4 actions to align SDGs with climate goals

Climate
Biodiversity
Pollution
Health
Human Agency

Eat mostly plants, unprocessed, in parts self grown

Climate
Biodiversity
Pollution
Health
Human Agency

Provide services for all, connected with walking, cycling, and mobility services

Climate
Biodiversity
Pollution
Health
Human Agency

Electrify everything, stop burning (also biomass)

Climate
Biodiversity
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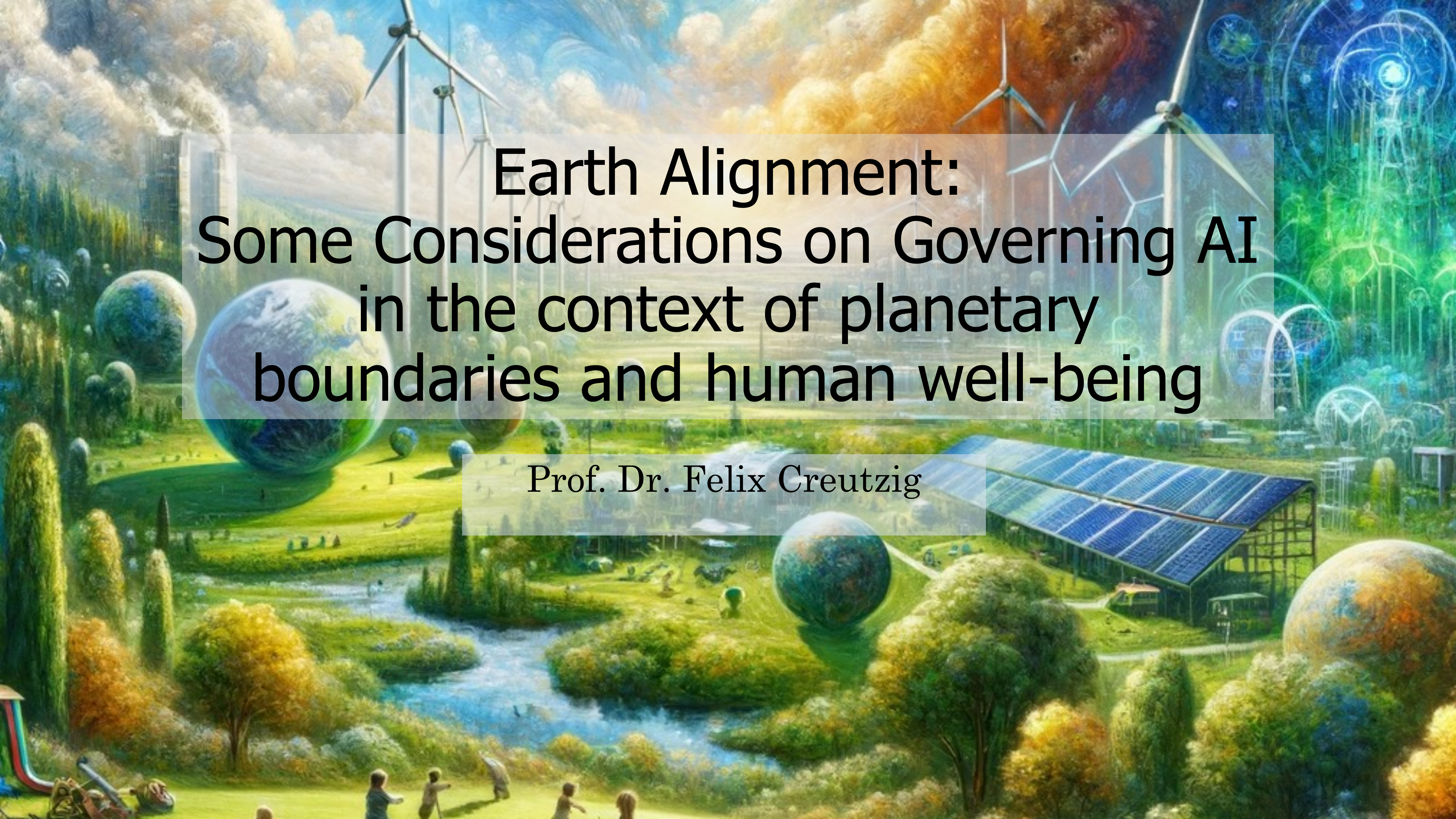
Align AI



Earth Alignment: Some Considerations on Governing AI in the context of planetary boundaries and human well-being

Prof. Dr. Felix Creutzig

Why Earth Alignment?

A crucial time in human and Earth history

6 out of 9 planetary boundaries, including climate change, slipping away

AI becomes a structural force changing societies and technosphere

Current (regulatory) focus on safety, security, privacy and copyright

Joint focus in Earth Alignment

Defining "Earth alignment" of AI:
The principle of aligning the development, deployment and use of AI systems to *promote* planetary stability and stewardship for the benefit of humankind.

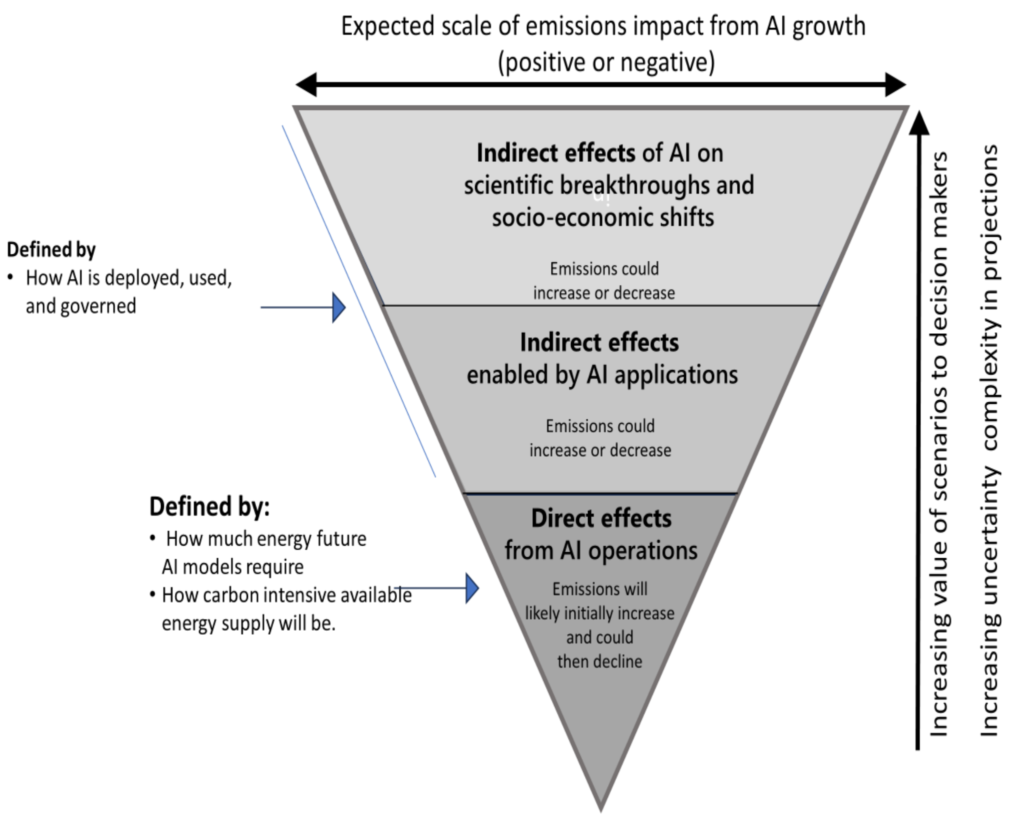
Differentiated from the principles of "do no harm" or "the precautionary principle" in that it actively seeks to leverage AI's capabilities to drive sustainability transformations

3 Earth Alignment principles

(EA1)	Actively utilize AI for decarbonization and biodiversity protection and avoid harmful usage
(EA2)	Promote fair and distributed approaches to power and control and protect human agency
(EA3)	Advance social trust, cohesion and access to reliable information

EA1: AI & decarbonization trajectories: Forget about the computing part

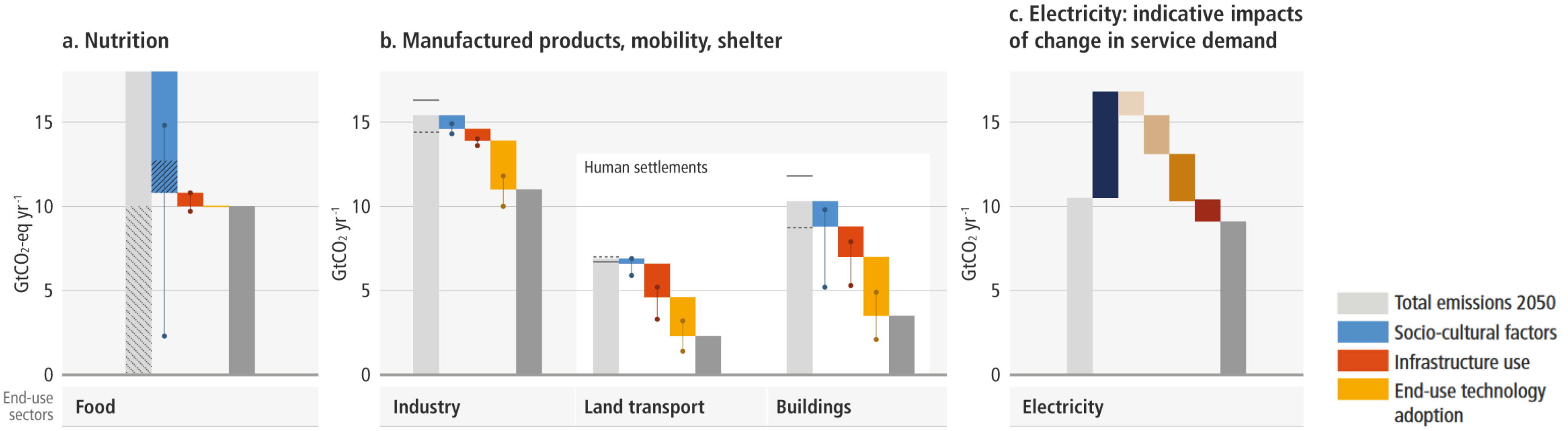
- Installed AI processors responsible for approximately 0.01% of global GHG emissions
- Enery requirements grow 10x by 2027
- Remains quite small and can be adressed by energy efficient algorithms and renewable energy
- Systemic impacts much more relevant



Luers, Creutzig et al (2024)

EA1: Refocus AI solutions on service provisioning

Demand-side mitigation can be achieved through changes in socio-cultural factors, infrastructure design and use, and end-use technology adoption by 2050.



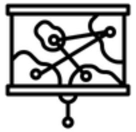
EA1: Interpretable AI models to provide sustainable urban planning insights

Create accurate data bases

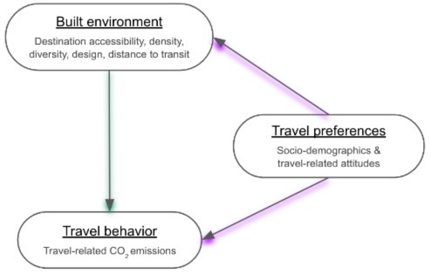
Monitoring

Map relevant features

Mapping

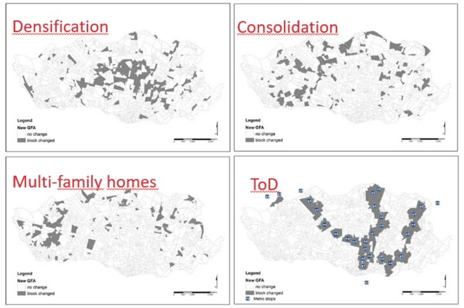


Compute interpretable metrics (e.g., with SHAP values, causal inference, and double machine learning)



Computing

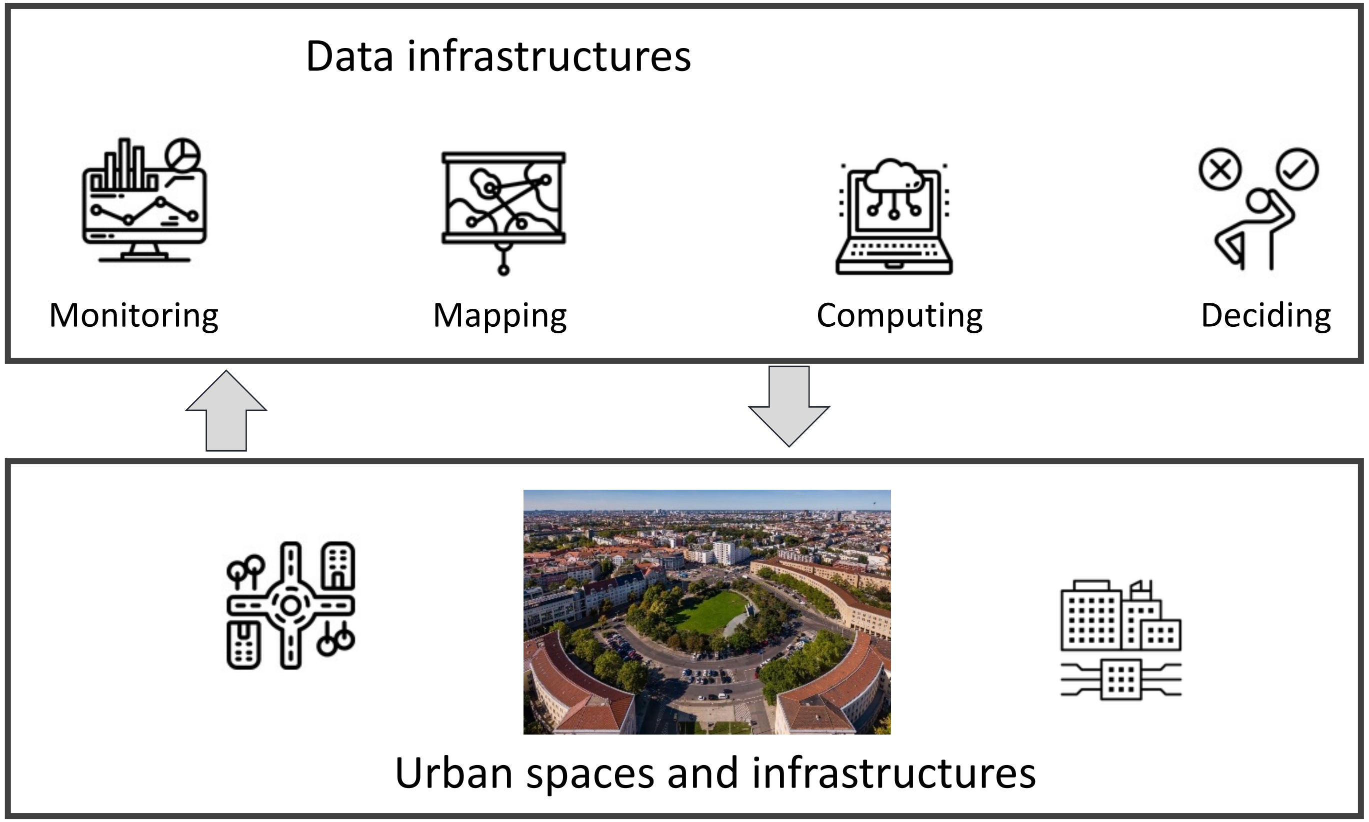
Use results to make informed decisions



Deciding

A number of data and ML publications in recent years

EA1: Joint governance of data, AI and physical infrastructure



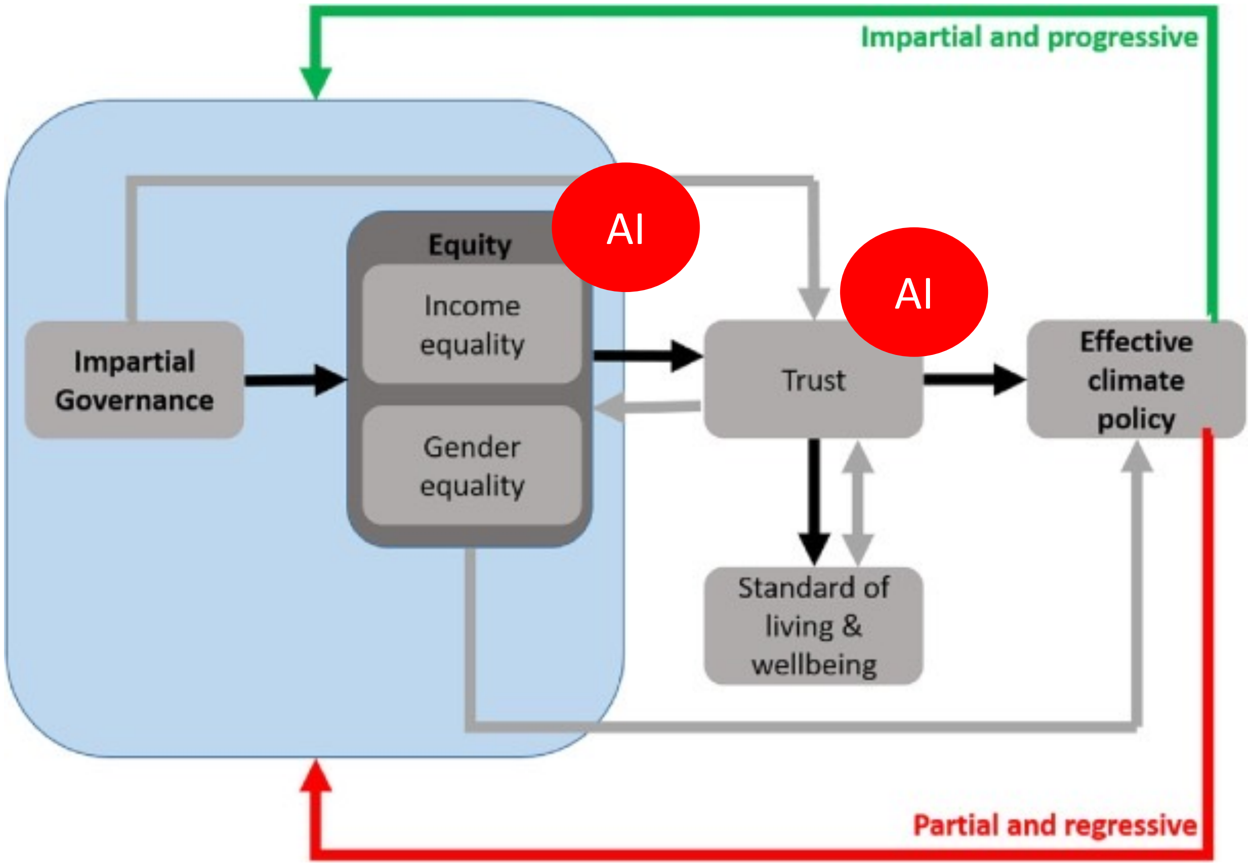
Requires
- Substantial investments
- Trusted data governance
- Citizen engagement
- Transport and urban planning guidance.

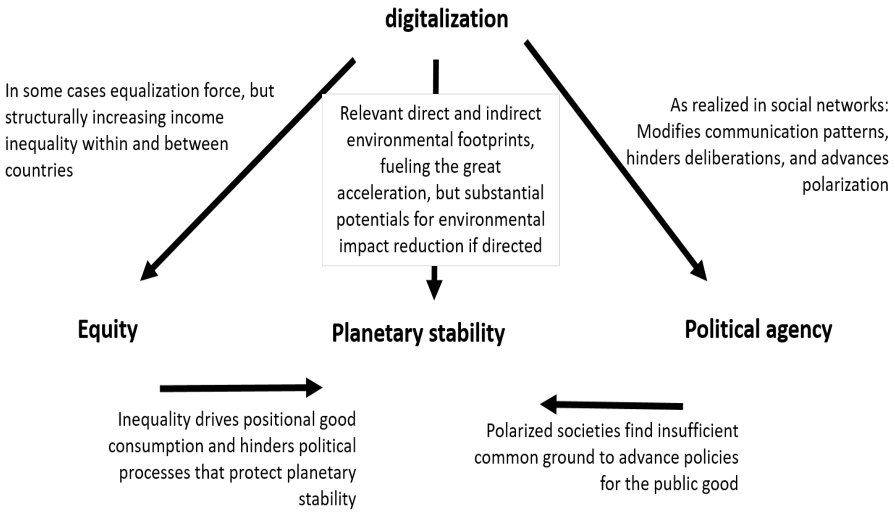
Builds on political alignment.

Municipal ownership in contrast to big tech ownership.

Creutzig et al, ERIS (2022)
Creutzig et al, in review
Ke & Creutzig, in preparation
Hintz, Kaack & Creutzig, submitted

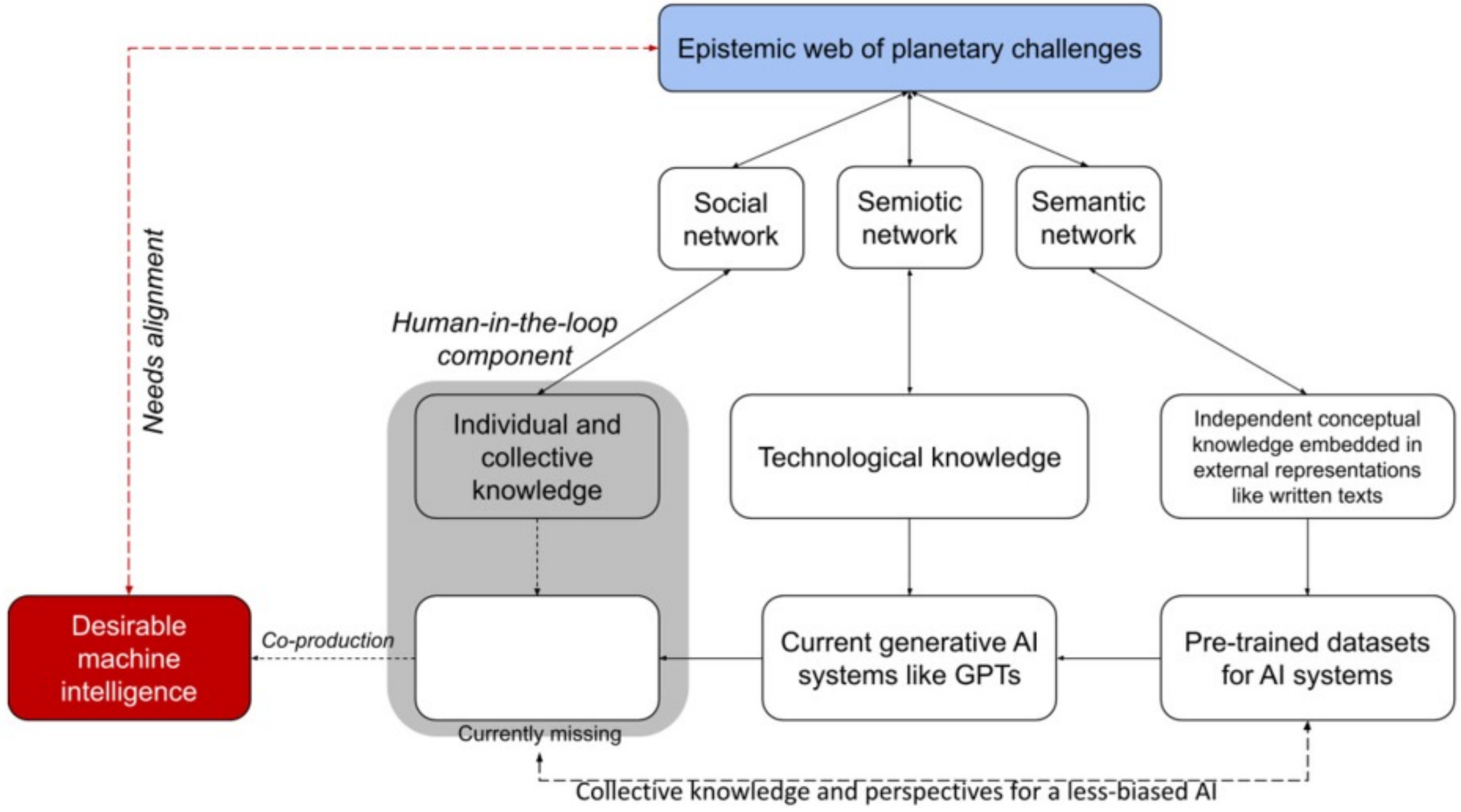
EA2: Fair resource distribution essential for effective climate policies





See also Krishna Gummadis contributions
Creutzig et al (2022)
Creutzig et al (2023)

EA3: Combine new AI technology (GPTs) with (scientific) knowledge about our planetary system



Debnath, Creutzig et al (2023)

EA3: Create propsective knowledge: 6 elements for scenario design

1. Holistic:

Include direct and indirect impacts, e.g., on political stability

3. Participatory:

Elicit expertise and buy-in from relevant international bodies

5. Transparent:

Make data sharing mandatory and establish standards

2. Quantitative:

Quantify direct and indirect effects (CO2e/yr)

4. Timely:

Rapidly update crucial parameters

6. Connected:

Link to other scenarios on climate change (SSP, IAM community, …)

Luers, Creutzig et al (2024)

The way forward: Contributing to Earth Alignment

- Curate a knowledge base
- Create a Chinese-US-European working group
- Develop scenarios
- Suggest governance strategies for Earth alignment

I-AIIG @ Tsinghua
NAS
Academia Europaea?

Relevant publications

Gaffney, Creutzig et al.
Earth Alignment for Artificial Intelligence
Nature Sustainability (2024)

→ Outlines the 3 Earth Alignment principles

Luers, Creutzig et al.
AI's full impact on climate must be better understood – here is how.
Nature (2024)

→ Calls for scenarios exploring the impact/potential of AI on climate change and solutions


ANNUAL REVIEWS

Annual Review of Environment and Resources

Digitalization and the Anthropocene

Felix Creutzig, Daron Acemoglu, Xuemei Bai, Paul N. Edwards, Marie Josefine Hintz, Lynn H. Kaack, Siir Kilkis, Stefanie Kunkel, Amy Luers, Nikola Milojevic-Dupont, Dave Rejeski, Jürgen Renn, David Rolnick, Christoph Rosol, Daniela Russ, Thomas Turnbull, Elena Verdolini, Felix Wagner, Charlie Wilson, Aicha Zekar, and Marius Zumwald

→ Explores the past, present and future of digitalization in the Anthropocene

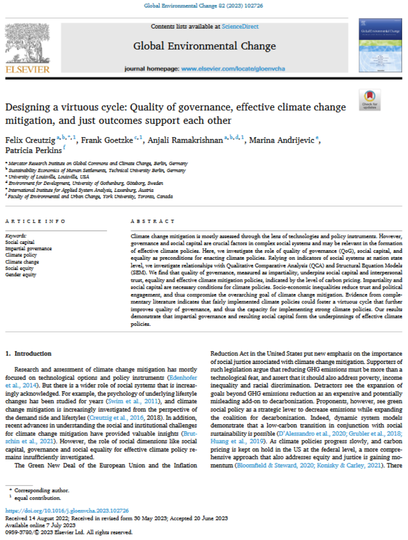

npj | climate action

PERSPECTIVE OPEN

Harnessing human and machine intelligence for planetary-level climate action

Ramit Debnath, Felix Creutzig, Benjamin K. Sovacool and Emily Shuckburgh

→ Calls for human-in-the-loop AI to produce less biased data underpinning a global epistemic web on planetary health


Global Environmental Change

Designing a virtuous cycle: Quality of governance, effective climate change mitigation, and just outcomes support each other

Felix Creutzig, Frank Goetzke, Anjali Ramakrishnan, Marina Andrijevic, Patricia Perkins

→ Empirically demonstrates the causal loop between fair distribution, social trust, and climate policies

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