Equity and Distributional Implications in Global Climate Scenarios

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Why many climate scenarios underrepresent equity and distributional impacts

- **Embedded assumptions in scenarios:** Global climate scenarios rely on stylized assumptions about economic development, technology adoption, and policy coordination, which implicitly shape who bears costs and who reaps benefits.
- **Distributional impacts across nations:** These assumptions often obscure distributional consequences across regions, sectors, and communities, with significant implications for equity and fairness in global climate action.
- **Cost-optimality vs. fairness:** Most scenarios emphasize cost-effectiveness and aggregate efficiency, while equity considerations tend to be treated as secondary or added later through post-hoc analysis, underscoring the need for a paradigm shift in how we build and interpret scenarios.
- **Propagation channels:** Mitigation actions in one region can transmit unintended impacts elsewhere shaping global welfare distribution in ways not always captured by conventional modeling.
- **Policy relevance:** Highlighting these distributional dimensions is crucial for designing climate policies that are not only efficient but also perceived as legitimate and just, strengthening global cooperation

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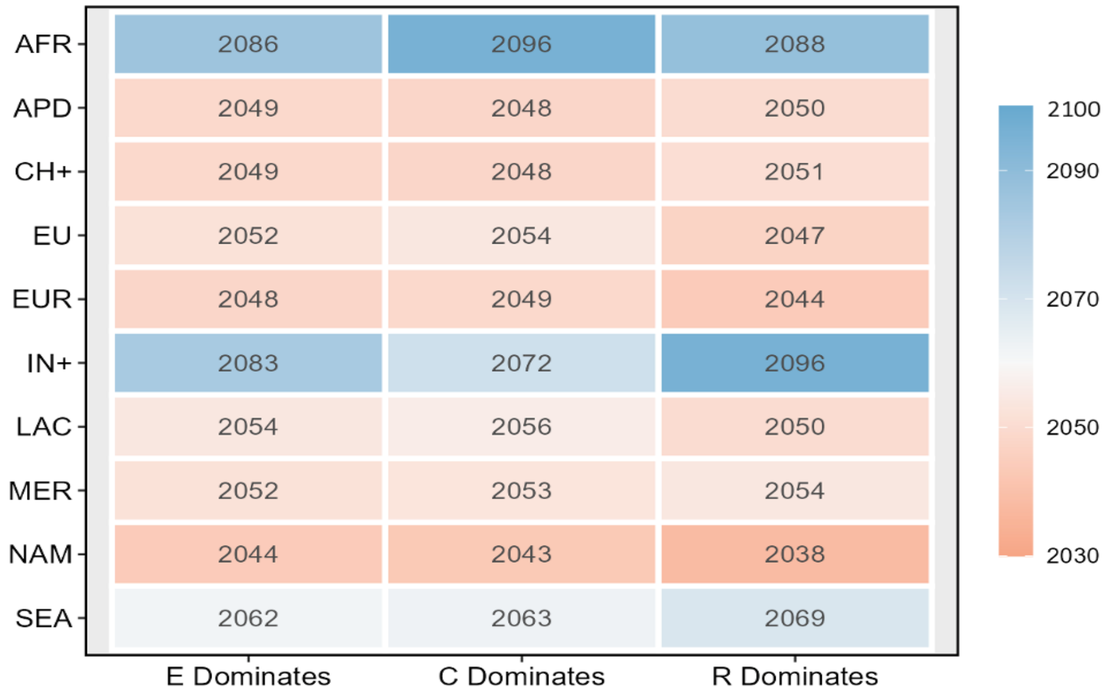
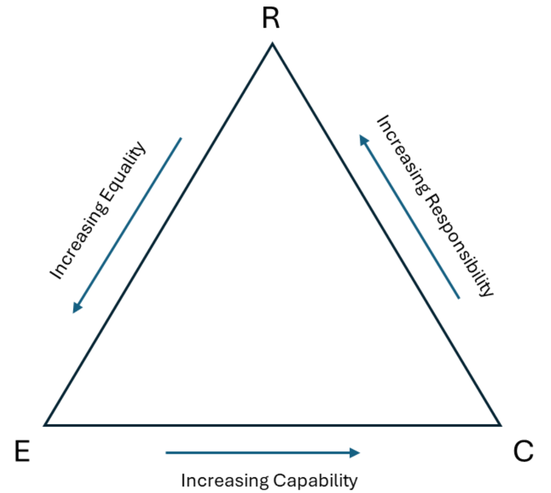
Distributing the remaining carbon budget : a blueprint for fairness

Allocating the Carbon Budget Fairly Produces Varying Regional Net-Zero Timelines



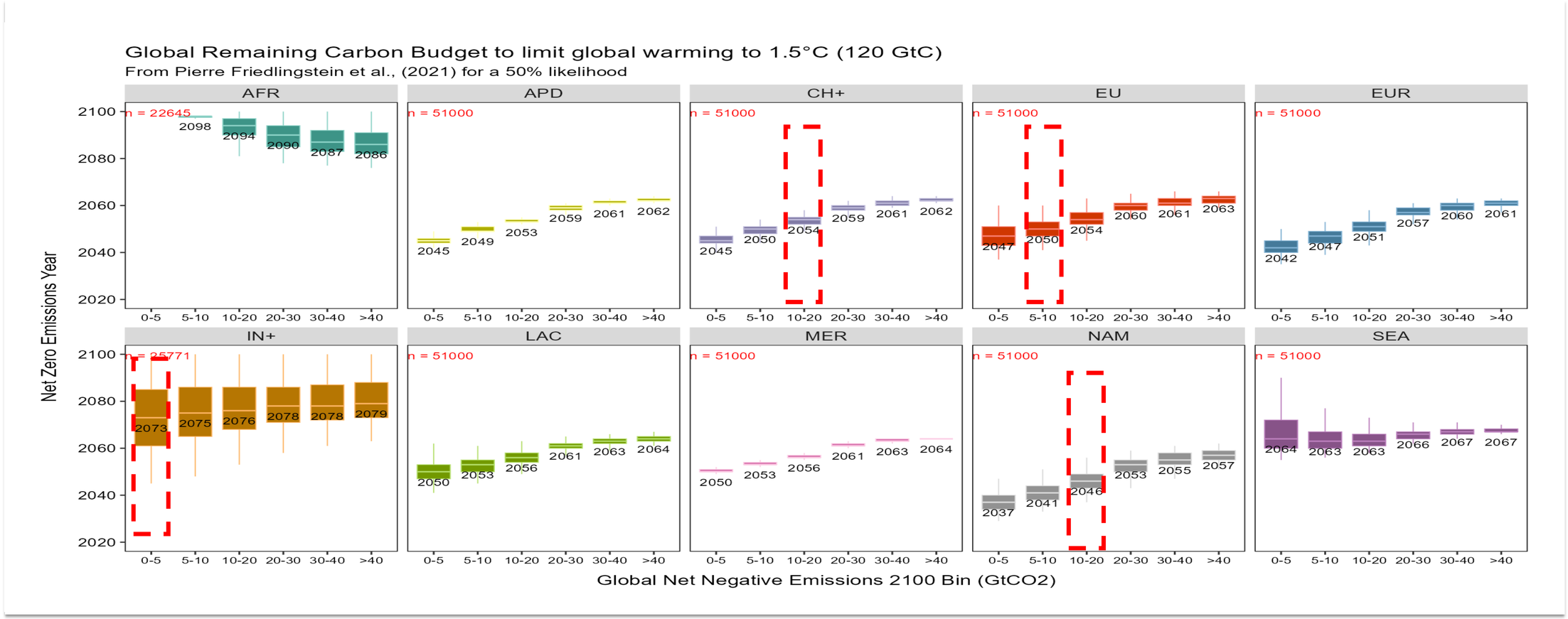
Equitable scenarios highlight achieving net zero emissions can vary significantly across regions, reflecting different starting points, economic capabilities, and historical responsibilities



Source: Kamboj et al 2025

The chart is structured for ten global geographic regions: AFR (Africa), APD (Asia Pacific Developed), CH+ (China+), EU (European Union), EUR (Eurasia), IN+ (India+), LAC (Latin America and the Caribbean), MER (Middle East), NAM (North America), and SEA (Southeast Asia).

Fair-Share Pathways Require Net-Negative CO_2, with Earlier Action from High-Capability, High-Responsibility Regions



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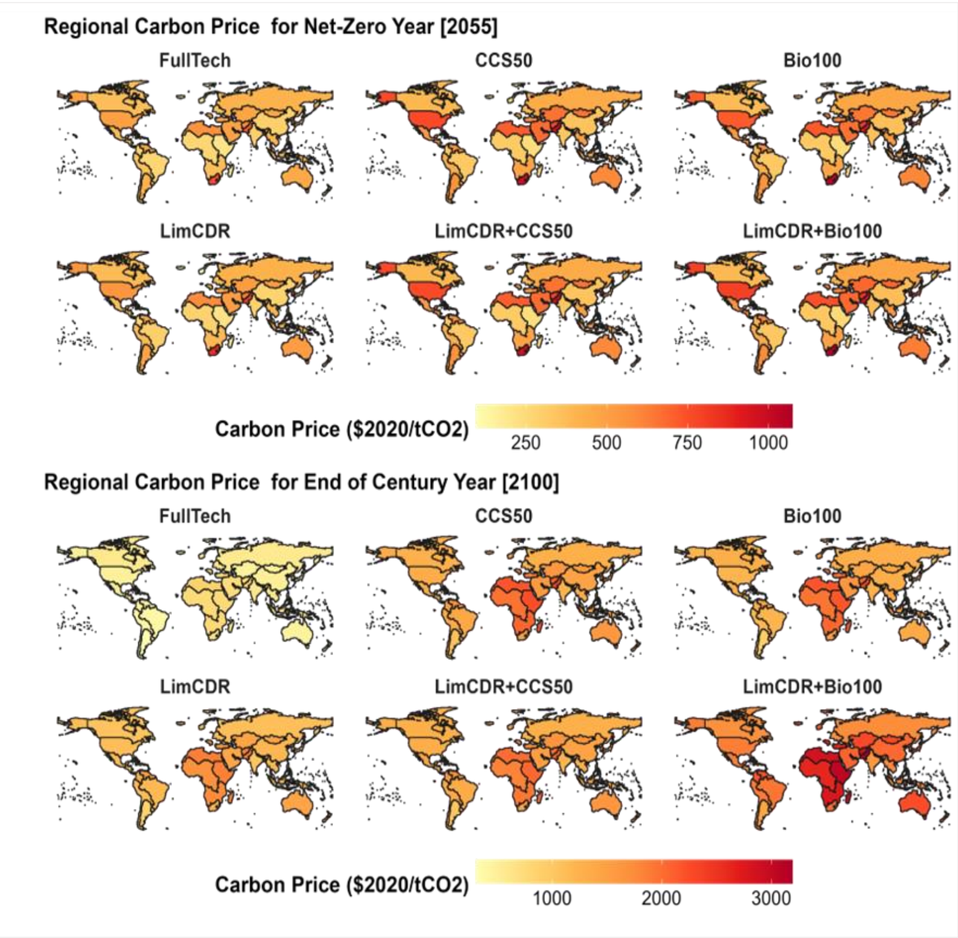
Inequality implications of limited clean technology deployment

Limited Access to Negative Emissions Technologies (NETs) Could Raise Carbon Prices and Widen Regional Inequality Gaps



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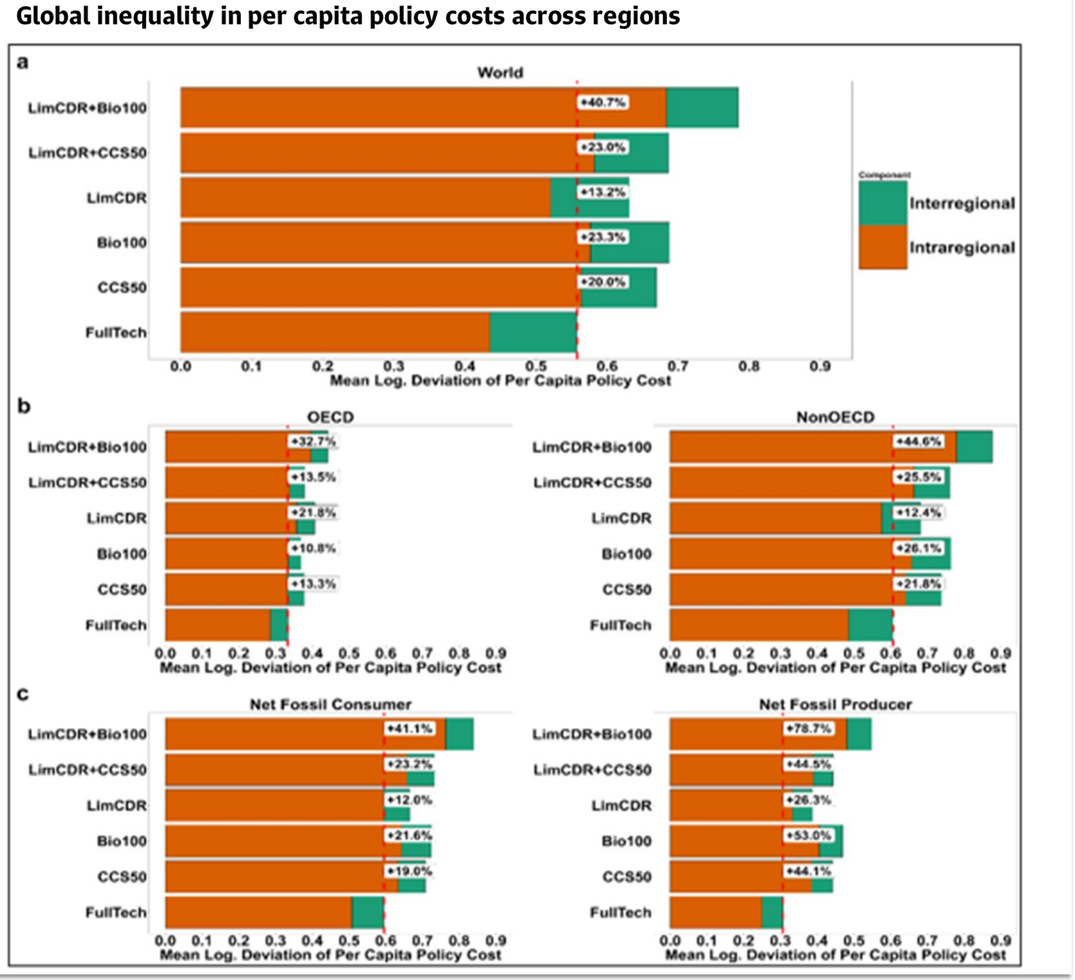
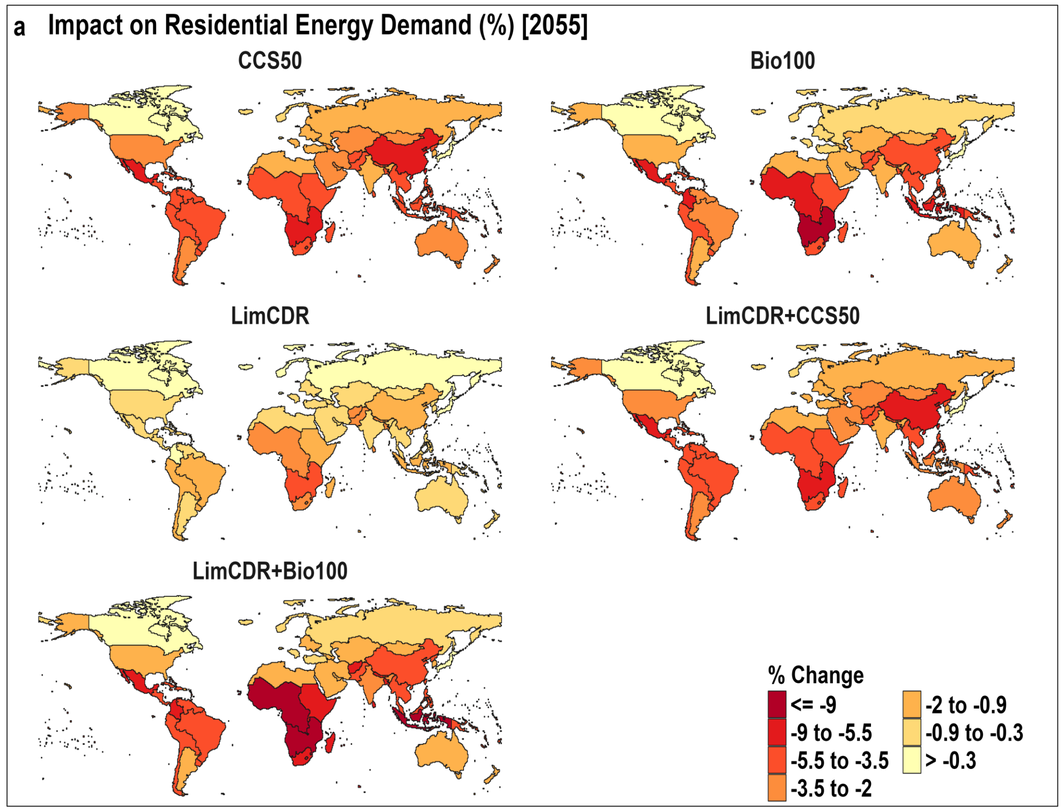
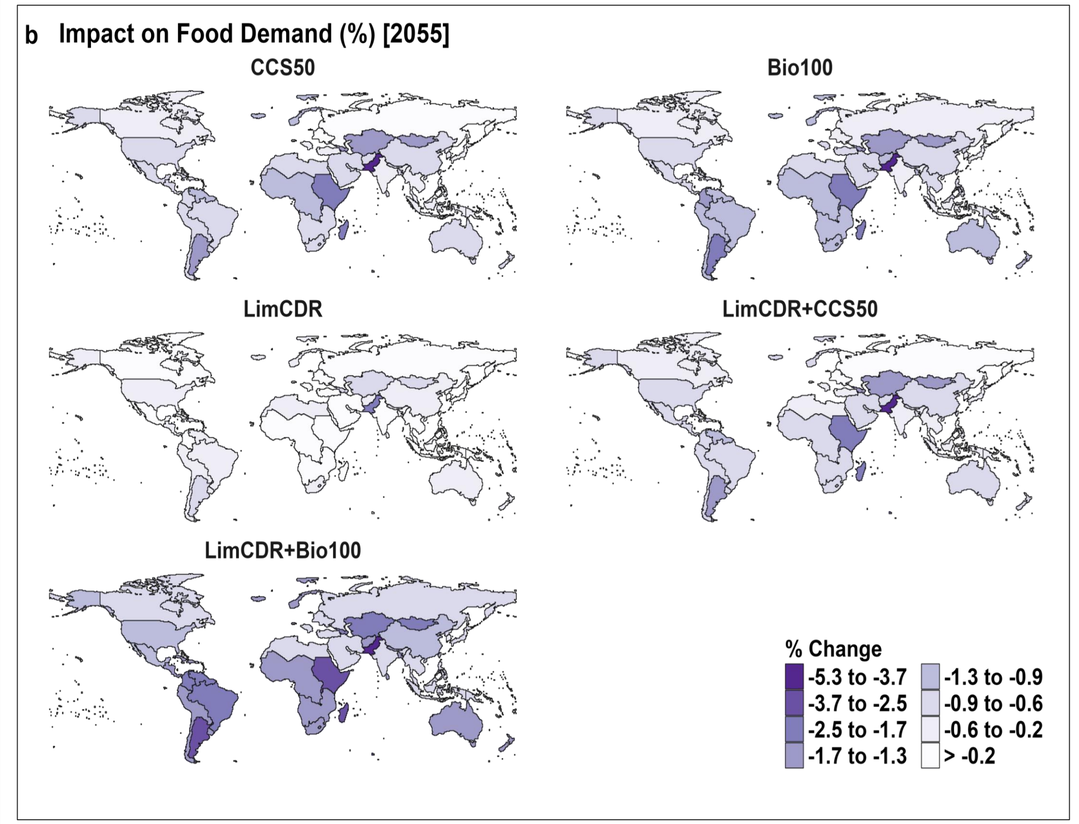


Constrained NETs Could Amplify Inequality via Food and Energy Prices—Hitting Developing Economies Hardest





Source: Apeaning et al 2025

Concluding Remarks

Key Insights and lessons

- **Fair-share budgets require paired action :** A fair distribution of the remaining carbon budget requires both deep near-term cuts and credible long-term removals; the effort should be allocated by capability, responsibility, and need.
- **Technology access is decisive :** Bottlenecks raise marginal abatement costs, push carbon prices toward politically infeasible levels, and widen regional inequalities.

Ongoing work

- **Build response-measure scenarios :** Embed access and affordability, finance flows, technology transfer, and social protection; quantify spillovers in trade, energy and food prices, and poverty across regions.
- **Stress-test and design safeguards :** Test pathways under feasibility constraints to identify cooperative instruments that preserve development space and enable a just transition.

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