UNIVERSITY OF CAMBRIDGE

Environmental Sustainability of Research and Innovation Practice

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Guidance for research grant applicants

Preface

This document contains guidance, reflective questions, tools, frameworks, and other resources to serve as a source of inspiration for academics, researchers and research professionals wishing to adopt or promote sustainable research practices aligned with the University of Cambridge's commitment to delivering world-leading research and teaching in an environmentally responsible way. This first version is the result of collective work and insights between the Cambridge Research Office and the Environmental Sustainability Team and will be revised over time as further developments and discussions take place across the University and beyond.

To provide feedback and suggestions please contact us: Researchstrategy@admin.cam.ac.uk

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1. Introduction

The University of Cambridge is committed to delivering our world-leading research and teaching in an environmentally responsible way, taking action to improve our operational environmental performance,[1] to maximise net benefits for society.

The University is a signatory of the Concordat for the Environmental Sustainability of Research and Innovation Practice, which has been developed collaboratively by representatives from across the UK's research and innovation sector, including universities, research institutes and funding organisations. In line with this concordat, funders are increasingly expecting applicants for research grants to articulate in their applications how they will embed environmental sustainability in their research project.

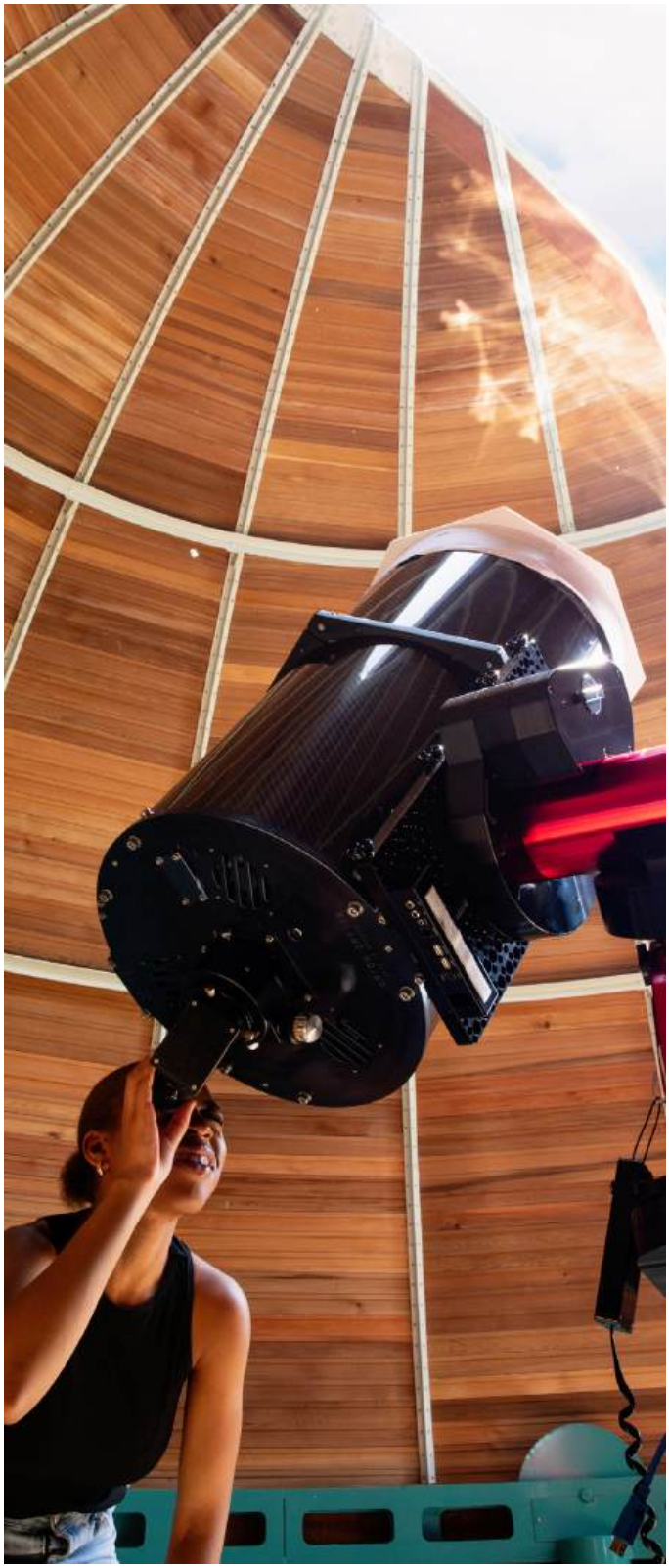
This guidance is designed to:

i. help research grant applicants to consider the environmental impact of their research and associated activities;

ii. identify and embed more environmentally sustainable approaches to research and innovation practices;

iii. respond effectively to questions raised by funders in grant application processes.

This resource should be used in conjunction with reference to the specific call guidance and the funder's terms and conditions.



2. Concordat for the Environmental Sustainability of Research and Innovation Practice

The Concordat for the Environmental Sustainability of Research and Innovation Practice[2] has been co-developed across the UK R&I sector and represents a shared ambition for the UK to continue delivering cutting-edge research, but in a more environmentally responsible and sustainable manner.

By signing the Concordat[3] (November 2024), the University commits to progressively embed environmental sustainability into its research and innovation practices through action in six priority areas:

1. Leadership and system change
2. Sustainable infrastructure
3. Sustainable procurement
4. Emissions from business and academic travel
5. Collaborations and partnerships
6. Environmental impact and reporting data

The Concordat covers all aspects of environmental sustainability, including but not limited to carbon emissions, water, waste, and biodiversity.

The Concordat defines environmental sustainability as:

> *...ensuring our interactions with the environment avoid depletion or degradation of natural resources, reduce, or eradicate our greenhouse gas emissions and allow for long-term environmental quality; ensuring that the needs of today's population are met without compromising future generations' ability to meet their needs.*

3. Considerations for different categories of research activity

Ensuring research is conducted in an environmentally sustainable way requires an awareness of the specific impacts associated with different types of research activity. Projects may often encompass a number of these activities. The design of a project will determine many of the environmental impacts resulting from it.

3.1 Lab-based research

Laboratories are resource-intensive environments. The resources consumed in laboratories are much higher than other work environments such as offices. For example, laboratories typically consume 3 to 5 times more energy per square metre than office spaces. High resource use, including energy, water and materials (such as equipment and consumables), and waste generated all contribute to the environmental impact. Researchers working in lab settings can take steps to reduce their environmental impact.

» **Maximise equipment use** – share, maintain, repair and reuse equipment. Consider opportunities for sharing and making use of second hand or reconditioned equipment where this is possible.

» **Minimise consumable use** – use and investigate reusable alternatives to minimise single-use items; reduce volumes of consumables wherever possible (reagents and single-use items); consider opportunities to share common chemicals, consumables and reusable alternatives; avoid purchasing more than is required.

» **Reduce energy and water consumption** – have systems in place to ensure:

- equipment is maintained and only on when required;
- optimise management of cold storage - maintain inventories and equipment, maximise space use, ensure maximum suitable storage temperature (e.g. -70°C vs -80°C) and monitoring, use of centralised storage facilities;
- close fume cupboards sashes whenever possible do not use for storage;
- recirculate water used for cooling and ensure level of water purity is appropriate;
- include energy and water efficiency, and maintenance, in procurement decisions.

1. Is your lab certified under the Laboratory Efficiency Assessment Framework (LEAF) or a similar scheme? Are you or could you be working towards the next level of certification?
2. If applying for a grant, what are the funder requirements in relation to environmental sustainability and lab certification?[a]
3. Do you already access shared equipment, or could you for your project, and what equipment and resources could be shared with others?
4. What opportunities are there to reduce consumable use in your project design?
5. How could opportunities to minimise the environmental impact of materials and equipment required be considered in procurement decisions?

[a] Wellcome and CRUK require labs to have certification of environmental efficiency to receive funding

Selected tools and frameworks

Laboratory Efficiency Assessment Framework:[4] developed at University College London (UCL), LEAF is a programme and standard designed to enhance the sustainability of laboratories. Labs participating in LEAF work towards bronze, silver, or gold certification based on the number and impact of sustainability actions implemented. The University of Cambridge is signed up to LEAF, meaning any lab within the institution can take part and work towards improving their environmental performance.

Equipment sharing programme:[5] UKRI and individual Research Councils expect there to be efficiencies in the use of equipment. The University has developed an Equipment Sharing Database to record all the shareable equipment in the University.

Jisc Equipment Data Service:[6] This national equipment portal lists research equipment and facilities in academia and research organisations across the UK.

Warp It reuse platform:[7] an online marketplace to redistribute office furniture, lab equipment and other resources conveniently and legally within the University for free.

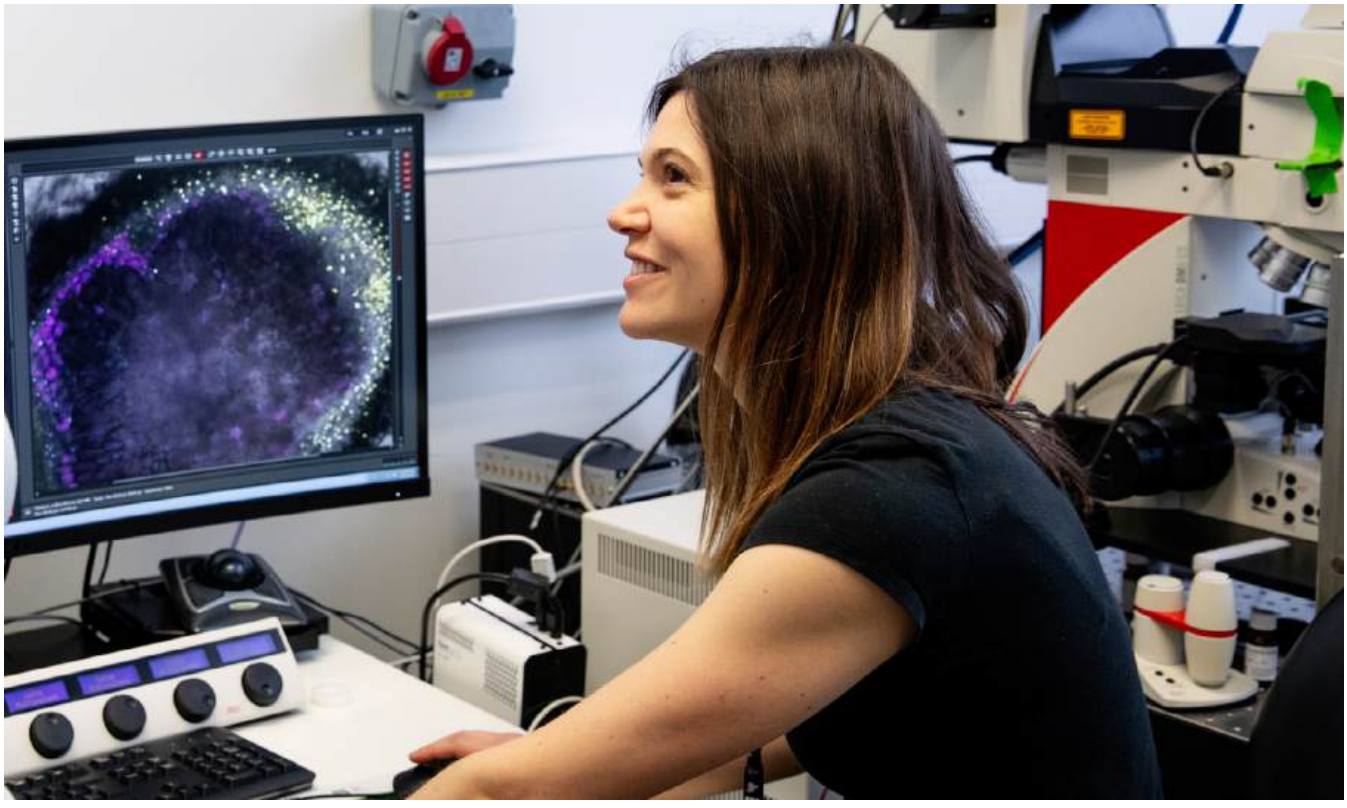
UniGreenScheme:[8] an asset resale service tailored for universities, helping institutions extend the life of research equipment. It offers an online marketplace where staff can purchase second-hand items, as well as collection and resale services for equipment that is no longer needed. This supports the circular economy and helps reduce procurement-related waste and emissions.

3.2 Computational research

Computational research can have significant environmental impacts due to the energy demands of data storage, processing, and high-performance computing. Addressing these impacts requires a focus on energy-efficient computing practices and sustainable digital infrastructure. It is also important to recognise that energy efficient computing innovations alone are not sufficient to achieve increased environmental sustainability as the so-called rebound effect can result in higher environmental footprint caused by increases in usage.

The environmental impact of computing can be broadly divided between (i) the carbon footprint of powering the computers during the task itself; (ii) the impact of long-term data storage; and (iii) the life cycle footprint of the hardware.[9] There are actions researchers can take to make their highly-intensive computational work more sustainable, some of which are suggested here.

- **Choose energy-efficient computing facilities** - where possible, use energy-efficient data centres i.e. CSD3, select cloud computing services with sustainability commitments, and adjust computing workflows to reduce energy use.
- **Optimise code and algorithms** – one of the most effective ways to reduce the carbon footprint of analysis is simply to ensure that the most efficient software for the task has been used. Additionally, simple optimisations in data processing and algorithm design can significantly lower computational costs. Make conscious decisions about research questions and the amount of analysis needed to keep efficiency wins without over-extending the scope of the compute.
- **Assess and reduce carbon-footprint** - using tools to assess the carbon impact of computational work can help researchers make more informed decisions to mitigate the carbon impact of a project.



Selected tools and frameworks

Green DiSC:[10] a certification scheme designed to provide research groups and institutions with a structured approach to reducing the environmental impact of their computing activities. It offers a roadmap with specific criteria for both research teams and central sustainability or IT teams. Currently, only Bronze-level certification is available, but Silver and Gold levels are in development, offering a progressive pathway to more sustainable computing practices.

Green Algorithms:[11] a project led by researchers from the Department of Public Health and Primary Care at the University of Cambridge, Green Algorithms promotes environmentally sustainable computational science. It provides researchers with tools such as carbon footprint calculators to estimate the environmental impact of their computational work, as well as practical guidance on reducing energy consumption. The project also offers training materials, past talks, and publications to support researchers in adopting greener computing practices.

Research Computing Services:[12] The University of Cambridge's national centre for digital research infrastructure, including High Performance Computing, Data Storage and Secure Research Computing.

1. Have you used any tools to assess the carbon footprint of your work? What changes has or will this lead to?
2. Are you using energy efficient facilities/services e.g. CSD3?
3. Are codes and algorithms optimised for efficiency?
4. Are you using the best software for the task including the latest software updates?

3.3 Health research and clinical trials

Health research and clinical trials play a critical role in advancing medical knowledge and improving patient outcomes. The environmental impacts of clinical research can often be reduced when considered in the design and process of a study. There are ways that researchers conducting clinical studies and trials can integrate sustainability into their work, some of which are outlined here.

- **Reduce waste in clinical settings -** minimise single-use items ensuring reusable alternatives are chosen, where safe and feasible. Use best practice guidelines for safe and sustainable waste disposal in research and healthcare settings.
- **Optimise energy use** – implement energy-efficient storage solutions for samples and medical research data (see Sections 3.1 and 3.2).
- **Ensure sustainable logistics and procurement** - understand the environmental impact of transporting samples and supplies, and explore lower impact options such as sourcing locally; source materials from sustainable and ethical suppliers and consider environmental impacts across health research supply chains.

1. If you will be conducting a clinical study or trial, have you considered assessing or estimating associated carbon emissions?
2. What can you learn from carbon audits of previous clinical trials to help keep the environmental impact of your proposed study or trial as low as possible?
3. Have you considered alignment with local NHS trusts, for example Cambridge University Hospitals NHS Foundation Trust's Green Plan?
4. Could samples and data be shared from/with other studies?
5. Can single-use materials be reduced or replaced with reusable alternatives, where it is safe and practical to do so?

Selected tools and frameworks

MRC Hubs for Trials Methodology Research - Enabling Lower Carbon Clinical Trials:[13] collated resources and reference materials for publicly funded trialists in the area of Greener Trials, including NIHR Carbon Reduction Guidelines and how to access the Greener Trials Toolkit.

MRC Epidemiology Unit - BioRepository Sample Storage and Processing Facilities:[14] advanced automated systems for retrieving and arraying biological material for biomarker applications, as well as cost-effective solutions for DNA extractions and Quality Control.

NHS England Safe and Sustainable Management of Healthcare Waste:[15] Health Technical Memorandum (HTM 07-01) on best practice for waste management and ways to improve the environment and carbon impacts of managing waste.

NIH-supported Scientific Data Repositories:[16] Find information on and a list of NIH supported repositories for sharing and accessing scientific data.

3.4 Fieldwork

Fieldwork is an essential part of many research projects, often vital for collecting data and advancing knowledge. However, field trips can also carry a significant environmental footprint, particularly due to the long-distance travel and transportation often involved.

There are actions researchers can take to minimise the environemental impact of fieldwork.

- **Reducing the carbon impact of travel** - limit the frequency and necessity of long-distance travel, opt for lower-carbon transport options such as trains or buses where possible, and combine multiple research tasks into fewer trips to minimise overall emissions.
- **Plan efficient fieldwork logistics** – reduce waste generated during fieldwork by using reusable materials and consider the environmental impacts of equipment trasnport in the field.
- **Leverage guidance and tools** - use travel management tools that prioritise sustainable options and help researchers make environmentally conscious decisions when planning fieldwork trips.

Selected tools and frameworks

Responsible and Ethical Fieldwork – RGS:[17] the Royal Geographical Society provides comprehensive guidance for conducting responsible and ethical fieldwork, with a focus on reducing environmental impact. It offers practical advice on planning efficient fieldwork logistics, using sustainable equipment, and considering the carbon footprint of travel.

1. Have you undertaken a carbon audit to determine the carbon footprint of your planned fieldwork? Has this informed any changes to the original plan to help reduce carbon emissions?
2. Are you planning fieldwork with environmental efficiency in mind e.g. combining activities into the fewest possible trips?
3. Can you limit the number of people travelling by using in-country partners for data collection etc?
4. Can you access or source equipment or other resources locally, rather than shipping them, if this is the lower carbon option?
5. If collecting samples, are you using low intrusive sampling methods and only sampling what you need? Can you justify any impact on wildlife and the ecosystem?
6. What are the considerations for storage of data and samples collected?

4. Research equipment and consumables

The procurement and use of office equipment, research equipment and consumables can contribute significantly to the environmental footprint of research. From the extraction of raw materials and manufacturing processes to packaging, shipping, and eventual disposal, every stage in the lifecycle of equipment and supplies has environmental implications. It is important that researchers and professional services colleagues take steps to reduce these impacts.

- **Use shared equipment where possible –** check the University's Equipment Sharing Database, and/or consider whether it is feasible to use equipment available at another institution.
- **Embed sustainability in procurement decisions -** prioritise products that meet required performance and quality standards while offering reduced carbon emissions and environmental impact.
- **Extend equipment lifespan -** maintain and service equipment regularly, and consider repairing or reconditioning existing equipment where feasible, rather than replacing with a newer model.
- **Reuse and recycle materials and equipment -** utilise available services to repurpose, donate, or responsibly recycle equipment and reduce waste from single-use or disposable items.

Selected tools and frameworks

(see also Section 3.1)

Sustainable Procurement | Procurement Services:[18] provides comprehensive guidance on embedding sustainability into purchasing decisions. It outlines the University's commitment to ISO 20400 standards for Sustainable Procurement, which aim to ensure that products and services deliver the most positive environmental, social, and economic impacts over their entire lifecycle. Researchers are encouraged to select products with improved carbon footprints that also meet price, performance, and quality requirements. The site also details practical steps for making more environmentally responsible purchasing decisions and links to the Sustainable Procurement Policy and the University's Equipment Sharing Database.

1. Do you already have access to key equipment needed for your project? If not, can you arrange for access to shared equipment?
2. If you plan to purchase equipment in relation to this project, has a Life Cycle Assessment been completed?
3. Is equipment regularly maintained and serviced to extend its lifespan and reduce the need for replacement?
4. Are materials and equipment being reused, repurposed, or responsibly recycled to minimise waste?

5. Associated activities

Conducting research usually involves some associated activities which, while not taking place as frequently as other elements, can still contribute significantly to overall carbon emissions.

5.1 Research related travel

Travel to conferences, to meet with collaborators and for fieldwork (see Section 3.4) can be responsible for a significant proportion of the carbon emissions of a research project, particularly where air travel is concerned. Many funders' policies only allow essential travel and encourage for climate conscious travel, whereby the environmental cost of travel is prioritised over the financial cost and individual convenience, but not over individual safety considerations or principles of inclusivity. There are simple measures that can help reduce travel-related carbon emissions.

- **Eliminate non-essential travel** – consider whether virtual collaboration or event attendance is a reasonable option, reducing the need to travel, and plan accordingly.
- **Make lower carbon travel choices** – when travel is essential, choose available modes of travel that have the lowest environmental impact, measured in terms of carbon footprint of travel per passenger per kilometre.

Selected tools and frameworks

Productivity suites and collaboration tools:[19] a number of options are available to staff and students to help reduce the need for travel.

Guidelines for Sustainable Business Travel:[20] applies to all domestic and international travel outside the University estate for research, education and business purposes related to the University.

Carbon Contributions Scheme:[21] a portal where you can accurately calculate the carbon emissions of your essential business flight(s) and purchase University verified carbon contribution units.

RouteZero Journey Planner:[22] planning tool available to anyone at the University, which helps with booking low-emission journeys.

1. What are the funder's expectations in relation to sustainable business travel?
2. Could you hold collaboration meetings online rather than in person?
3. If you plan to attend a conference, would online attendance be appropriate?
4. Where travel is essential, are you prioritising modes of transportation with the lowest environmental impact (e.g. train over air travel)?
5. If air travel is essential, have you considered purchasing carbon units from the University's Carbon Contributions Scheme?

5.2 Research outputs

Research outputs such as publications, datasets, software, and conference presentations are essential for knowledge dissemination, but the processes involved can carry environmental costs. These include emissions associated with conference travel, printing, data storage, and even the digital infrastructure that supports publishing and sharing research. Researchers should look to embed more sustainable approaches.

- **Store data sustainably -** using energy-efficient data centres for long-term data storage, archiving only what is necessary, and following FAIR (Findable, Accessible, Interoperable, Reusable) data principles to minimise duplication of effort.
- **Share knowledge efficiently -** disseminating research through existing institutional repositories, preprint servers, and collaborative platforms to avoid redundancy and reduce hosting-related emissions.
- **Share research openly** - choosing open access for your research outputs where possible to enable the wide dissemination of research, promote transparency and minimise duplication of research.
- **Preserve research for the future** - ensuring that the channels you use to disseminate research are sustainable, trustworthy and are committed to preservation and long-term access to minimise risk of losing research.

Selected tools and frameworks

Research Data Management webpages:[23] provides information and support relating to research data.

Apollo:[24] University of Cambridge repository: the institutional repository of the University of Cambridge, is CoreTrustSeal[25] certified and managed by the Open Research Systems team based in Cambridge University Library.

Open Research webpages:[26] provides information and support relating to open research.

Cambridge Open Engage:[27] a collaborative platform that enables open sharing of early research findings, reducing the need for resource-intensive traditional conferences. It allows researchers to gather feedback early and promote transparency and efficiency in the research process.

1. Are you practicing sustainable data management, such as archiving only the necessary data to reduce storage demands and environmental impact?
2. Are you choosing a Trustworthy Digital Repository for sharing your work that is committed to the long-term preservation of your research outputs? (e.g. Apollo - the University of Cambridge repository, has CoreTrustSeal certification as a sustainable and trustworthy repository.
3. Are you reusing existing research data wherever possible so that energy is not wasted by recreating it unnecessarily?
4. Are you making your research data as reusable as possible, following FAIR principles, so that others do not use more energy by duplicating it?
5. Have you considered publishing null results so that energy is not wasted by others replicating the research unnecessarily?

6. Further resources

Environmental Sustainability Hub SharePoint site: provides access to resources and ways to get involved

https://universityofcambridgecloud.sharepoint.com/sites/UoC_EnvironmentalSustainability

EUAC, The Alliance for Sustainability Leadership in Education: Membership body for sustainability in the post-16 education sector in the UK and Republic of Ireland

https://www.eauc.org.uk/home

UKRI Environmental Sustainability pages

https://www.ukri.org/who-we-are/policies-standards-and-data/corporate-policies-and-standards/environmental-sustainability/#contents-list

SPARK Hub: an open-access platform for greening research, developed by UKRI in collaboration with research communities

https://sparkhub.eu/

MRC Environmental sustainability programme impact report 2023/24

https://www.ukri.org/publications/mrc-environmental-sustainability-programme-impact-report-2023-to-2024/

Wellcome-RAND Europe report on advancing environmentally sustainable health research: provides an overview of global efforts to reduce the environmental impact of health research

https://wellcome.org/reports/advancing-environmentally-sustainable-health-research

Francis Crick Institute conference on sustainable medical research (2024): co-hosted by the MRC, NHS England, and NIHR, this conference provided a platform for discussing the role of research funders in driving sustainable practices, sharing knowledge, and identifying barriers to scaling up sustainability efforts in medical research

https://www.ukri.org/publications/mrc-nhs-and-nihr-conference-on-research-outputs-in-environmental-sustainability/

7. References

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25 https://www.coretrustseal.org/

26 https://www.openresearch.cam.ac.uk/

27 https://www.cambridge.org/engage/coe/public-dashboard

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