which has generated 57.94MWh which corresponds to 49 tonnes of C02.
10. Switched to a 100% renewable energy tariff.

TheMK GreenPlan

NHS
Milton Keynes University Hospital
NHS Foundation Trust

Carbon Footprint in the NHS

#MKUHGreenerFuture

What is carbon footprint?

Carbon footprint is the term used to describe the total amount of greenhouse gases, including carbon dioxide (CO_2), emitted by a person, organisation or country.

The average CO_2 emissions per capita globally is 4.79 tons, with total global emissions of 35 billion tons[1]. This value has risen exponentially over the last 100 years - global CO_2 emissions were at approximately 3.5 billion tons in 1920[1].

With no intervention, this trend will continue, leading to catastrophic rises in global temperature, rises in sea levels, severe weather events, crop failures and famine. These changes can already be seen today with 9 out of the 10 of the hottest years on record occurring in the last decade[2].

What is the world doing?

The Paris Agreement, signed in 2015, is a global commitment to the goal of limiting global warming by two degrees (but preferably 1.5) compared to the pre-industrial revolution era, and reducing emissions to as close to zero as possible by the middle of this century. The small number of remaining emissions will be absorbed through forests and new “carbon capture” technologies, giving “Net Zero” global emissions.

Current evidence shows that the world is currently on track for 2.4 degrees which is an improvement over the last six years, but still not meeting targets[3]. New pledges at the recent COP26 climate summit will increase the pace of implementing the Paris Agreement, however significant emission cuts are still needed to limit global warming to 1.5 degrees[4].

The Covid-19 pandemic has had a significant impact on the global carbon footprint over the last two years. With an increase in working from home and a reduction in travel of all forms, the UK’s carbon footprint decreased by 17% in 2020[5]. On the other hand, increased use of single-use PPE and single-use plastics has generated more waste. Data is not yet available to quantify the net impact of these effects.

What is the UK doing?

The UK's "Build Back Better" Net Zero strategy aims to combine economic re-growth coming out of the pandemic, with "The Green Industrial Revolution" - innovation, research, new jobs, cutting emissions and becoming a global leader in tackling climate change. Key elements of this plan are[6]:

- Fully decarbonise our power system by 2035
- Advancing offshore wind - 40GW by 2030
- Electricity as the primary source of energy, with low carbon alternatives such as hydrogen and biofuels
- All new heating appliances to be low carbon from 2035
- Ban on sale of diesel and petrol vehicles by 2030
- Zero emissions rail network by 2050
- Kickstart zero emissions international travel
- Carbon capture usage and storage clusters by 2030
- Increasing woodland planting rates to 30,000 hectares per year
- New national parks and areas of outstanding natural beauty

What is the NHS doing?

The climate emergency is intrinsically linked to healthcare. Reaching the goals of the Paris Climate Change Agreement could see 5,700 lives saved every year from improved air quality[3] and up to a third of new asthma cases could be prevented[6].

The driving forces behind climate change are the same drivers of health inequalities, both must be addressed in order to move forward.

The NHS, as the largest employer in the country, is responsible for 4% of the nation's carbon emissions[7] and 3.5% of all road travel in England relates to the NHS[8].

In October 2020, the NHS announced its ambition to be the world's first net zero national health service by 2040, with an 80% reduction by 2028-2032. Emissions influenced by the NHS (NHS Carbon Footprint Plus) aim to be at net zero by 2045, with an 80% reduction by 2036-2039.

NHS emissions have already been reduced by 62% since 1990 (from 16.2 to 6.1 $MtCO_{2e}$), and the NHS carbon footprint has come down by 26% (from 33.8 to 24.9 $MtCO_{2e}$). However there is still a significant challenge ahead to get to net zero, we still need to remove 6.1 $MtCO_{2e}$ - which is equivalent to the emissions of the entirety of Croatia[8].

The greatest areas of opportunity for change are in the following:

Estates and facilities = 15% of total emissions

- New hospitals built with low carbon materials and upgrade current hospital buildings.
- 100% LED lighting (estimated saving of £3 billion over next 30 years).[8]
- Adaptations to air conditioning, heating (heat pumps) and ventilation with intelligent real-time monitoring and control (estimated saving of £250 million per year)[8]. This cost will overlap with cost of regular maintenance.
- On-site solar panels / other renewable energy sources, e.g., fuel cells, biomass boilers, hydrogen power.
- Improved recycling facilities and waste management.
- Reusable sharps bins.
- Reusing crutches, wheelchairs, support frames with 40% of all walking aids refurbished in the next five years.
- Fixing rather than replacing broken equipment.

Travel and Transport = 14% of total emissions

- Transitioning all NHS vehicles to low, ultra-low or zero emissions (90% by 2028).
- Electric vehicle charging infrastructure and incentivise staff.
- Enabling active forms of travel including having the provision of electric bikes and storage, car park priority for carpooling which could save 461 ktCO2e/yr.[8]

Supply Chain - not directly controlled by the NHS but can be influenced

- More efficient use of supplies, low carbon substitutions and product innovation.
- Refurbishing and reusing single use devices.
- 10% reduction in clinical single-use plastics in the short term, eventually saving a total of 224 ktCO2e.[8]
- Switch to 100% recycled content paper.
- Embedding sustainability into decision making.
- Life cycle assessments of high-volume products, especially single use, consider reusable alternatives.
- Pooling NHS purchasing power to enable sustainable procurement.
- Before 2030, the NHS will no longer purchase from suppliers that do not meet our commitment to net zero.

Food and catering = 6% of total emissions

- New standards for healthcare food - more sustainable, healthy, local food and limiting waste.
- Increasing plant-based food and drink options.
- Carbon labelling of food products to empower the consumer.
- Reducing single-use plastics.

Medicines = 25% of total emissions - (20% in production and transport, and 5% at the point of use, from anaesthetic gases and metered dose inhalers)

- Optimising prescribing.
- Substituting low carbon alternatives in anaesthesia (desflurane to sevoflurane) and reuse of gases - could reduce the carbon footprint of anaesthetic gases by 40%. The emissions from one bottle of desflurane are equal to burning 440kg of coal.[8]
- Substituting for dry powder inhalers - a 30% uptake would result in a reduction of 374 $ktCO_{2e}$/yr.[8]
- Improvements in production and waste processes.

New service model

- Optimising location of care, making it closer to home.
- Digitally enabling primary and outpatient care.
- Reducing unnecessary intervention.
- Combining several treatments or diagnostic services into a single visit. This could avoid 8.5million km of unnecessary travel per year, saving 1.7$ktCO_{2e}$/yr.[8]

Illness prevention and health inequalities

- Earlier and quicker testing, detection and intervention in cancer and community diagnostic hubs.
- Tackle wider determinants of health, i.e., education, employment, income.
- Improved shared decision-making.
- Empowering people to have more control over their health, increasing focus on population health.

Digital transformation (Rapidly accelerated by the Covid-19 pandemic)

- Remote consultations.
- App based health sensing e.g., Smart Inhalers.
- Moving away from paper altogether.
- “Smart hospitals” - linking buildings to patient flow.
- Reducing video/scan resolution to lower energy requirements to store.
- Ensuring data companies are minimising their own environmental impact.

Building capability in all staff

- Support staff in sustainable development.
- Tailored induction module on link between healthcare and climate change as well as interventions that can be taken.
- Introduction of sustainable healthcare into curricula.
- **Supporting staff resilience.**

Offsetting

- Planting trees, green spaces

What is Milton Keynes University Hospital doing?

Milton Keynes University Hospital (MKUH) has set itself the target of net zero by 2030. Our “Green Plan” relates to not just the Trust, but to its impact on the local community, as one of the largest employers in the area. It will encompass targets to reach net zero, to improve biodiversity and wellness, and to improve sustainable use of resources.

This includes:

- 2500 solar panels installed across the hospital, producing 8% of our total electricity needs, with plans to establish another 800 by the end of summer 2022.
- Improved roofing and insulation.
- LED and motion sensor lighting.
- All hospital electricity supplied by a renewable provider.
- Improving recycling - glass, cardboard and dry mixed recycling is reprocessed as construction materials. Takeaway containers switched to vegware.
- Food service uses real time information and portion control, reducing waste.
- Lower use of volatile anaesthetic gases, reviewing inhaler prescription and disposal.
- Identifying appropriate disposal of waste medicines and recycling blister packaging.
- 30 electric vehicle charging points.
- 25% of outpatient consultations held virtually.
- Investment in staff wellbeing.
- Biodiversity - ringfencing the green space across the site, maintaining garden areas with electrically powered equipment.

What you can do

Net zero is the responsibility of **all staff**. Simple things that can be done on an individual level include:

- Switching off lights when not needed.
- Turning off equipment when not required.
- Turning off the tap.
- Closing doors when you leave a room.
- Considering whether single-use items are needed before opening.
- Reuse or repair rather than throwing away.
- Walking or cycling to work.
- Opting for carpooling or public transport.

Just the simple steps of turning off equipment when not in use, switching off lights and closing doors could save the NHS £45 million and 200ktCO_{2e}/yr[8].

What next

Even with all this, there will still be residual carbon emissions. The NHS will continually look to reduce this, through research and innovation.

We need to adapt, aiming to continuously improve and further our goals. The work will never be finished, and plans will be constantly subject to change as technology evolves.

In the future there will be the need to secure negative emissions, for example using direct energy generation, bio-sequestration and carbon capture and storage.

Resources

- Green Impact for Health Toolkit
- Greener NHS dashboard
- Carbon Plan.org
- Nature.org - Calculate Your Carbon Footprint
- Our World in Data.org
- NICE's Asthma Patient Decision Aid

References

1. Ritchie, H. and Roser, M., 2020. *CO_2 and Greenhouse Gas Emissions*. Our World in Data. https://ourworldindata.org/co2-and-other-greenhouse-gas-emissions

2. Gov.uk. 2019. *PHE Heatwave Mortality Monitoring*. <https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/942646/PHE_heatwave_report_2019.pdf
3. UNFCCC. 2015. *Paris Agreement*. <https://unfccc.int/sites/default/files/english_paris_agreement.pdf
4. UN Climate Change Conference (COP26) at the SEC – Glasgow 2021. *COP26 Outcomes* <https://ukcop26.org/the-conference/cop26-outcomes/>
5. Le Quéré, C., Jackson, R., Jones, M. et al., 2020. Temporary reduction in daily global CO2 emissions during the COVID-19 forced confinement. *Nature Climate Change*, 10(7), pp.647-653.
6. Gov.uk. 2021. *Net Zero Strategy - Build Back Greener*. <https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1033990/net-zero-strategy-beis.pdf>
7. Khreis H, Cirach M, Mueller N, de Hoogh K, Hoek G, Nieuwenhuijsen MJ, et al. Outdoor air pollution and the burden of childhood asthma across Europe. Eur Respir J 2019; 56(3).
8. NHS England, 2020. *» NHS becomes the world's first national health system to commit to become 'carbon net zero', backed by clear deliverables and milestones*. England.nhs.uk. <https://www.england.nhs.uk/2020/10/nhs-becomes-the-worlds-national-health-system-to-commit-to-become-carbon-net-zero-backed-by-clear-deliverables-and-milestones/#:~:text=%E2%80%9CThe%20NHS%20has%20already%20made,major%20part%20of%20the%20solution.%E2%80%9D>
9. England.nhs.uk. 2020. *Delivering A Net Zero National Health Service*. <https://www.england.nhs.uk/greenernhs/wp-content/uploads/sites/51/2020/10/delivering-a-net-zero-national-health-service.pdf

TheMK GreenPlan

NHS
Milton Keynes University Hospital
NHS Foundation Trust

Environmental sustainability and the carbon emissions of pharmaceuticals

The MKUH Story

#MKUHGreenerFuture

Climate change is the most significant health threat modern society has ever faced[1] and it affects all sectors of society domestically and globally. The consequences of climate change, such as rising sea-levels, changes in precipitation resulting in flooding and drought, heatwaves, more intense hurricanes and storms, and degraded air quality, will affect human health and environmental determinants of health.

Healthcare utilisation creates greenhouse gas emissions, which exacerbate acute and chronic health conditions, which leads to a further need for the use of healthcare services. In the UK, the healthcare's carbon footprint consisted of approximately 3% of the total CO_2 equivalent emissions in 2010[2], 10% of the USA's total CO_2 emissions in 2016[3], and 7% of Australia's total CO_2 emissions in 2014–15[4].

There are three major pharmaceutical impacts on the environment:

- The chemical effects of the active pharmaceutical ingredients (APIs),
- The large carbon footprint involved in manufacturing and distribution,
- Pharmaceutical waste.

Environmental sustainability measures in medicines management aim to target these three areas to reduce their contribution to the carbon footprint.

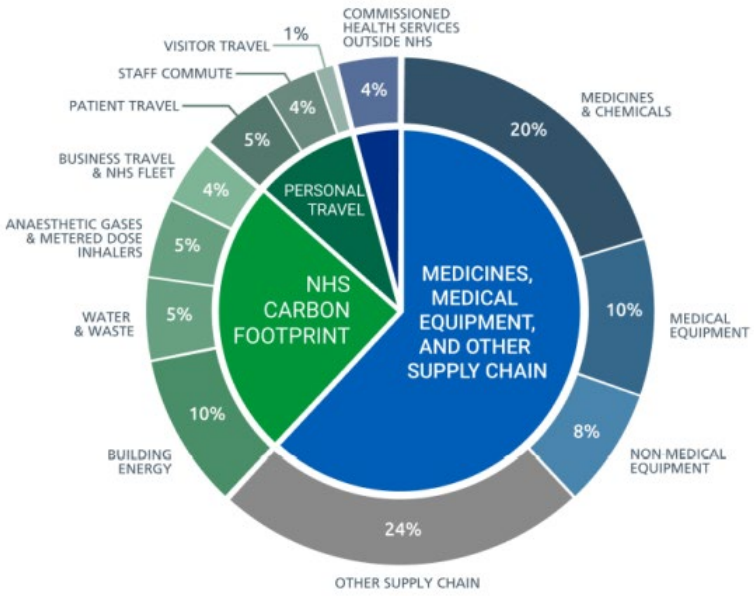
The most common intervention in healthcare is prescribing medicines and this accounts for 25% of carbon emissions in the NHS.[1] RPS published a climate declaration on September 2021 and this policy aims to reduce the impact medicines has on the environment.

Two clear and feasible targets emerge for the NHS net zero commitment: [2]

- for the emissions we control directly (the NHS Carbon Footprint), net zero by 2040, with an ambition to reach an 80% reduction by 2028 to 2032,
- for 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.

By working with our suppliers, we can ensure that all of them meet or exceed our commitment on net zero emissions before the end of the decade.

Figure 2: Sources of carbon emissions by proportion of NHS Carbon Footprint Plus



A small number of medicines account for a large portion of the emissions, and there is already a significant focus on two such groups – anaesthetic gases (2% of emissions) and inhalers (3% of emissions) – where emissions occur at the 'point of use'. The remaining 20% of emissions are primarily found in manufacturing and freight transport in the supply chain. [2]

Figure 10: Reducing emissions from inhalers and anaesthetic gases

Low carbon inhalers

Most of the emissions comes from the propellant in metered-dose inhalers (MDIs) used to deliver the medicine, rather than the medicine itself. MDI use in England alone is responsible for the equivalent of nearly one million tonnes of CO_2 per year.[6] The NHS Long Term Plan set targets to deliver significant and accelerated reductions in the total emissions by moving to lower carbon inhalers, such as dry powder inhalers (DPIs).[2]

Reduction will be possible by:

- significantly increasing the use of DPIs for those patients who it is appropriate for,
- increasing the frequency of greener disposal of used inhalers,
- supporting the innovation in and use of lower carbon propellants and alternatives.

The International Pharmaceutical Aerosol Consortium (IPAC) is co-ordinating a consortium of large pharmaceutical companies to develop a programme encouraging patients to return inhaler devices to pharmacies for green disposal. Two major pharmaceutical suppliers have committed to action on reducing the carbon impact of their MDIs and, from 2025, reformulating their inhalers so they can be used with low carbon propellants.

Anaesthetic gases

The NHS Long Term Plan committed to lowering the 2% of the NHS' carbon footprint from anaesthetic gases by 40%, by transforming anaesthetic practice. This requires efforts to shift from desflurane to lower carbon alternatives such as sevoflurane; effective capture, destruction, or reuse of these gases; and reduction in the atmospheric release from leftover nitrous gas canisters.

There has been a significant reduction in the use of anaesthetic gas since 2018, with monthly volumes of some volatiles falling by nearly 50%, saving 17kt CO_2e per year. With further clinical engagement, it could be feasible to reduce the use of desflurane to as little as 5% by volume, saving a further 23 ktCO2e per year.

The capture and destruction of nitrous oxide could cut over one-third of NHS anaesthetic emissions. This technology has been readily deployed in Sweden for some 16 years and could save an estimated 90kt CO_2 emissions if implemented across 132 high impact trusts in the NHS. Scaled across the entire health service, this could deliver up to a 75% reduction in nitrous emissions. College of Paramedics estimated that 30% of nitrous oxide is left in canisters after use. Recycling or reusing this is technically difficult, with new methods required to address the residual nitrous oxide.

Clinical waste management

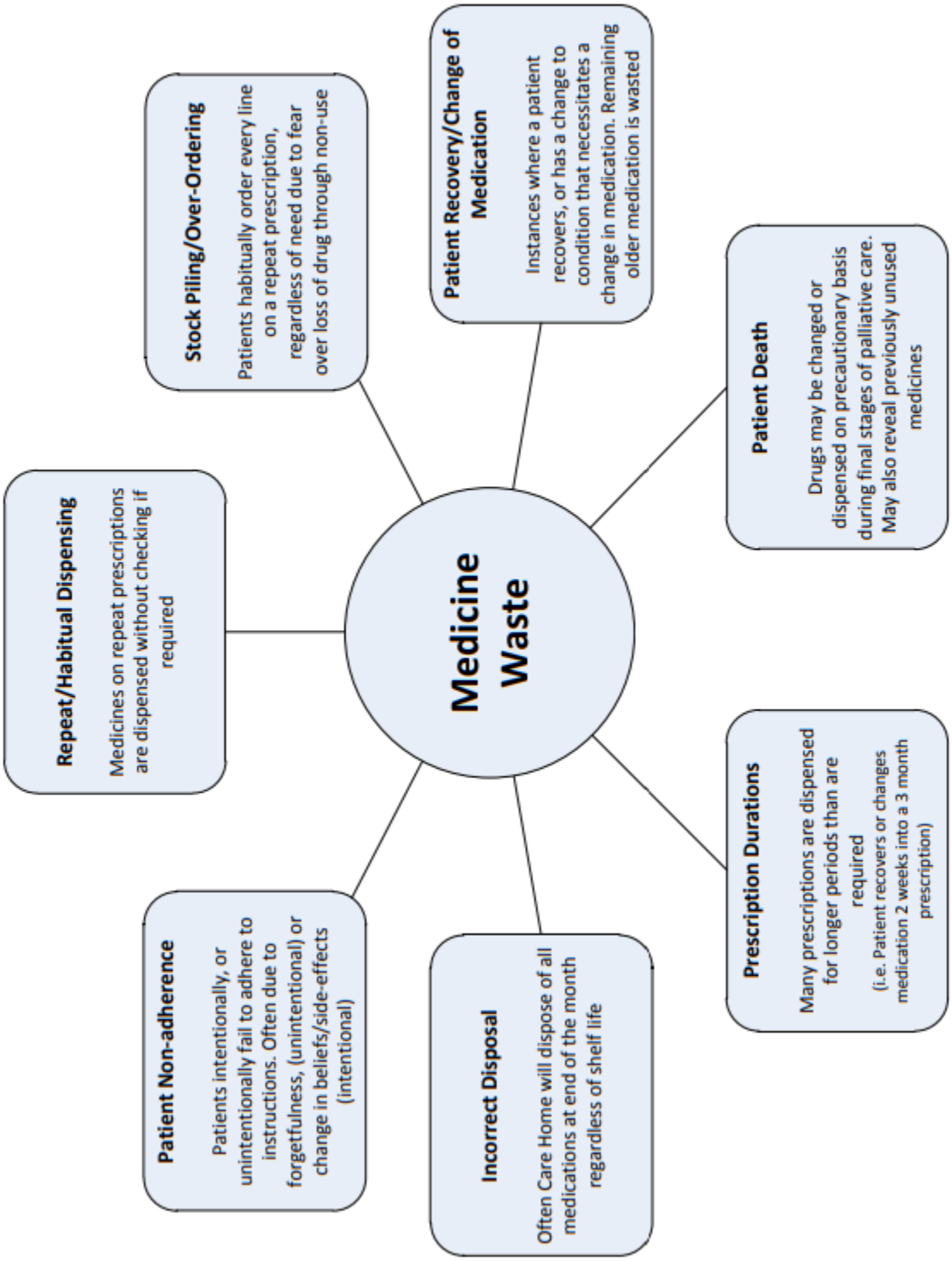
Clinical waste is any waste that consists wholly or partly of human tissue, blood or bodily fluids and excretions or is contaminated with biologically active pharmaceutical agents. Clinical waste management and correct classification of waste streams has many important benefits including cost efficiencies, reducing the impact of hazardous waste on the environment due to strict regulations and health and safety.

Segregating waste into the right stream is the key to cost-savings and low CO_2 emissions. Not only this, but all waste producers have a legal responsibility to ensure that waste is disposed of correctly, safely and in the most environmentally friendly manner possible.

Each year, it has been estimated that more than £300 million is wasted on unused or partially used medicines in the UK.[5] When advising patients to return medicines, pharmacists should ask them to return only the medicine and blister packs and recycle the cardboard and paper leaflets in their usual paper recycling.

Causes of medicine waste

MKUH is determined to reduce the impact pharmacological activities has on the environment and is taking steps to change this.



On-going projects

Several projects under the Green Plan are underway at MKUH. These include:

1. In paediatrics there is an audit being undertaken to understand what people (patients and clinicians know about the safe disposal of inhalers. This includes reviewing inhaler prescriptions and disposal as well as patient choice across the region.
2. In anaesthetics they are lowering the use of volatile anaesthetic gases
3. We are identifying how we return and appropriately dispose of waste medicines
4. We are introducing carbon alternate medicines e.g., tablets for children where suitable.

   For further information about our other initiatives to reduce our carbon emissions as part of our Green Plan, visit our website: https://www.mkuh.nhs.uk/about-us/green-plan

Clean measures by MKUH

Milton Keynes University Hospital NHS Foundation Trust in partnership with Tradebe has developed formal control systems for the safe disposal of waste from the organisation. The systems are designed to ensure we meet the requirements of the 'Safe Management of Healthcare Waste Guidance' from the Department of Health and the Trust's Waste Disposal Policy:

1. Use of biobins which can be recycled - cardboard bins with plastic liners.
2. Unused medications on inpatient wards are returned to Pharmacy for recirculation, this has saved the Trust approximately £55,000.
3. A sharpsmart proposal has been tabled to continue improving pharmaceutical waste management at MKUH. In the coming year we plan to shift to reusable ps bins throughout the organisation. This is estimated to save 27,592 single use containers from being manufactured thus saving 18.2 tonnes of single use plastics being produced and incinerated. This will also save 105.78 tonnes of CO_2 emissions and there is an estimated gross saving of £10,013 per annum for waste prevention compared to the existing disposal methods.

Challenges

Like most NHS Trusts across the UK, there are challenges along the path to net zero target. MKUH has identified two major areas:

- Recycling blister packs: there is still a risk of chemical contamination and there is a risk of patient confidentiality breach.
- Major waste from MKUH is PPE. This has increased since the pandemic and we need to find ways to minimise this.

References

1. Delivering-a-net-zero-national-health-service.pdf (england.nhs.uk) Accessed 20/2/22
2. Sustainable Development Unit. Carbon Hotspots Cambridge, UK: Sustainable Development Unit; 2014 [Available from: https://www.sduhealth.org.uk/areas-of-focus/carbon-hotspots.aspx.
3. Eckelman MJ, Sherman J. Environmental impacts of the US health care system and effects on public health. PloS one. 2016;11(6):e0157014. pmid:27280706
4. Malik A, Lenzen M, McAlister S, McGain F. The carbon footprint of Australian health care. The Lancet Planetary Health. 2018;2(1):e27–e35. pmid:29615206.
5. https://www.england.nhs.uk/wp-content/uploads/2015/06/pharmaceutical-waste-reduction.pdf Accessed 19/03/22
6. https://northeast.devonformularyguidance.nhs.uk/formulary/chapters/3.-respiratory/the-environmental-impact-of-inhalers. Accessed 19/03/22

TheMK GreenPlan

NHS
Milton Keynes University Hospital
NHS Foundation Trust

Inhaler Disposal

#MKUHGreenerFuture

In October 2020, the NHS announced its ambition to become the world's first healthcare system to commit to reaching net carbon zero. This commitment was made in response to the profound and growing threat to health posed by climate change.

The NHS is the largest employer in Britain and is responsible for around 4% of the nation's carbon emissions, with a carbon footprint of 18 million tonnes CO_2 per year. The NHS must play a major role in leading a reduction in carbon output whilst maintaining and improving health outcomes both nationally and locally.

A small number of medicines account for a large portion of the emissions, and there is already a significant focus on two such groups – anaesthetic gases (2% of emissions) and inhalers (3% of emissions) – where emissions occur at the 'point of use'. The use and safe disposal of inhalers in particular is a specific focus for the NHS in helping to reduce its carbon footprint over the next few years.

Focus on inhalers

The use of inhalers accounts for approximately 4.3% of the NHS' total carbon emissions. To put that into context, the number of tonnes of CO_2 emitted by inhalers alone in the UK is about the same as Costa Rica's annual emissions.

The Montreal protocol saw a phase out of chlorofluorocarbons (CFCs) that directly damage the ozone layer, but Meter Dose Inhalers (MDI) still contain a hydrofluorocarbon (HFC) propellant which is released unchanged into the atmosphere and acts as a potent greenhouse gas. In the UK we have a reliance on MDIs - they make up 70% of inhaler prescriptions which is higher than any other European country.

A very high proportion of inhalers go to landfill where any residual propellant gas inevitably leaks out into the atmosphere. The release of remaining propellant can account for up to 25% of the life cycle of CO_2 from an inhaler. As well as the gases released, the plastic is generally not recycled which further adds to the carbon footprint.

Inhalers are a frequently prescribed and vital treatment in paediatrics, making it one of the key areas that we want to target to better understand how we can safely prescribe, use, and dispose of inhalers in the most environmentally friendly way possible.

The impact of inhalers on the environment

From October 2021 – January 2022, the Trust conducted two separate surveys; one directed at MKUH colleagues, and the other at paediatric patients, parents, and carers. The aim of these surveys was to understand the awareness that these groups had on the environmental impact caused by inhalers to identify how and where we can offer more education and information about inhaler use.

Most staff (61%) said that they were not confident in their knowledge of the environmental impact of inhalers. Moreover, staff were unaware of the sustainable ways to dispose of inhalers, with 36% unable to name any potential methods for to do so and less than 20% stating that they routinely advise patients and caregivers on how to dispose of their inhalers.

Of the parents and carers surveyed, almost 50% had a child who had used an inhaler for five or more years. Most of the responders (69.4%) said they dispose of their inhalers in the general waste, with only one parent recalling that they had ever been given advice on how to dispose of the inhaler properly.

Unsurprisingly, many of the parents wanted to help with ensuring that inhalers are delivered, distributed, and disposed of in an environmentally friendly way. 88.5% said they would like to have more information on responsible disposal of inhalers, with 98.4% stating that they would use a recycle point if it were available to them.

Actions we are taking at Milton Keynes University Hospital

Following the insights gathered as part of our surveys, and in line with our commitment to be net carbon zero by 2030, we are working on several initiatives to improve staff, patient, and parent knowledge of the safe disposal of inhalers.

These include:

- Providing education for staff on the environmental impact of inhalers, so they in turn can have the confidence to advise patients on safe disposal.
- Working with our pharmacy colleagues to include clear information on disposal in inhaler prescription packs.
- Putting up key information posters in clinical areas.
- Delivering advise to patients online via our website.
- Disseminating our insights to other NHS trusts to improve their awareness

Further information

Through reducing harmful carbon emissions, we can help improve health and the quality of life of our communities. It is important that we act now so that we can continue to provide a sustainable service today and for future generations.

As part of our ambitions to be net carbon zero, we need the support of all our staff, patients, visitors, and the local community. If we all make small changes, we can make a huge difference, and the safe disposal of inhalers will go a long way to reducing our carbon footprint.

You can help by returning used inhalers to your local pharmacy, where they will be disposed of with other medical waste. This is then thermally treated to destroy the greenhouse gases.

If you wish to have a copy of the detailed results or if you have any suggestions please contact Dr Jyothi Srinivas, Paediatric Consultant by email jyothi.srinivas@mkuh.nhs.uk