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REGULATING AI FOR SAFETY, COHESION, AND CLIMATE

Presented by:

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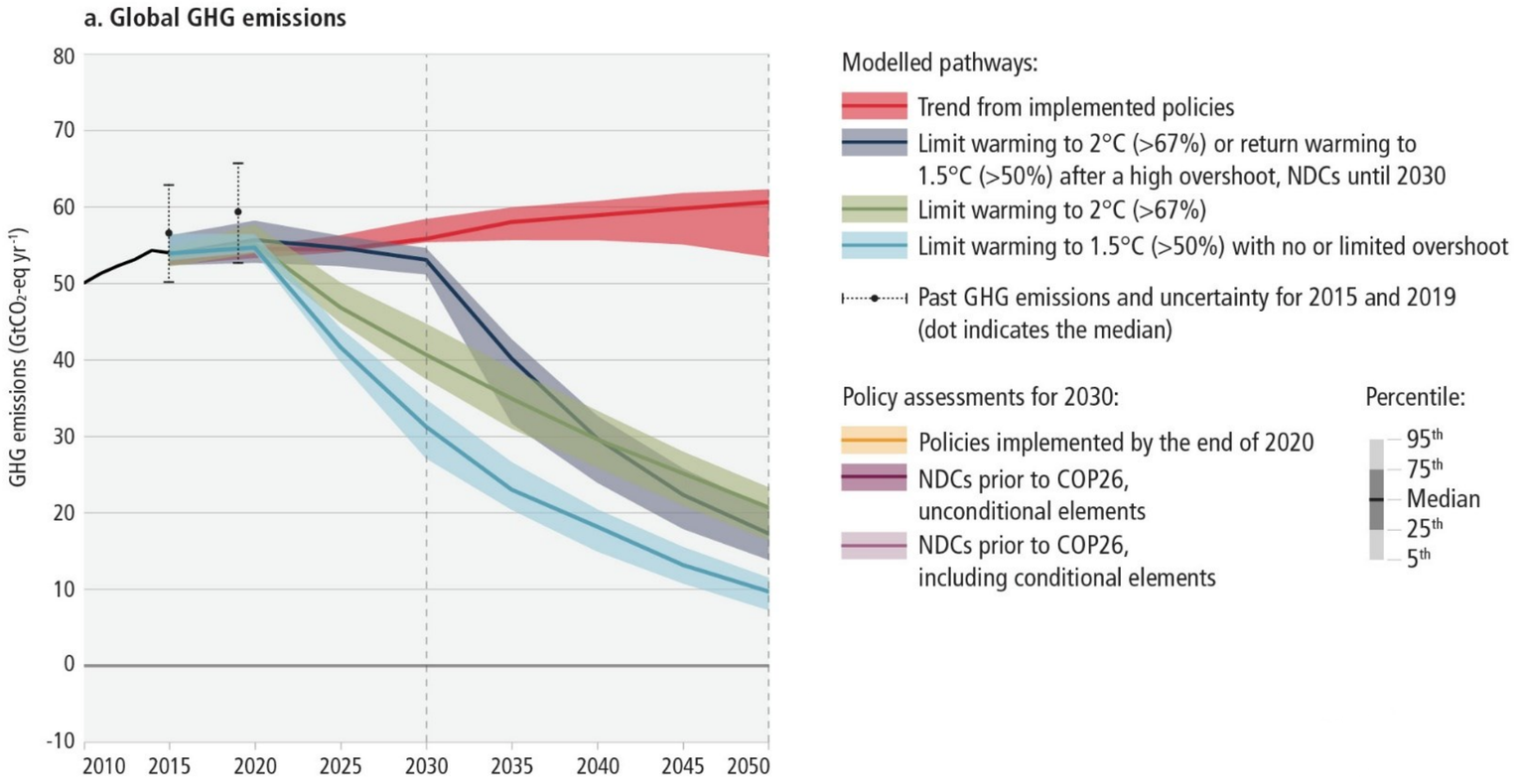
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Agreed policies and targets will not stabilize our climate

Projected global GHG emissions from NDCs announced prior to COP26 would make it likely that warming will exceed 1.5°C and also make it harder after 2030 to limit warming to below 2°C.



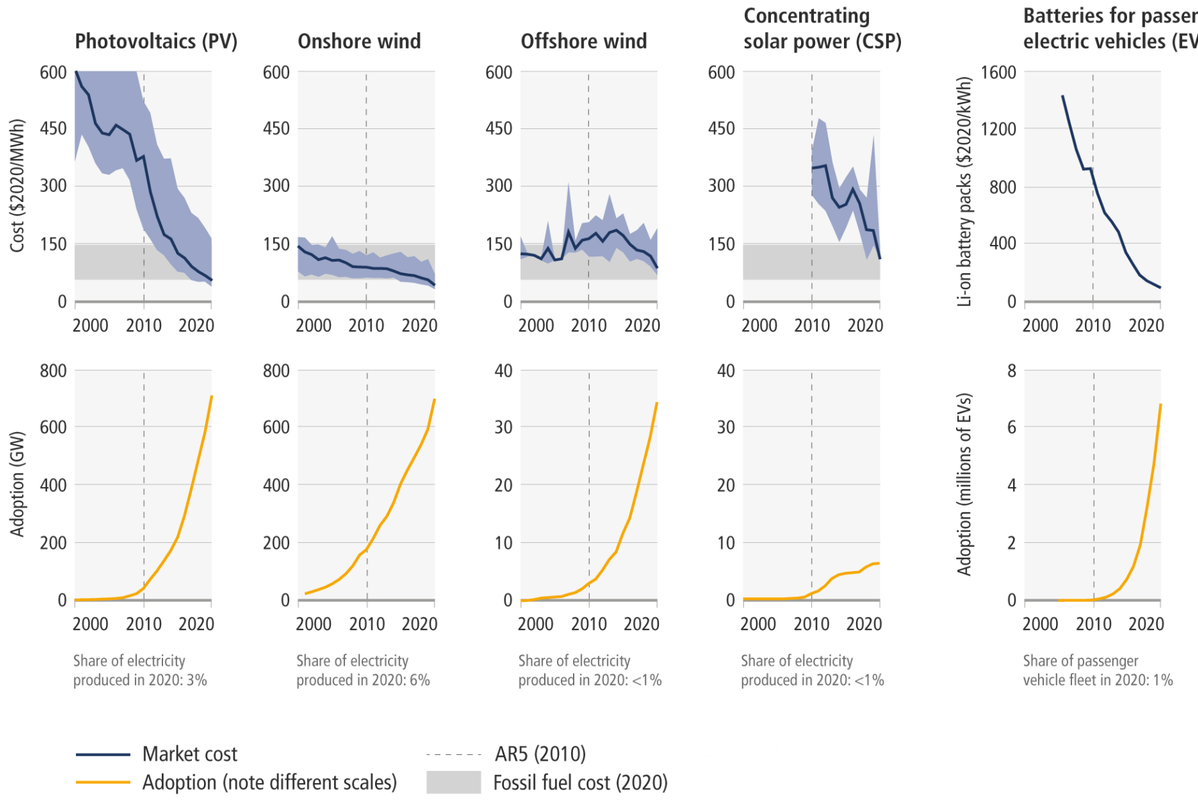
IPCC (2022) Summary for Policymakers. In: Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report, Figure SPM.4, panel a.

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Key solutions for climate change – is AI required or even helpful?

- Economics of key technologies make climate change mitigation a positive sum game
- Key technologies will need to scale in industry (carbon free steel, cement, …)
- All of this does not require AI
- Technologies might be enough to keep us below 2°C – in a low-energy demand (LED) world. AI's energy demand may make LED harder to achieve.

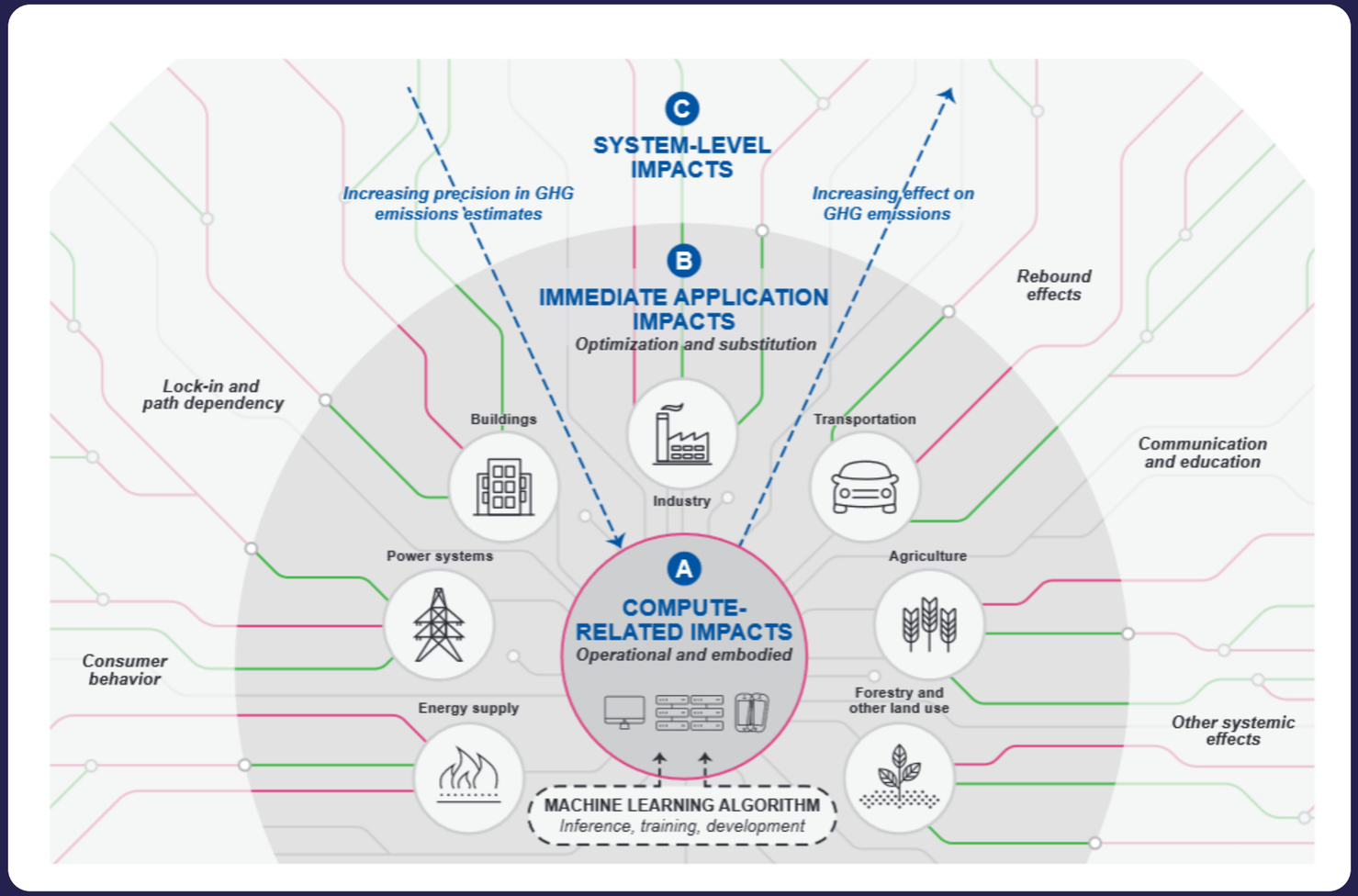
The unit costs of some forms of renewable energy and of batteries for passenger EVs have fallen, and their use continues to rise.



IPCC (2022) Summary for Policymakers. In: Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report, Figure SPM.3.

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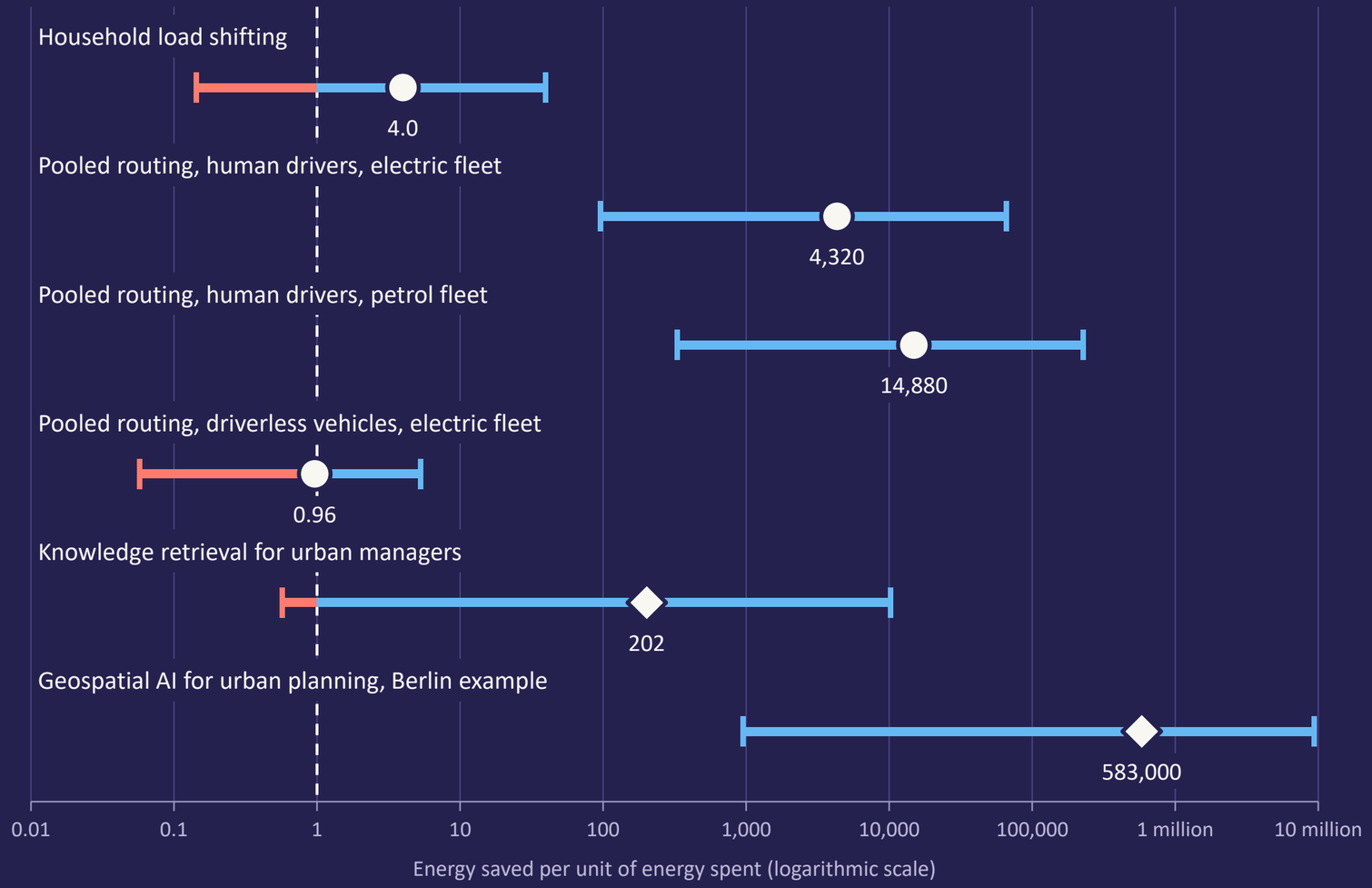
Accounting framework: system level effects dominate but are highly uncertain



Kaack, L. H., Donti, P. L., Strubell, E., Kamiya, G., Creutzig, F. and Rolnick, D. (2022) Aligning artificial intelligence with climate change mitigation. Nat. Clim. Change 12, 518–527.

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AI computing uses far less energy than is at stake; devices and follow-up decide the balance



Computing is the small part

In all four cases, AI computing uses far less energy than is at stake.

Devices can flip the sign

Standby devices cause over 99% of the cost of household load shifting. On-board computers of driverless vehicles use about 450 Wh per trip, about as much as pooling saves in an electric fleet.

Advice must be followed

Tools that inform decisions save energy only if the decision changes. The Berlin analysis needs about 100 kWh once; housing near rail stations would save about 58 GWh per year.

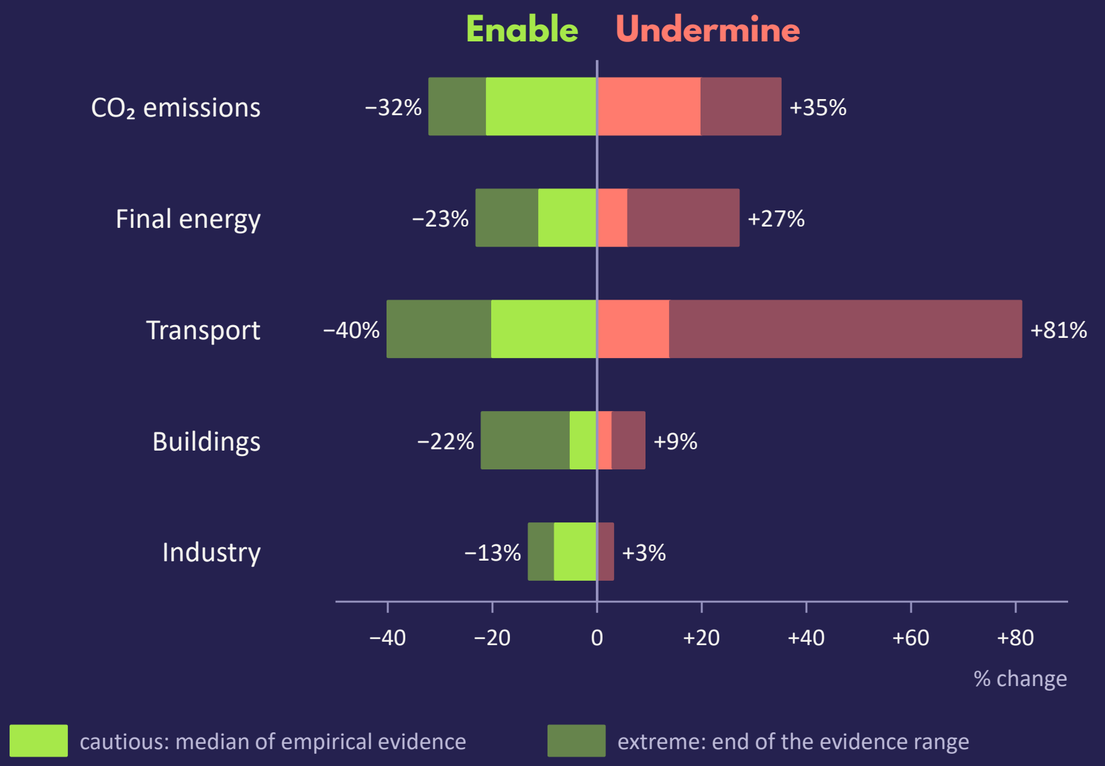
- acts directly on a system
- informs decisions
- range from worst to best case; red where a tool uses more than it saves
- break-even

Creutzig, F. (draft v0.8) Guidance on smart cities and digitalisation for urban climate neutrality. JRC, Figure 5 and Annex 4. Markers show central estimates; for the petrol fleet and the Berlin example, the saving is fuel energy and the cost is electricity; energy for manufacturing devices is not included.

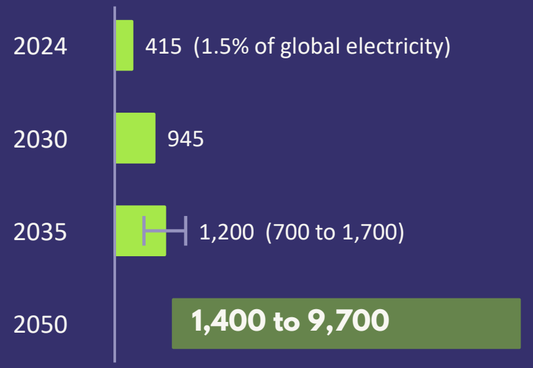
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AI's climate effect is decided by rebound in transport and buildings

Digital and AI applications: change in 2050 relative to the reference scenario, current climate policies



Data centres themselves: electricity, TWh per year



2024 to 2035: IEA base case and range of cases. 2050: data centres and networks Wilson et al

CO_2 from data-centre electricity

180 Mt 2024 **300 to 500 Mt** 2035

below 1.5% of energy-sector emissions; the whole ICT sector today: 1.4 to 3.8% of global CO_2

Outcomes with 2 °C policy, extreme variants

Energy-supply investment to 2050

Enable **US$35 tn**

Undermine **US$75 tn**

Probability of staying below 2 °C

Enable **82%**

Undermine **69%**

Year of global net zero (reference 2063)

Enable **2060**

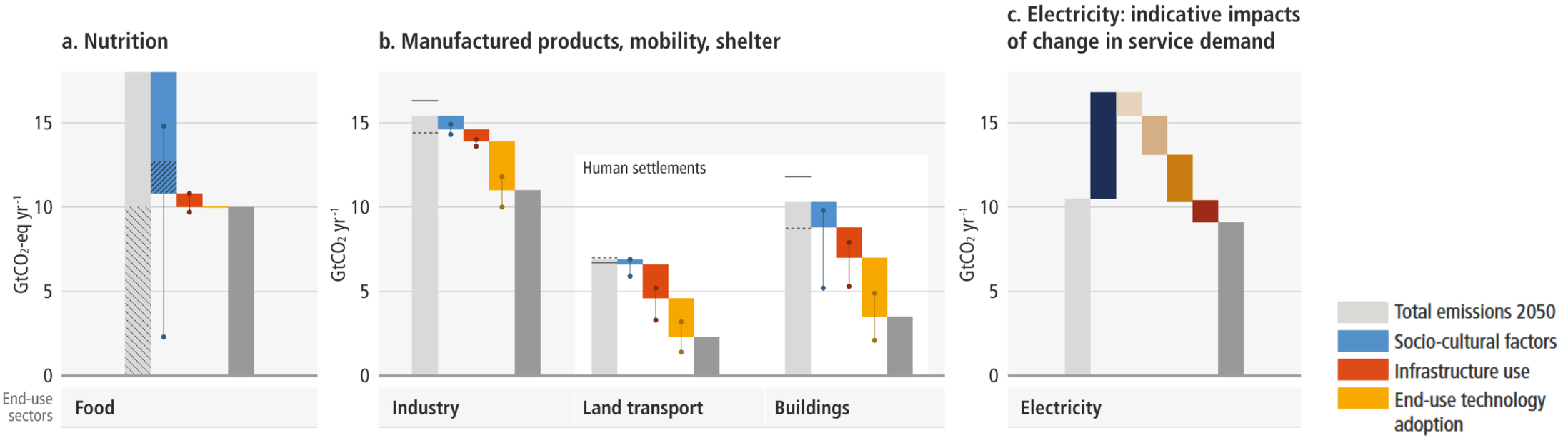
Undermine **2066**

Wilson, Krey, Maczek, Fan, Zakeri, Javaid, Mastrucci, Paccou, Beath, Bieser, Coroamă, Creutzig, Masanet, van Ruijven and Riahi (2026) Research Square preprint rs-8941019 (MESSAGEix; 2 °C variant, 600 $GtCO_2$ budget); IEA (2025) Energy and AI; ICT share: Malmodin et al. (2024), Freitag et al. (2021).
Ürge-Vorsatz, Diana, and Felix Creutzig. "Energy demand and decarbonization in 2025 and beyond." Nature Reviews Clean Technology 2.1 (2026): 4-5.

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Refocus AI solutions on service provisioning

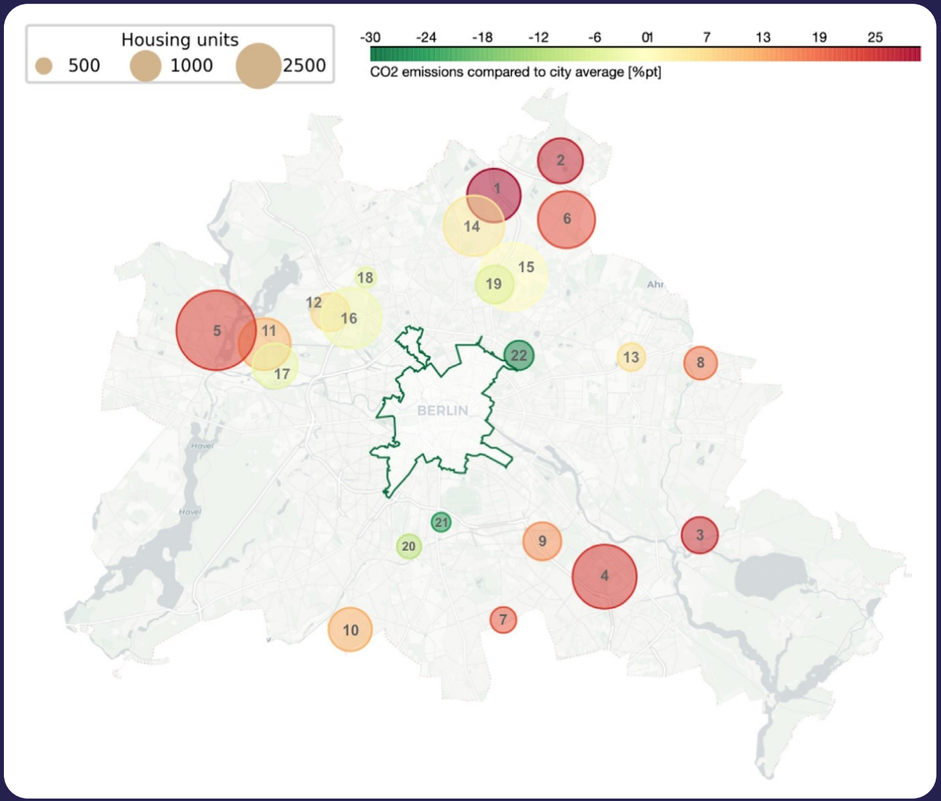
Demand-side mitigation can be achieved through changes in socio-cultural factors, infrastructure design and use, and end-use technology adoption by 2050.

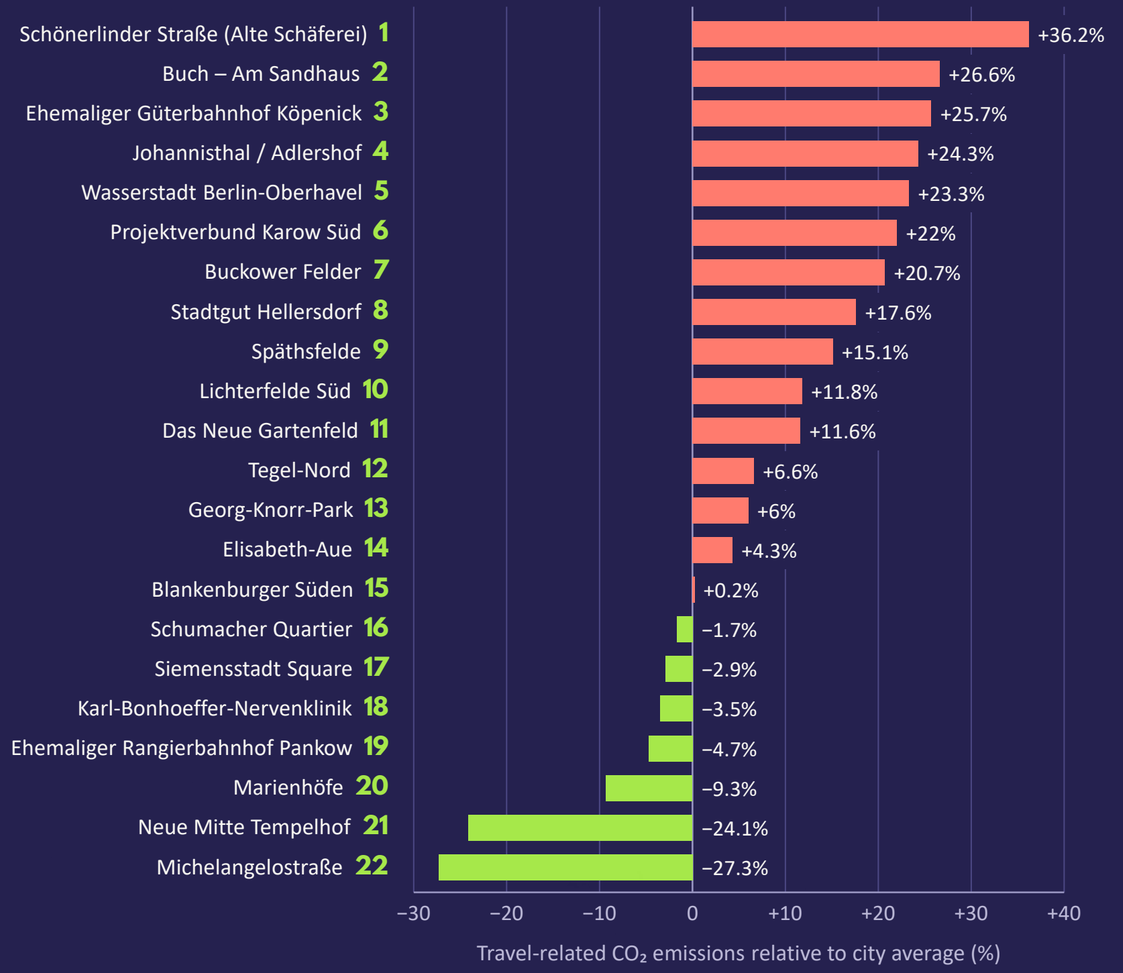


IPCC (2022) Summary for Policymakers. In: Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report, Figure SPM.6, upper panels.

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Berlin: 15 of 22 planned housing sites would raise the city's per-capita travel emissions





+11.9%
all planned settlements

−14.6%
within 7 min walk of rail (TOD)

−31.0%
20 best-located neighbourhoods

Nachtigall, F., Wagner, F., Berrill, P. and Creutzig, F. (2025) Built environment and travel: tackling non-linear residential self-selection with double machine learning. Transp. Res. D 140, 104593 (CC BY 4.0). Map and site values from Fig. 7, bars simplified to the total effect per site; strategies from Fig. 8.

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Joint governance of data, AI and physical infrastructure

Data infrastructures

Monitoring

Mapping

Computing

Deciding



Urban spaces and infrastructures

Requires

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

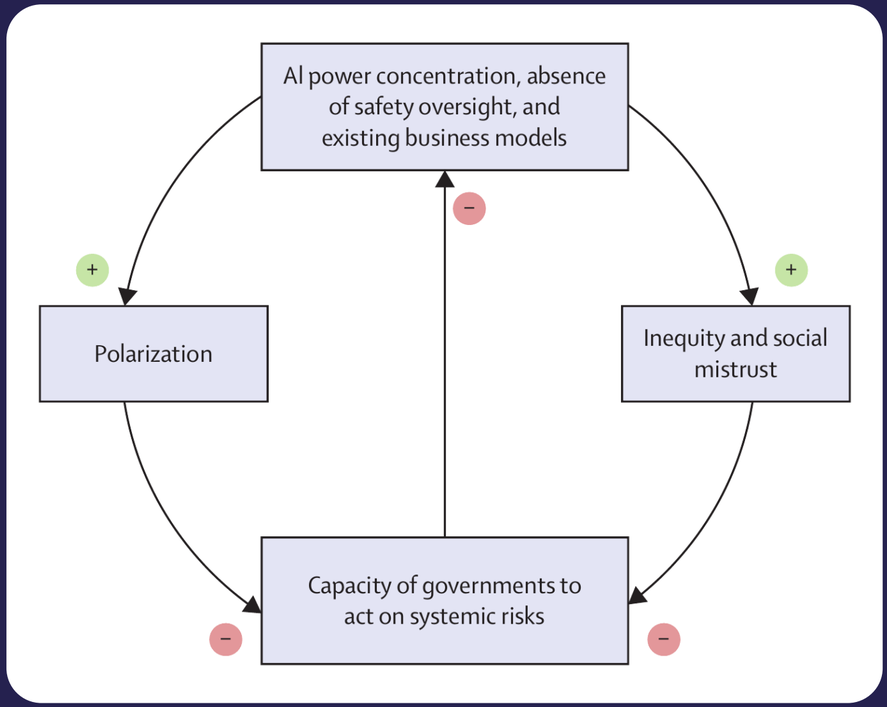
Builds on political alignment.

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

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Govern AI as a global commons



Feedback loops that erode the capacity to govern

Compute

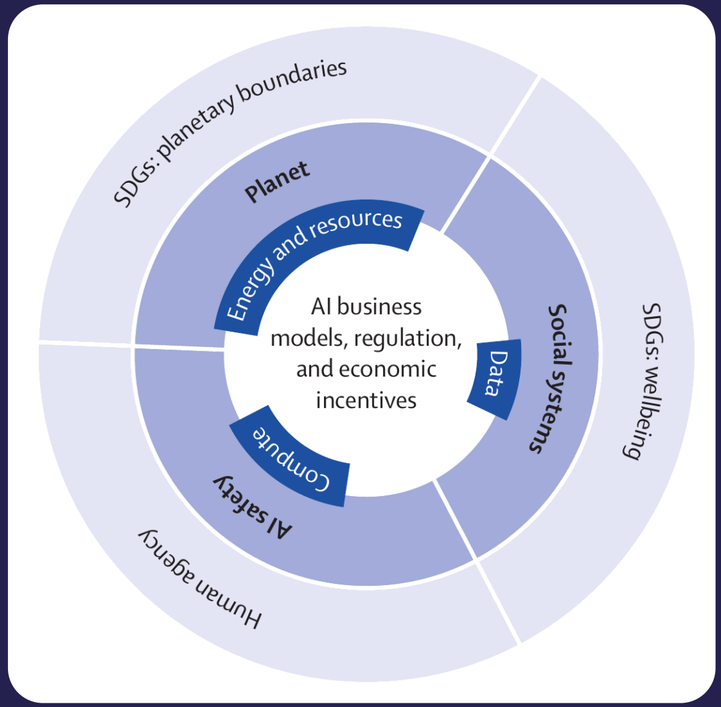
AI safety, human agency

Energy and resources

planetary boundaries

Data and knowledge

social systems, wellbeing



Feedback loop erodes capacity to govern, and regulating and taxing at three intervention points – compute, energy, data – can shift the feedback cycle towards positive outcomes

Creutzig, Denton, Hine, Joshi, Ke, Kyrychenko, Lan, Messner and O'Neill (2026) Governing artificial intelligence for planetary health. Lancet Planet. Health 10, 101408.

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Thirteen rules for what the EU AI Act leaves open: democracy, equity, planet and safety

14 proposals online submissions, May to July 2026 › **2 workshops** 25 June and 21 July 2026 › **17 contributors** white paper v42, 14 September 2026 › **2 spin-offs** Science Policy Forum draft, UK policy brief

1 Licence to operate no certificate, no market; thresholds tighten on a schedule; export conditionality on lithography and optics

Democracy and agency

- 2 Gatekeeping oversight, public knowledge
- 3 Competition and market shaping

Labour and equity

- 4 Labour across the AI supply chain
- 5 Vulnerability and exploitative design
- 6 Scale effects: decisions, agent networks
- 7 Taxation

Planetary health

- 8 Life-cycle disclosure
- 9 Environmental limits on compute

Safety

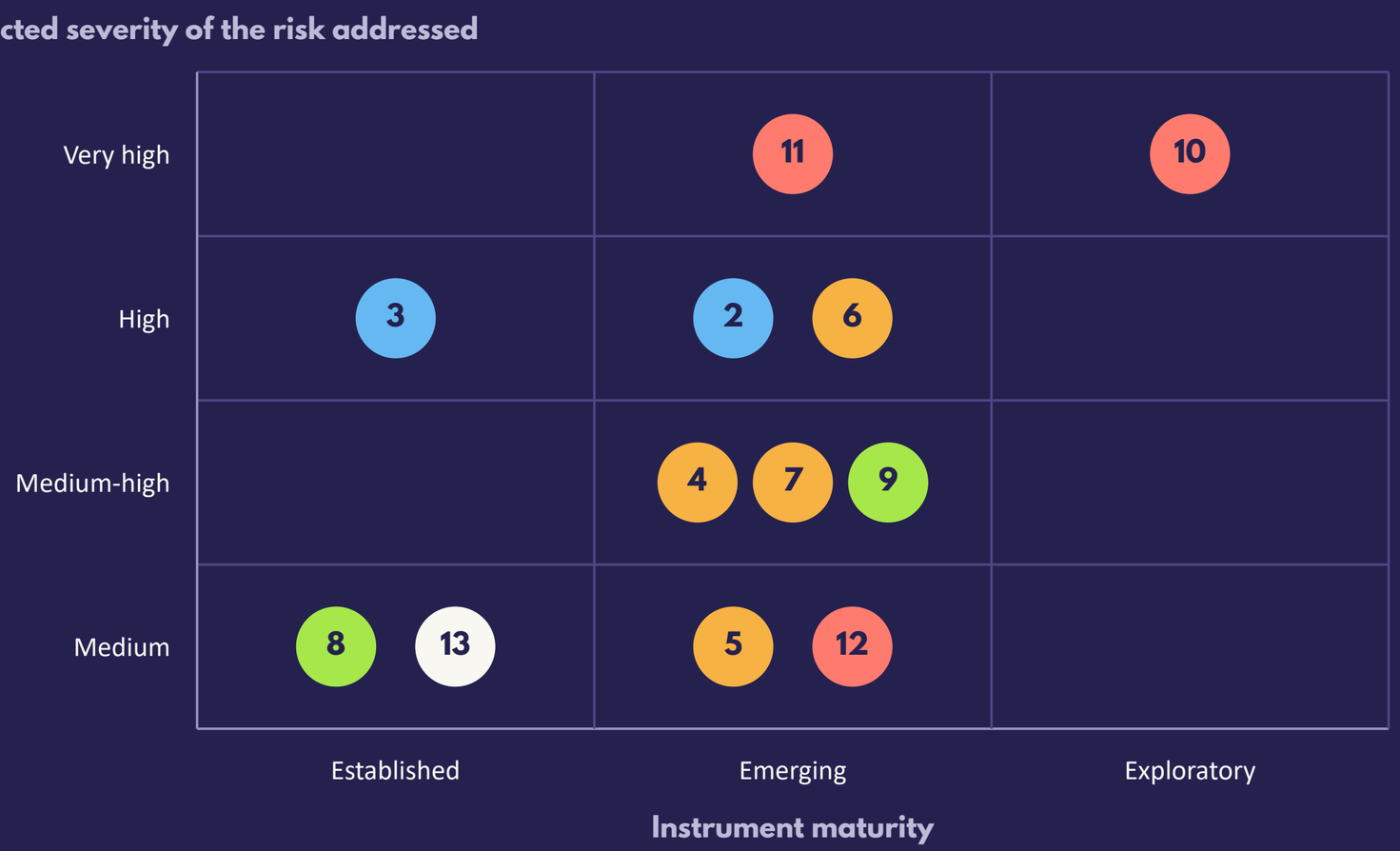
- 10 Red lines: behaviours, applications, scale
- 11 Dangerous-capability evaluations, monitorability
- 12 Liability for agentic AI

13 Implementation complete the standards layer, keep sectoral safeguards, establish a European AI Impact Observatory next to the AI Office

Creutzig et al. (2026) Thirteen rules for advancing AI regulation in Europe. White paper v42, 14 September 2026, Bennett Institute, University of Sussex, with sixteen co-contributors. Link: https://bennettinstitutesussex.org/stories/new-bennett-led-report-sets-out-thirteen-rules-for-advancing-ai-regulation-in-europe/

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Act now where instruments exist; build new instruments for the most severe risks



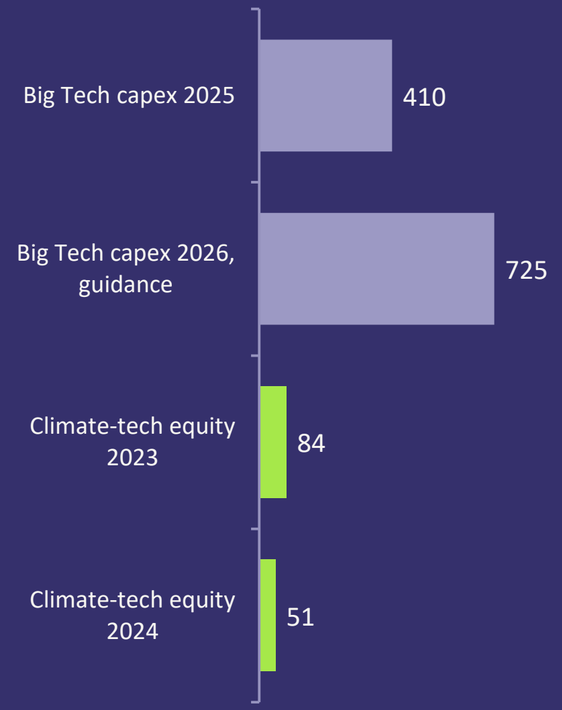
Safety · Democracy · Labour, equity · Planet · Cross-cutting

1. Licence to operate (no severity rating)
2. Gatekeeping oversight, public knowledge
3. Competition and market shaping
4. Labour across the AI supply chain
5. Vulnerability and exploitative design
6. Scale effects: decisions, agent networks
7. Taxation
8. Life-cycle disclosure
9. Environmental limits on compute
10. Red lines: behaviours, applications, scale
11. Dangerous-capability evaluations, monitorability
12. Liability for agentic AI
13. Implementation: standards, sectoral law, observatory

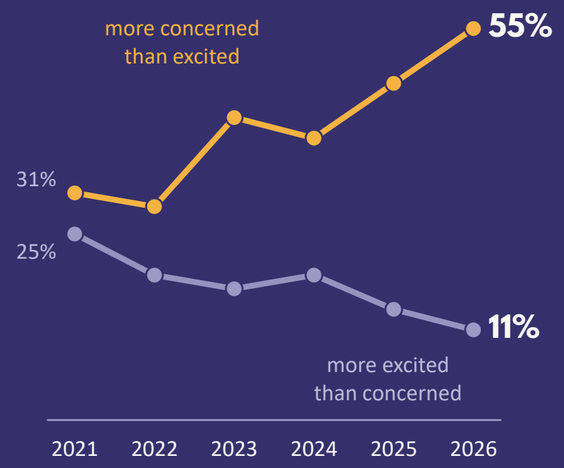
White paper Fig. 3. Severity mapped by the authors from the expert severity and catastrophic-probability rankings of Saeri et al. (2026), a three-round Delphi study of 272 experts; mixed rules placed at their centre of gravity.

AI matters for capital flows, jobs, and investmets

Capital: AI capex versus climate-tech financing, US$ bn



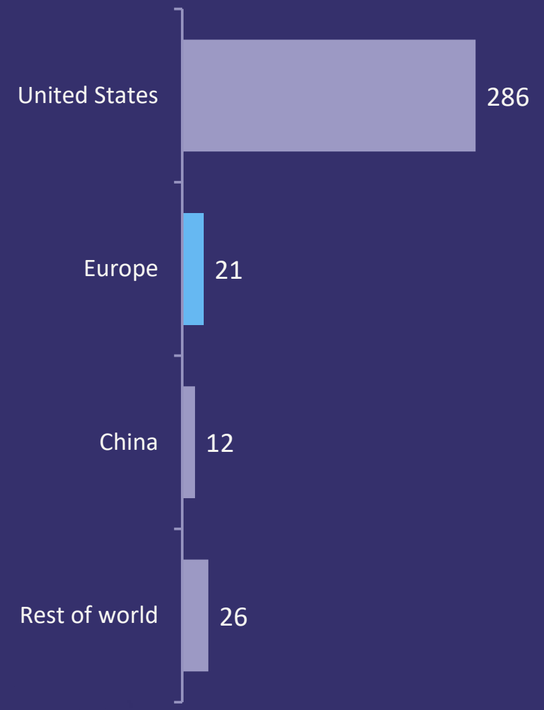
Expectations: adults aged 18 to 29, United States, share of respondents



73%

of 18 to 29-year-olds expect AI to reduce jobs over the next 20 years (61% in 2024)

Investment: private AI investment 2025, US$ bn

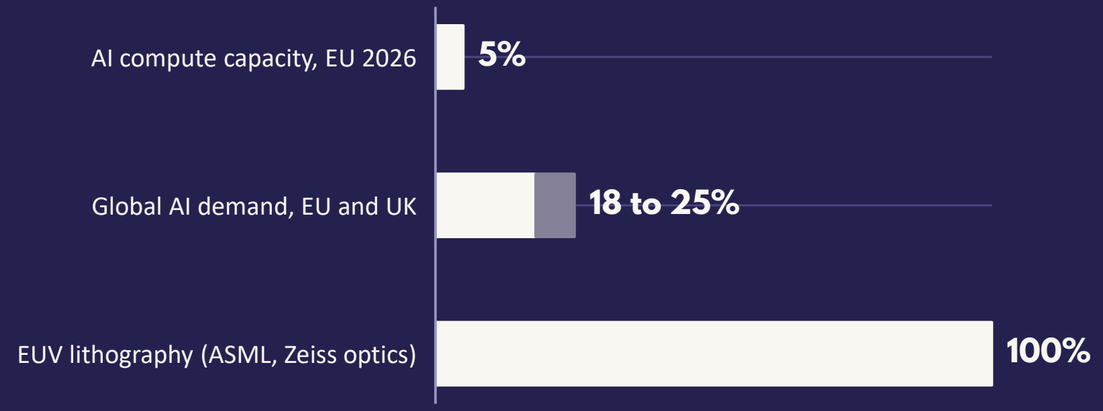


Financial Times compilation of Q1 2026 earnings (Alphabet, Amazon, Meta, Microsoft; via Tom's Hardware, 30 April 2026); BloombergNEF (2025); Pew Research Center, survey of 3,488 US adults, 22 to 28 June 2026; Stanford AI Index 2026 (rest of world as residual of the global total).

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Europe and UK is a sidenote on compute but holds key levers: demand, chokepoints and existing law

Europe's share of the world total



How demand becomes leverage: the Brussels effect

1 Market scale
about a fifth of global AI demand; EU-27 alone in the mid-teens
exclusion is costly

›

2 Conditionality
rules attached to market access: AI Act GPAI obligations, procurement, liability
the licence to operate

›

3 Non-divisibility
providers adopt EU documentation, transparency and provenance norms worldwide
rules travel

Channels GPAI market-access regime · high-risk use-case regime · public procurement and the AI Continent programme (about €200 bn) · data-residency rules · export of technical standards

Existing law already allows action

EU AI Act, Arts. 51 to 55 and 91 to 94
evaluation, model access, mitigation orders, withdrawal of general-purpose models

AI Act Art. 51(3), delegated act
turn the 10^{25} FLOP reporting line into prior authorisation

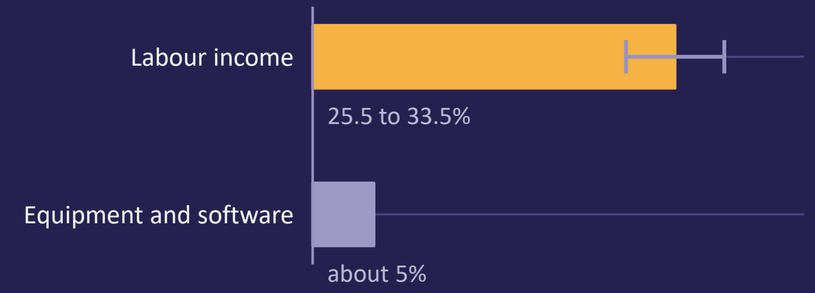
UK DMCCA 2024, conduct requirements
fair ranking and audit logs for AI-generated answers already exists

Compute share: Bruegel Policy Brief 18/2026; demand, lithography and the leverage components: white paper Annexes A1 and A2 (Europe 22 to 24% of the AI market by revenue, 18 to 21% of generative AI; ChatGPT about 80% of the chatbot market); Bradford (2020) The Brussels Effect.

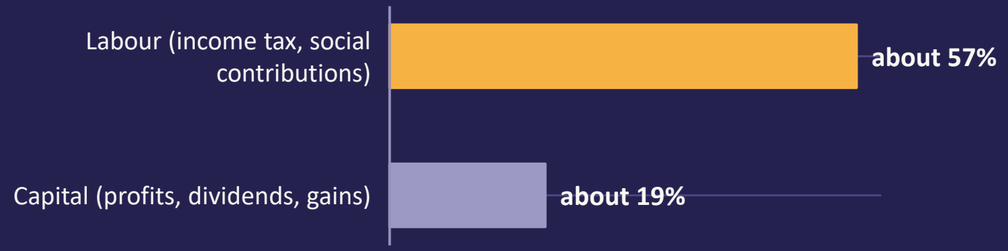
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Taxes on compute, energy and data relevant for steering and revenue

Effective tax rate, United States



OECD tax revenue by source



Stylised model, OECD

10%

of value added shifted from labour to capital

−2.1%

tax revenue across the OECD

Three new tax bases

Compute

usage-based levy per unit of compute or per token collected at destination

Energy and resources

tax on the absolute energy, water and material use of data centres

Data

levy on data appropriation
revenues returned to those who supplied the data or paid into a sovereign fund

Agarwala, M. and Creutzig, F. (2026) Sustainability principles can address the looming AI tax gap. SSRN working paper 6549198, doi:10.2139/ssrn.6549198
tax rates: Acemoglu, Manera and Restrepo (2020) Brookings Pap. Econ. Act.; OECD revenue shares and instruments: white paper rule 7.

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Five guardrails

OVERARCHING

1 Joint licence to operate

- Shared market-access conditions, tightening on a published schedule
- Mutual recognition of evaluations and market-access decisions

Vehicle EU-UK summit, Brussels, 20 November 2026 · TCA review · UK G20 presidency 2027

2 Make AI pay its way

- Extend the Digital Services Tax into a usage-based levy on compute or tokens
- Data-appropriation levy; end tax treatment that favours automation over employment

Vehicle Finance Bill · OECD · G20 2027 · common front with EU states and in the OECD

SECTORAL

3 No test, no deployment

Safety, severity very high

- Statutory AISI access before every release
- Quantified cyber, chemical and biological thresholds decide release; contained testing
- With the EU: common thresholds and mutual recognition

Vehicle Frontier AI bill (novel)

4 Accountable answers

Democracy, severity high

- A few firms decide which sources millions see
- Chatbot providers held responsible for what they publish, as newspapers are
- Too few channels: the CMA requires diversification, with choice screens listing rival AI assistants

Vehicle Liability and competition law

5 Power within limits

Planet, severity medium-high

- Consent and grid connection tied to new, hourly matched renewables, with additionality
- Water for people, not machines
- Data centres: 2.5% of UK electricity, 20 to 41 TWh by 2035

Vehicle Data-centre National Policy Statement, Growth Zones (planning policy)

Bennett Institute policy brief (2026).
Full White paper: https://bennettinstitutesussex.org/stories/new-bennett-led-report-sets-out-thirteen-rules-for-advancing-ai-regulation-in-europe/

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