POLICY BRIEF

A critical evaluation of Green Plans to support decarbonisation of NHS Trusts in England

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brighton and sussex medical school

Green Healthcare Hub

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Abbreviations

BREEAM	Building Research Establishment Environmental Assessment Method
BSMS	Brighton and Sussex Medical School
CO2e	Carbon Dioxide equivalent
EF	Estates and Facilities
EV	Electric Vehicle
ICS	Integrated Care System
ICT	Information and Communication Technology
LED	Light-emitting diode
Mt	Megatons
NHS	National Health Service
NHSE	National Health Service England
OSMU	On-Site Medicine Usage
REGO	Renewable Energy Guarantee of Origin
SCP	Supply Chain and Procurement
SMART	Specific, Measurable, Achievable, Relevant and Time-Bound
TT	Travel and Transport
ULEV	Ultra-low emissions vehicle
ZEV	Zero-emissions vehicle

Executive Summary

In this paper we investigate tools and approaches for the decarbonisation of NHS Trusts in England.

We first analyse current Green Plans of NHS Trusts in England, to ascertain if they specify Trust governance structures for delivering sustainability, and to evaluate stated sustainability commitments against the SMART framework (Specific, Measurable, Achievable, Relevant, Time-bound) for the four themes of Estates and Facilities, Travel and Transport, Supply Chain and Procurement and On-Site Medicine Usage. We find that only 14 of 190 Green Plans Trusts meet the threshold for SMART strategies across all these four sectors of emissions, and the SMART components with the worst performance were “measurable” (specified in 346/760 = 46% of Green Plan strategies across all four themes) and “time-bound” (322/760 = 42%).

Then we look for evidence of progress in decarbonisation of the NHS. We find that national reported data suggest a 27% reduction in NHS Carbon Footprint between 2020 and 2023, but with no publicly available data to verify this statement. A review of NHS Trust Annual Reports shows little and piecemeal reporting of progress, with little reporting of carbon. Where carbon is evaluated, as many report an increase in Carbon Footprint as a decrease.

Next, we gather stakeholder opinion of current decarbonisation policy of the NHS through interviews with sustainability professionals working within Trusts, clinical and non-clinical staff, and the wider public. Our findings show that more top-down support is needed, and expected, to guide Trusts in this process.

Finally, we explore existing tools for measuring health provider sustainability performance, from the UK, Canada, Norway, Switzerland and the USA, and undertake a review of academic and grey literature to evaluate green strategies currently being suggested by Trusts.

We conclude with three recommendations to support decarbonisation of NHS Trusts:

1. Improve existing centralised guidance by introducing specific measurable targets, with clear timelines for delivery.
2. Prioritise areas for decarbonisation, and determine which should be delivered by NHS Trusts and which require support of national strategy
3. Ensure accountability through mandatory public reporting of progress

Introduction

According to 2020 data, NHS England has a Carbon Footprint of 6.1 MtCO2e (megatons of carbon dioxide equivalents) and 24.9 MtCO2e in its Carbon Footprint Plus.[1]

Table 1: Components of Carbon Footprint and Carbon Footprint Plus. Adopted from Greener NHS[1]

Carbon Footprint	Carbon Footprint Plus
Fossil fuels	Everything in Carbon Footprint AND
NHS facilities	Medical devices
Anaesthetics	Medicines
NHS fleet and leased vehicles	Freight transport
Electricity	Food and catering
Energy well-to-tank	Business services
Business Travel	Construction
Waste	Commissioned health services outside the NHS
Water	Manufacturing (products, chemicals, gases)
Metered dose inhalers	ICT
	Staff commuting
	Patient and visitor travel

In 2020 NHS England (NHSE) published the report *Delivering a Net Zero NHS,* which presented a breakdown of carbon emissions of the NHS in England based upon a hybrid accounting model. It stated ambition to achieve:[1,2]

1. 80% reduction (cf. 1990 baseline) between 2028 and 2032 for the NHS Carbon Footprint, and net zero by 2040.
2. 80% reduction (cf. 1990 baseline) by 2036-2039 for NHS Carbon Footprint Plus, and net zero by 2045.

This document recognises four areas for direct intervention to decarbonise the NHS: Estates and Facilities (EF), Travel and Transport (TT), Supply Chain and Procurement (SCP) and On-Site Medicine Usage (OSMU).[1]

As part of the 2021/22 NHS standard contract, every NHS Trust and Integrated Care System (ICS) in England was mandated to produce a Green Plan by January 2022,[1,3] outlining a three-year strategy for reducing carbon emissions in line with national trajectories.[3] Updated Green Plan guidance was published in February 2025, including a requirement to produce refreshed Green Plans by 31st July 2025.[4]

For development of Trust strategy, the 2021 *How to Produce a Green Plan* guidance recommended use of SMART (Specific, Measurables, Achievable, realistic and Time-bound) strategies.[3]

For reporting progress on sustainability, Trusts are expected to provide a quarterly update on 12 carbon and 7 policy related indicators in the areas of workforce, medicines, travel and transport, estates and facilities, supply chain and procurement, food and nutrition, and adaptation, which are collected on the *Greener NHS Dashboard*.[5] Trusts are also expected to update progress against their Green Plans in Trust Annual Reports.[3]

Other members of the UK health service have also generated approaches to decarbonise. Scotland and Wales have published documents that outline net zero ambition, whilst Northern Ireland included healthcare in their Climate Change Act from 2022.[6–8] These strategies incorporate either a central (Wales and Northern Ireland)[7,8] or regional (Scotland)[6] top-down structure to oversee process (England uses a hybrid model).

Purpose and structure of this report

This report evaluates the first iteration of Green Plans, published in 2021/2022 by NHS Trusts in England. We look for evidence that Trusts have developed Green Plan strategy that is SMART, we evaluate evidence of performance against that strategy, and we explore possible tools and mechanisms to improve performance.

The report is divided into five sections.

In Section 1, we evaluate published Green Plans of NHS Trusts in England for the period 2022-2025 (ICS Green Plans are outside of scope). We report the range of decarbonisation strategies proposed and analyse if those strategies are “SMART”.

In Section 2 we analyse Trust Annual Reports for evidence of sustainability policies that have been adopted, implemented and/or completed by Trusts since the publication of their Green Plan, and for measurable change resulting from these actions, including estimated change to Carbon Footprint.

In Section 3 we use interview data collected to report stakeholder opinion of the decarbonisation policy of the NHS in England, including three groups of respondents: those who are sustainability leads at their Trust; other workers in healthcare, and the public.

In Section 4 we critically analyse existing tools for measuring and driving improvement in sustainability performance of health institutions.

In Section 5 we scope literature to evaluate potential strategies for improving the sustainability performance of health institutions and how performance could be measured.

Finally, and building upon previous sections, we make policy recommendations for future approaches and tools for the decarbonisation of NHS Trusts in England.

Section 1

Content analysis of current NHS Trust Green Plans

We searched for Green Plans for all 211 NHS Trusts in England, using the websites of individual Trusts, the Google search engine, and/or contacting the Trust directly (search completed June 2024). In 15 instances we could not locate a Green Plan, and here we substituted existing *Sustainable Management Development Plans* (the precedent to Green Plans), where available. All sustainability documents henceforth will be referred to as "Green Plans".
For available Green Plans we undertook a mixture of qualitative and quantitative analysis to extract data on:

- The organisational structure proposed to deliver the Green Plan
- Strategic commitments to sustainability. These commitments were defined as statements of previous activity to meet sustainability objectives, or statements of intended future activity.
- How carbon and financial costs were actually or intended to be measured and reported

Green Plans were available for 190 Trusts and unavailable for 21 Trusts. Within the 190 Green Plans we identified 16,123 commitments, of which 12,003 were relevant and included in our analysis.

We classified commitments into four themes for decarbonisation: Estates and Facilities (EF), Travel and Transport (TT), Supply Chain and Procurement (SCP) and On-Site Medicine Usage (OSMU)[1]. We analysed extracted data to determine whether stated objectives are SMART (specific, measurable, achievable, relevant and time-bound).

Organisational structure outlined in Green Plans

Appointment of a board-level sustainability lead was a requirement set out in NHS England guidance, and we found that 72% (136/190) of Trusts reported having appointed such a role. In addition, 87% (166/190) reported creation of staff networks and teams for sustainability, and 86% (164/190) having instigated education and training in sustainability.

Strategies included in Green Plans

Of the analysed Green Plans, 99% (189/190) documented strategy for Estates and Facilities (EF), 99% (188/190) for Travel and Transport (TT), 99% (188/190) for Supply Chain and Procurement (SCP), and 77% (146/190) for On-site Medicine Usage (OSMU). 17 Trusts (9%) explicitly stated that they do not use anaesthetic gases or inhalers in their activities, which means some of the proposed strategies for OSMU are not relevant to their Carbon Footprint. Table 2 (overleaf) outlines the most common decarbonisation strategies under the four themes we identified, and Figure 1 illustrates the number of Trusts that have committed to them.

Table 2: List of the most common reported strategies used for decarbonisation, selected from Trust Green Plans, and analysed in this study

Estates and Facilities	Travel and Transport	Supply Chain and Procurement	On-Site Medicine Usage
Decarbonise energy consumption	Low carbon travel	Foster a circular economy	Reduce emissions from anaesthetic gases
Reduce energy usage	Green travel plan	Foster on-site recycling	Phase out desflurane
Fossil fuels divestment	Car sharing initiatives	Strategies to reuse obsolete	Reduce nitrous oxide usage
Monitor energy consumption	Cycle to work scheme	WARP IT services	Reduce usage of anaesthetic gases
Improve energy efficiency	Provide Cycling Infrastructure	Reduce Overall Consumption	Introduce sevoflurane
General efficiency measures	EV Charging Infrastructure	Embed general circular economy principles	Reduce general emissions from anaesthetic gases
Improve heating technology	General strategies for low carbon travel	Move away from single-use culture	Reduce emissions from MDIs
Install LED lightning	Decarbonise trust's fleet	Follow the NHS plastics pledge	Reduce MDI usage
Redesign estates	Switch to fully electric fleet	Switch to reusable products	Reduce overprescribing
Switch to renewable sources of energy	Salary sacrifice scheme	Include whole life costing of products	Switch to dry powder inhalers
Renewable energy on-site	Procure ULEVs and ZEVs	Phase out single-use plastics	Reduce general emissions from inhalers
Purchase renewable electricity	General fleet decarbonisation	Influence procurement choices	
Reduce water consumption	Reduce overall travelling	Implement the supplier roadmap	
Address water leakage	Reduce fleet mileage	10% Social value guidance for supplier tenders	
Decrease water usage	Reduce business mileage	Alter procurement behaviour	
Monitor water consumption	General reduction of mileage	Sustainable procurement	
Water efficiency technology	Improve air quality	Procure medical equipment sustainably	
Reduce water consumption		Procure non-medical equipment sustainably	
Biodiversity and health benefits		General strategies to procure goods sustainably	
Promote on-site biodiversity		Reduce paper usage	
Develop green space on-site		Digital transformation	

Estates and Facilities	Travel and Transport	Supply Chain and Procurement	On-Site Medicine Usage
Promote health benefits of green spaces		Decrease emissions from IT services	
General biodiversity gains		Reuse oibsolete IT hardware	
Shift to zero – carbon construction		Research and innovation	
Waste management		Decrease emissions from food procurement	
Zero waste to landfill		Work with catering services	
Reduce incineration waste		Low carbon menu	
Reduce hazardous waste		Decrease emissions from food delivery	
Composted waste		Decrease food miles	
General waste management procedures		Procure locally produced food	
Decarbonise energy consumption		Produce food on-site	
		Decrease food waste	
		Decrease direct food wastage	
		Shift to greener logistics solutions	
		Sustainable pharmaceutical prescribing	
		Reduce pharmaceutical plastics	
		Reduce prescription where appropriate	
		E-prescribing	
		Procure pharmaceuticals sustainably	
		Reduce the use of chemicals	

Figure 1a-d: Number of NHS Trusts in England with sustainability commitments in the area of a) Estates and Facilities, b) Travel and Transport, c) Supply Chain and Procurement and d) On-Site Medicines Usage. Overarching sustainability themes are colour-coded in darker green, and sub-themes in lighter green

Figure 1a: Estates and Facilities

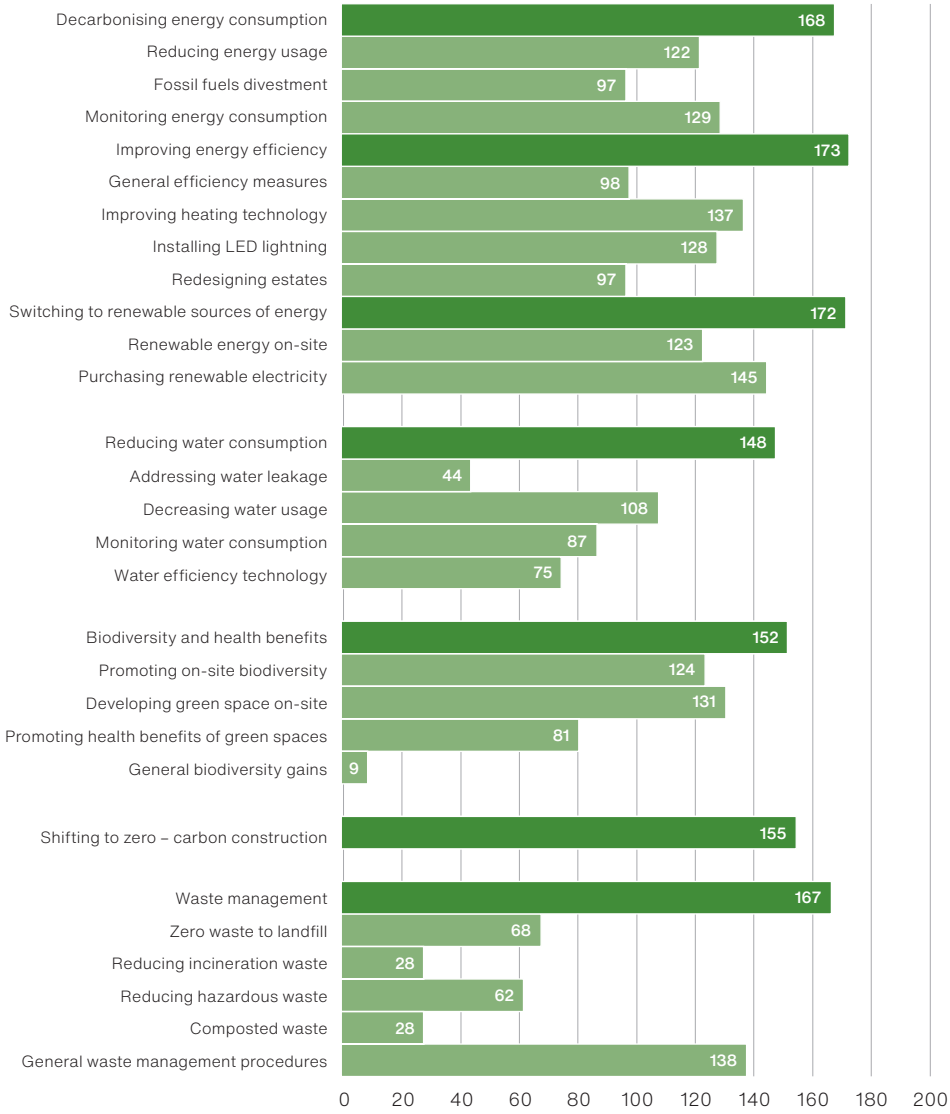


Figure 1b: Travel and Transport

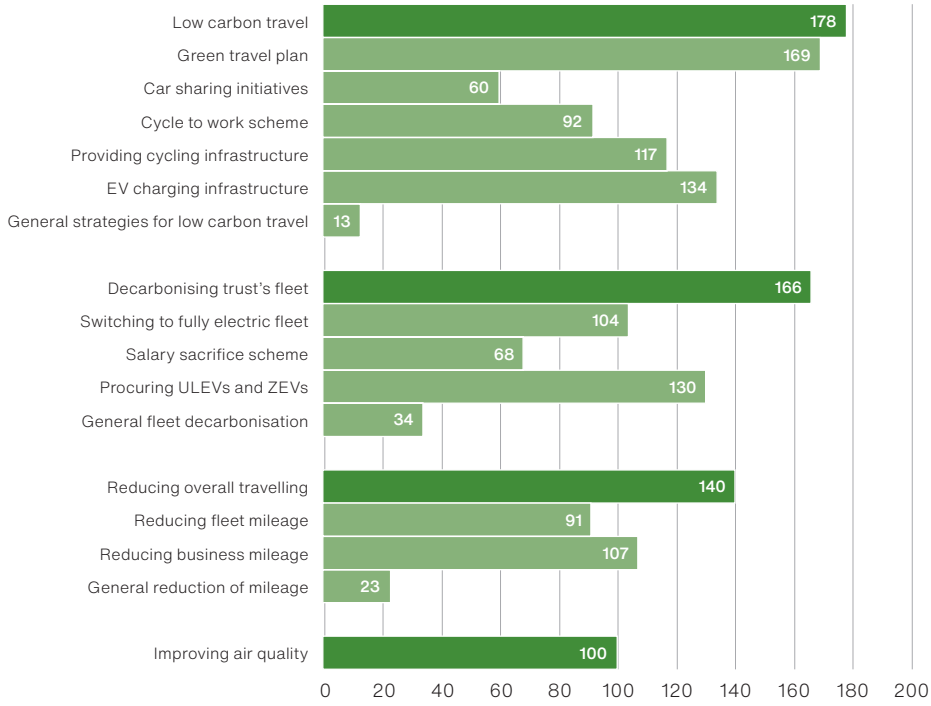


Figure 1c: Supply Chain and Procurement

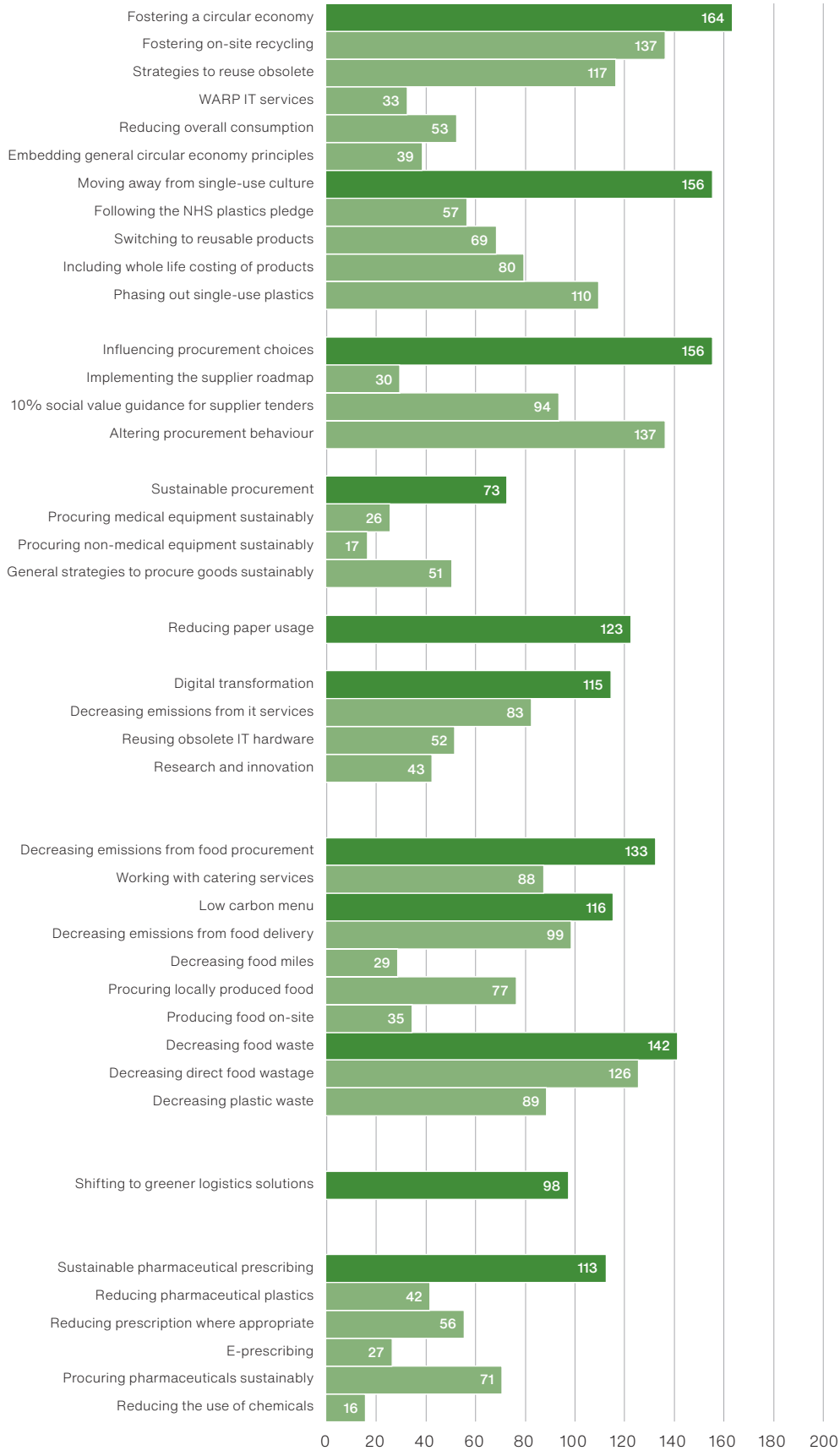
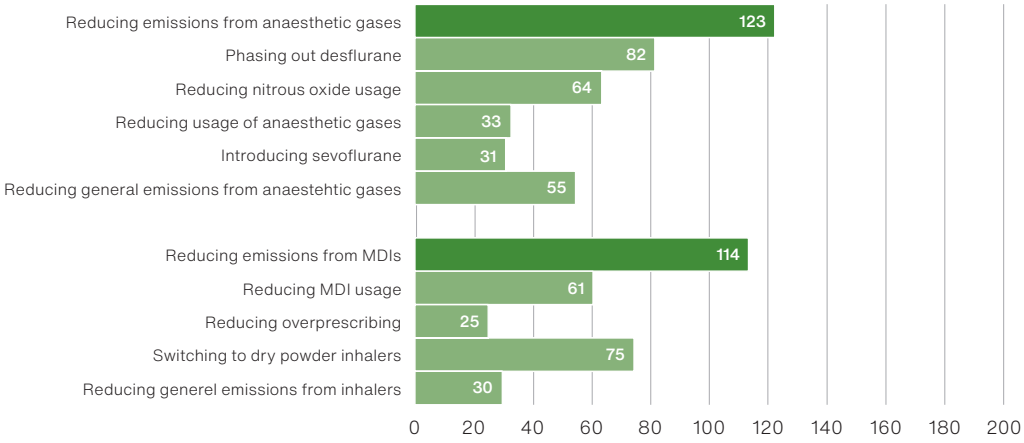


Figure 1d: On-Site Medicines Usage



SMART analysis of existing strategies

To evaluate the quality of stated strategies, we used the SMART framework: assessing whether the strategy is specific, measurable, achievable, relevant and time-bound. SMART has become a mainstream method for developing and evaluating programs.[9,10]

We created a definition of SMART objectives (Table 3), based upon Doran[11] and Huey.[12,13] For each Trust, we divided their stated strategic commitments into the four theme areas (EF, TT, SCP and OSMU) and scored whether commitments within each theme were SMART. For example, if there were four commitments in Estates and Facilities, each of those was evaluated against being Specific, Measurable, Achievable, Relevant and Time-Bound, making a total of 4x5=20 possible points. We used a lenient classification threshold, whereby if at least 50% of points were scored in a theme, we classified the entire theme for that Trust as being "SMART".

Table 3: Definition of SMART used in this study to evaluate strategic commitments

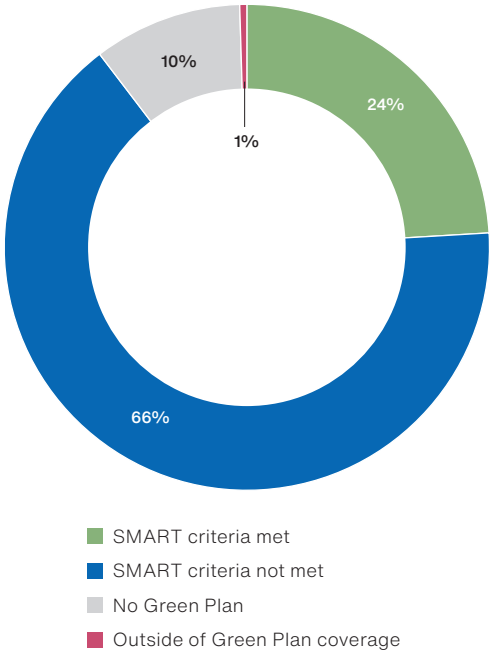
Specific	The commitment has at least three sub-strategies
Measurable	The commitment has an explicitly mentioned amount OR has described measurable outcomes/overarching targets
Achievable	The commitment sets out a future target that appears realistic given financial, cultural and technological constraints
Relevant	The commitment uses tangible strategies that reinforce what it sets out to do (excluding monitor and review, for instance)
Time-bound	The commitment has an explicitly stated timeframe

Figure 2 shows the number of Trusts with strategies within each theme meeting the SMART threshold (as defined above), and the proportion of strategies meeting each SMART component. The SMART components with the worst performance were "measurable" (specified in 346/760 = 46% of Green Plan strategies across all four themes) and "time-bound" (322/760 = 42%).

Overall, only fourteen (14/190 = 7%) Trusts met the threshold for SMART strategies across all four sectors of emissions.

Figure 2a-d: Percentage/number of Trusts with Specific, Measurable, Achievable, Relevant and Time-bound Strategies in a) Estates and Facilities, b) Travel and Transport, c) Supply Chain and Procurement and d) On-Site Medicines Usage.

Figure 2a: Estates and Facilities



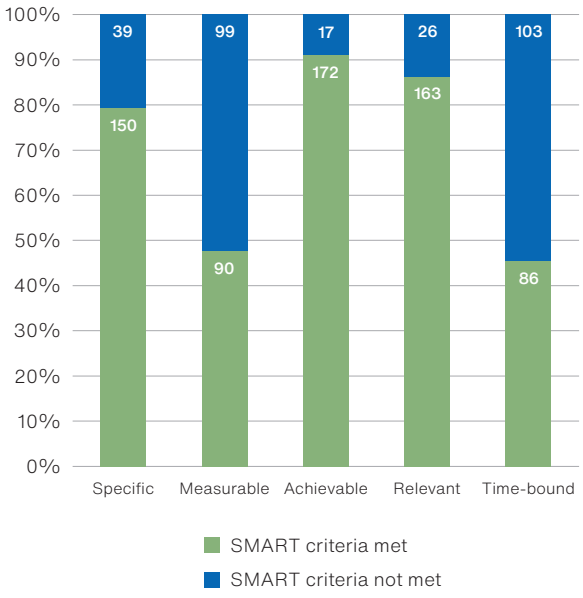
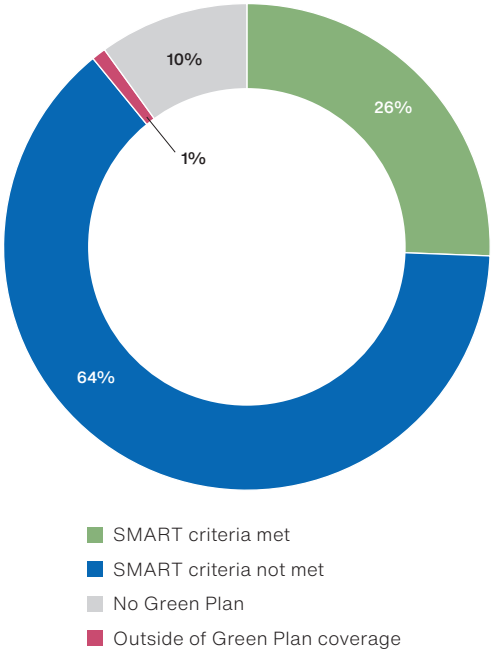


Figure 2b: Travel and Transport



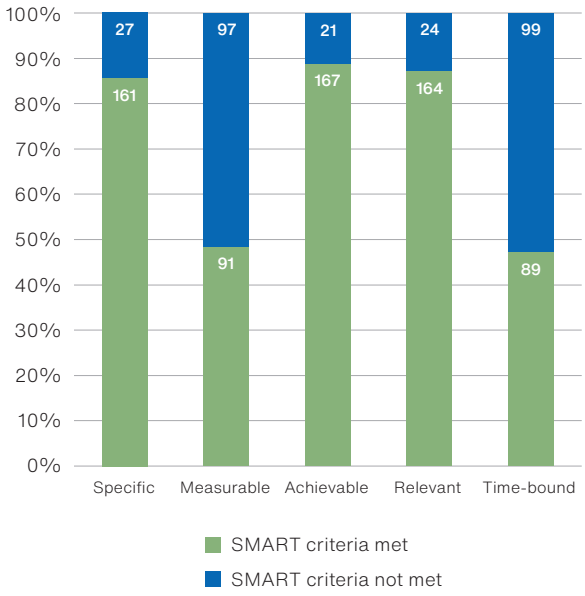
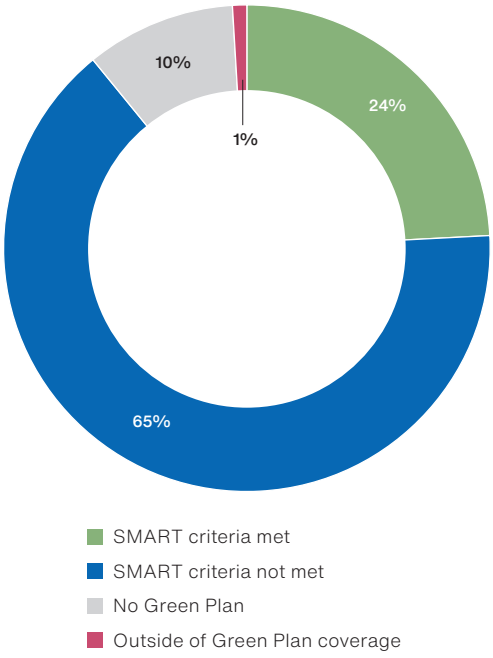


Figure 2c: Supply Chain and Procurement



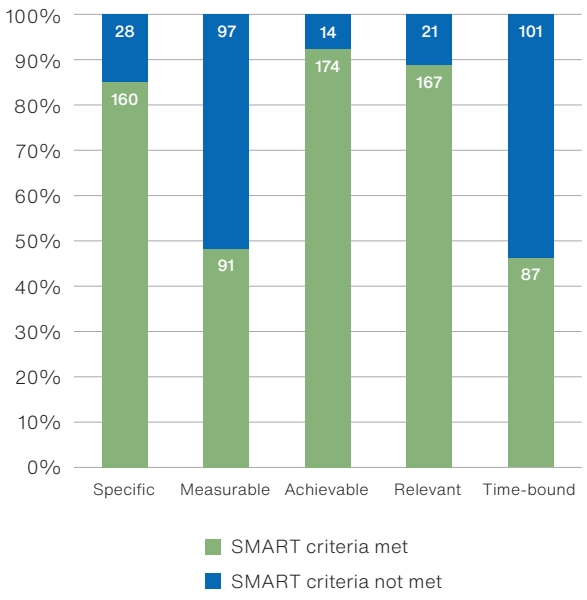
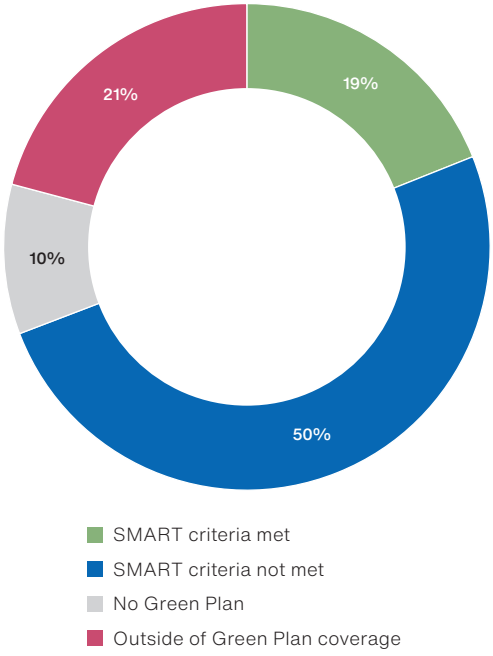
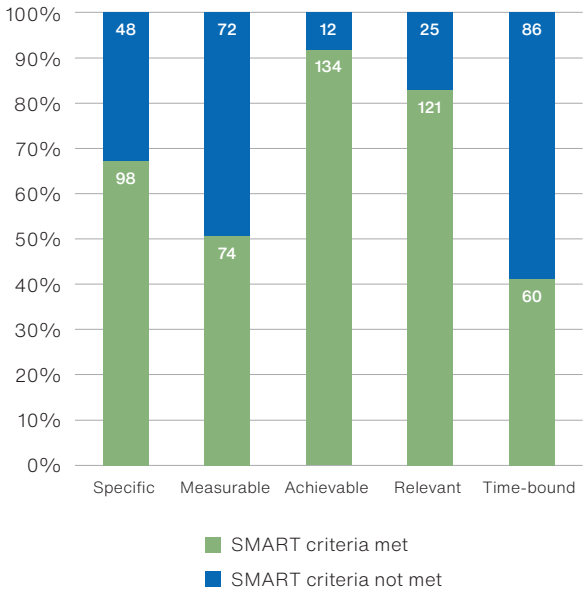


Figure 2d: On-site Medicines Usage





Measurement and reporting of carbon and finance

The Green Plan guidance does not require Trusts to calculate or report their Carbon Footprint or Carbon Footprint Plus, nor estimate costs of any proposed strategy. Nevertheless, 131 Trusts (131/190 = 69%) provided an estimate of baseline Carbon in their Green Plan, and of these 89 (89/131 = 68%) focused only on their Carbon Footprint and excluded their Carbon Footprint Plus (see Table 1). Where baseline carbon was reported, it did not necessarily correlate to the 2021/22 financial year date for the publication of Green Plans (Table 4).

Table 4: Date of baseline carbon estimates in Green Plans

Financial year	Number of Trusts
2015/16	1
2016/17	0
2017/18	0
2018/19	6
2019/20	44
2020/21	67
2021/22	7
2022/23	6
Not reported	80

We found occasional data from some Trusts on pre-baseline Carbon Footprint, but for the most part these were estimated using a different methodology and therefore not suitable for comparative analysis.

No Green Plan included cost savings or cost pressures of decarbonisation strategies. Of all Green Plans, 20 Trusts reported securing public funding, and 52 further Trusts expressed intention to apply for such schemes.

Section 2

Evaluation of progress against NHS Trust Green Plans

We looked for evidence for progress in sustainability policy adoption and carbon reduction from two sources: nationally reported data and data reported in Trust Annual Reports.

National reported data, including the Greener NHS Dashboard

The Greener NHS Dashboard is a central database located on the *NHS Futures* platform, which provides an overview of the organisation's progress against a series of reporting metrics.[5] The metrics cover (to a varying extent) the nine areas outlined in Green Plan guidance.[5] Metrics related to scope 3 emissions (including supply chain and procurement, food and nutrition, and patient and visitor travel) are under development.[5]

The Dashboard collates updates on these metrics from Trusts and ICSs, which are reported quarterly to the Greener NHS[5]. Trust reporting on metrics is (to our understanding) mandatory for 18 sustainability actions and not mandatory for 11.[5] The Dashboard is supported by a Green Plan Support Tool, which assists sustainability leads in Trusts to self-assess progress (and benchmark against others) and helps them estimate their Carbon Footprint and Carbon Footprint Plus. We are not aware of consequences for failing to report to the Dashboard or failing to show progress.

We have seen summary evidence from the Dashboard of reduction in carbon emissions for key priority areas such as volatile anaesthetic gases (including desflurane and nitrous oxide), primary care inhalers, and energy consumption from secondary estate and fleet emissions.[5] We understand there is also evidence of progress against measures not converted to carbon savings, such as purchase of low, ultra-low and zero emission vehicles (LEVs, ULEVs and ZEVs), proportional clinical waste segregation, and efficiency of heating and lighting technologies.[5]

NHSE reported an estimated total Carbon Footprint and Carbon Footprint Plus in 2020, and has done the same in its annual reports and accounts from the 2022/23 financial year onwards.[1,14–16] The estimate is for NHS Trusts, using data predominantly derived from the Greener NHS Dashboard (so not publicly available).

Table 5: Reported Carbon Footprint and Carbon Footprint Plus of NHS Trusts in England 2020-2024, rounded to the nearest 50ktCO2e[1,14–16]

Period	Carbon Footprint (ktCO2e)	Carbon Footprint Plus (ktCO2e)
2023-2024	4,450	To be published in 2025
2022-2023	4,550	21,700
2021-2022	5,100	Not Available
2020	6,100	24,900

This evidences a 27% decrease in Carbon Footprint between 2020 and 2023, and a 13% decrease in Carbon Footprint Plus over the same time period[16]. Given the lack of public availability of data underlying this calculation we are unable to verify the drivers of the reduction, but we understand the major contributors to reduction of Carbon Footprint are decarbonisation of energy sources, and a reduction in use of desflurane and nitrous oxide[5].

NHSE reports being on track to meet its target of a 44% decrease in carbon emissions by 2025, because in 2023/24 it is 81% below the 2017/18 baseline for emissions the NHS directly controls[16] .

In their 2023/24 annual report NHSE also reported that £850 million have been secured by Trusts through the Public Sector Decarbonisation Scheme, mostly to fund energy efficiency projects[16].

Trust reported data

NHS Trusts are expected to publish progress against their Green Plan in their Annual Reports. We searched for Annual Reports for all 211 NHS Trusts in England, using the websites of individual Trusts, and/or the Google search engine (search completed April 2025). We extracted Annual Reports for 2022/23 and 2023/24 (reports for 2024/25 were not available at the time of analysis).

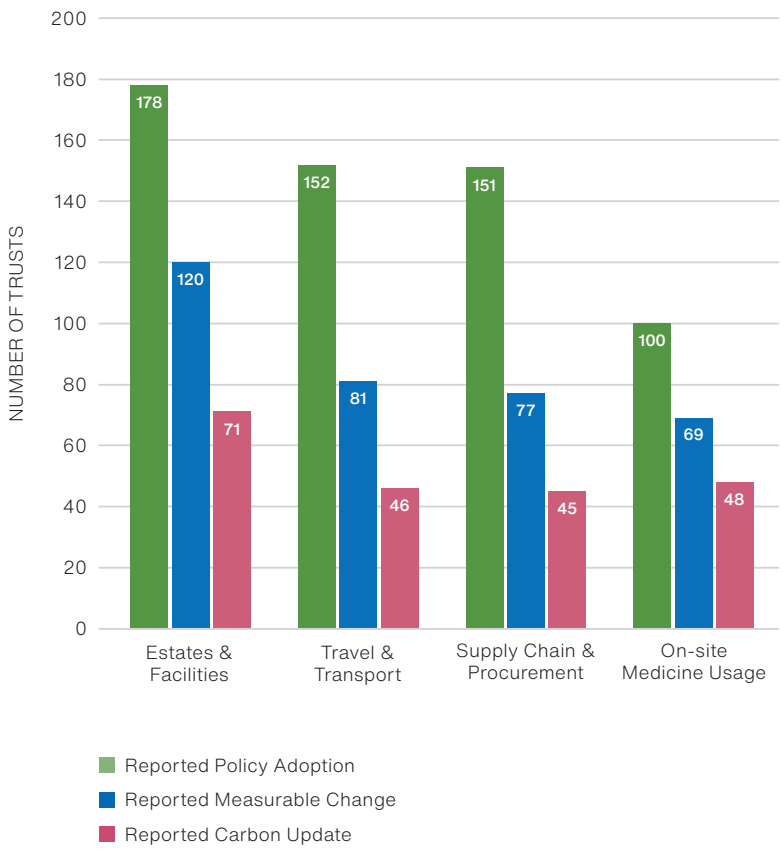
Annual reports were available for 196 Trusts for the financial year 2022/23 and 205 Trusts for the financial year 2023/24. We analysed the most recent 2023/24 reports for evidence of progress, but used data from the 2022/23 report for two Trusts where the 2023/24 report was not available.

We looked for evidence of policies that have been adopted, implemented and/or completed by Trusts since the publication of their Green Plan, and for measurable change resulting from these actions, including estimated change to Carbon Footprint. We divided reported changes into the same four themes of decarbonisation: Estates and Facilities (EF), Travel and Transport (TT), Supply Chain and Procurement (SCP) and On-Site Medicine Usage (OSMU).

For the financial year 2022/23, 90% (176/196) of Annual Reports provided an update of progress in policy against their Green Plan commitments. For the 2023/24 financial year this was 95% (196/205).

In the 2023/24 financial year, 49% (96/196) of Trusts reported a measurable change associated with such progress, and for 36% (70/196) this included estimated carbon emissions: 21% (41/196) for Carbon Footprint, and 14% (28/196) for Carbon Footprint Plus (one Trust did not specify what the Carbon Footprint change related to). Figure 3 summarises progress and measurement for the four themes of decarbonisation.

Figure 3: Summary of progress against Green Plan commitments reported in Progress Annual Reports for the financial year 2023/24 (and two reports from financial year 2022/23: see text)



We looked in more detail at changes reported to carbon, as this is the key metric of the NHS Net Zero Plan.

Where carbon estimates were reported, we found that for the theme of Estates and Facilities this often related to a broad strategy, but for the other three themes this was more often reported for a specific and narrow action (e.g. switching from single use to reusable gowns saved X amount of carbon) rather than a broad strategy within that theme (e.g. switching all disposable items in the Trust to reusable where feasible saved X amount of carbon).

For the 41 Trusts reporting their Carbon Footprint, 38 compared this to historic data. Compared to baseline, 87% (33/38) reported a decrease in Carbon Footprint and 12% (5/38) reported an increase. Compared to the previous year, 55% (21/38) of Trusts reported a decrease in Carbon Footprint and 45% (17/38) reported an increase. Data on the scale and cause of the increase or decrease in Carbon Footprint were not clearly reported.

For the 28 Trusts reporting their Carbon Footprint Plus, 23 compared this to historic data. Compared to baseline, 48% (11/23) reported a decrease in Carbon Footprint Plus and 52% (12/23) reported an increase. Compared to the previous year, 48% (10/21) of Trusts reported a decrease in Carbon Footprint Plus and 52% (11/21) reported an increase. Again, data on the scale and cause of the increase or decrease in Carbon Footprint Plus were not clearly reported.

Overall, these data (from a small number of Trusts) suggest significant progress in reduction of Carbon Footprint, which may now have stagnated. There has likely been no appreciable change to Carbon Footprint Plus.

Section 3

Stakeholder opinion of current decarbonisation approach of the NHS in England

To gather opinion on current policy on decarbonisation in the NHS in England, we conducted:

1. Individual online semi-structured interviews with five individuals leading sustainability work at different NHS Trusts in England
2. Individual online semi-structured interviews with eleven individuals working in various clinical and non-clinical roles in the NHS in England (with a particular focus on the topic of procurement)[17]
3. An in-person group meeting comprising sixteen members of the public (from the Sussex region)

Interview data were collected prior to late 2024, before new Green Plan guidance was issued. Participants volunteered their time, and their views therefore likely represent those most engaged in this agenda, which may not reflect the views of others.

Opinions of sustainability strategy leads

Four themes emerged across the interviews: a lack of clear guidance or policy, a lack of financial support, a lack of human resource support, and difficulty with measurement.

Guidance and policy to date

Interviewees expressed disappointment with guidance Trusts have received to date to support their decarbonisation processes. All were disappointed at the lack of specific guidance on calculating baseline and future Carbon Footprinting.

In terms of targets for action, there was felt to be excessive focus on estates and facilities and a lack of guidance for Trusts on decarbonising procurement (with a request for policy on reusable products, sustainable procurement choices, and enabling a circular economy).

There was a concern that whilst targets for decarbonisation have been set, there is a lack of specific guidance on how to achieve them or defining best practice. There was support and expectation for a more top-down approach to guide decarbonisation (including mandates), as part of a strong coordinated and centralised policy.

Lack of financial support

All respondents stated that Trusts do not have the financial resource to implement the large-scale changes that achieving net zero requires.

Participants shared differing views around current financing, with two participants happy with funding their Trusts had acquired through government schemes and public funds (although they criticized the difficulty in obtaining such funds), but others disappointed that some internal or external funding sources and loan schemes had been cut.

One participant expressed concern that the requirement for purchase of 100% REGO renewable energy had led to a large increase in cost (because of increased demand), diverting funds from investment in other potential decarbonisation strategies.

Lack of human resource support

Respondents all recognised the challenges of getting the workforce to participate in the sustainability agenda from a socio-cultural perspective. This was seen not necessarily as a lack of ideological investment amongst staff, but rather the incapacity of Trusts to support staff time for activity related to sustainability.

The NHS workforce was recognised as extremely stretched at present, with insufficient resource to deliver the corporate function of the Trust, and over-reliance on goodwill and bottom-up engagement to drive sustainability initiatives. One participant noted that their Trust has greatly benefitted from employment of two full-time sustainability research fellows, but this scheme was discontinued.

Difficulty with measurement

Respondents also discussed the issue of measurability as an obstacle to tangible change. There was a feeling that evaluating “carbon is king” but was difficult or sometimes impossible to measure. It was noted that some important changes, such as cultural or organisational change, may not have an attached carbon measurement, but are critical to sustained change.

Opinions of other workers in the NHS

There was consensus that NHS staff lacked the knowledge and skills to lead sustainability strategy. There was opinion that there was failure of government to enforce a coherent sustainability strategy, or to implement key performance indicators.

Several participants felt that sustainability was not part of the hospital’s cultural identity, and that progress was hampered by risk aversion, bureaucracy, a lack of joined up systems and budgets, entrenched working practices, a focus on short-term goals, and lack of human resource. Some felt able to make change in their workplace, others less so. Where change was being made, it was often based upon the drive of individuals, rather than systemic institutional change.

Opinions from the public group meeting

Participants universally agreed they would like to see an NHS that is sustainable, without negative effect on the environment. The group believed strong national policies to support sustainability should be created and adhered to, regardless of a change in government. They also discussed the importance of sustained financing to support such work, and valid tools to measure progress.
With regards to medical products, they felt that NHS should change its business model to focus on sustainability of products rather than the current dominance of price, with potential for labelling of the sustainability credentials of products, and financial penalties for less sustainable products. They were also of the opinion that infrastructure should be developed enabling medical products such as crutches and blood pressure monitors to be re-issued to new patients, and mechanisms should be introduced for safe reuse or disposable of unused medications. They felt public education could help support such change.

Section 4

Other tools for measuring sustainability performance of health providers

We explored a selection of other tools for measuring the performance of health providers on environmental sustainability, to see if their content or performance could inform future strategy for the Greener NHS. We contacted those who developed these tools, and (where possible) report on the content included, evidence of user engagement, and evidence of performance of the tool in driving change.

We are aware of other tools being developed or in use, and so our selection is not exhaustive.

Green Theatre Checklist (Surgical Colleges, UK)

The Green Theatre Checklist was released in 2022 as a collaboration of all UK surgical colleges.[18] A revised version was released in early 2025.

The checklist provides a series of checkboxes of principles (rather than specific metrics) for actions before, during and after a surgical procedure (Table 6) and is supported by a compendium of evidence to support each action as environmentally preferable, and (where relevant) clinically safe.[18] It is based upon self-assessment with no centralised monitoring, and so whereas we are aware of uptake of the checklist in the UK (and elsewhere), the extent of this is unknown.[18] One report from the Bradford Royal Infirmary found incomplete performance against items on the checklist.[19]

Table 6: Components of the Green Theatre Checklist[18]

Stage of surgical procedure	Action
Anaesthesia	Avoid nitrous oxide
	Use total intravenous anaesthesia
	Use low flow rates for inhalational anaesthesia
	Avoid unnecessary equipment and reuse where possible
	Minimise drug waste
Preparing for Surgery	Rationalise sterile field and PPE use
	Reduce water and energy consumption
	Avoid clinically unnecessary interventions
Intraoperative equipment	Review and rationalise equipment used
	Reduce unnecessary use of equipment
	Opt for reusable equipment instead of single use
	Use low carbon alternatives
After the operation	Power off equipment not in use
	Recycle where possible
	Repair and maintain equipment

NHS Scotland National Green Theatres Programme Heatmap (Centre for Sustainable Delivery, Scotland)

The NHS Scotland national Centre for Sustainable Delivery was commissioned to deliver the National Green Theatres Programme (NGTP), as a key component of the Scottish Government's Climate Emergency and Sustainability Strategy 2022- 2026[20].

The NGTP primarily involves development and implementation of specific, realistic and measurable actions for Health Boards to implement within operating theatres, with broader aims of cultural change to support environmental sustainability[20]. The programme started in March 2023 and provides a list of actions for implementation, which Health Boards measure and report back to the NGTP (*Table 7*)[21].

The programme actions are based on an empirical evidence base, with many of the actions originally piloted by clinical professionals in their own setting, then further researched and scoped in-house by the NGTP team before national dissemination. The process of development includes theoretical *projected opportunity* for cost and carbon savings, corroborated on the ground through conversations with Health Board clinicians and sustainability teams.

Reporting on progress of implementation and resultant savings is on a quarterly basis via direct communication with the 15 Health Boards in NHS Scotland. Sustainability teams feedback relevant information to the NGTP team, which colour codes it as: green – action complete, yellow – action in progress but incomplete, and orange – action not yet started. Resultant data are converted into a heat map, which is used as an aid for programme reporting. Actions are heterogeneous, which means that in some cases they might be either inapplicable or inappropriate for some health boards, depending on their size and individual circumstance.

Reporting is framed as an opportunity to learn and coach teams rather than manage performance, which supports the NGTP to develop a relationship of trust with Health Board clinicians and sustainability staff, and ensure engagement. 15 Health Boards participate in the programme with 14 completing the last round of validation and measurement.[20]

The program is projected to deliver an estimated annual carbon savings of 21,973 tCO2e and annual financial savings of at least £7.9 million (Table 7)[21].

In addition to the list of actions for implementation, there is a set of actions for adoption which are encouraged but not required[22]. These include:[22] enabling active travel, reducing use of ethyl chloride spray in testing sensory level for neuraxial and regional blocks, using telephone and video conferencing appointments, switching off non-productive devices, introducing reusable plastic trays, rationalising patient warming devices, and patient self-removal of urinary catheters.

Currently, the programme covers only operating theatres but is exploring expansion into additional clinical areas, including renal, endoscopy, and pathway development.

Table 7: Actions for implementation and projected annual carbon and cost savings in the National Green Theatre Programme across all 15 Health Boards[21]

Action	Projected annual carbon savings (CO_2e)	Projected annual cost savings (£)	Date of guidance publication
Switch off out of hours anaesthetic gases scavenging systems (AGSS)	232 tonnes	£270,000	May 2023
Change to surgical fluid suction system that discharges into grey water system	75 tonnes	£235,000	May 2023
Change pre-operative paracetamol from intravenous to oral	38 tonnes	£53,000	May 2023
Embed waste segregation	353 tonnes	£473,809	May 2023
Decommission nitrous oxide (N_2O) manifolds	6,486 tonnes	TBC	May 2023
Switch off of out of hours heating ventilation air conditioning (HVAC)	5,937 tonnes	£3,587,549	May 2023
Embed rubbing not scrubbing	135 tonnes	£40,959	October 2023
Rationalising fluid giving sets and warming devices	12 tonnes	£257,000	October 2023
Reducing the use of battery-operated pulse lavage	96.5 tonnes	TBC	April 2024
Lean surgical trays	1,591 tonnes	£2.5 million	July 2024
Reducing unnecessary use of sterile gloves	402 tonnes	TBC	November 2024
Reusable surgical caps	51 tonnes	£135,905	November 2024
Remove desflurane	6,400 tonnes	£834,000	N/A
Embed immediate sequential bilateral cataract surgery	164 tonnes	TBC	April 2025

CASCADES Scorecard / Cut the Carbon Initiative (Ontario Health, Canada)

The *Cut the Carbon Initiative* was developed and implemented by Ontario Health (a regional health body) in Canada, in collaboration with the CASCADES initiative at the University of Toronto.[23–25] It is focused on surgical and perioperative healthcare, and targets five areas: sustainable leadership, low value care, waste, reusables and anaesthetic gases.[24,25]

The system includes a scorecard with targets (Table 8)[23] to enable annual reporting and tracking of progress by participating healthcare providers and includes guidance on how to support change.[23] Health providers self-report on these metrics against a colour coded scheme:

- Red – No sustainability commitment in this area
- Orange *(Working on)* – Evidence for sustainability commitments in this area but inability to meet the measurable requirements to achieve yellow status
- Yellow *(Partially Achieved)* – Evidenced ability to meet the measurable requirements for yellow but inability to achieve green status
- Green *(Achieved)* – Evidenced ability to meet the most advanced measurable requirements for sustainability

Reporting is conducted through completing a short digital form. Although the targets are named, many are not specific or measurable, for example "developing support from clinical staff" for reusable sterile surgical gowns (without clear definition of what support means or is measured) or "transfusions only done when clinically indicated" for use of blood products (it seems difficult to define what would constitute a blood transfusion not clinically indicated).

In any given period, individual providers are expected to report on at least one of the five areas specified.[24,25] In the initial phase, uptake of this initiative amongst health providers in Ontario was voluntary and estimated at around 70%, but in 2024 the program became mandatory and tied to funding provided to these providers. Participating institutions now have designated roles to existing staff to collect and collate information.

Ontario Health have interest in expanding the scope of this initiative.

Table 8: Components of the CASCADES Scorecard[23]

Sustainable opportunity	Desired action	Measurable steps	Colour-code
Sustainability Leadership	Implement a leadership structure	Green team of volunteers established	Yellow
		Formal environmental sustainability perioperative committee in place	Green
		Committee time allocated to staff	Green
Low-Value Care	Reduce low-value pre- and post-op visits and testing	Decision-tool to aid in consensus around necessity of specific tests in place	Yellow
		Low-value pre- and post-op testing is eliminated	Green
		Lower-carbon test options are considered when testing is necessary	Green
		Virtual visits are offered when appropriate	Green
	Reduce unnecessary blood product wastage	Stock of blood products audited to determine proper ordering frequency/volume	Yellow
		Delivered education around wise blood use	Yellow
		Blood products are ordered in accordance with use (avoid excessive overordering; monitor expiration dates)	Green
		Transfusions only done when clinically indicated	Green
Anaesthetic Gases	Eliminate desflurane	Provided education on environmentally friendly gases, AND	Yellow
		Carbon intensity warning stickers placed on desflurane vaporizers	Yellow
		Sevoflurane is the default gas on the vaporizer	Yellow
		Desflurane vaporizers removed from anaesthetic machine	Yellow
		Desflurane not available in operating rooms, but can still be accessed from automated medication dispensing system	Yellow
		Desflurane removed from formulary	Green
		Desflurane eliminated from use	Green
	Use ≤0.5L/min fresh gas flow	Provided education to encourage minimal fresh gas flows ≤ 0.5l/min	Yellow
		Routine use of automated control of end-tidal inhalation anesthetic concentration programs with minimal fresh gas flows of ≤ 0.5l/min (EtControl TM on GE or Target-Controlled Anesthesia on Draeger)	Green
	Minimize environmental impact of nitrous oxide	Provided education/training on minimizing clinical use of N_20, AND	Yellow
		Working group established to engage relevant partners, including clinical users, pharmacy, biomedical engineering, and facilities	Yellow
		No longer using bulk N_20 tank or centralized piped nitrous as a supply source (switch to cylinders at point of use), and	Green
		N_20 no longer used as a carrier gas	Green

Sustainable opportunity	Desired action	Measurable steps	Colour-code
Reusables	Use reusable anesthesia equipment	Reusables used instead of single-use products for 1 of the below items	Yellow
		Reusables used instead of single-use products for 2-3 of the following items: • Circuit face masks • Laryngeal mask airways • Breathing circuits (or extended use circuits in lieu of reusables, for ≥ 24 hrs)	Green
	Use reusable sterile surgical gowns	Removing single-use gowns from custom packs	Yellow
		Removing single-use gowns from sterile core	Yellow
		Developing support from operating room management/leadership	Yellow
		Developing support from clinical staff	Yellow
		Implementing trials of reusable gowns	Yellow
		Routine use of reusable sterile surgical gowns	Green
	Encourage patients to bring their own reusable belongings bags	Patients are encouraged to bring their own reusable garment bags (through appointment communications, surgery pamphlets, and/or posters)	Yellow
		Plastic patient belongings bags are given to no more than 30% of patients	Green
	Use rigid containers or reusable linens in place of blue polypropylene wrap to protect sterilized trays	Rigid containers and linens are used to wrap at least 50% of trays	Yellow
		Rigid containers and reusable linens are used to protect at least 75% of sterilized trays, and	Green
		Blue wrap is used only for equipment that is too irregular in shape or size to be inserted into a hard case and is unsuitable to be wrapped in reusable linens	green
Waste	Lean trays and/or custom packs to include only frequently used items	Developed a process for yearly review/audit of trays and/or packs, and	Yellow
		Developed process to make changes to trays and/or packs based on review	Yellow
		Criteria above AND	Green
		Each surgical division has at least one lean surgical tray and/or custom pack for at least one high-volume surgical procedure	Green
	Segregate biomedical and pharmaceutical waste accurately	Posted clear signage on accurate waste segregation or	Yellow
		Conducted education/training on proper waste segregation (pharmaceutical, biomedical and sharps)	Yellow
		Criteria above AND	Green
		Regular waste audits (minimum once per year)	Green
	Pursue re-manufacturing of single-use devices (where reusables are not available)	Where reusable devices are not available and single-use devices are in use, these are collected for remanufacturing	Yellow
		Criteria above AND	Green
		Remanufactured devices are purchased back when reusable devices are not available	Green

Norwegian National Dashboard (Norwegian Directorate of Health, Norway)

Norway has developed software for hosting a public centralised online Dashboard to monitor and support progress towards low carbon healthcare.[26] It includes a number of areas to report (Table 9), with estimated associated carbon emissions for Scopes 1, 2 and 3 based on spend (with a few based on other data).[27] At present there are 39 organisations using the platform (12 South-East Norway, 8 Central Norway, 7 West Norway, 7 North Norway, and 5 national).[27] The platform is supported by peer support networks and centralised oversight.[26,27] Individual providers follow a set of goals that have been nationally prioritised, while the four regional bodies gather data on estimated carbon emissions at the institutional level.[26,27]

The software allows for public visibility of progress, and with some defined metrics. For example, it has led to an 89% decrease amongst users in consumption of the anaesthetic gas desflurane (a potent greenhouse gas) over a 4-year period (2667 kg in 2019 to 286 kg in 2023)[27]. In 2023 the platform also evidenced a 4% reduction in energy consumption (cf. 2019), an 11% uptake of virtual patient consultations (against a target of 20%), 26% recycling of materials, and a 6% food waste reduction (against a target of 50% cf. 2019).[27] Anecdotal evidence is that public visibility of such data, and the identification of health providers that are outliers, leads to those outliers taking improvement action.

An update on the Dashboard is expected in 2025, with updated data for 2024, emissions trajectories, and new goals for biodiversity. Regulating bodies have expressed interest to continually improve the Dashboard.

Table 9: Components of the Norwegian National Dashboard, divided by scope of emissions[27]

Emissions scope	Area of data reporting
Scope 1 and 2	Energy consumption
	Business travel
	Gases
	Patient journeys
Scope 3	Medicines
	Medical Equipment
	Purchasing healthcare services from private non-profit hospitals
	Purchasing healthcare services from private contracting parties
	ICT
	Medical consumables
	Construction and property management
	Administration
	Laboratory products and equipment
	Surgical products
	Consulting services
	Purchasing public healthcare services
	Canteen and catering
	Ambulances
	Other patient transport purchases
	Purchasing healthcare services from contracted specialists
	Waste

Commercially available tools

The Geneva Sustainability Centre is a global not-for-profit membership-based organisation. They have developed in partnership with their commercial partner *Deloitte* a *Sustainability Accelerator Tool,*[28] launched in late 2023 as a platform to support healthcare institutions to identify, track, benchmark, and guide sustainability performance. It has domains including environmental impact along with health, equity, wellbeing, leadership, and governance.[28] It was piloted with 18 organisations, and as of November 2024 is used by 40 organisations worldwide. The tool operates with a commercial user licence of 2,500 CHF per hospital in a high-income country. The platform, or data on its performance, are not publicly available.

Practice Greenhealth is a private US organisation that has created a *Sustainability Benchmark Report* targeted at US health providers.[29] This includes uploading qualitative and quantitative data, with performance normalised to the relative size of the organisation, adjusted patient days, and other relevant factors.[29] The report covers a wide set of measures divided into eleven main sustainability themes (leadership, waste, chemicals, food, greening the operating room, procurement, energy, water, buildings, climate, transportation) with qualitative and quantitative subthemes, some of which can be associated with specific carbon metrics.[29] Full details of the platform are only available to subscribers.

The *Royal College of General Practice* has a *Green Impact for Health Toolkit*,[30] focused on primary care (rather than hospitals), but with access restricted to only UK registered General Practices through a commercial licencing mechanism.

Limitations of existing tools

All of the tools listed here have some limitations in their suitability to measure the environmental impact of healthcare institutions in the NHS. They may:

- Be limited in scope (e.g. the *Green Theatre Checklist, NHS Scotland National Green Theatres Programme* and *CASCADES Scorecard* focus only on surgical care)
- Fail to detail how particular strategies were prioritised or evidenced
- Specify relevant metrics for analysis for only some (*CASCADES Scorecard; Norwegian National Dashboard)* or none (*Green Theatre Checklist*) of the suggested components
- Function behind a paywall/commercial licence (*Sustainability Accelerator Tool*, *Sustainability Benchmark Report, Green Impact for Health Toolkit*).

Section 5

Optimising measurement of the sustainability performance of health institutions

Our analysis of tools for decarbonisation of health systems (Section 4) shows that there are similarities and differences in approaches. It is not clear which strategies should be prioritised, and how outcomes should be measured.

We undertook a scoping review of potential strategies that could be adopted to decarbonise the NHS, deriving these from existing Green Plans (Section 1) alongside relevant academic and grey literature (based upon an internet search, because we recognise only some data relevant to our purpose are published in academic journals). We framed our analyses from the perspective of measurable action and evaluated if and how such strategies are already measured on the Greener NHS Dashboard, and how such measurement could be improved or introduced.

Our results are presented in table 10, divided into each of the four themes for decarbonisation: Estates and Facilities (EF), Travel and Transport (TT), Supply Chain and Procurement (SCP) and On-Site Medicine Usage (OSMU).

Further work would be needed to prioritise these suggested strategies and convert them into specific metrics to measure performance.

We recognise the strategies detailed here do not cover wider system changes with potential for even greater impact. This could for example include public health or primary care measures to reduce the overall need for care, or streamlining care to minimise unnecessary appointments or investigations. In addition, there are institutional changes beyond decarbonisation that deserve attention, for example for hospital estates and hospital supplies to build resilience against climate change related adverse weather events.[31]

Table 10 a-d: Topics and supporting evidence for selected strategies for decarbonisation of healthcare institutions in the themes a) Estates and Facilities, b) Travel and Transport, c) Supply Chain and Procurement and d) On-Site Medicines Usage. % contribution of the theme is based upon analysis of NHS England hospital Carbon Footprint from Tennison et al.[2]

Table 10a

Theme of Decarbonisation (% contribution)	Topic	Commonly used strategies across Trusts	Metrics collected on Greener NHS Dashboard[5]	Suggested additional or alternative metrics
Estates and Facilities (15%)	Reduce energy usage	Install smart meters for monitoring energy consumption, enabling real-time collection, distribution and analysis of energy consumption[32]	• Quantity of energy and electricity consumption • Annual tCO2e from energy and electricity (secondary care)	
		Decrease emissions from e.g. heating, lighting[33,34] and IT servers	• % of sites with a heat decarbonisation plan • Annual tCO2e from heating, lightning (secondary care)	
	Fossil fuel divestment	Purchase renewable electricity (e.g REGO-backed) which supports decarbonisation[35]	• Number of Trusts purchasing renewable electricity • Proportion of renewable electricity being purchased	• Quantity of renewable electricity being purchased • Estimated carbon savings
		Generate renewable energy on-site	• No identifiable metric	• Quantity of renewable electricity generated • Estimated carbon savings
	Improve energy efficiency	Improve heating technology, for example installation of low-carbon boilers and heat pumps,[36,37] electrified heating, and improved building insulation.[38]	• Number of oil-led heating systems • Emissions from fossil-fuel-led heating sources • Annual tCO2e from heating (secondary care)	
		Install LED lighting to reduce energy consumption. However, LED lights are a potent source of light pollution and contain significant embedded carbon.[39–41]	• % of gross internal area covered by LED lighting	• Annual tCO2e of LED lightning (incl. embedded carbon)
	Redesign estates	Zero – Carbon Construction. BREEAM standards and Passivhaus accreditation include whole-life costing of the estate, evaluation of embedded carbon, compliance with efficiency standards and disposal at end-of-life.[42,43]	None	• Evaluation of existing and new estates against metrics specified in the BREEAM and Passivhaus standards
	Decrease water usage	Install smart water meters to decrease water wastage by monitoring consumption in real-time and enabling habits of water-conservation amongst staff.[44,45]	None	• Annual volume of water consumption
		Install water-efficient technology to decrease water demand. This, however, needs to be coupled with instilling a water-saving culture amongst users for optimal results.[45]	None	• Number of Trusts with installed specific water-efficient technologies • Annual volume of water consumption

Table 10b

Theme of Decarbonisation (% contribution)	Topic	Commonly used strategies across Trusts	Metrics collected on Greener NHS Dashboard[5]	Suggested additional or alternative metrics
Travel and Transport (10%)	Create a green travel plan for patients, visitors and staff (mandated by 2026)[46]	Car sharing initiatives amongst staff to reduce car journeys and corresponding emissions.[47] Some Trusts have utilised car-sharing apps to facilitate the process.	• Number of Trusts with third-party operated car clubs	• Number of reduced single- occupancy journeys through car sharing • Associated carbon saving
		Promote active travel to decrease travel-related carbon emissions and improve health of staff.[48,49]	• Number of Trusts with cycle-to-work leads and salary sacrifice schemes • Number of Trusts with different sustainable travel-related schemes	• Number and distance of journeys by active travel (on foot or by bicycle) • Associated carbon saving
	Switch to an electric fleet	Provide EV charging on-site to support electric-powered travel. It is important to consider upfront carbon and capital costs of installation.[50]	None	• Number of EV chargers on-site • Number of vehicles using them annually
		Procure ULEVs and ZEVs to decarbonise current fleet, but low- emission vehicles should not substitute reducing single-occupancy travel.[46]	• Number of Trusts who purchase only ULEVs and ZEVs • Total fleet emissions • Percentage of fleet meeting standards for LEV, ULEV and ZEV	• Number of ULEVs or ZEVs used by staff annually • Associated carbon savings from the change
		Introduce a salary sacrifice scheme to incentivise purchase of more sustainable modes of transport amongst staff.[51]	• Number of Trusts with vehicle salary sacrifice schemes for staff to purchase ULEVs or ZEVs	
	Reduce fleet mileage	Reduce business mileage through use of virtual meetings and reduce reimbursement for local travel.[52]	None	

Table 10c

Theme of Decarbonisation (% contribution)	Topic	Commonly used strategies across Trusts	Metrics collected on Greener NHS Dashboard[5]	Suggested additional or alternative metrics
Supply Chain and Procurement (61%)	Foster a circular economy	Promote on-site recycling. Recycling is a complementary strategy to reduce and reuse but should not be implemented alone.[53] For instance, it is inefficient when applied to plastic products.[53]	None	• Recycled Volume Annually • Associated Carbon Savings
		Reuse obsolete bulky non-clinical items. Items such as couches, beds, chairs, often can and should be refurbished instead of sent to landfill.	• Number of Trusts with walking aids refurbishment and reuse schemes	• Volume and types of items repaired or refurbished • Associated carbon savings
		Reuse obsolete IT hardware. ICT is an industry with high planned obsolescence.[54,55] Guidance on how to treat outdated yet functioning IT hardware is available.[56] WarpIT is an internet platform that allows users to donate rather than dispose unwanted items[57] and has saved more than 20kt of carbon emissions and diverted 6kt of waste from landfill.[57]	None	• Volume and types of items repaired or refurbished • Associated carbon savings
		Reduce overall consumption of medical goods. Not using a medical device will reduce its Carbon Footprint by 100%.[58]	None	• Procurement volumes
		Switch to reusable products where possible. A systematic review found that on average switching from a single-use to a reusable product leads to a 38-56% reduction in life-cycle Carbon Footprint.[58]	None	• Volumes and proportions of reusable items (by type) • Associated carbon saving
		Include whole life costing of products for both carbon and capital costs.[58]	None	• Associated carbon saving
	Implement the supplier roadmap	Since 2022, NHSE has mandated a series of changes that Trusts need to implement to evaluare the sustainability progress of their suppliers and to prioritise more sustainable partners in their procurement.[59]	• Number of Trusts who have included the minimum of 10% of Net Zero and Social Value in every tender • Number of Trusts with CRP inclusion in Procurement	• Suggest this metric is removed in favour of volumes and proportions of reusable items (by type) – see above
	Phase out single-use plastic products and packaging	The NHS Plastics Pledge is a directive to reduce single-use plastics from hospitals. To date that has focused on food-associated plastics but is expected to expand to clinical products such as gloves, gowns and hygiene products.[60,61]	None	• Volume of single-use plastics clinical packaging • Volume of single-use clinical plastic products
	Reduce paper usage	Recycling paper is believed to bring about GHG emission, water, energy and landfill waste savings.[64] Studies have shown however, that recycling paper brings about carbon savings only when the process is facilitated through renewable electricity.[65] Reducing paper usage thus remains the priority.	• Number of Trusts purchasing recycled paper	• Quantity of total and recycled paper purchased • Associated carbon savings
		Digitising documents such as admission letters, test results and scans, reduces paper consumption within Trusts, but should be balanced with the Carbon Footprint of the servers that store this information and the ICT hardware to support them	None	• Carbon footprint of servers/ICT hardware

Table 10c (continued)

Theme of Decarbonisation (% contribution)	Topic	Commonly used strategies across Trusts	Metrics collected on Greener NHS Dashboard[5]	Suggested additional or alternative metrics
	Appropriate waste streams	Segregate waste appropriately – for example incineration has high carbon intensity[62] and associates with high-levels of toxic pollutants and adverse effects on population health.[63]	• Data on clinical waste segregation	• Volumes and Carbon Footprint of different waste streams
	Reduce pharmaceutical footprint	Reduced pharmaceutical plastic packaging, which perhaps needs a central mandate rather than action by individual Trusts.[60,61]	None	• Volumes of pharmaceutical plastic packaging • Associated Carbon Footprint
		Use electronic prescribing. Reduces paper usage and can eliminate duplication.	None	• See above
		Reduce prescribing where appropriate.* Addressing issues of polypharmacy and medicines optimisation could allow both better treatment and reduction in pharmaceutical demand.[66,67]	None	• Volumes of prescribed medicines • Volumes of pharmaceutical waste • Associated Carbon Footprint
	Procure sustainable food options	Support low carbon menus. Plant-based meals have half the Carbon Footprint of meat-based alternatives, and proven benefits in decreasing risk for a multitude of diseases.[68]	• Number of Trusts with seasonal changes in menus • Number of Trusts with plant-based and lower carbon menus	• Carbon footprint of menus • Volumes of food by type
	Locally produced food	Decrease distance of travel of procured food, which lowers Carbon Footprint, and supports locally sourced fresh food. However, the carbon reduction from this change is context-dependent.[69]	None	• Reported food miles • Associated Carbon Footprint
		Produce food on-site. In addition to providing sustainably sourced food with low mileage, on-site gardens can improve well-being of staff and patients.[70]	None	• Volumes of food produced on-site
	Decrease direct food wastage	Decrease plastic waste from catering services, as outlined in the NHS Plastics Pledge.[60,61] Similar guidance should be implemented to pharmaceuticals plastics and other single-use plastic products across clinical settings.	None	• Volumes of food plastic packaging • Associated Carbon Footprint
		Decreasing direct food waste through optimising portions, understanding consumer behaviour and meeting demand.	• Number of Trusts with strategies to reduce food waste • Number of Trusts with digital meal ordering systems	• Food waste volume • Associated Carbon Footprint

*We recognise that reduced prescribing can affect in-patient as well as outpatient care, and where in-patient would more appropriately fit under the theme of "on-site medicines usage".

Table 10d

Themes of Decarbonisation (% contribution)	Topic	Commonly used strategies across Trusts	▪ Metrics collected on Greener NHS Dashboard[5]	Suggested additional or alternative metrics
On-Site Medicine Usage (5%)	Phase out desflurane	Replace desflurane with other anaesthetic agents. Sevoflurane is a 10 times less potent carbon emitter than desflurane and has comparable if not better anaesthetic qualities.[71]	· Volume of volatile anaesthetic gases · Annual carbon emissions from volatile anaesthetic gases	
	Reduce emissions from anaesthetic gases	Reduce nitrous oxide usage. Nitrous Oxide is the third most potent known greenhouse gas,[72] and is often used as an analgesic gas in midwifery practice[73]. Reduced usage and addressing leaking manifolds [74] should be considered, alongside replacing piped with canister based gas, and technology for break-down.[73]	· Volume of Nitrous Oxide · Emissions from Nitrous Oxide	
	Reduce metered dose inhaler (MDI) Usage**	Reduce overprescribing of inhalers to decrease demand for carbon-intensive MDIs.	· Number of inhalers supplied (by type) · Annual carbon emissions from inhalers supplied (by type)	
		Switch to dry powder inhalers. Dry Powder Inhalers are 20-30 times less carbon intensive than MDIs.[75] In 2017, 70% of inhalers used in the UK were MDI.[75]	· Number of inhalers supplied (by type) · Annual carbon emissions from inhalers supplied (by type)	

** We recognise that many inhalers prescribed will in fact be for outpatient use, and so would more appropriately fit under the theme “supply chain and procurement”.

Policy recommendations

There is evidence of significant progress in decarbonisation of the NHS in England between 2020 and 2023 (Section 2). However, some of the data underlying these estimates are not publicly available, meaning the accuracy and the drivers of this estimated reduction are uncertain. We understand the reduction is likely driven largely through use of renewable energy sources, and through reductions in use of volatile gas anaesthetics.

At an institutional level, our analysis of Trust Annual Reports shows a less positive picture. At best there is patchy evidence of progress, and where estimated as many Trusts reported an increase in Carbon Footprint as a decrease (Section 2). In essence, the overwhelming majority of Green Plans at present appear to be empty promises.

This represents a serious threat to meeting the net zero objectives of the NHS by 2040. Recent guidance for refreshed Green Plans has been issued, but here we make recommendations to optimise the scope and performance of this strategy.

Recommendation 1

Improve existing centralised guidance by introducing specific measurable targets, with clear timelines for delivery

Whereas the Greener NHS has produced a number of guidance documents to support NHS Trusts to decarbonise, our "SMART" analysis of Green Plans in Section 1 found fewer than half of Trust strategies specified how progress would be measured, and fewer than half were time-bound. Interviews in Section 3 show strong and consistent support for a top-down centralised NHS approach to decarbonisation.

Going forward, we recommend improving existing (and developing future) national guidance by identifying specific and measurable sustainability metrics, and requiring Trusts to deliver performance against those metrics within a specified timeframe.

Some such metrics already exist on the Greener NHS Dashboard[5], but our analysis in Section 5 finds some are premised on the adoption of policy or ideas, rather than measurable performance. Where possible, specific performance metrics should be preferred. There is also currently no requirement to deliver against many of those metrics.

Recommendation 2

Prioritise areas for decarbonisation, and determine which should be delivered by NHS Trusts and which require support of national strategy

We recognise a range of opportunities for delivering decarbonisation (Section 5), but some may have relatively small effect (e.g. recycling plastic packaging) compared to other strategies (e.g. moving to a circular economy to reduce single use products and associated packaging), and some actions may be easy to implement (e.g. using recycled paper) compared to others (e.g. digitising all medical records to remove paper). Some strategies lack evidence to support them, and so may need caution before being applied.

National strategy should therefore prioritise areas for decarbonisation based upon both evidence of effectiveness and scale of the effect.

Aligned to this, there needs to be an evaluation of what is/should be in the scope of Trusts to deliver, and what needs support or delivery through national strategy. To date Trust Annual Reports evidence a focus of decarbonisation on Estates and Facilities (Section 2), which is likely because this is an area Trusts can directly influence, with relatively little complexity to the change. Other strategies, such as enabling a circular economy for medical products, delivering remote care, or digitising health records, must be supported through national strategy to create the necessary supporting infrastructure, regulatory environment, and economic models (as evidenced and recommended for medical products in our previous policy brief[58]).

The financing of change also needs consideration, but often this is an invest-to-save model, as the majority of green strategies also save money (see for example case studies reported in the *Green Surgery* Report[74]).

Recommendation 3

Ensure accountability through mandatory public reporting of progress

Our analysis in Section 2 found that over 100 Trusts did not provide any evidence of meaningful progress against their Green Plan, and a further 15 Trusts provided no evidence. We understand that submission of evidence by Trusts to the Greener NHS Dashboard has also been inconsistent.

Trusts should be held accountable in their progress against specified performance targets (under recommendation 1) and performance should be publicly visible.

Evidence from the *Norwegian National Dashboard*[27] and *NHS Scotland National Green Theatres Programme Heatmap* in Section 4, alongside other databases such as the *Planetary Health Report Card* (for ranking medical schools)[76], show that visibility of healthcare institution sustainability performance helps drive improvement. Anecdotally that is because of institutions not wishing to be publicly visible as under-performing, but public availability of data can also enable peer-to-peer learning.

Evidence from other public sector organisations also shows a regulatory compliance model to be an effective driver for change in environmental performance.[77] Other NHS performance metrics published on public-facing databases[78] notably CQC reports on patient quality and safety, are also known to drive improvement.[78,79] And there are additional arguments for having public visibility and accountability. The NHS is funded through the taxpayer and should be accountable to them. Public reporting of data may allow academics or policy makers to support process, by identifying and addressing areas that are more difficult to decarbonise.

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