BRAID
Bridging Responsible AI Divides

Who Owns the Future of Green AI?

Jo Lindsay Walton

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BRAID
Bridging Responsible AI Divides

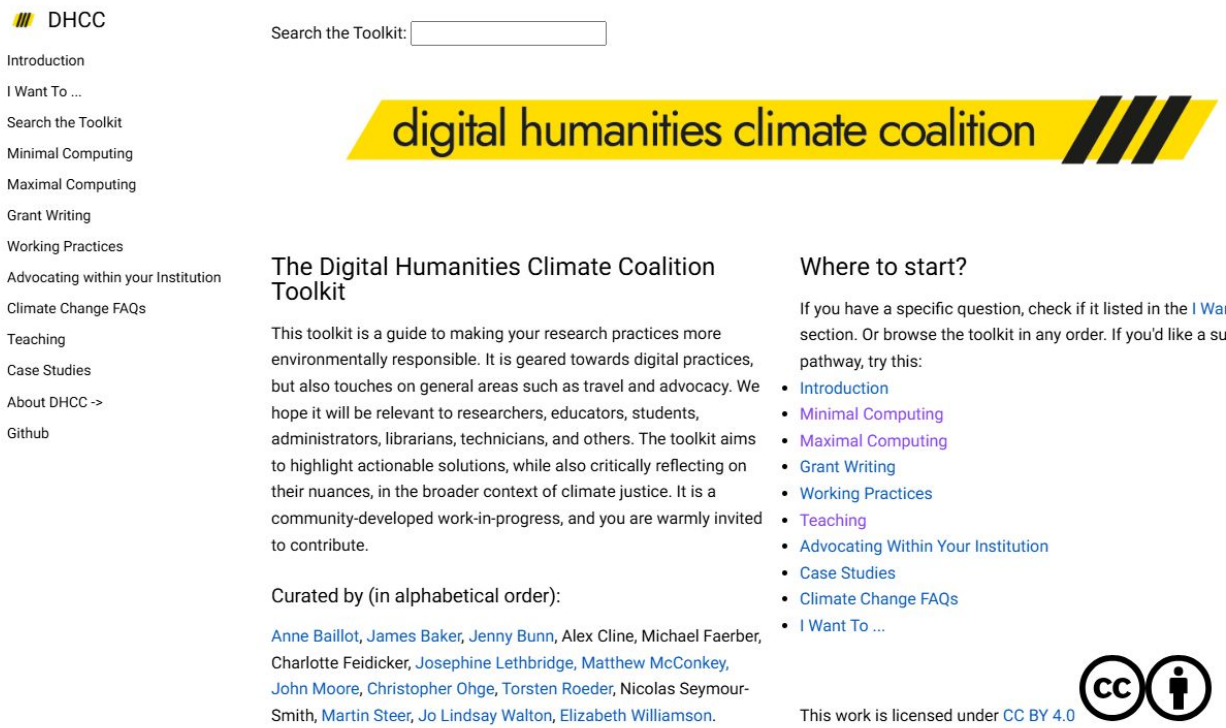
Sustainable AI Futures

BRAID Demonstrator (2025-2028)

Project Lead: Prof Samantha Walton, Bath Spa University

Digital sustainability training and advocacy

The Digital Humanities Climate Coalition



Digital sustainability training and advocacy

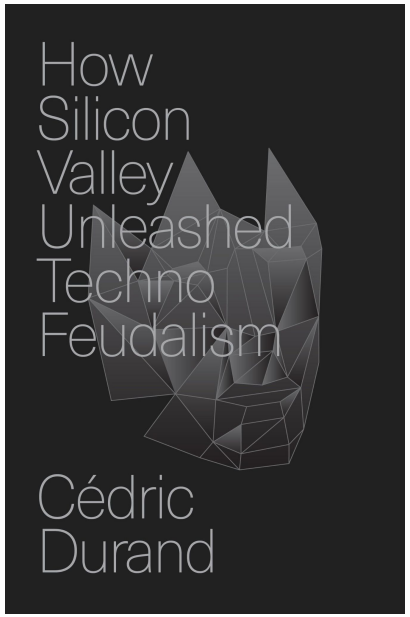
Increasingly pushed to think more about the big picture -- to think about **the political economy of AI** alongside practitioner knowledge and institutional policies

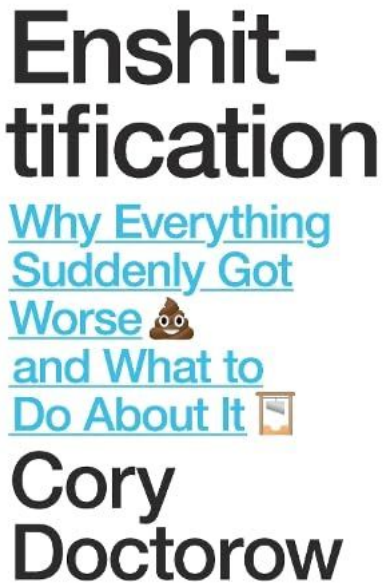
The political economy of AI

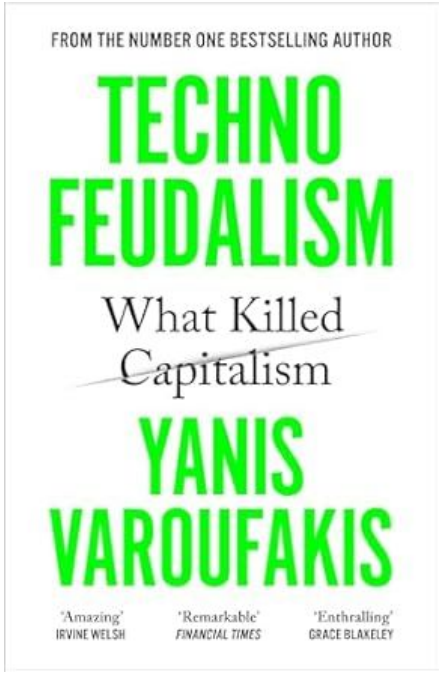
- AI market is highly oligopolistic, but the degree of oligopoly differs by layer of the stack.
- Also it's a sort of duopoly of oligopolies, one US-dominated and one China-dominated
- Chips: NVIDIA + a teeny bit of Google, ADM
- Compute: Azure, AWS, GCP (+ Alibaba, Tencent, Huawei, Baidu)
- Foundation models: OpenAI, Google DeepMind, Anthropic, Meta, xAI (+ ERNIE, Qwen, Yi, Deepseek)
- Amazon probably deserves special mention, since it is so huge and diversified

	Rank	Name	Market Cap
☆	1	NVIDIA NVDA	£3.583 T
☆	2	Apple AAPL	£3.086 T
☆	3	Microsoft MSFT	£2.871 T
☆	4	Alphabet (Google) GOOG	£2.660 T
☆	5	Amazon AMZN	£2.021 T
☆	^1 6	Broadcom AVGO	£1.271 T
☆	v1 7	Saudi Aramco 2222.SR	£1.269 T
☆	8	Meta Platforms (Facebook) META	£1.197 T

The political economy of AI

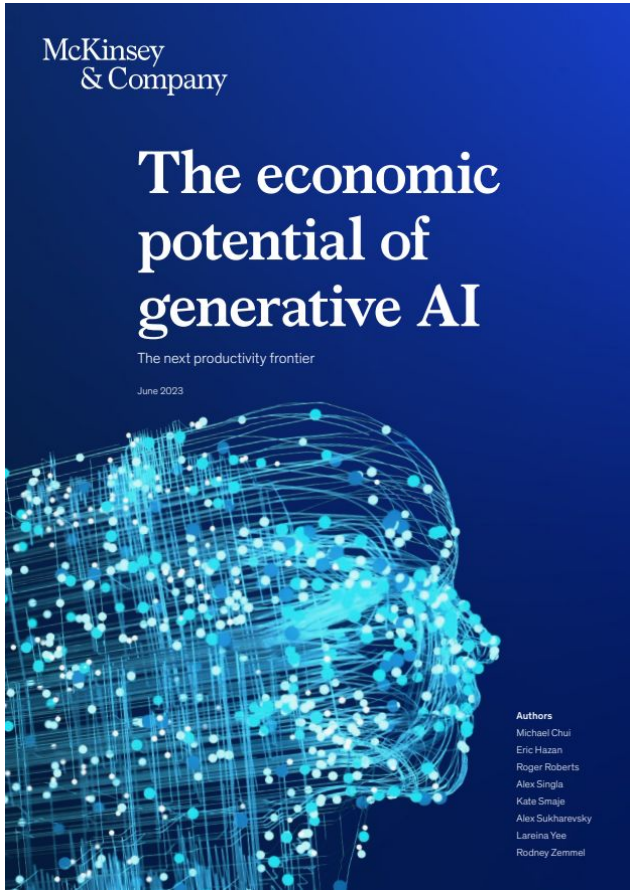






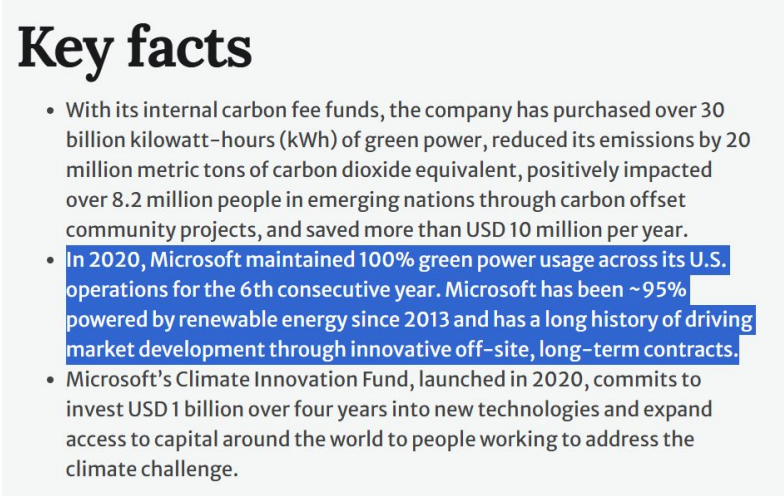
Thought leadership on AI

- Hard to find reliable evidence about the big picture!
- Here's an example (not to do with environment, at least not directly)
- Knowledge workers spend roughly 20 percent of their time "searching for and gathering information"
- A bit of digging showed this to be ultimately based on a 2004 survey (the year The Facebook launched)
- The survey had also been manipulated in 2012. The data implied a 66 hours working week, and to reduce it to 46.5 they kept the "knowledge categories" at 100% and reduced the other categories (also aggregating them)



Thought leadership on AI

- Well, what about corporate disclosures -- sustainability reports, ESG, things like that?
- This too proves quite difficult to interpret
- For example, green power claims are often based on a **market-based accounting** basis, and don't include **location-based accounting**
- So you quite quickly get in the complicated world of energy procurement and energy transition

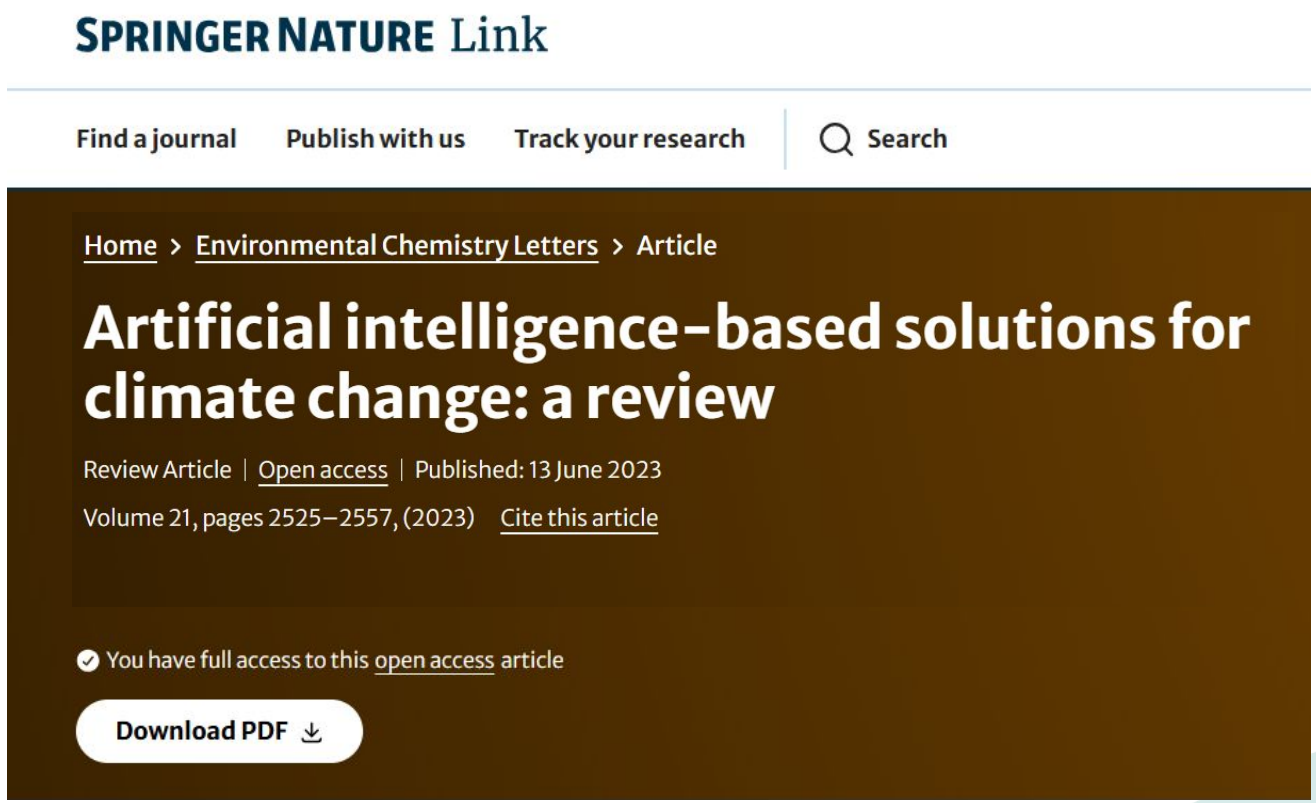


Key facts

- With its internal carbon fee funds, the company has purchased over 30 billion kilowatt-hours (kWh) of green power, reduced its emissions by 20 million metric tons of carbon dioxide equivalent, positively impacted over 8.2 million people in emerging nations through carbon offset community projects, and saved more than USD 10 million per year.
- In 2020, Microsoft maintained 100% green power usage across its U.S. operations for the 6th consecutive year. Microsoft has been ~95% powered by renewable energy since 2013 and has a long history of driving market development through innovative off-site, long-term contracts.
- Microsoft's Climate Innovation Fund, launched in 2020, commits to invest USD 1 billion over four years into new technologies and expand access to capital around the world to people working to address the climate challenge.

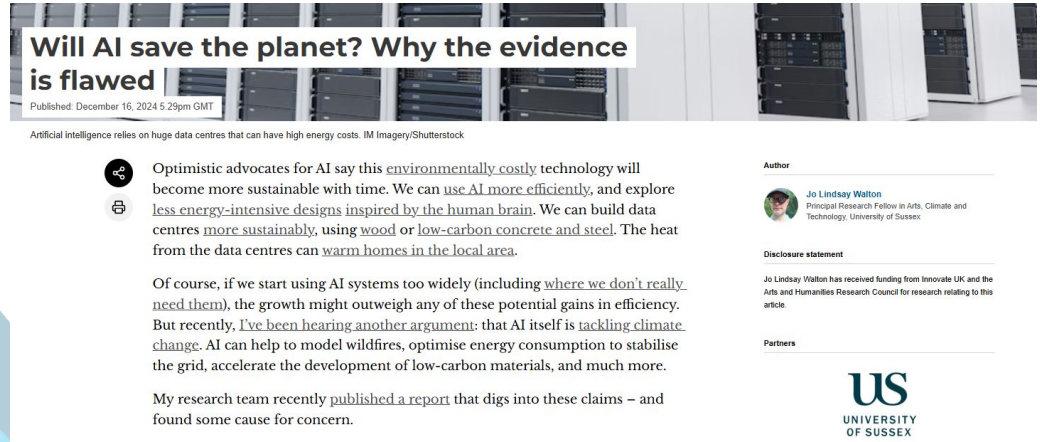
Evidence base of AI for climate

- What about academic research?
- Here too, we began to have concerns about the quality of some of the research (and more longstanding concerns about how it filters out into media, grey literature, policy, etc.)
- Here is a striking example - a survey article covering a range of AI-based solutions for climate change, in an academic journal
- In *The Cloud and the Climate* (2024) we uncovered problems with this paper



Evidence base of AI for climate

- GenAI had been misused and the paper was full of hallucinations
- The sources didn't say what was claimed!
- We received an extensive rebuttal from the authors, where they claimed to have relied on their own extrapolative expertise



Will AI save the planet? Why the evidence is flawed

Published: December 16, 2024 5.29pm GMT

Artificial intelligence relies on huge data centres that can have high energy costs. IM Imagery/Shutterstock

Optimistic advocates for AI say this environmentally costly technology will become more sustainable with time. We can use AI more efficiently, and explore less energy-intensive designs inspired by the human brain. We can build data centres more sustainably, using wood or low-carbon concrete and steel. The heat from the data centres can warm homes in the local area.

Of course, if we start using AI systems too widely (including where we don't really need them), the growth might outweigh any of these potential gains in efficiency. But recently, I've been hearing another argument: that AI itself is tackling climate change. AI can help to model wildfires, optimise energy consumption to stabilise the grid, accelerate the development of low-carbon materials, and much more.

My research team recently published a report that digs into these claims – and found some cause for concern.

Author

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Principal Research Fellow in Arts, Climate and Technology, University of Sussex

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Partners

US
UNIVERSITY OF SUSSEX

intelligence methods are utilized in optimizing and enhancing hybrid energy systems, which could include applications related to discerning appropriate geological formations for carbon storage and predicting the behavior of carbon dioxide in such storage sites.

In our paper, the citation of Abdalla et al. (2021) is particularly justified because of its detailed exploration of AI's role in enhancing complex energy systems' efficiency, reliability, and adaptability. These qualities are critical for effective carbon storage, where geological assessments and predictive modeling of carbon dioxide behavior are essential. The principles and methodologies outlined in the article serve as a robust theoretical basis for extending AI applications to carbon storage, supporting the claim that AI can significantly improve site selection and storage management processes.

At first glance, the focus of Abdalla et al. (2021)'s study may appear unrelated to carbon storage. However, a thorough reading of the article reveals a deeper connection. The discussions on AI's capabilities for energy system optimization, configuration design, and operational control provide transferable insights that are highly relevant to carbon storage challenges. Specifically, the article's emphasis on predictive modeling and system adaptation aligns closely with the needs of carbon storage projects, where AI must evaluate geological suitability and anticipate long-term storage behaviors under varying conditions.

transition and curb carbon emissions? The role of trade openness", (https://doi.org/10.1016/j.jclepro.2024.141298) in the reputable journal of *Journal of Cleaner Production*. They cited the same ref based on context and understanding as "For instance, AI technology can accurately forecast national grid power supply and demand (Mat Daut et al., 2017), optimize the dispatch of renewable energy (Abdalla et al., 2021), and curtail fossil energy consumption (Chakraborty et al., 2021).". The authors herein cited the same paper discuss AI's ability to optimize renewable energy dispatch, improve energy transition processes, and reduce reliance on fossil fuels. The citation is based on the contextual understanding and application of the reference to support the authors' analysis of AI's role in the energy sector and carbon emissions reduction.

These papers utilize Abdalla et al. (2021) for supporting broader claims within its own context, which underlines flexibility and interdisciplinarity of applicability of the reference, which further assures that Abdalla

Evidence base of AI for climate

- Well, this wasn't a journal that specialises in AI and/or climate
- What about a "top" journal instead?
- To be fair, this article has lots of great stuff going for it, and it is in the "Comments" section
- This one estimates that AI is responsible for only 0.01% of GHG emissions

Evidence base of AI for climate

- It's not the main focus of the paper, and the point "AI is not contributing a big share of GHG emissions right now" is probably valid (unless … well, maybe we'll get to that later)
- But the figure of 0.01% appears to be unsupportable: it contains a stock/flow error, and the estimate it draws on is based on a stock market analyst's 2023 prediction of NVIDIA sales

Uncertainty ahead

The direct impacts of AI on climate so far are relatively small. AI operations for large models require millions of specialized processors in dedicated data centres with powerful cooling systems. AI processors installed in 2023 consume 7–11 terawatt hours (TWh) of electricity annually, which is about 0.04% of global electricity use[3]. That is less than for cryptocurrency mining (100–150 TWh) and conventional data centres plus data-transmission networks (500–700 TWh), which together accounted for 2.4–3.3% of global electricity demand in 2022, according to the International Energy Agency (IEA). Thus, in terms of total global greenhouse-gas emissions, we calculate that AI today is responsible for about 0.01%, on the basis of IEA assessments showing that data centres and transmission networks together account for about 0.6% (see go.nature.com/3q7e6pv).

3. de Vries, A. *Joule* **7**, 2191–2194 (2023).

Article Google Scholar

Evidence base of AI for climate

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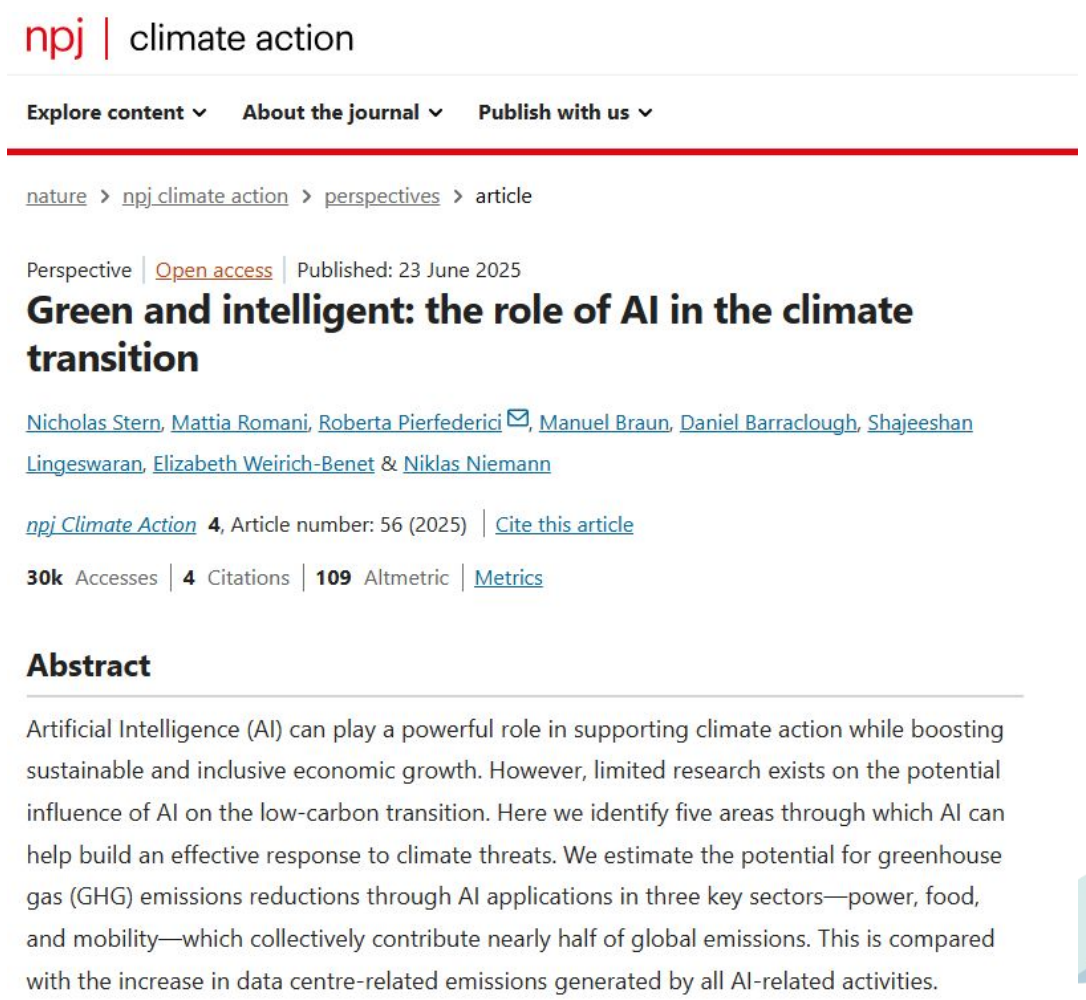
Evidence base of AI for climate

- Here is a *Nature* paper from the "Perspectives" stream (seems to be midway between "Comments" and main "Articles" stream)
- The analysis suggests that AI will be overwhelmingly net carbon negative
- What questions would you have about such a study?
- How do you think such a study would have been carried out?



npj | climate action

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Perspective | Open access | Published: 23 June 2025

Green and intelligent: the role of AI in the climate transition

Nicholas Stern, Mattia Romani, Roberta Pierfederici, Manuel Braun, Daniel Barraclough, Shajeeshan Lingeswaran, Elizabeth Weirich-Benet & Niklas Niemann

npj Climate Action **4**, Article number: 56 (2025) | Cite this article

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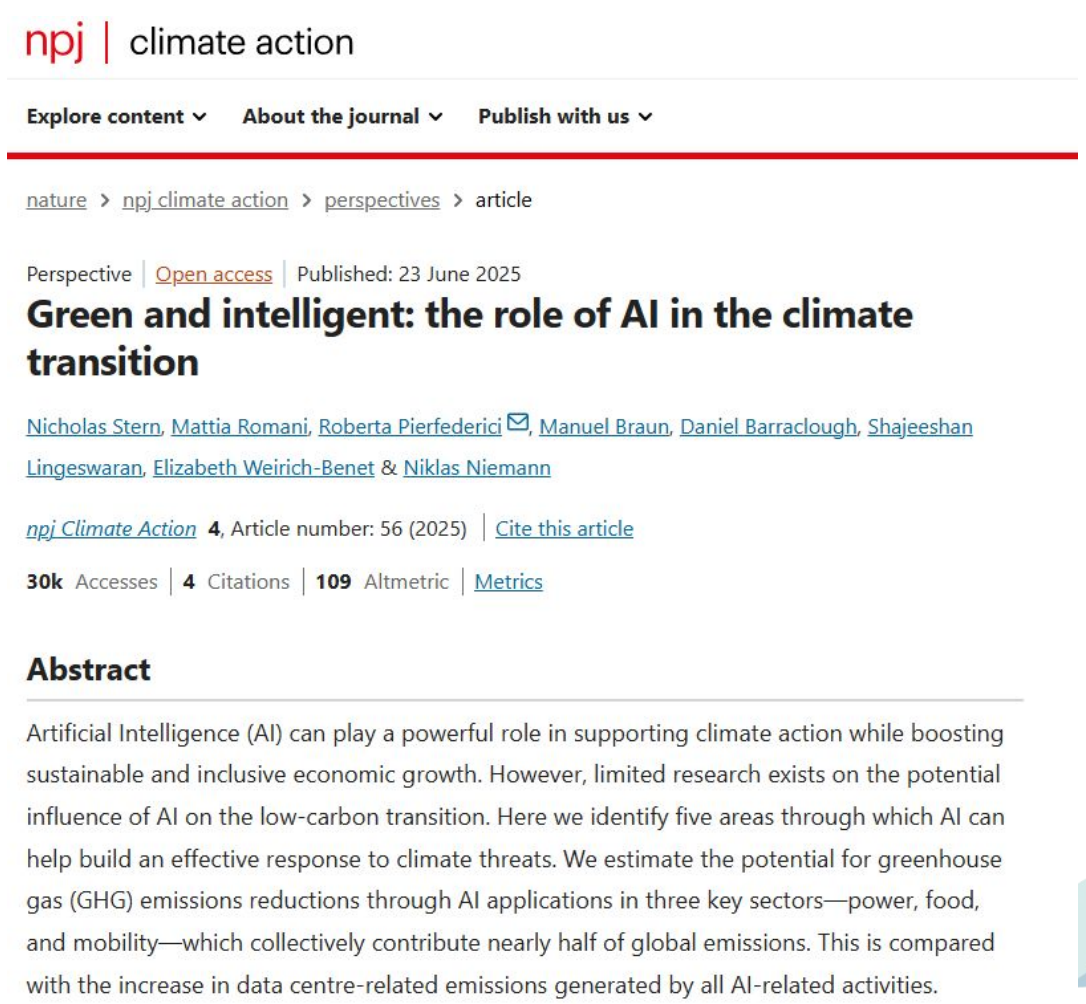
Abstract

Artificial Intelligence (AI) can play a powerful role in supporting climate action while boosting sustainable and inclusive economic growth. However, limited research exists on the potential influence of AI on the low-carbon transition. Here we identify five areas through which AI can help build an effective response to climate threats. We estimate the potential for greenhouse gas (GHG) emissions reductions through AI applications in three key sectors—power, food, and mobility—which collectively contribute nearly half of global emissions. This is compared with the increase in data centre-related emissions generated by all AI-related activities.

Evidence base of AI for climate

- Three “climate solutions” are **mapped onto S-curves** (i.e. assuming that each of these will scale rapidly before 2035 no matter what)
- Modelling how much extra mitigation might come from optimising these solutions with AI, based primarily on **expert elicitation** (we don’t know the methodology)
- Comparing this to a relatively narrow scope for AI (energy only, no embodied emissions, no enabled emissions)



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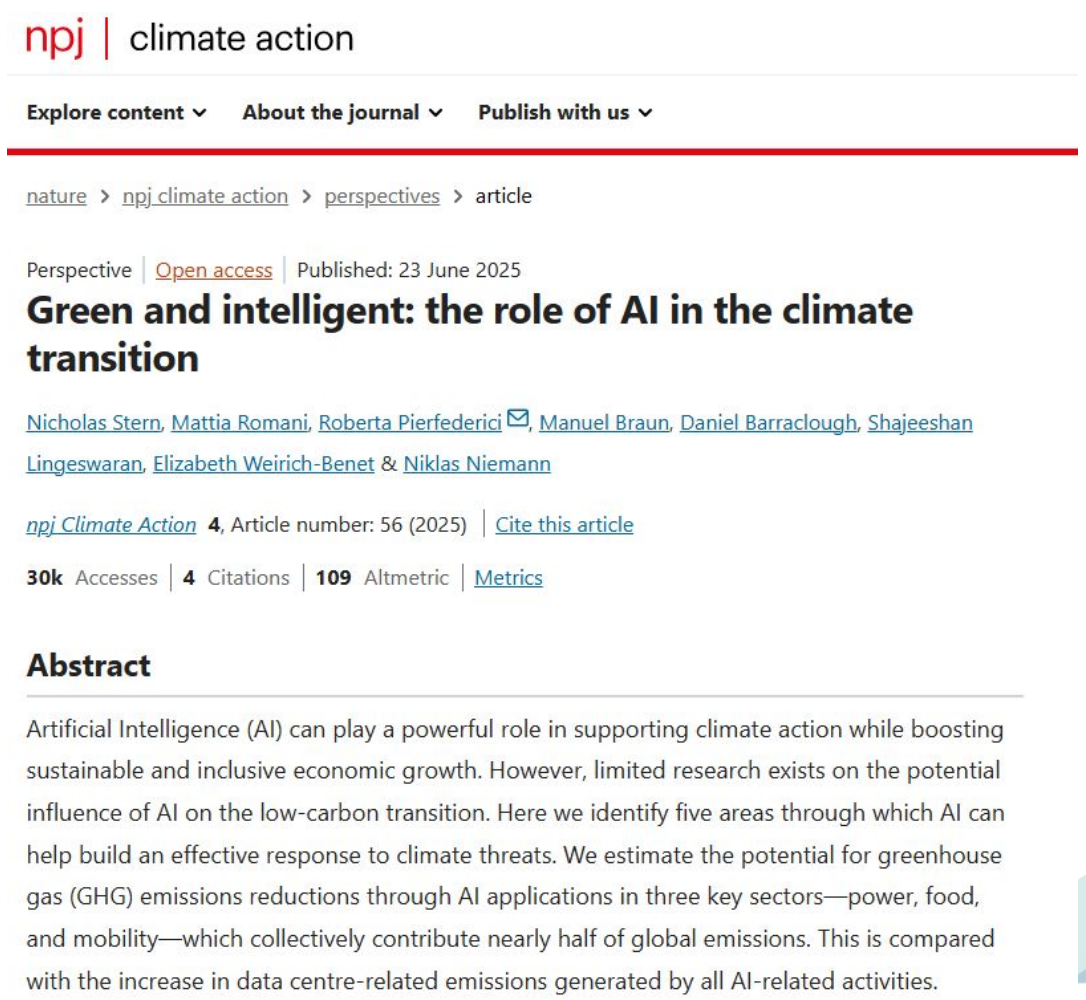
Evidence base of AI for climate

- Nothing inherently wrong with expert elicitation, nothing inherently wrong with S-curves (partly based on HATCH technological adoption data), and if you disagree with the model boundaries, you can always go make your own research
- It does contribute to the sense of **AI being self-offsetting**



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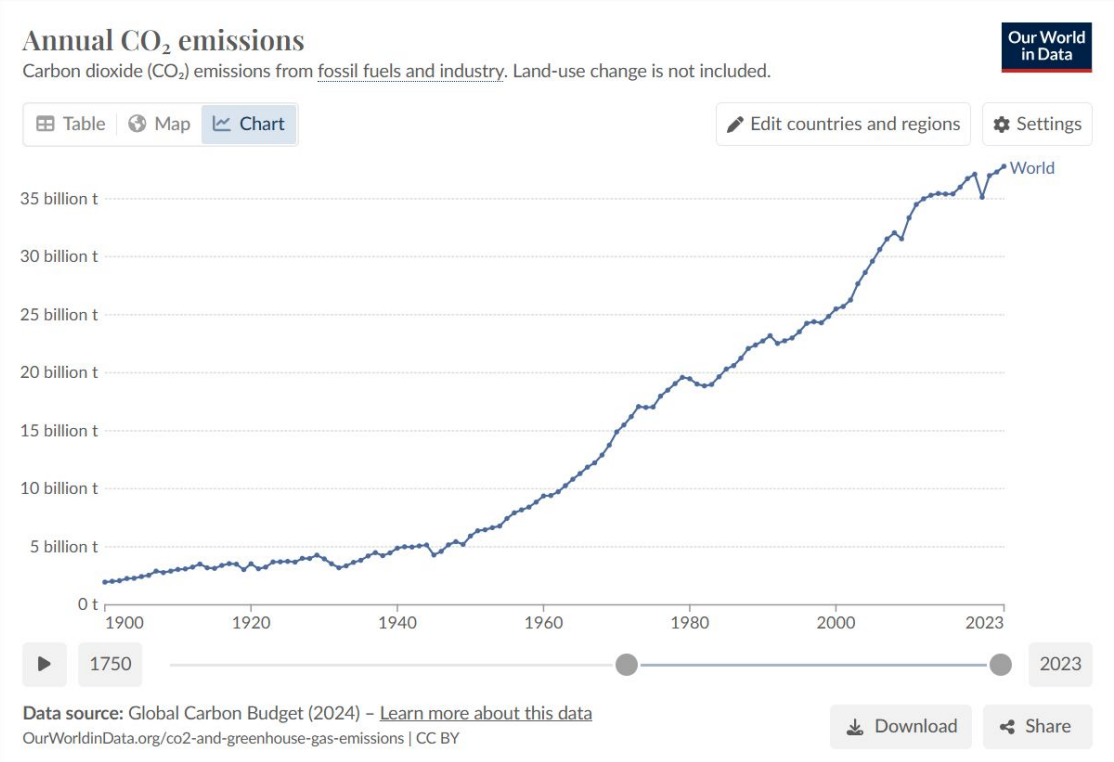
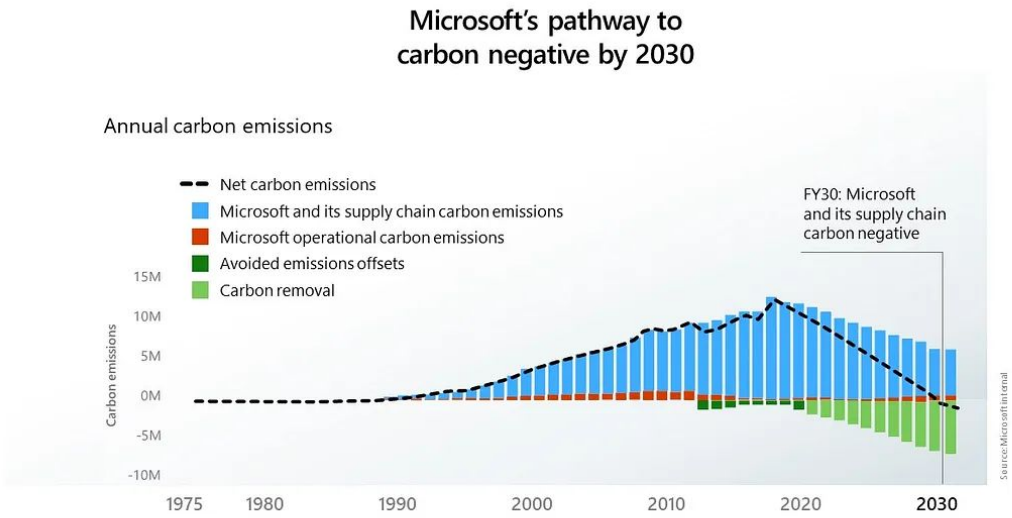
Big tech’s carbon pledges





Big tech’s carbon pledges

- AI is being identified as the reason for missed targets
- Tech companies are now pointing to AI-driven carbon efficiencies outside their value chain
- In other words, we’re invited to offset “unsustainable AI” with “AI for sustainability”

Big tech’s carbon pledges

“In 2020, Microsoft leaders referred to our sustainability goals as a “moonshot,” and nearly five years later, we have had to acknowledge that the moon has gotten further away. However, the force creating this distance from our goals in the short term is the same one that will help us build a bigger, faster, and more powerful rocket to reach them in the long term: artificial intelligence (AI). This is not hyperbole. Already, we are seeing AI make a positive impact on the planet, and in the coming years, this technology will begin to rapidly accelerate climate solutions at a scale we’ve not yet seen. In November 2023, we introduced our *AI and Sustainability Playbook*, which highlights five foundational enabling conditions needed to unlock AI’s full transformative potential for accelerating sustainability progress. In January, we shared a report that highlights our progress and the innovations that have advanced each of those five pillars.

Building the AI economy of the future is a top priority for our business, but we are also in the business of sustainability. As CSO, it is my job to ensure that these dual mandates are working together. “

Melanie Nakagawa

Big tech’s carbon pledges

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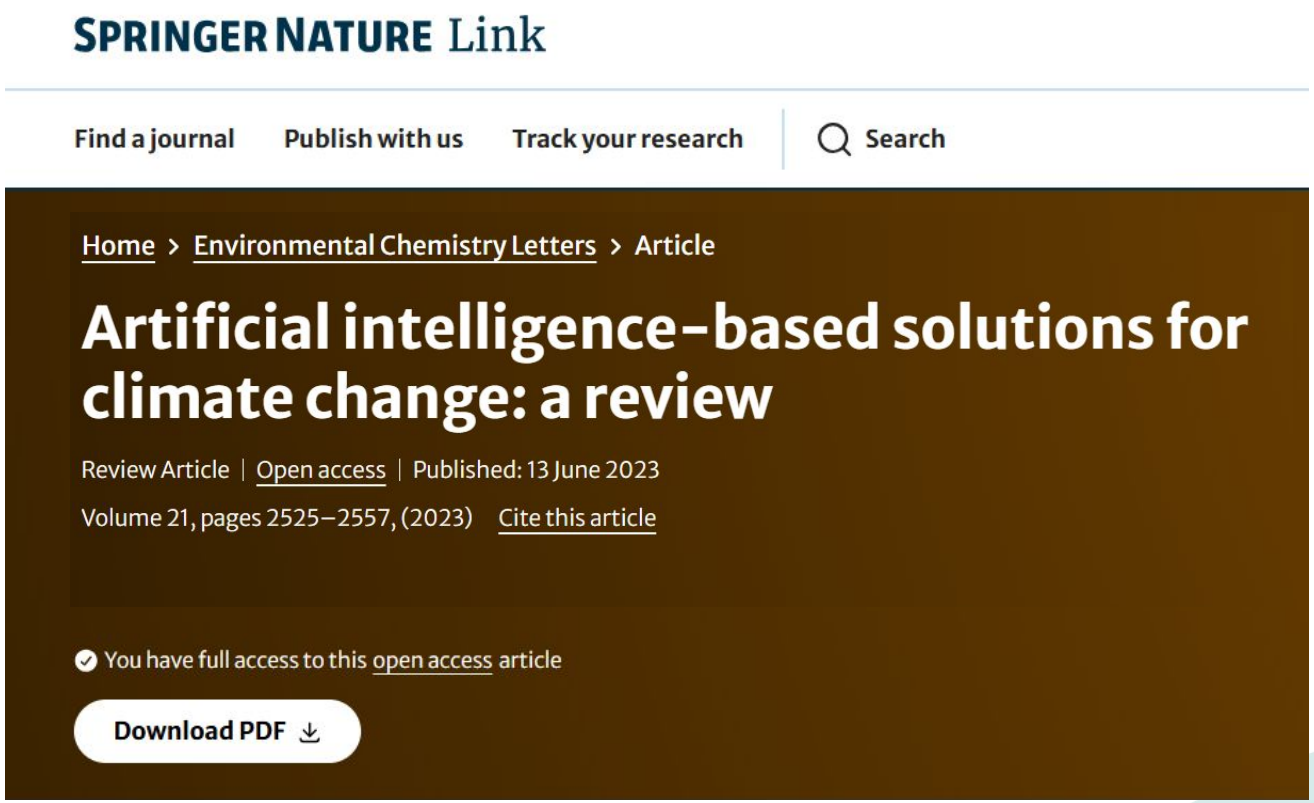
Evidence base of AI for climate

- A couple months ago, this paper was quietly retracted

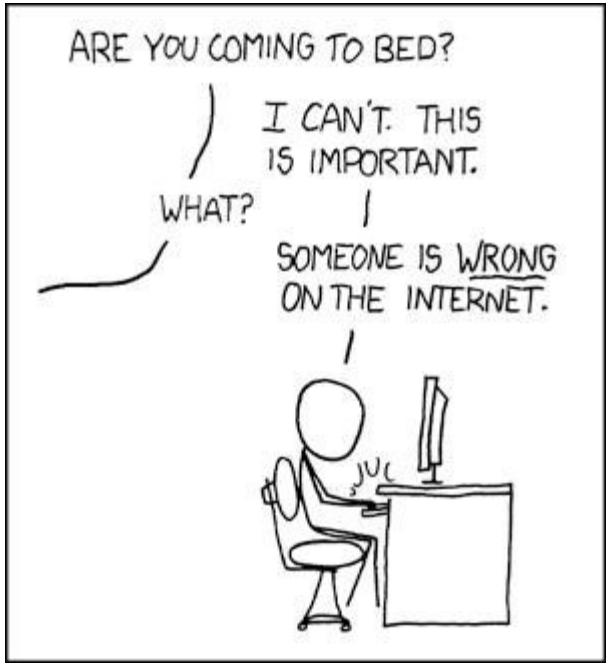


Evidence base of AI for climate

- A couple months ago, this paper was quietly retracted
- Meanwhile, it has over 250 citations
- But … does any of this actually matter?

Does it matter?

- Sure, it is a bit eye-roll that so many “AI for climate” claims are overinflated, that underpinning research is slapdash, that methodologies are cherry-picked, and that there is not a robust collaborative culture around this work …
- But what if they happen to be broadly right anyway?
- What if AI *is* on balance really good for climate and environment?
- What if AI does create new options for Global South?



Does it matter?

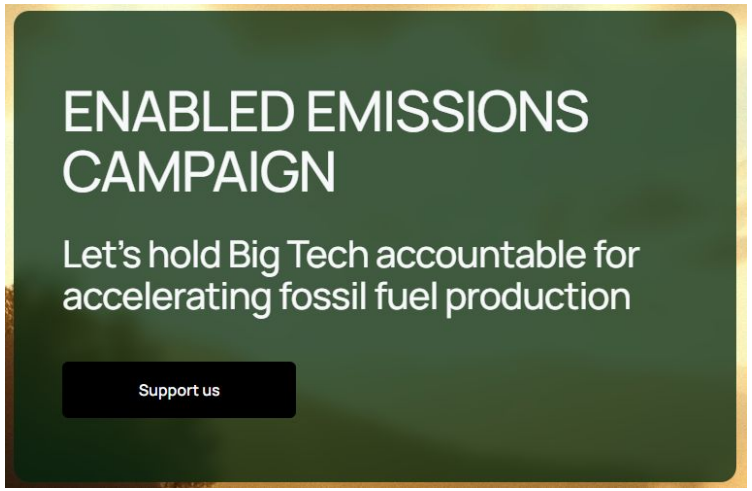
- After all, I have *some* doubts about the environmental critique of AI, at least as a strategic priority
- **Other environment issues.** How much attention and resources is AI taking up within the broader environmental movement? (I really don't have a good sense of this, I'm in such a bubble!). What are the complementarities and trade-offs with, say, the push for a fossil fuel non-proliferation treaty?
- **Other AI issues.** And does the environmental critique of AI sometimes work as a proxy for all the other things people don't like about AI, that may be harder to name or describe?
- For example …

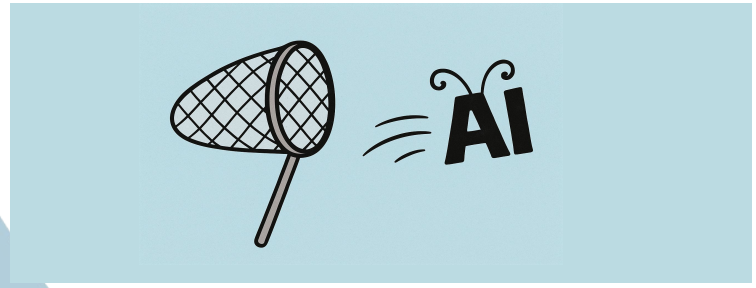
Does it matter?

- What do we talk about, when we talk about AI and the climate? Questions about environmental impact of AI may also be **a way of expressing other misgivings about AI and the tech industry** …
- For example, **technological unemployment** and other impacts on our experience of work
- Deskilling, cognitive outsourcing, longer term **psychological** effects of AI
- **Intellectual property**, and the enclosure and commodification of common cultural and intellectual resources
- The **unaccountable "black box"** treated as as a feature, not a bug
- **Hallucination**, **deepfakes**, AI slop, even further reduced reliability of the public sphere
- The outsize influence of (especially) **the US tech industry** on how we imagine the future

Theories of theories of change?

- **Mission-oriented innovation policy** (e.g. Mazzucato): Moonshot missions that actually get to the moon. Standards, tooling, but much more.
- **Design thinking:** Start from user needs (incl. nature as stakeholder), prototype quickly, and iterate toward workable solutions.
- **Organisational change (e.g. Kotter):** Provide a familiar internal roadmap—create urgency, build coalitions, generate early wins, embed change.
- **Open source, public AI, share best practice:** Scan for things being done well and scale them up. Open source inspirations. Ostrom, commons.
- **Strategic niche management:** Grow alternatives in protected niches, learn from them, and scale when they are ready to challenge incumbents.
- **Activist / organising traditions:** Build a real base, form durable relationships. Abolitionist insight: focus on immediate harm reduction while being ambitious in your vision. "Repertoire of contention": the tools available to a movement at a given time. "Diversity of tactics."
- **Public interest communications:** Use research-driven messaging, framing, trusted messengers, etc. to identify relevant publics and to build understanding and support.
- **Systems thinking** (e.g. Meadows): Map actors and feedback loops to find leverage points and avoid pushing on symptoms. (Good insights on cultural shifts: impactful but hard to do!)
- **Backcasting:** Define the future you want, then work backwards to identify the steps and conditions needed to reach it.





PUE?PAH!

No AI for fossil proliferation.

Legal challenges to data centers.

Reject global net carbon impact assessments.

Demand more and better DC data.

AI for sustainability: citation needed

Scope 2 Public Consultation

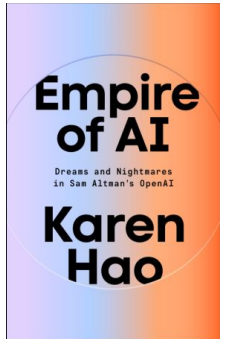
Review Consultation Materials

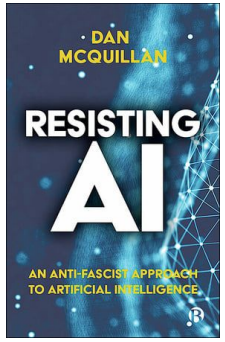
Complete Consultation Survey

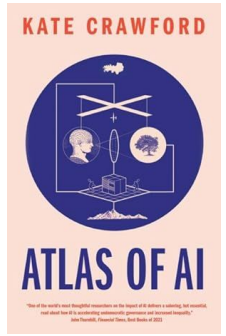
Electricity-Sector Consequential Methods Public Consultation

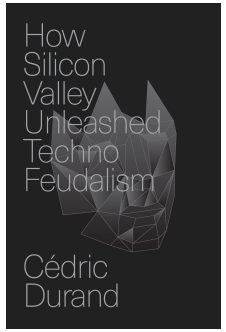
Review Consultation Materials

Complete Consultation Survey









Radically rethink “transparency”

Oppose emissionality and scrutinise 24/7

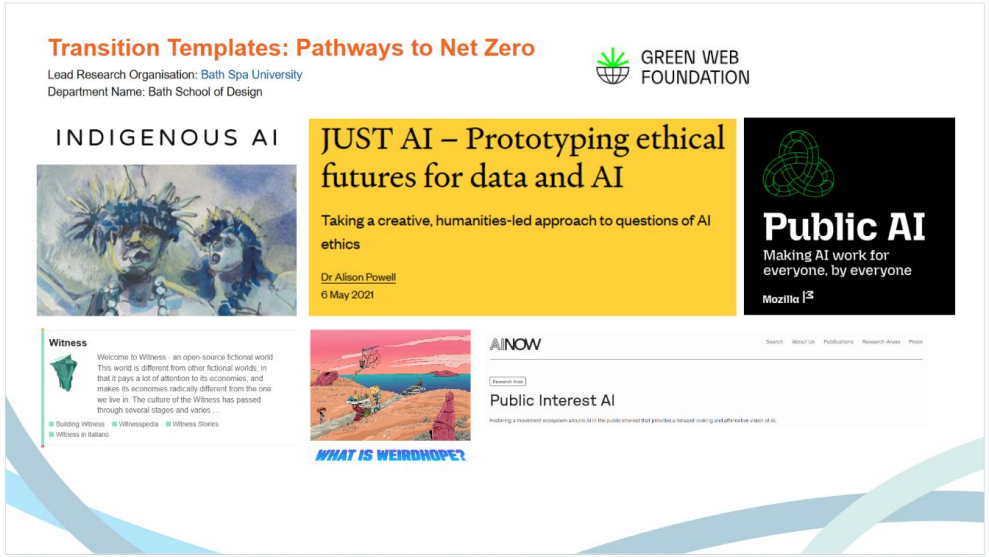
Start a Critical AI Studies reading group

Sign The Answer is Us solidarity statement

Climate Majority Project

CITIZEN NETWORK
FOR A WORLD WHERE EVERYONE MATTERS

Citizens assemblies



Imagine better futures, and backcast

Transition Templates: Pathways to Net Zero

Lead Research Organisation: Bath Spa University
Department Name: Bath School of Design

GREEN WEB FOUNDATION

INDIGENOUS AI

JUST AI – Prototyping ethical futures for data and AI

Taking a creative, humanities-led approach to questions of AI ethics

Dr Alison Powell
6 May 2021

Public AI

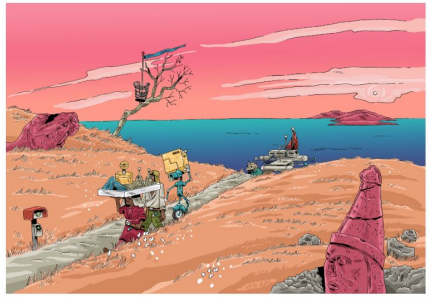
Making AI work for everyone, by everyone

Mozilla

Witness

Welcome to Witness - an open-source fictional world. This world is different from other fictional worlds, in that it pays a lot of attention to its economies, and makes its economies radically different from the one we live in. The culture of the Witness has passed through several stages and varies …

Building Witness Witnesspedia Witness Stories
Witness in italiano



WHAT IS WEIRDHOPE?

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Research Area

Public Interest AI

Fostering a movement ecosystem around AI in the public interest that provides a forward looking and affirmative vision of AI.

	Decomputing or Steady-State	Slow Growth Infrastructure	Medium Growth Infrastructure
Democratisation	**1A. Public Compute Compact:** We decide together how to use our highly climate-constrained AI resources, if we want AI at all. Cf. public participatory budgeting. Public utility DCs with democratic oversight. International cooperation. North-South infrastructural imbalances are addressed.	**1B. Directed Growth Social Infrastructure:** AI as a civic utility. Infrastructure growth focused mostly on the Global South, and areas particularly suited (natural cooling).	**1C. Democratic Frontier Missions:** Participatory approach baked into AI compliance. A world with abundant AI, but all frontier systems require public deliberation. Citizens audit model behaviour through playful "civic simulations." Large models help coordinate watershed stewardship and cross-border climate action.
Decentralisation and Open-Sourcing	**2A. The Local Mesh:** What ever happened to the cloud giants? There is AI but models are usually small and specific. Data centers are small too and part of temperature control as much as compute. Community/municipal clouds. How does sufficiency align with decentralisation?	**2B. Federated Open Ecosystems:** Infrastructure is decentralised but linked. Many kinds of DC. Universities, co-ops, libraries, and public labs run their own open clusters and connect through federated protocols. South–South alliances with shared model repositories. Communities adapt models to local conditions. Coordination comes from co-designed open standards rather than scale.	**2C. Polycentric Open Accelerators:** Abundant AI, but truly polycentric, with hundreds of research centres (non-profit) advancing frontier systems. Lots of Indigenous AI. AI for arts, culture, education, and collective imagining. How to prevent enclosure?
Purpose-Driven	**3A. Mission Minimalism:** Compute focused on essential climate, biodiversity, and public health tasks, that show genuine potential. Many priorities shaped by Global South development needs	**3B. Purpose-led Expansion:** Growth tied to social missions. Worker power. Post-work inspiration, epistemological Luddism inspiration. Automation must create work experiences that feel meaningful.	**3C. Social-Industrial Mobilisation:** Large frontier systems exist inside mission-oriented alliances focused on climate stabilisation and the successors to the Global Goals. Predominantly Global South leadership.

Near Term	Medium Term	Long Term
Demand participatory oversight: we begin to run citizens' assemblies; prototype public auditing tools; strengthen civil society coalitions; push hard on opacity law; test competition tools that begin constraining cloud-giant dominance; prioritise transparency and co-design in procurement.	**AI civil society shifts from resistance to governance:** regular assemblies; innovative media forms improve public sphere; independent review councils; transparent impact scorecards; cultures of public deliberation; declining corporate control of technical standards and narratives.	**People's AI:** major systems require structured public review; civic simulations standard; democratic boards govern access; global norms enforce procedural openness and limit unilateral corporate influence.
Nourish distributed, small scale alternatives: we begin to launch municipal clusters; begin federations among universities, libraries, co-ops; publish procurement templates; advance interoperability and access requirements; support non-US competitors; campaign for stronger anti-competition interventions.	**Local clusters with real counterpower:** dozens of community facilities linked by open standards; shared governance charters; regional model repositories; federated protocols widespread; public-sector workloads shift away from hyperscalers; public funding for smaller sustainable DCs; big tech companies are split up	**Polycentric AI ecology:** hundreds of linked public-interest clusters; multiple innovation centres; legal and structural checks on consolidation; local ownership and model adaptation normal practice.
Strengthen international alignment: Global South–led groups on climate-first AI are convened; we draft joint principles linking compute to SDGs; we build evidence to counter climate obstruction; support coalitions challenging industry-led narratives; start multilateral talks tying AI resources to development priorities.	**Coordinated global benchmarks:** regional blocs adopt shared climate and development standards; SDG-linked resource tests for major systems; South-led coalitions shape agendas; cross-border evidence partnerships undercut obstructionism; firms accountable to multilateral frameworks; AI is less tech and more science	**Mission-led global governance:** AI is finally delivering a few of the wonderful promises from the old days; frontier systems subject to international climate and development mandates; Global South has leapfrogged; climate and SDG progress prerequisites for large-scale training; transnational mechanisms limit regulatory capture and lobbying power.
Advocate for fair, binding resource constraints: We start to reject broken tools fixing broken systems; we create independent fact-checking and verification resources; strong greenwashing law encompasses a lot of AI hype; legal challenges to DCs increase cost; the anti-AI movement gathers momentum	**Constraint-led planning:** DC capacity hasn't grown as much as expected; DC siting shifts to cooling/water/energy advantage and reflect Global South development goals; DCs only built with strong local consent; strong regulations restrain extractive growth.	**Sufficiency-oriented infrastructure:** growth bounded by climate-water-energy limits; norms for constrained and equitable operation embedded in law; North–South asymmetries reduced; corporate expansion checked by binding resource tests and international oversight.

Does it matter?

- Yes I think so

Thank you!

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