The Academy of Medical Sciences

For people, for planet: improving the environmental sustainability of health research

An analysis with recommendations for the UK and the US

Executive summary

NATIONAL ACADEMY of MEDICINE

Introduction

Improving the environmental sustainability of health research in the United Kingdom and the United States is both an ethical imperative and a practical necessity, due to its sizeable carbon footprint.

A step-change is needed to create a culture of sustainability in health research. The research sector should lead the way in efforts to reduce the impact of health research on the environment and to embody climate-conscious values and behaviour, while continuing to fulfil its primary purpose of improving health for all.

Health research can and should be made more sustainable, in order to contribute to global development and to environmental and sustainability goals, as well as to serve its fundamental purpose of improving health outcomes for all. Overcoming the tension between health research's positive health impacts and its negative effects on the environment demands coordinated system-level action by all stakeholders in the health research sector, to reduce environmental harm while safeguarding scientific quality and equity.

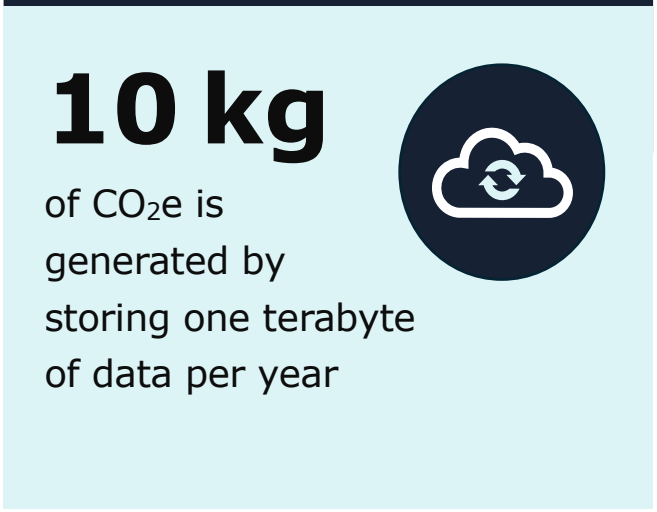
This is an executive summary of the report entitled "For people, for planet: improving the environmental sustainability of health research". **The report presents a series of policy recommendations for how the UK and US health research sectors can embed environmental sustainability across health research to create a sector that meets the needs of both people and planet.** The report is the work of 16 interdisciplinary researchers, convened by the UK Academy of Medical Sciences and the US National Academy of Medicine.

The impact of health research on the environment

While there is currently no overall estimate for the impact of the health research sector on the environment, studies suggest that individual types of health research, such as wet laboratory research, clinical research and computational research, have sizeable carbon footprints:[1,2,3]

Laboratories have been estimated to use around **10 times more energy and around four times more water than offices**. Laboratories have a high carbon footprint and plastic waste from laboratories globally has been estimated in the millions of metric tonnes each year. [4]

Carbon footprints vary widely in clinical trials research – from **small trials generating as little as one metric tonne of greenhouse gases to large, complex trials producing thousands of metric tonnes.** [5] For example, one major cardiovascular trial was estimated to have emissions of around 2,500 metric tonnes.[6]



High-performance and cloud computing, artificial intelligence (AI) and long-term data storage have growing footprints. For example, **storing one terabyte of data is estimated to generate around 10 kg of carbon dioxide equivalent (CO_2e) per year**, and many clinical trials require that data is retained for decades. [7] Reducing the net environmental effect of AI requires reducing the energy consumed in the process, as well as gains in efficiency.

Despite the progress achieved so far in making health research more sustainable, major challenges remain, key among them being the availability and standardisation of information and methodologies used to quantify the impact of health research; the need to build the capacity of researchers and organisations in environmentally sustainable health research; and the time, cost and resources required to provide the necessary research infrastructure and training.

---

[1] Sustainable Healthcare Coalition (no date). *How we calculated global clinical trial greenhouse gas emissions* [web page] https://shcoalition.org/low_carbon_clinical_trials/

[2] Nature Computational Science (editorial) (2023). *The carbon footprint of computational research.* Nat Comput Sci **3**, 659. https://doi.org/10.1038/s43588-023-00506-2

[3] Nathans J & Sterling P (2016). *Point of view: How scientists can reduce their carbon footprint*. eLife **5**, e15928. https://doi.org/10.7554/eLife.15928

[4] Greever C & Star S (2021). *Three strategies to make labs more sustainable*. Lab Manager, 26 May. https://www.labmanager.com/three-strategies-to-make-labs-more-sustainable-25945

[5] You F, *et al.* (2025). *Carbon emissions associated with clinical trials: a scoping review*. Journal of Clinical Epidemiology **181**, 111733. https://doi.org/10.1016/j.jclinepi.2025.111733

[6] Mackillop N, *et al*. (2023) *Carbon footprint of industry-sponsored late-stage clinical trials*. BMJ Open **13(8)**, e072491. https://pubmed.ncbi.nlm.nih.gov/37604634/

[7] UNEP (2024). *AI has an environmental problem. Here's what the world can do about that*. https://www.unep.org/news-and-stories/story/ai-has-environmental-problem-heres-what-world-can-do-about

Report findings

The report highlights that the health research sector is resource-intensive and needs to take a concerted and collaborative effort to reduce its environmental impact and become more sustainable. Although there have been efforts by individual researchers, research organisations, funders and businesses to reduce emissions and other environmental impacts, progress so far has been sporadic. Sustainable practices will only spread across the whole sector when governments, regulators, funders, suppliers and research organisations work together in a decisive and coordinated way to bring about change.

The report is not the first to call for the health research sector to address its contribution to climate change, but it is the first to examine how this can be achieved through collective and collaborative action by stakeholders at all levels of the health research system in the UK and the US.

The key findings of the report, which are summarised in the next section, are organised into the following six themes:

1. Data, metrics and information availability
2. Funding
3. Regulation
4. Procurement and supply chain
5. Infrastructure
6. Capacity building of researchers and organisations

Call to action

The time for coordinated action is now: the health of people and the planet are inseparable, and the health research system, which works to improve human health, must itself become a model of environmental stewardship.

Cooperation is vital. The health research sector can accelerate the sustainability transition by convening funders, regulators, publishers, industry, and research leaders to agree on minimum, proportionate standards, tools and expectations. It can also organise pooled investments in shared infrastructure and resources, including data systems, carbon calculators and training on sustainability. Doing so will reduce duplication, foster comparability, and empower researchers everywhere – from well-resourced labs to under-resourced settings – to participate in, and benefit from, a sustainable health research 'ecosystem'.

Key findings

Data, metrics and information availability

Better quantification of the environmental impact of health research is needed. This **requires standardised tools and methodologies.** Carbon footprinting is increasingly used in health research, but the tools and methods used to calculate the emissions from digital activities are heterogeneous, often labour intensive, and underdeveloped.

Gaps remain in terms of understanding and quantifying the environmental impact of broader categories of health research, such as implementation research, community health research and behavioural research. Furthermore**, existing data focuses largely on quantifying the carbon emissions of research activities**, rather than wider environmental impacts.

CO_2e is an established unit for measurement and targeting in relation to greenhouse gas emissions. However, accurate CO_2e calculations **require robust emissions factors,** such as grams of CO_2e emitted per mile of car travel or per unit of energy used, to enable comparison and prioritisation.

Tools and methodologies that offer such factors for health have been developed. However, **these tools are not widely used as they are not mandated by regulation**. The lack of pressure to adopt environmental measurement inhibits the emergence of a global 'gold standard' of environmental reporting. To reduce the burden on individual researchers and projects, organisational investment and pooled data are crucial. The growing use of high-performance computing and AI in health research must also be addressed as data centres are energy-intensive and the use of AI may lead to even greater demand as more data is processed and stored.

Funding

Funders can catalyse sustainable practices by setting environmental requirements and expectations, incentivising good practice and investing in capacity building. UK funders have taken the lead here – by publishing policies, setting up central hubs for resources and beginning to set environmental criteria for fund applicants – yet sector-wide standards, monitoring frameworks, and shared guidance are still needed in both the UK and the US.

Working together, funders and researchers have the potential to **integrate environmental sustainability standards, capacity-building investments, and interdisciplinary collaborations that drive long-term impact**. Funders can also foster capacity building in research by encouraging researchers to incorporate sustainability education into their teams.

Funders have great potential to promote the transition to sustainability but they need to **scale up initiatives** in this area. Health research funders need to work together to **develop minimum standard guidance, funding assessment criteria and monitoring frameworks,** as well as **fostering and incentivising** environmentally sustainable research practice across the health research sector. To gain

buy-in, mitigate unintended consequences and make progress, funders also need to **work with researchers and research organisations, as well as other stakeholders**, to agree standard requirements.

Regulation

Regulation plays a crucial role in health research, ensuring that ethical, safety and scientific standards are met in studies conducted by both academic and industry research teams.

Regulatory frameworks in both the US and UK are currently mainly designed to ensure research is conducted ethically, safely and effectively. **Sustainability is a relatively new consideration and its integration into these frameworks is as yet inconsistent**. Regulatory frameworks will need to evolve in order to integrate environmental considerations into health research governance.

Challenges to incorporating sustainability requirements into regulation include their potential negative impact on innovation. However, **regulations can support innovative research methods that drive both scientific progress and sustainability**. Examples of such methods include adaptive trials, where early results are used to modify the design of the trial while it is in progress; decentralised trials, where activities take place away from traditional sites, sometimes in patients' homes; and the use of AI.

Smaller institutions often struggle with financial and technical capacity constraints, which can limit their ability to comply with evolving sustainability regulations. **Developing flexible regulatory pathways**, such as tiered requirements that are scaled to institutional size and capacity, can ensure that **both large and small institutions are able to meet sustainability goals without undue burdens**. There is also scope for **larger organisations in industry to take the first steps**.

Procurement and supply chain

Procurement and supply chain management are critical components of health research, encompassing the purchase and use of laboratory equipment, clinical supplies, pharmaceuticals and infrastructure. These **materials have significant environmental footprints over their life cycles, from production to disposal.**

'Sustainable procurement' is the process of acquiring goods and services while minimising environmental, social and economic impacts. It requires **collaboration among stakeholders, including funding agencies, policymakers and industry leaders**. As efforts to improve environmental performance grow, procurement policies and practices need to evolve to **incorporate sustainability measures** and reduce the carbon emissions of health research.

Consistent procurement policies and standards could require suppliers to publish the environmental impact of their products and services, increasing transparency and allowing procurers to make informed decisions. **Capacity-building initiatives**, such as training programmes for suppliers, could help to promote sustainable purchasing practices. **Technological advances,** including AI-driven supply chain inventory management and blockchain for enhanced transparency, also offer potential solutions. **Financial**

incentives and government support for sustainable procurement could also alleviate the financial burden on researchers and suppliers.

Infrastructure

Buildings, equipment, energy systems, computing platforms, and enabling services, such as travel and data platforms, are significant drivers of emissions. **Physical and electronic infrastructure consume considerable energy and generate significant quantities of waste**. Research teams require organisational support to construct and maintain infrastructure in ways **that reduce energy demand and minimise waste without compromising operations or research quality**.

Long-term, strategic financial **investment in more sustainable infrastructure requires ample public and private funding.** In addition, there are challenges around ensuring optimal design and quality of research buildings and computing infrastructure. Such challenges mean that progress on making infrastructure sustainable has been slow so far.

A range of construction and engineering techniques can improve the sustainability of health research infrastructure:

- **Active design approaches**, such as solar panels, wind turbines and district heating, use mechanical and electrical technologies to optimise heating, ventilation, air-conditioning systems and other applications.
- **Passive design approaches**, such as natural ventilation, shading, thermal insulation and green roofs, take advantage of local conditions to improve indoor comfort while reducing energy demand.
- **Building facade engineering** optimises daylighting and heat exchanges during summers and winters.

Several frameworks now exist to help research organisations design and build infrastructure sustainably, as resources permit. The UK Green Building Council framework provides guidance on creating net zero buildings in the UK, and the US also has a Green Building Council whose Leadership in Energy and Environmental Design (LEED) programme offers a framework for achieving cost-effective green buildings.

Capacity building of researchers and organisations

Capacity building is the process of strengthening the abilities of individuals, organisations or communities to achieve their goals and adapt to changing circumstances. Improving the sustainability of health research requires **enhancing the capability of research organisations – covering their skills, knowledge, resources and processes.**

Progress in this area requires resources, time, incentives, and the presence of communities of practice. Training and partnership resources currently exist, but they are unevenly distributed and implemented. Expectations need to be matched by **accessible support**. To reduce the environmental

impact of health research, organisations need to **build centralised institutional capacity** to increase the individual capacity of researchers, faculty and students to design and conduct sustainable research.

There is a significant gap in capacity building in this area due to a number of barriers: financial and resource constraints; a lack of training; and a lack of standardised and consistent tools, frameworks, resources and guidance. Some **capacity-building initiatives are emerging**, particularly among UK funders and through grass roots initiatives such as accreditation schemes, although their scale, scalability and maturity vary.

Sustainability training and capacity building needs to be **scaled across research career pathways at all levels**, beginning with undergraduate studies and continuing through postgraduate programmes and into all professional levels.

To achieve this, **major financial investment will be needed**, alongside **coordinated action and guidance** from government, health research funders and research organisations. **Collaboration and sharing of best practices, training materials and resources** is also needed to scale up capacity among research organisations.

Call to action

Here we present a range of solutions to address the issues outlined above. The solutions below are a selection of recommendations from the main report.

Please refer to the main report for our full list of recommendations.

Key:


Health research organisations


Health research funders


Health research regulators


Health researchers


Health research groups/teams & leads


Sustainability and environmental impact information providers


National health research bodies


Government departments


Suppliers


Institution review boards


Health research educators


Health research publishers


Umbrella organisations


Relevant state/local environmental agencies


Higher education institutions


Health research training providers


Industry

Data, metrics and information availability

Pages 20-28 in the main report

Recommendation 1: Utilise existing carbon footprint data to promote sustainable health research practices

a) Make national and institutional carbon footprint data on health research accessible on open access and centralised online platforms

b) Incorporate learning and awareness raising on environmental impact metrics into health and related research curricula and teaching materials

c) Include an introduction to environmental impact metrics in staff and student inductions

d) Adapt environmental impact data and metrics to consider both health and economic impacts, and to ensure optimal communication with policymakers and the public

e) Review the current use of digital tools, data storage and the accessibility of research data to maximise its use and ensure that data is not stored unnecessarily

Recommendation 2: Utilise existing carbon footprint data to promote sustainable health research practices

a) Commit to carbon footprinting through measuring and monitoring CO_2e

b) Provide equitable training to researchers on quantifying carbon footprints

c) Gradually include carbon footprint data as a component of health research assessments

d) Encourage the inclusion of carbon footprint data and sustainable research methods in health research publications

e) Include digital technologies and data storage in carbon footprinting exercises for health research

f) Integrate environmental footprint assessment into institutional review board (IRB) processes

Recommendation 3: Expand support for carbon calculators and other quantitative tools that can be used across health research contexts

a) Develop funds and funding schemes to support accessible carbon footprinting tools

b) Collate and share up to date data for carbon footprint calculations and for identifying 'carbon hotspots'.

c) Support local and international collaborative efforts to standardise tools and carbon calculators

d) Promote the adaptability of quantitative tools for interdisciplinary, national and international contexts

Funding

Pages 29-34 in the main report

Recommendation 1: Strengthen environmental sustainability standards in health research

a) Identify and set minimum aligned levels of accreditation for researchers

b) Collaboratively develop minimum standard guidance for researchers on including environmental sustainability in health research

c) Include environmental impact assessments in grant applications, with minimum additional bureaucracy

d) Establish joint funding calls and joint funding initiatives for sustainable health research

e) Incentivise sustainable research practices by providing additional funding for the incorporation of sustainability assessments in grant applications

f) Set clear and realistic goals and establish shared principles for approaching sustainability, between funders and research organisations

g) Promote transparency, accountability and measurable impacts through clear metrics and aligned evaluation frameworks to track the environmental impact of funded projects

h) Provide additional resources and centrally accessed support to smaller scale and less resourced settings

Recommendation 2: Foster sustainability education and capacity building in research

a) Competitively recognise progress towards sustainability amongst grant applicants

b) Encourage senior researchers to integrate sustainability education into their teams

c) Actively promote the development of tools that can help researchers integrate sustainability into their work

d) Explore novel funding schemes to support projects that emphasise environmental sustainability

e) Encourage researchers to reduce the environmental impact of their research by promoting the use of sustainable resources, minimising waste, and adopting environmentally friendly practices.

Recommendation 3: Strengthen partnership working, including public–private partnerships and public/patient involvement in funding for environmentally sustainable research

a) Encourage collaboration between public and private sectors to scale up funding for environmentally sustainable health research

b) Develop joint policies between private and public funders to make sure they achieve at least the same minimum standards in environmentally sustainable research

c) Foster good practice and shared learning between private and public funders

d) Establish a coalition of funders to share expertise and hold centrally accessible resources

e) Showcase impact and build public support to explain how funded research has become more environmentally sustainable

Regulation

Pages 35-38 in the main report

Recommendation 1: Integrate sustainability into existing regulatory frameworks

a) Revise research governance frameworks to include sustainability criteria, such as carbon footprint reduction and resource conservation requirements

b) Expand environmental impact assessments (EIAs) to cover all research phases

c) Develop flexible regulatory compliance pathways for smaller institutions

Recommendation 2: Develop new regulatory models to support sustainable research

a) Establish frameworks that enable the use of innovative environmentally sustainable research techniques

b) Establish joint sustainability reporting requirements for funded research

c) Develop progressive certification programmes that encourage and recognise incremental sustainability improvements across research organisations

Recommendation 3: Strengthen monitoring, accountability and reporting systems

a) Standardise sustainability metrics across research institutions and countries to enable meaningful national and international collaboration

b) Work toward periodic sustainability reporting, with flexible pathways for smaller or less well-resourced organisations

c) Develop a digital, open access platform for sharing sustainability data and innovative practice from research regulators across the research community

Recommendation 4: Incentivise compliance and innovation in sustainable research

a) Provide targeted financial and technical support to smaller research institutions to help them meet sustainability requirements

b) Recognise and reward exemplary sustainable research practices

c) Support adaptive regulatory updates based on implementation data, which allow for sustainable research practices and regulations to evolve based on real-world implementation experiences and stakeholder feedback

d) Develop comprehensive sustainability training programmes for researchers, ethics committees and regulatory personnel to enhance capacity and ensure effective compliance with sustainability requirements

Procurement and supply chain

Pages 39-43 in the main report

Recommendation 1: Develop and embed sustainable procurement processes

a) Minimise resource consumption through efficient research design and waste reduction

b) Promote sustainable materials and renewable resource use

c) Integrate environmental criteria into procurement decisions

Recommendation 2: Build capacity and foster an equitable and sustainable supply chain

a) Support supplier transition to greener practices through training, incentives and collaboration programmes

b) Train stakeholders in sustainable procurement practices

c) Ensure supply chain resilience by designing policies which support diverse, smaller suppliers

Recommendation 3: Drive innovation through sustainable research and development

a) Invest in technology and innovation to improve procurement sustainability

b) Advance research on sustainable research materials

c) Adopt digital tools that increase supply chain efficiency while minimising their own environmental impacts

Recommendation 4: Align policies and harmonise standards

a) Embed sustainable procurement in national and international policy frameworks

b) Standardise procurement practices and standards across regions to enable cross-border collaboration and consistency

c) Balance regulation with ensuring access for all through frameworks that promote sustainability without excluding smaller or less well-resourced suppliers

Infrastructure

Pages 44-49 in the main report

Recommendation 1: Ensure adequate provision of physical infrastructure to effectively support, promote and sustain environmentally sustainable health research in the long term

a) Adopt and invest in sustainable building practices through the use of innovative active and passive building design in research centres and facilities

b) Incorporate sustainable hardware infrastructure within clinical data/research centres to manage the computational demands of AI and machine learning-enabled big data processing

c) Incentivise top-down cross-sectoral investment in greener research campuses, communities, cities and infrastructure

Recommendation 2: Ensure adequate provision of electronic infrastructure to effectively support, promote and sustain environmentally sustainable health research in the long term

a) Promote the considered use of digital technologies to facilitate migration to virtual electronic systems

b) Adopt environmentally sustainable technological tools in health research to minimise carbon footprints

c) Invest in the development of standardised protocols for health research that account for sustainability, the incorporation of AI and machine learning tools in such protocols, open sourcing of algorithmic codes, and ethical codes of practice

Recommendation 3: Ensure adequate provision of supportive service infrastructures to promote and sustain environmentally sustainable health research in the long term

a) Promote efficient and foresightful governance which incentivises, empowers and financially supports research organisations to adopt sustainable infrastructure

b) Design and enable effective procedures to monitor and manage water, waste and energy, with the aim of minimising negative environmental impacts

Capacity building of researchers and organisations

Pages 51-56 in the main report

Recommendation 1: Expand institutional capacity to support training on environmentally sustainable research

a) Leverage targeted funding streams and incentives to drive capacity building of researchers within research institutions

b) Actively share promising practices, resources and training materials to build collective capacity and to support smaller or less well-resourced organisations in adopting sustainability practices

c) Support sustainability in international partnerships through ensuring appropriate training, tools and resources to implement sustainable research practices are shared

d) Develop a co-created standardised framework and best practice guidance for training and capacity building across research disciplines

Recommendation 2: Develop and scale sustainability training and capacity building across research career pathways

a) Fund sustainability training at all research career levels to build long-term capacity

b) Embed sustainability into mandatory training programmes, such as Good Research Practice, Good Clinical Practice and research ethics training

c) Offer technical training in sustainable research practices tailored to a wide range of research environments, not limited to laboratory settings

d) Co-create technical assistance resources or consultative services to review research proposals and operations, offering tailored recommendations for reducing environmental impact

e) Develop and scale formal structured curricula on sustainable research and make this accessible to public and private sectors

Recommendation 3: Promote transparency and collaboration in sustainability training and capacity-building efforts

a) Share sustainability training materials, curricula, methods and tools across organisations to support sector-wide improvement

b) Conduct coordinated reviews of current practice to identify effective training models, barriers to adoption and opportunities for scaling sustainability capacity

The Academy of Medical Sciences

Follow us on social media:

/company/acmedsci
@acmedsci
/acmedsci
@acmedsci.bsky.social
/acmedsci

Academy of Medical Sciences
41 Portland Place
London W1B 1QH

Registered Charity number: 1185329
Incorporated by Royal Charter
Registration number: RC000905

NATIONAL ACADEMY of MEDICINE

Follow on social media:

/company/national-academy-of-medicine/
@theNAMedicine
/thenamedicinesci
/bsky.app/profile/nam.edu
/NamEdu

The National Academy of Sciences
2101 Constitution Ave, NW
Washington, DC