Enablers for inclusive, whole-of-society transformations

Elmar Kriegler, Potsdam Institute for Climate Impact Research

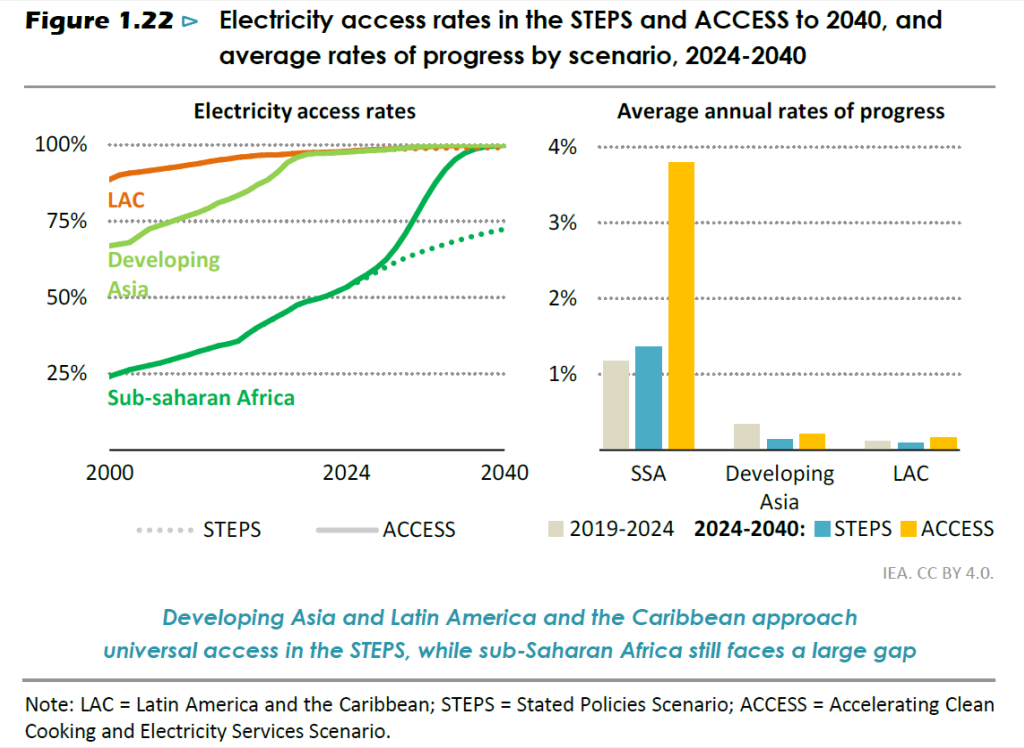
June 9th 2026, 18th Meeting of the SBSTA Research Dialogue, Bonn

Enablers of whole-of-society transformations

- Embedding climate action in the context of
  - climate and nature protection
  - human and economic development
  - energy and food security
- Ensuring an equitable and just transition
  - fair burden sharing at national and global level
  - increasing access to modern energy and healthy diets, maintaining affordability
- Political signaling of transformation objectives and milestones
- Cross-sectoral coordination and integration
- Redirecting investment flows to match investment needs

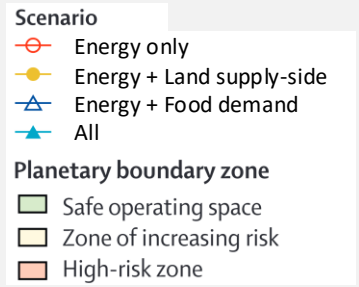
Climate and nature protection and human and economic development are intricately linked

Electricity is key for decarbonisation and development

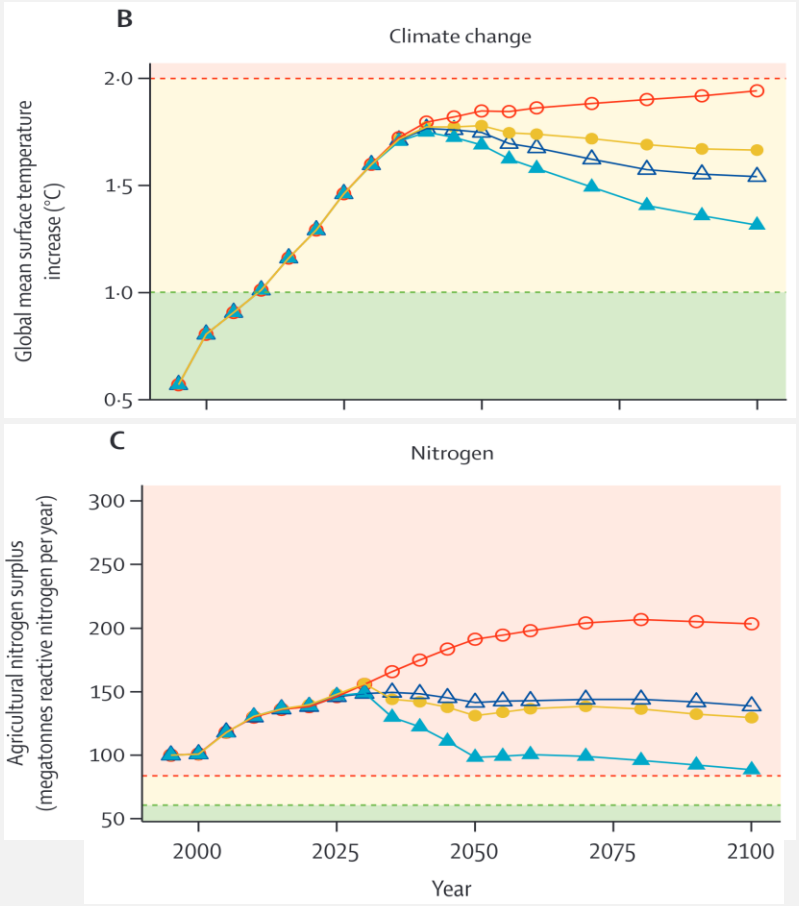


IEA, World Energy Outlook (2025)

Food systems and food demand shifts are key for human health, climate and nature protection



Planetary Health Diet



Beier et al., 2025, Lancet Planet. Health 9(10), 101249

Recent pathway literature connecting CC mitigation, nature protection, just transition, energy and industrial transformation

Food and land systems

nature food — Bodirsky et al. 2025

Article https://doi.org/10.1038/s43016-025-01268-y

A food system transformation pathway reconciles 1.5 °C global warming with improved health, environment and social inclusion

nature sustainability — von Jeetze et al. 2025

Article https://doi.org/10.1038/s41893-025-01595-9

Conservation outcomes of dietary transitions across different values of nature

Planetary boundaries under a land-based climate change mitigation scenario with a food demand transformation: a modelling study

Felicitas D Beier, Jan Philipp Dietrich, Jens Heinke, Gabriel Abrahao, Patrick von Jeetze, Benjamin Leon Bodirsky, Michael Crawford, Florian Humpenöder, Leon Merfort, Isabelle Weindl, Mario Herrero, Daniel Mason-D'Croz, Johan Rockström, Marina Sundiang, Sofie te Wierik, Anna Norberg, David Klein, Christoph Müller, Hermann Lotze-Campen, Alexander Popp

SCIENCE ADVANCES | RESEARCH ARTICLE

PUBLIC HEALTH

Food matters: Dietary shifts increase the feasibility of 1.5°C pathways in line with the Paris Agreement

Florian Humpenöder[1]†*, Alexander Popp[1,2]†, Leon Merfort[1,3], Gunnar Luderer[1,3], Isabelle Weindl[1], Benjamin Leon Bodirsky[1], Miodrag Stevanović[1], David Klein[1], Renato Rodrigues[1], Nico Bauer[1], Jan Philipp Dietrich[1], Hermann Lotze-Campen[1,4], Johan Rockström[1,5]

Energy and industrial systems

nature communications — Mori et al. 2026

Article https://doi.org/10.1038/s41467-026-72841-7

Challenges and opportunities of the full phase-out of fossil fuels under the 1.5 °C goal

nature communications — Schreyer et al. 2025

Article https://doi.org/10.1038/s41467-025-66682-z

From net-zero to zero-fossil in transforming the EU energy system

nature climate change — Bachorz et al. 2026

Article https://doi.org/10.1038/s41558-026-02635-8

Averting the steel carbon lock-in through strategic green investments

nature energy — Van Heerden et al. 2025

Article https://doi.org/10.1038/s41560-025-01703-1

Demand-side strategies enable rapid and deep cuts in buildings and transport emissions to 2050

Just transition

Cell Reports Sustainability — CellPress OPEN ACCESS

Article

The multi-faceted global poverty and income inequality landscape in a decarbonizing world

Shiya Zhao,[1,2,9,*] Shinichiro Fujimori,[1,2,3] Jihoon Min,[2] Jarmo S. Kikstra,[2,4,5] Tomoko Hasegawa,[1,3,6] Ken Oshiro,[7] and Saritha Sudharmma Vishwanathan[1,8]

Article | Open access | Published: 04 October 2024

A multi-model assessment of inequality and climate change

Johannes Emmerling, Pietro Andreoni, Ioannis Charalampidis, Shouro Dasgupta, Francis Dennig, Simon Feindt, Dimitris Fragkiadakis, Panagiotis Fragkos, Shinichiro Fujimori, Martino Gilli, Carolina

PNAS — RESEARCH ARTICLE | SUSTAINABILITY SCIENCE

Within-country inequality and the shaping of a just global climate policy

Marie Young-Brun[a,b,c,1], Francis Dennig[d], Frank Errickson[e], Simon Feindt[f,g], Aurélie Méjean[h], and Stéphane Zuber[a,b]

LETTER • OPEN ACCESS

Income and inequality pathways consistent with eradicating poverty

Jihoon Min*, Bjoern Soergel, Jarmo S Kikstra, Johannes Koch and Bas van Ruijven

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Environmental Research Letters, Volume 19, Number 11

LETTER • OPEN ACCESS

Closing decent living gaps in energy and emissions scenarios: introducing DESIRE

Jarmo S Kikstra*, Vassilis Daioglou, Jihoon Min, Fabio Sferra, Bjoern Soergel, Elmar Kriegler, Hanbit Lee, Alessio Mastrucci, Shonali Pachauri, Narasimha Rao ▾ Show full author list

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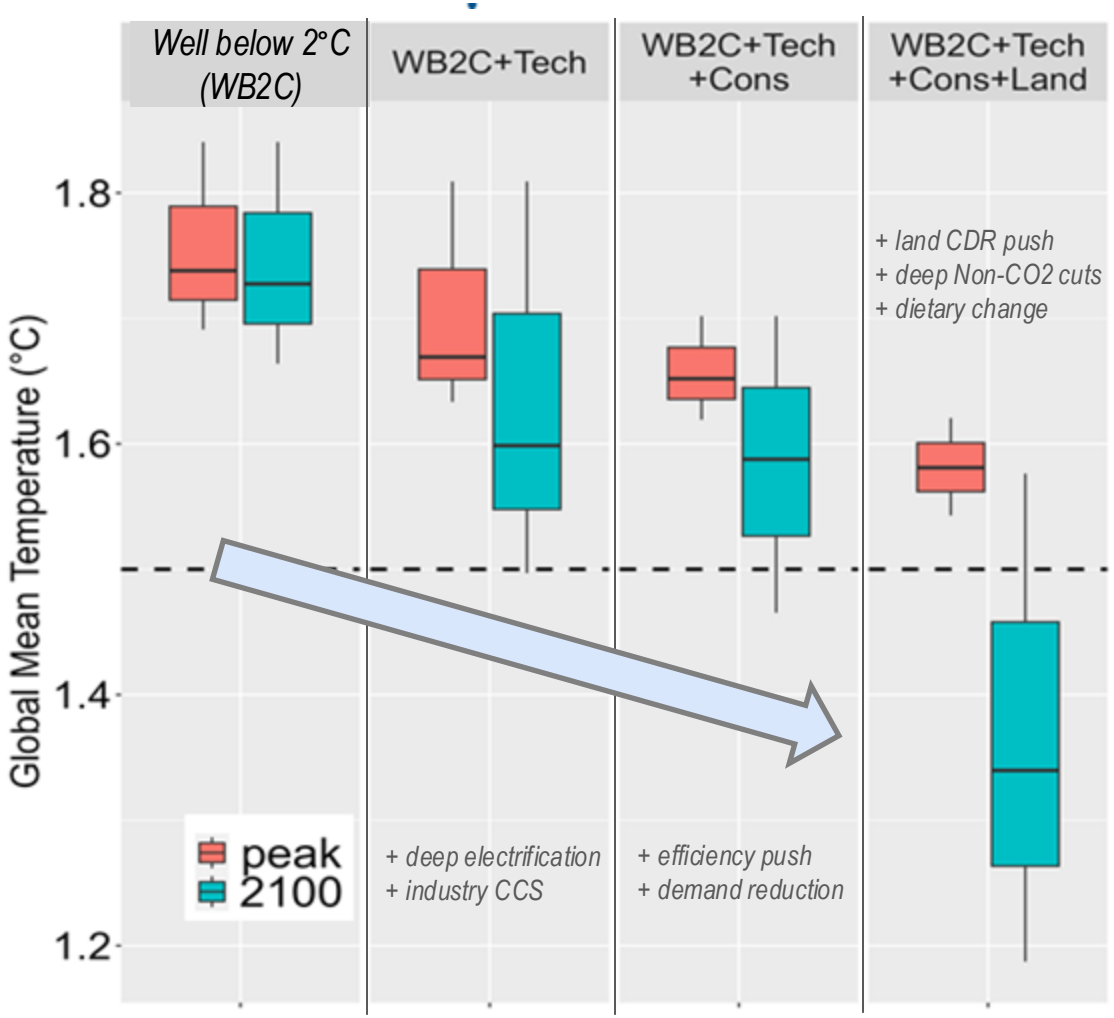
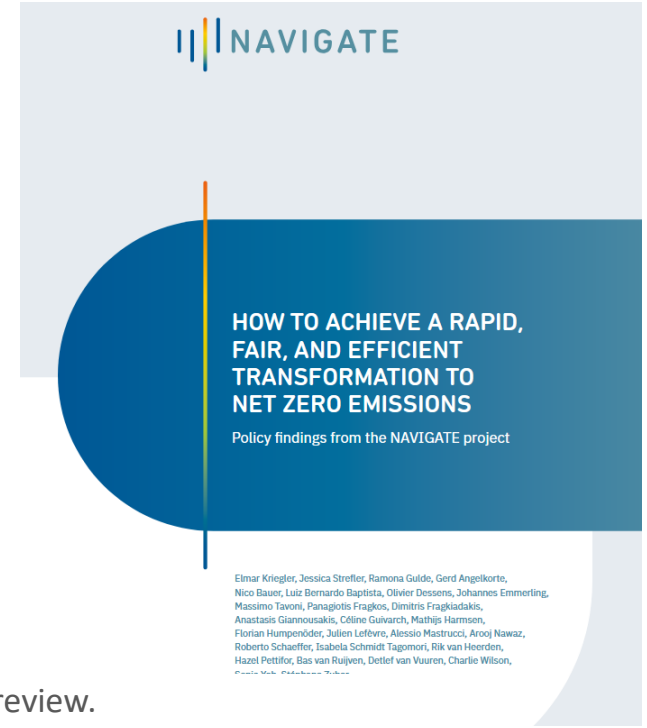
Environmental Research Letters, Volume 20, Number 5

Limiting overshoot requires cross-sectoral transformation



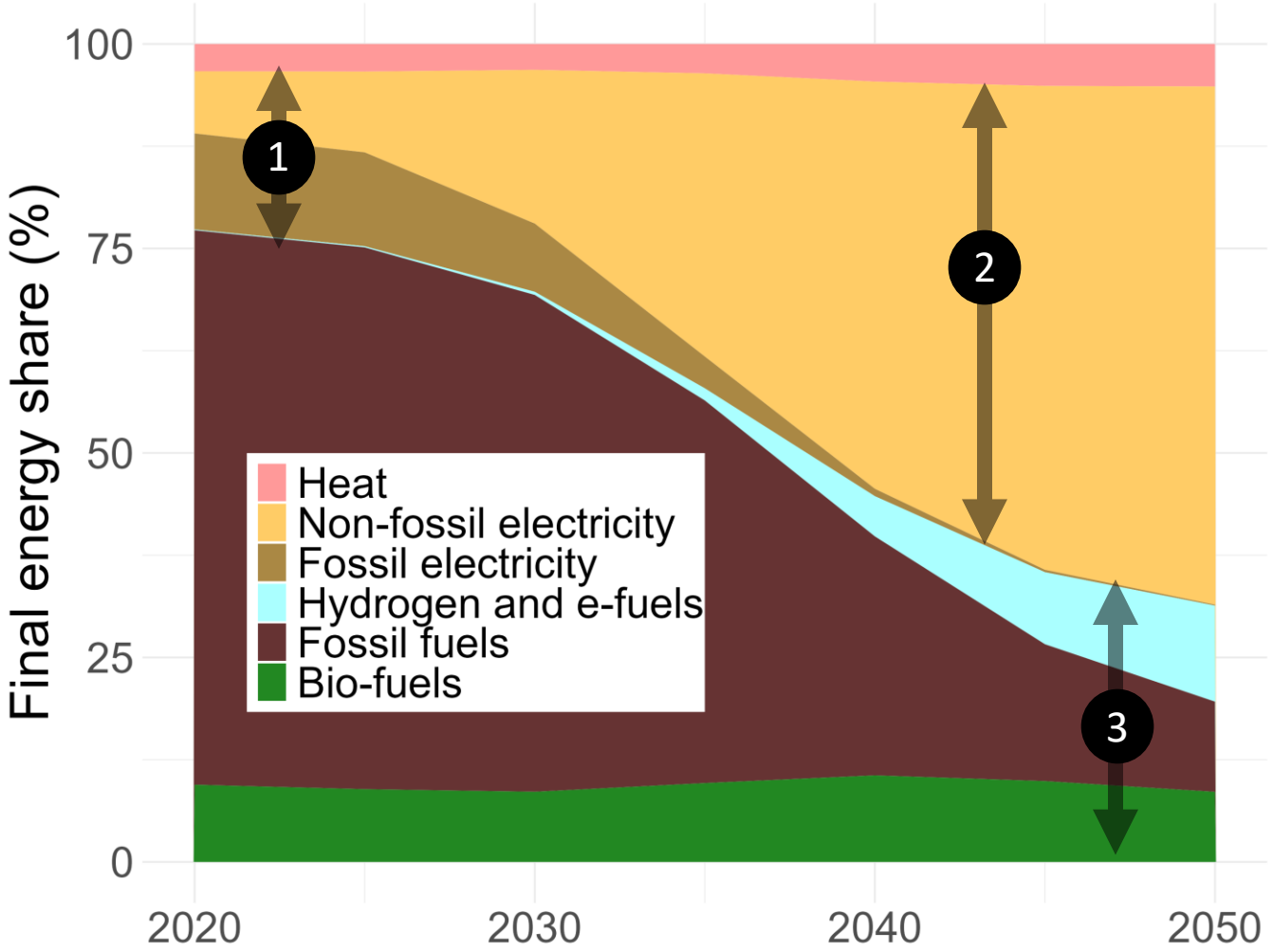
Accelerating and deepening emissions reductions by broad portfolio of transformative action across sectors

Energy transition combined with deep reduction in AFOLU emissions and carbon dioxide removal

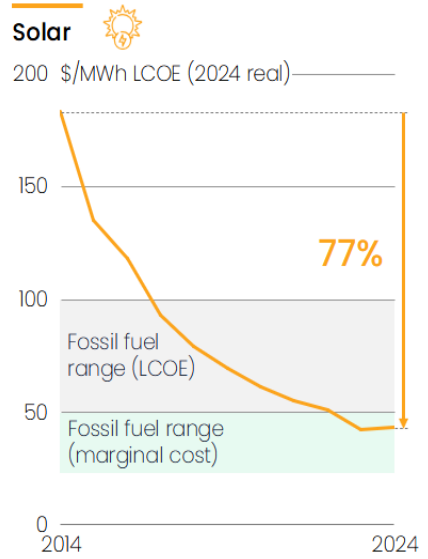


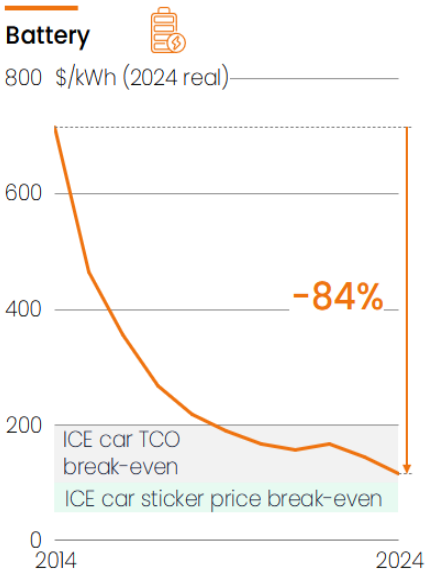
Strefler et al. (2026) A mix of policies is needed to close the climate ambition gap. In review.
Kriegler et al. (2023) Policy findings from the NAVIGATE project.

Energy system integration



1. Cheap renewables to replace fossil power
2. Deep electrification of all sectors (transportation, heating)
3. Green molecules replace fossil hydrocarbons (sustainable bio-fuels, hydrogen)





REMIND scenario of the *Rescuing 1.5°C* report, November 2025
https://doi.org/10.5281/zenodo.18234421

The Electrotech Revolution, September 2025
https://ember-energy.org/app/uploads/2025/09/Slidedeck-The-Electrotech-Revolution-PDF.pdf

PIK Energy Transition Lab
https://www.pik-potsdam.de/en/institute/labs/energy-transition

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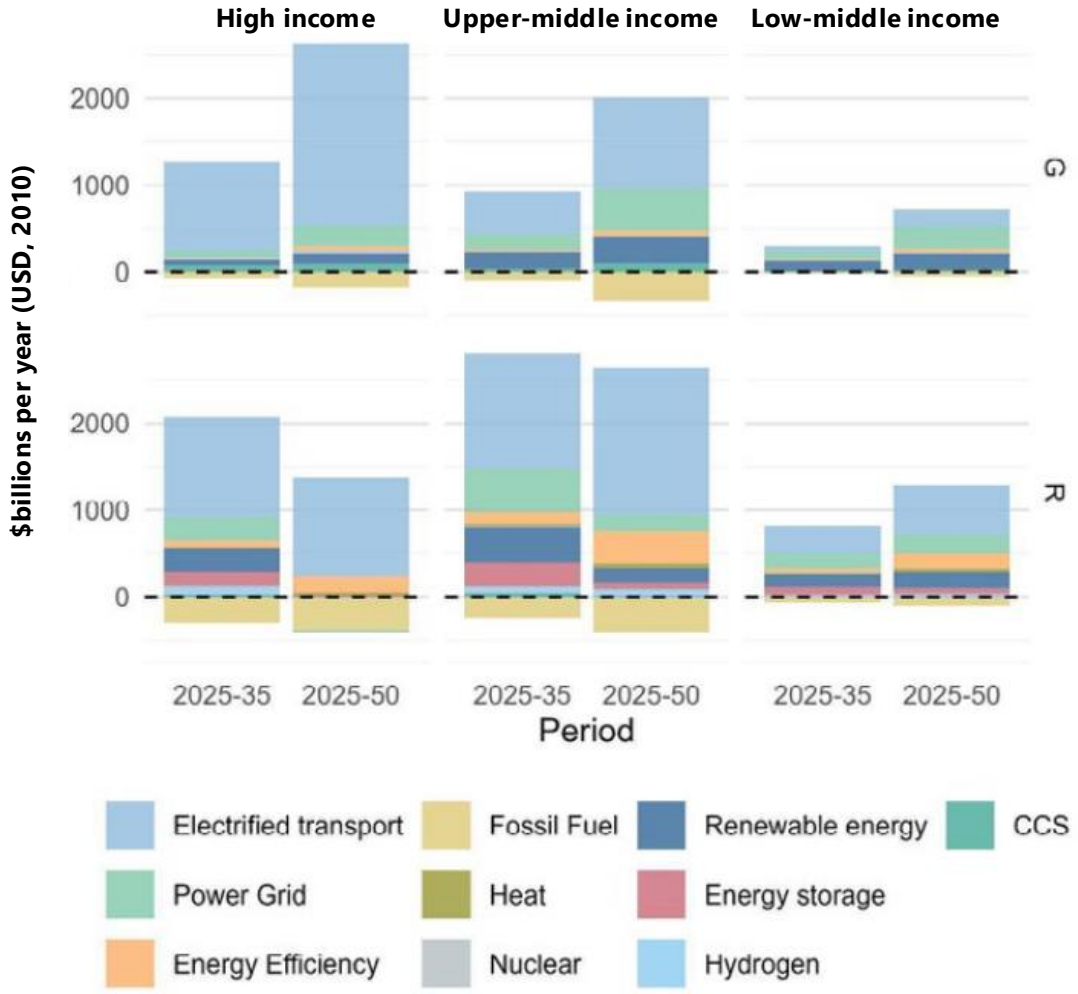
Energy investments

Regional energy investment upscaling for Net Zero 2050



Regional energy investment upscaling for Net Zero 2050 in 2035 and 2050, compared to 2025 level
Note that totals are not directly comparable as the scope of covered categories differs across models ("G": GCAM, "R": REMIND-MAgPIE) [Figure 5 in Guo et al. 2025, NGFS, adjusted]

NGFS Scenarios Portal

- Current global energy investments (~3 trillion USD annually) insufficient for a Paris-aligned transition.
- Annual investments must increase by ~5 trillion USD until 2050.
- Largest investment needs for electro-mobility and power grids, significant decline in fossil fuel investments.

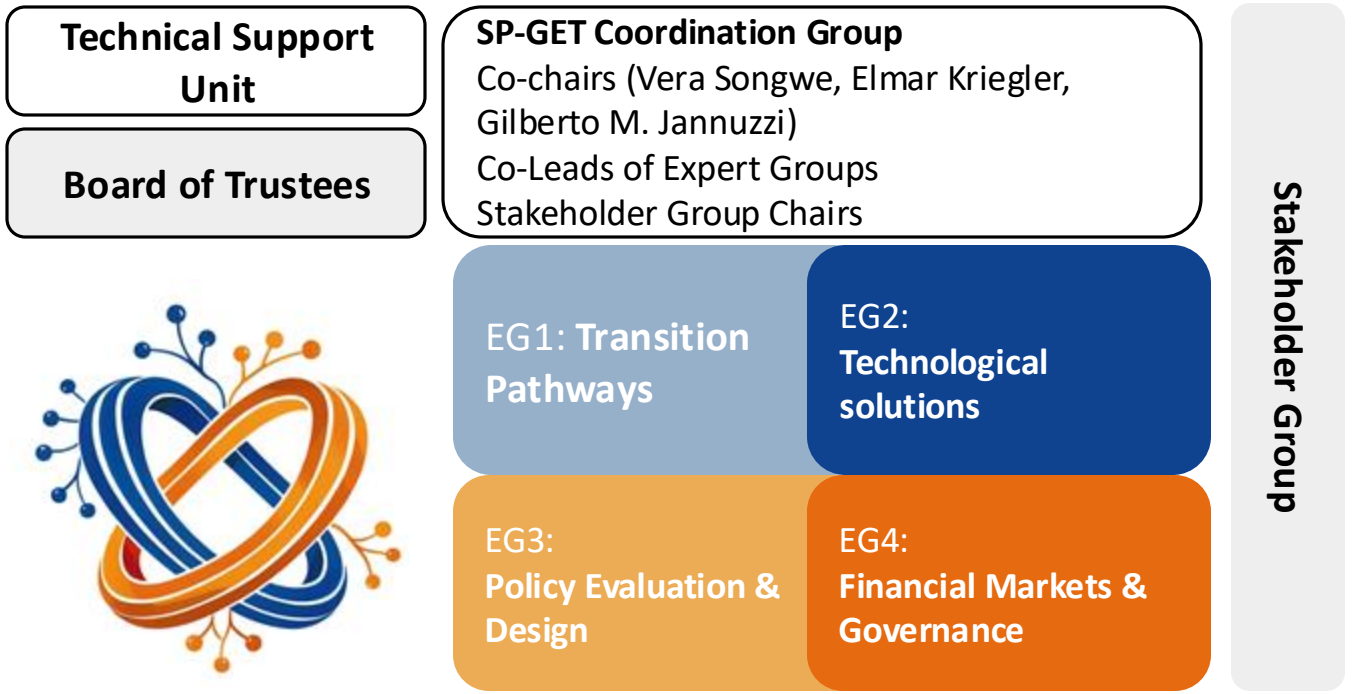
Guo et al. (2025), Network for Greening the Financial System.
Guo et al. (2026), Revisiting Global and Regional Energy Transition Investments for Net Zero 2050. (in preparation)

Potsdam-Institut für Klimafolgenforschung

Science Panel for the Global Energy Transition

Objective: Service decision makers with relevant and accurate science on the global energy transition away from fossil fuels

- **Map and develop** promising policy mixes, financial instruments, sustainable technology solutions, justice dimensions.
- **Policy-oriented assessment** of pathways transitioning away from fossil fuels.
- **Co-produce** scientific products with broad group of stakeholders.
- **Contribute** to the development of national energy transition roadmaps.



Status update

- Born at COP30 in Belem, launched in Santa Marta
- Working groups and stakeholder group now being constituted
- First products planned in time for COP31 in Antalya

Summary: Enablers of whole-of-society transformations

- Embedding climate action in the context of
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  - human and economic development
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References

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- Van Vuuren et al. (2025), Nature 641, 910-916

Just transitions

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- Zhao et al. (2025), Cell Rep. Sust. 2, 100487
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