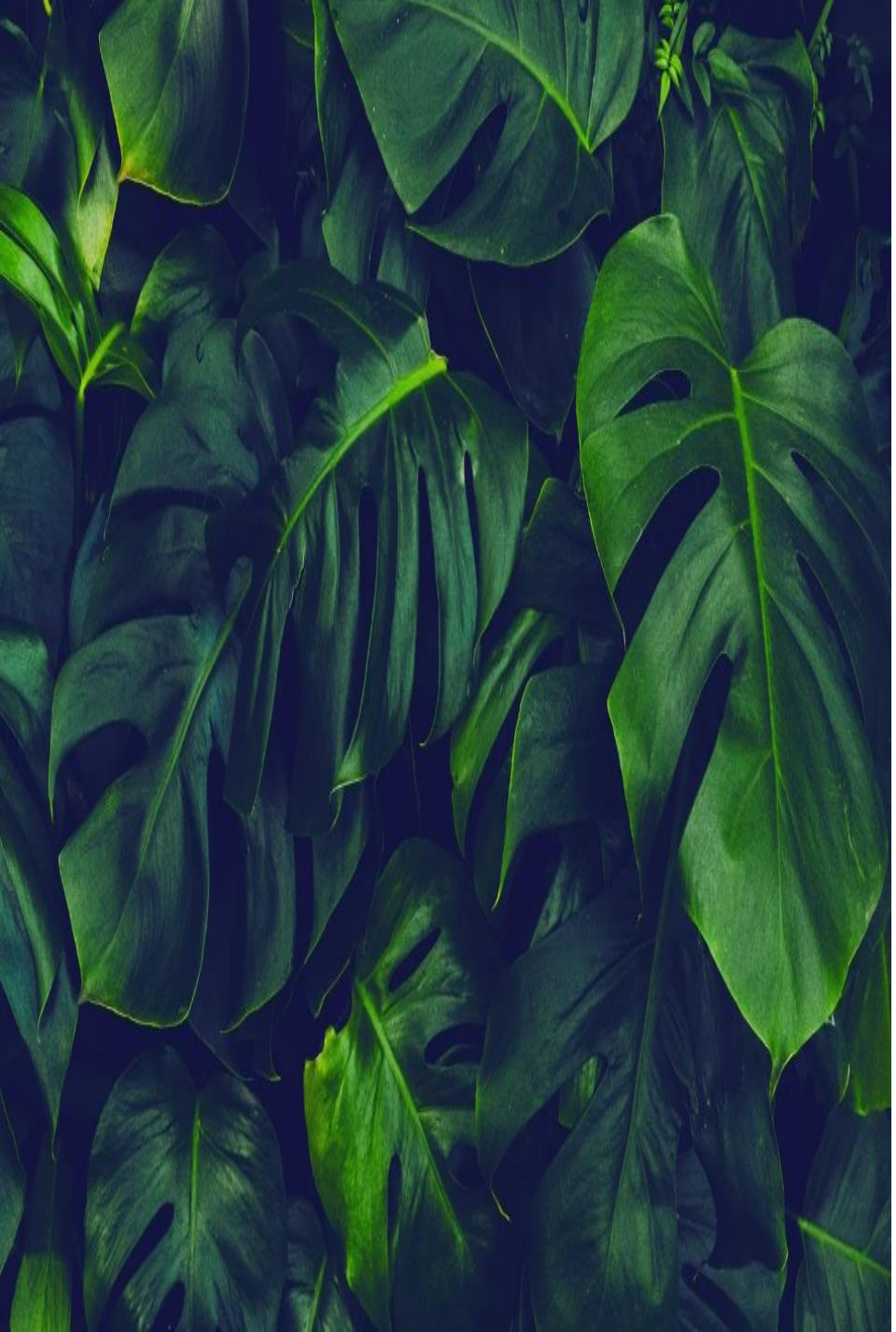


How are the environmental impacts of research are currently being addressed?

Dr Gabrielle Samuel
Department of Global Health and Social Medicine
King's College London
Gabrielle.Samuel@kcl.ac.uk
@gabriellesamue1

Format

- Charlotte talked about *why* we are here and why we *should* do something.
- I'm going to talk about what *is* happening in the broad research landscape.
- This afternoon, we'll talk about what we *can* do moving forward.

We need a shared understanding of practice: the research ecosystem

So, what has happened so far….

A rise in interest…(bottom up)….

UCL Home » Sustainable UCL » LEAF

Make your lab sustainable with LEAF

LEAF is a standard for sustainable laboratory operations. Find out how you can join the 70 global institutions already taking part and help address the climate and ecological emergencies through your science.

Laboratory based research is essential for advancing society but it is also extremely energy and resource intensive. It's estimated that laboratories are responsible for around 2% of global plastic waste and use 3-10 times more energy per meter squared than a typical office. By taking part in the LEAF programme you can make your laboratory more sustainable.

What is LEAF? ◀

What does LEAF comprise of? ◀

Who is using LEAF? ▼

LEAF is supported by the UKRN (UK reproducibility network). This is in recognition that high-quality research is

nature astronomy

Explore content ⌄ About the journal ⌄ Publish with us ⌄

nature > nature astronomy > comment > article

Comment | Published: 10 September 2020

The ecological impact of high-performance computing in astrophysics

Simon Portegies Zwart ✉

Nature Astronomy **4**, 819–822 (2020) | Cite this article

3681 Accesses | **35** Citations | **613** Altmetric | Metrics

J Biomol Tech. 2022 Dec 31; 33(4): 3fc1f5fe.d085ce95. PMCID: PMC10078834
Published online 2023 Feb 28. doi: 10.7171/3fc1f5fe.d085ce95 PMID: 37033093

Addressing the Environmental Impact of Science Through a More Rigorous, Reproducible, and Sustainable Conduct of Research

Susan M. Meyn, [1] Kathryn A. Ramirez-Aguilar, [2] Christopher W. Gregory, [3] Sheenah Mische, [4] Andrew W. Ott, [5] Katia Sol-Church, [6] Michael Sturges, [7] and Douglas J. Taatjes [8]

nature astronomy

Explore content ⌄ About the journal ⌄ Publish with us ⌄

nature > nature astronomy > perspectives > article

Perspective | Published: 10 September 2020

The imperative to reduce carbon emissions in astronomy

Adam R. H. Stevens ✉, Sabine Bellstedt, Pascal J. Elahi & Michael T. Murphy

Nature Astronomy **4**, 843–851 (2020) | Cite this article

9013 Accesses | **39** Citations | **194** Altmetric | Metrics

Reflecting on the environmental impact of research activities: an exploratory study

Computer Science > Computers and Society

[Submitted on 21 Oct 2019 (v1), last revised 4 Nov 2019 (this version, v2)]

Quantifying the Carbon Emissions of Machine Learning

Alexandre Lacoste, Alexandra Luccioni, Victor Schmidt, Thomas Dandres

From an environmental standpoint, there are a few crucial aspects of training a neural network that have a major impact on the quantity of carbon that it emits. These factors include: the location of the server used for training and the energy grid that it uses, the length of the training procedure, and even the make and model of hardware on which the training takes place. In order to approximate these emissions, we present our Machine Learning Emissions Calculator, a tool for our community to better understand the environmental impact of training ML models. We accompany this tool with an explanation of the factors cited above, as well as concrete actions that individual practitioners and organizations can take to mitigate their carbon emissions.

Comments: Machine Learning Emissions Calculator: this https URL
Subjects: Computers and Society (cs.CY); Machine Learning (cs.LG)

Interviews with researchers (health/data)

- Researchers wanted to take responsibility
- Struggled to reconcile perceived responsibilities in practice – data practices under institutional control
- Response-able (Haraway; Johnson and Michaelis, 2013)

-Samuel (submitted) *Researchers' views on their responsibilities towards the environmental sustainability of their practices: a case study of data-intensive UK health research*

-Samuel (2023). *UK health researchers' considerations of the environmental impacts of their data-intensive practices and its relevance to health inequities.* BMCethics.

Universities

UNIVERSITY OF OXFORD

ADMISSIONS RESEARCH NEWS & EVENTS ABOUT

Sustainability

Our priorities | Take Action | Link up and learn | News, Events & Campaigns | Who we are

Take Action > **Sustainable laboratories**

Sustainable laboratories

Laboratory buildings are responsi
consumption and carbon emissio

To address this, the Environmental Sustainabili
team has created the Sustainable Labs
programme, which specifically focuses on energ
reduction and sustainability in labs. We
encourage labs to sign up to LEAF (Laboratory
Efficiency Assessment Framework), and provide
resources to support award submission.

sustainability.leeds.ac.uk/get-involved/reduce-your-environmental-impact/sustainable-labs/

YouTube | Chapter 13: Enviro... | Cloud School - Int... | Health Data - Acc... | Maps | Google Scholar | News | Translate

In development

Sustainable Labs resource hub

We have developed a Sustainable Labs resource hub which has information, tools and advice to help labs become more sustainable.

If you have any materials you would like to add to the hub then please get in touch at sustainability@leeds.ac.uk.

THE UNIVERSITY of EDINBURGH

Schools & departments | MyEd

Search

SUSTAINABILITY

Sustainability home

Programmes and projects

Sustainability innovation & leadership

Reducing carbon and waste

Sustainable labs

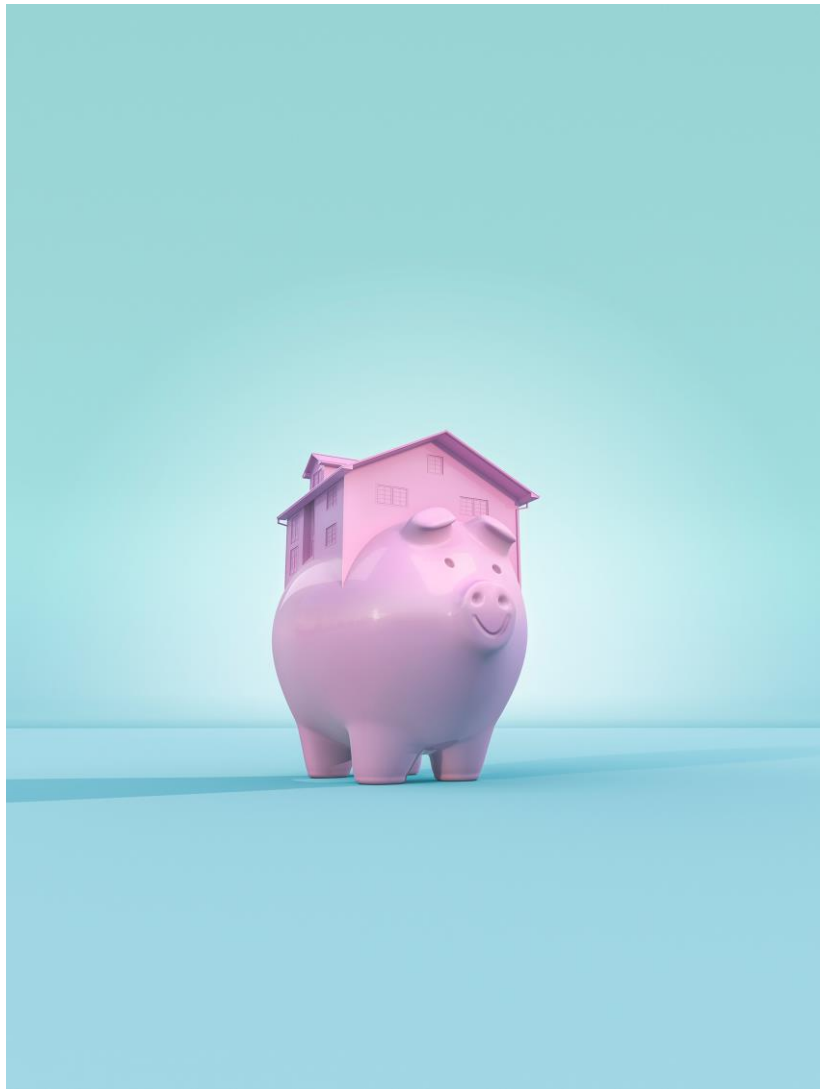
Home > Social Responsibility and Sustainability > Programmes and projects > Sustainability innovation & leadership > Reducing carbon and waste > Sustainable labs

Contact us

Sustainable labs

The Department of Social Responsibility and Sustainability can help you make your lab more sustainable through training, funding and advice. We also run an awards scheme to recognise your good practices in lab sustainability.

Funding bodies



Approach	Actions considered important to meet approach	Example of Funders
Aligning strategic vision of organisation with sustainability values	-Developing a corporate environmental sustainability programme -Having a funding portfolio that reflects the social and environmental determinants of health (co-benefit to health and sustainability goals)	HF
	-Embedding the principle of environmental sustainability across all investment decisions by 2025	UKRI
	-Developing a position statement regarding environmental sustainability	CRUK
Embedding knowledge and training into the organisation	-Providing training to grant administrators and policy leads	RS HF
	-Appointing a sustainability officer	NIHR RS
	-Leveraging partnerships (UKRI, Wellcome, Department for Health and Social Care, Scotland) to access knowledge; align closely with actions taken by wider sector	CSO
Adapting existing projects and infrastructure in line with environmental sustainability	-Supporting existing research with supplementary funding for sustainable changes	NIHR
	-Enabling carbon improvement across estates and infrastructure via review and funding	UKRI RS NERC NIHR
Long-term planning	-Strategies that ensure enthusiasm and willingness to address environmental agenda is translated into meaningful change	UKRI STFC
Collaboration	-Sharing best practices, ensuring alignment across R&I sector -Generating ideas, different ways of approaching context specific challenges -Collective impact across funders of various sizes through resource and knowledge sharing -Supporting transdisciplinary research to address both environmental and health impacts of research[1]	Various
Advocacy	-Establishing multi-level support/buy-in within funding bodies, and across wider research eco-system. Influencing researchers to deliver research in more sustainable manner -Need to connect with industry, as a key group of stakeholders investing in R&I research -Influencing government policy level. For example, raising the importance of environmental considerations of digital and health initiatives, such as NHS Digital, National AI Strategy, and broader research ambitions associated with national health and social care policies	Various
Driving towards net-zero carbon through operational strategies and supporting sustainable research	-Ring-fenced funding, operational capacity and providing guidance to research community	NIHR
	-Understanding impact of digital research infrastructures, estates, funded research, and taking leadership role to drive agenda within research community	UKRI NERC EPSRC STFC
	-Aligning strategies with NHS Net-Zero	NIHR CSO HF
	-Being committed to Net Zero target for endowment fund	HF
Having tools for measurement of carbon emissions	-Investing in essential tools for researchers, and for assessment feasibility -Ring-fencing schemes that fund the development of tools to assess carbon emissions (and environmental impacts more broadly) -Conducting some pilot reviews to explore what tools have been developed to assess carbon emissions and environmental impacts more broadly)	NIHR MRC W

Action taken to address environmental impact of research				
Status	**Internal (operational)**	**Guidance and Support**	**Ring-fenced funding**	**Assessment of sustainability criteria**
Scoping	UKRI: Digital Research Infrastructure Net Zero Scoping project NERC: Net-Zero. Oceanographic scoping project CRUK: research data strategy that includes an environmental sustainability strand.	UKRI: Concordat, intended for R&I sector RS: conference 'Transforming our Future' with focus on sustainability within research, projected January/February 2023		
Under consideration	RS: review of facilities management, digital archiving, publications RS: Ensuring relevant expertise within assessment panels HF: intervention at level of operational activities, including default virtual interviews	UKRI: formalised environmental sustainability working group, intended scope TBC HF: facilitate support for researchers through guidance and knowledge sharing (outcome of engagement with researchers)	NIHR: Supplementary funding to support best practices in live research HF: dedicated programmes of research focused on sustainability and health	HF & BBSRC: inclusion of assessed sustainability criteria. HF: reporting on environmental impact as part of progress reports
Implemented	RS and NIHR: recruiting to sustainability roles EPSRC/UKRI: staff training on environmental sustainability from Institute of Environmental Management and Assessment	NIHR: webpage of resources intended for researchers (part of their carbon reduction guidelines).[3] They have launched a call for feedback on how to update these resources.	NIHR: Funding is being committed to research to address knowledge gaps i.e., methodology for measurement of AI impact (Turing Institute); sustainable practices in clinical trials (University of Liverpool)[4]	BBSRC: sustainability criteria included in one funding call out, but un-weighted. Panel used to distinguish between closely ranked proposals[5] NERC: pilot requiring researchers to consider environmental impact of work
	HF: Currently working on next 3-year strategy, which will likely include support for NHS Net Zero and a focus on health and care benefits of environmental action UKRI Environmental Sustainability Strategy 2020 – 2040*: sets out short-, medium-, and long- term ambitions to reach net-zero across operations by 2040 NERC/UKRI: Low carbon improvement fund for existing infrastructure and assets. CRUK: position statement on environmental sustainability	MRC: established a 'Green Group' in August 2021 as a pilot scheme to explore environmental ambitions of the organisation. Current membership now at 30 industry bodies and research institutions	MRC: pilot projects are being funded that promote practical solutions for reducing the environmental impacts of health research W: commissioned work to explore current tools that can measure the environmental impacts of health research	W: ask for calculation of carbon footprint HF: applicants asked if they have an environmental policy, and to outline anticipated environmental impact of proposals, which is not an assessed criterion. This data is being used to inform any future assessed criterion EC: In order to reduce the environmental impact of their research, beneficiaries (including institutions) of the Marie Skłodowska-Curie Actions (MSCA)-the European Union's flagship programme for the mobility and training of researchers-are encouraged to align with the MSCA green Charter. MSCA will assess how researchers address this Charter, and if necessary, will consider mandatory regulation.

Concordat for Environmental Sustainability of Research and Innovation Practice

Overview

In July 2019, the UK government committed to achieving ‘net zero’ by 2050.

The UK Research and Innovation (R&I) sector delivers cutting-edge research and innovation essential to meeting this target and understanding and tackling the environmental challenges that we face.

While we must continue to support the UK’s researchers and innovators to solve today’s most pressing challenges and develop next-generation solutions, we recognise need to support this activity in an environmentally responsible way.

UKRI’s 2020 environmental sustainability strategy commits to taking a lead in our own operations to be ‘net zero’ by 2040 at the latest, by embedding sustainability in our operations and investment decisions, while driving

Closed 14 Sep 2023

Opened 20 Jul 2023

Contact

Jo Allatt

ukrisustainability@ukri.org

UKRI Net-Zero Digital Research Infrastructure (DRI) Scoping Project

Funder: Natural Environment Research Council (NERC)

Dates: 2021-23

Aim:

This project will provide a clear roadmap to deliver carbon neutral digital research infrastructure (DRI) by 2040 or earlier. This covers the entire DRI estate for UK Research and Innovation. To find out more about the UKRI Net Zero DRI project, visit the project website.

CEDA role:

The core project team will lead an initial, 18-month UKRI-wide study to survey the digital carbon landscape, run a set of demonstrators and develop a roadmap to ensure that our data infrastructure can achieve net zero. Taking a systems-based approach, CEDA will work to develop adaptation strategies for the way data is conserved, analysed and managed.

Are these changes going to be enough, even if at all levels?

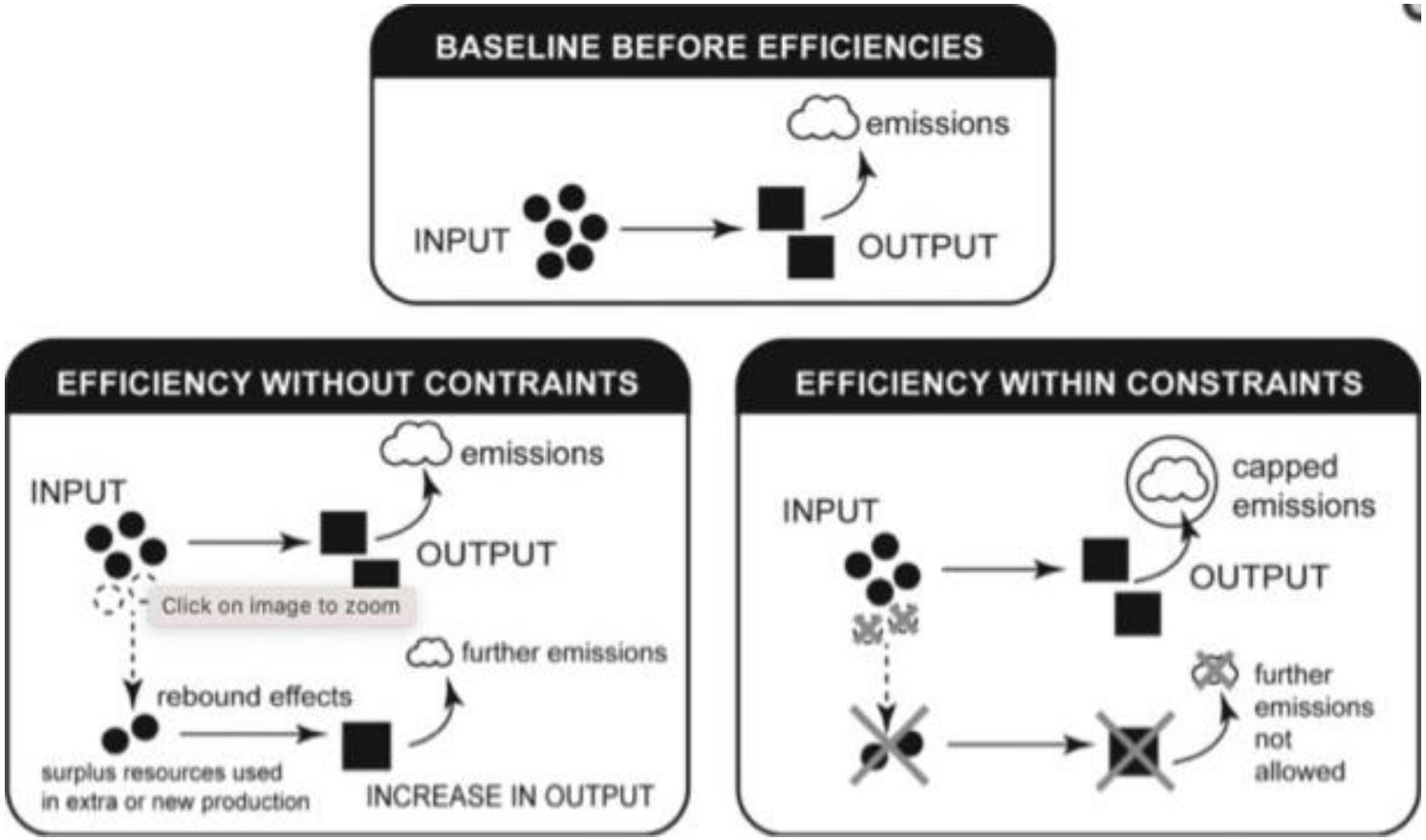
Systems thinking and efficiency under emissions constraints: Addressing rebound effects in digital innovation and policy

Kelly Widdicks [1], Federica Lucivero [2], Gabrielle Samuel [3], Lucas Somavilla Croxatto [2 4], Marcia Tavares Smith [1], Carolyn Ten Holter [2], Mike Berners-Lee [5], Gordon S Blair [1 6], Marina Jirotka [2], Bran Knowles [1], Steven Sorrell [7], Miriam Börjesson Rivera [8], Caroline Cook [9], Vlad C Coroamă [10], Timothy J Foxon [7], Jeffrey Hardy [11], Lorenz M Hilty [12], Simon Hinterholzer [13], Birgit Penzenstadler [14 15]

Affiliations + expand

PMID: 36873905 PMCID: PMC9982294 DOI: 10.1016/j.patter.2023.100679

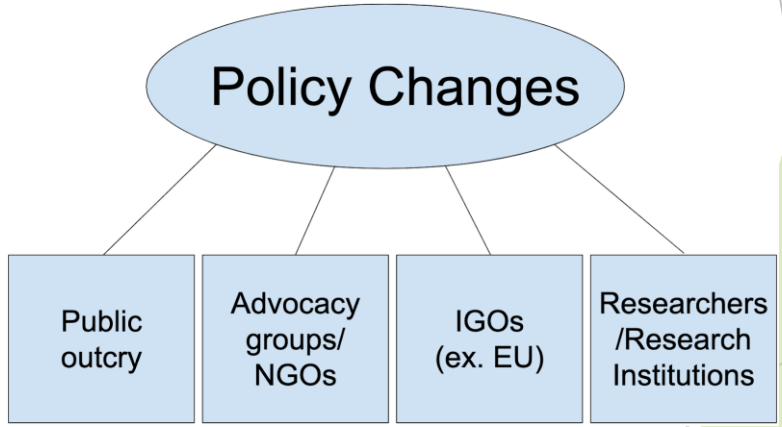
Free PMC article



Behaviour change is important

The need for both bottom-up and top-down approaches….

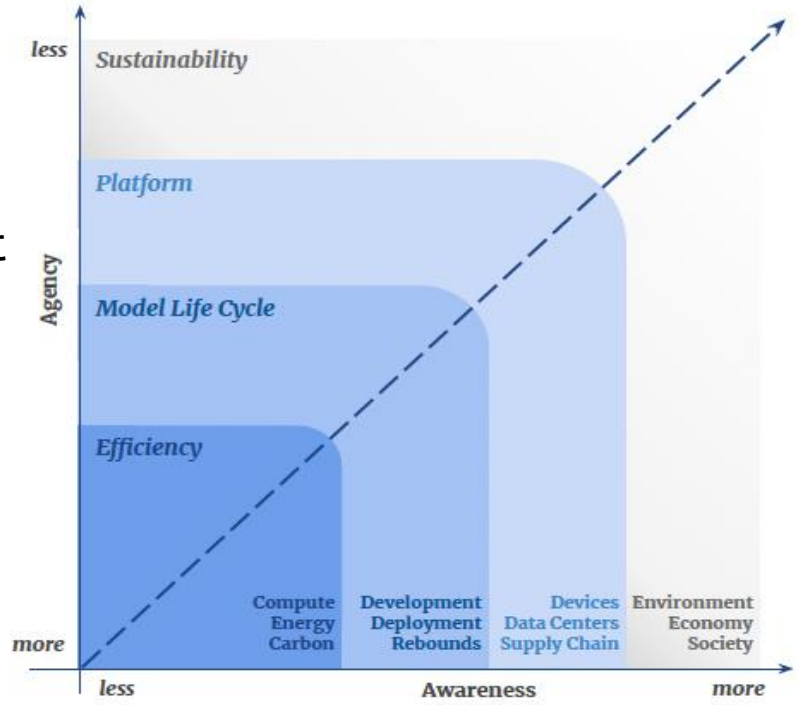
- In areas of research practice where we have no ability to change, we may not have responsibility, but there are still things we can do: advocacy.
  - Lessons learnt from animal ethics; change requires bottom up and top down irrespective of responsibility.
- In areas of research practice where we do have ability to change, we should make these changes, and today we will hear about what can be done



Sophia Stilwell

What can we do?

Behaviour changes at different levels



Efficiency is Not Enough: A Critical Perspective of Environmentally Sustainable AI

Dustin Wright[1*], Christian Igel[1*], Gabrielle Samuel[2] and Raghavendra Selvan[1,3*]

[1]Department of Computer Science, University of Copenhagen, Denmark.
[2]Department of Global Health & Social Medicine, King's College London, United Kingdom.
[3]Department of Neuroscience, University of Copenhagen, Denmark.

*Corresponding author(s). E-mail(s): dw@di.ku.dk; igel@di.ku.dk; raghav@di.ku.dk;
Contributing authors: gabrielle.samuel@kcl.ac.uk;

Final note

- Remember, this is exciting!
- We can improve health and improve sustainability goals with some innovative thinking!
- Creativity is what makes us good researchers!