



CORE₂

THE GREENHOUSE GAS REMOVAL HUB

Why CDR?

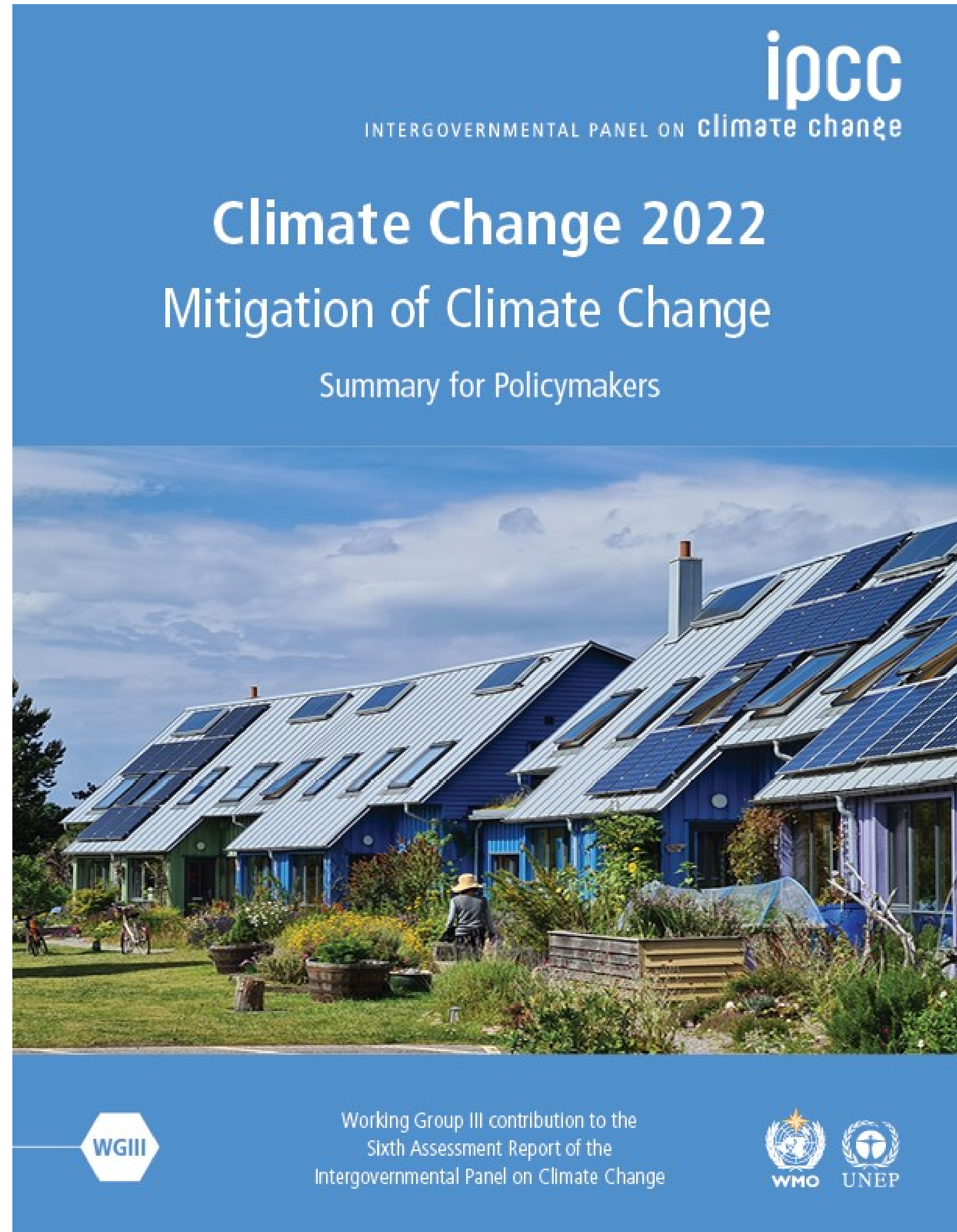
18 April 2024 | Steve Smith, University of Oxford

NEGEM: Visions and Pathways for Carbon Dioxide Removal in the EU





First, a reminder...

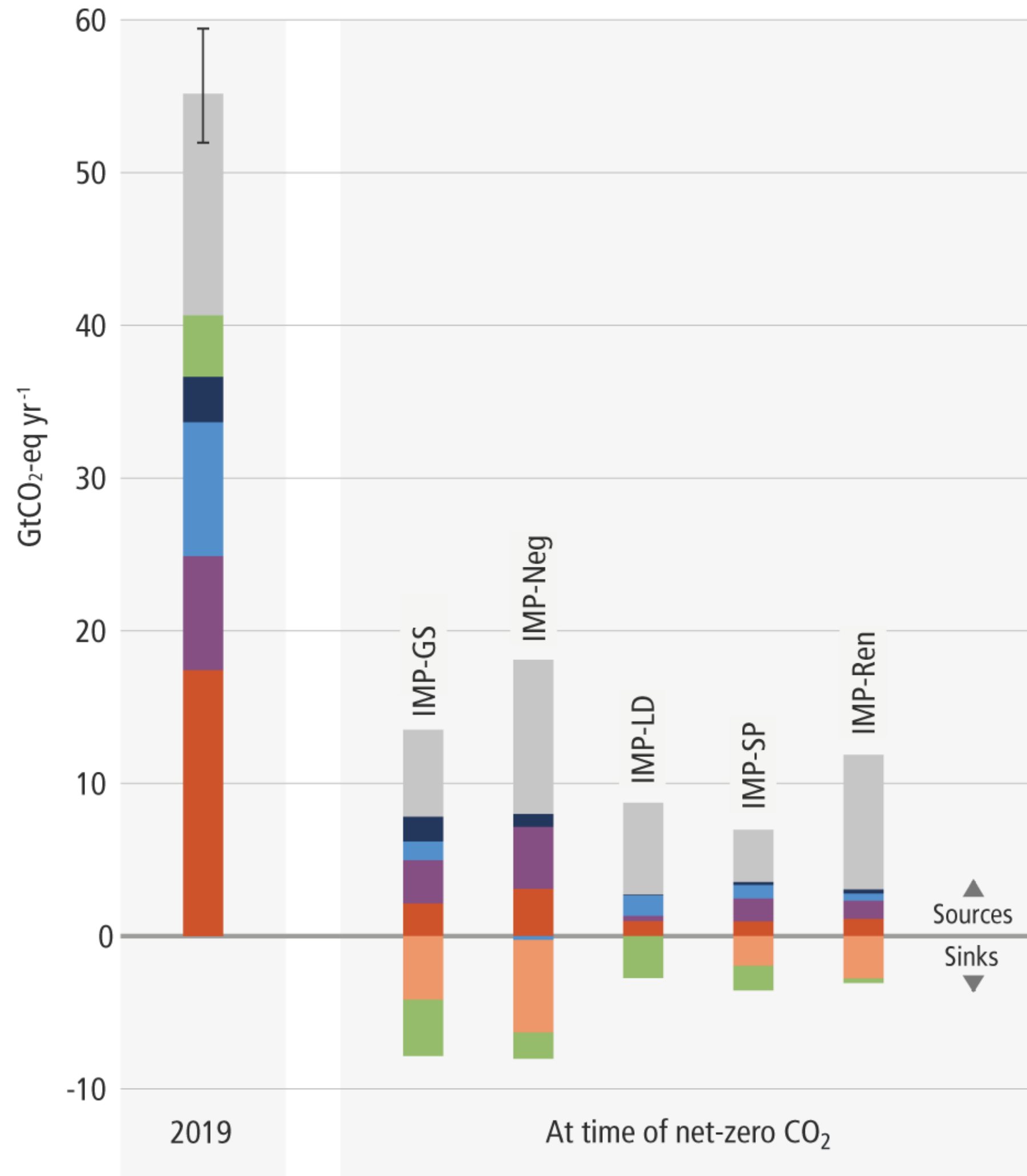


1. Because the IPCC says so

C.11 The deployment of carbon dioxide removal (CDR) to counterbalance hard-to-abate residual emissions is unavoidable if net zero CO₂ or GHG emissions are to be achieved. The scale and timing of deployment will depend on the trajectories of gross emission reductions in different sectors. Upscaling the deployment of CDR depends on developing effective approaches to address feasibility and sustainability constraints especially at large scales. (*high confidence*)



e. Sectoral GHG emissions at the time of net-zero CO₂ emissions (compared to modelled 2019 emissions)



1. Because the IPCC says so

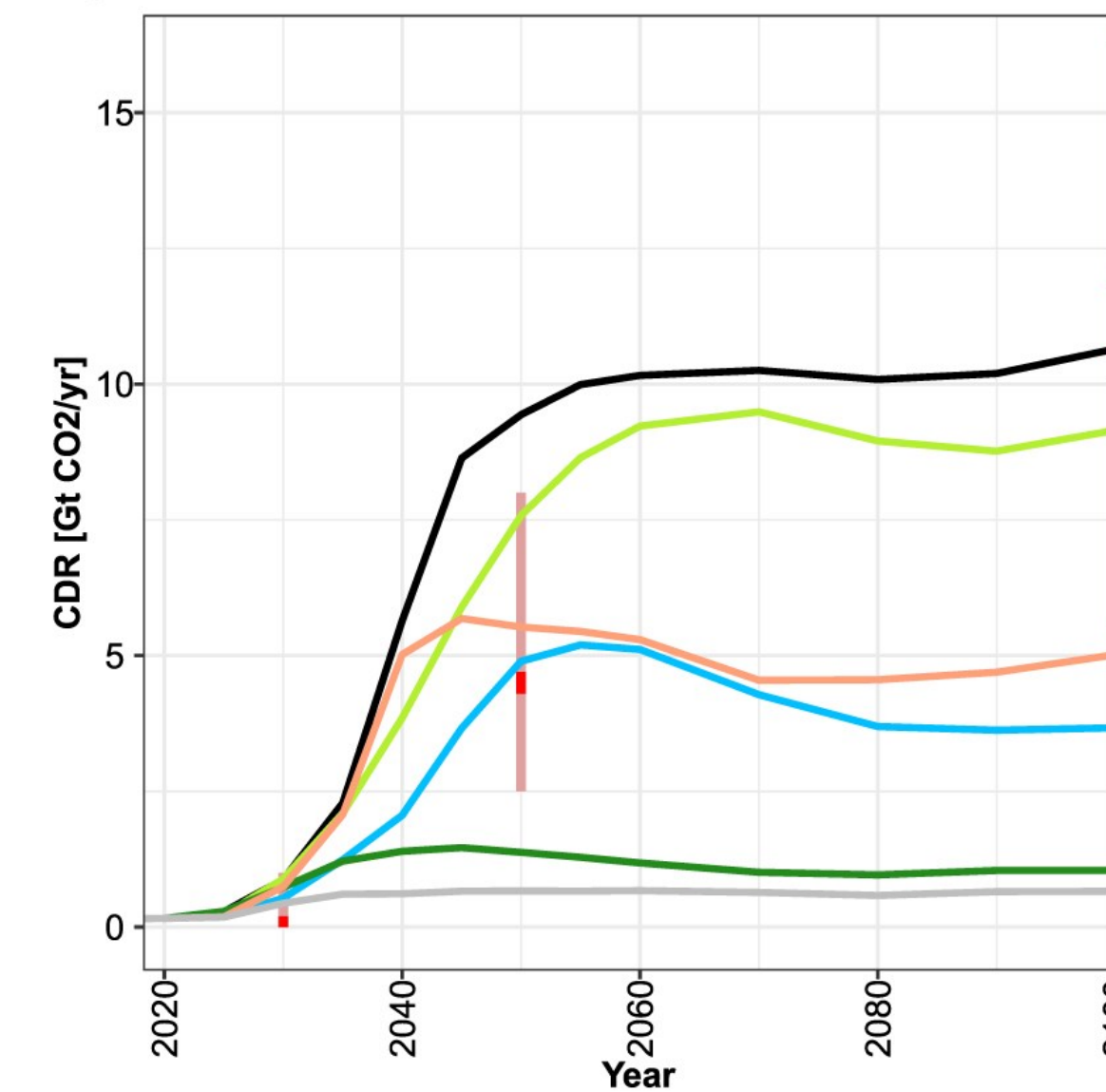
2. Because CDR has option value

Having a greater number of CDR options:

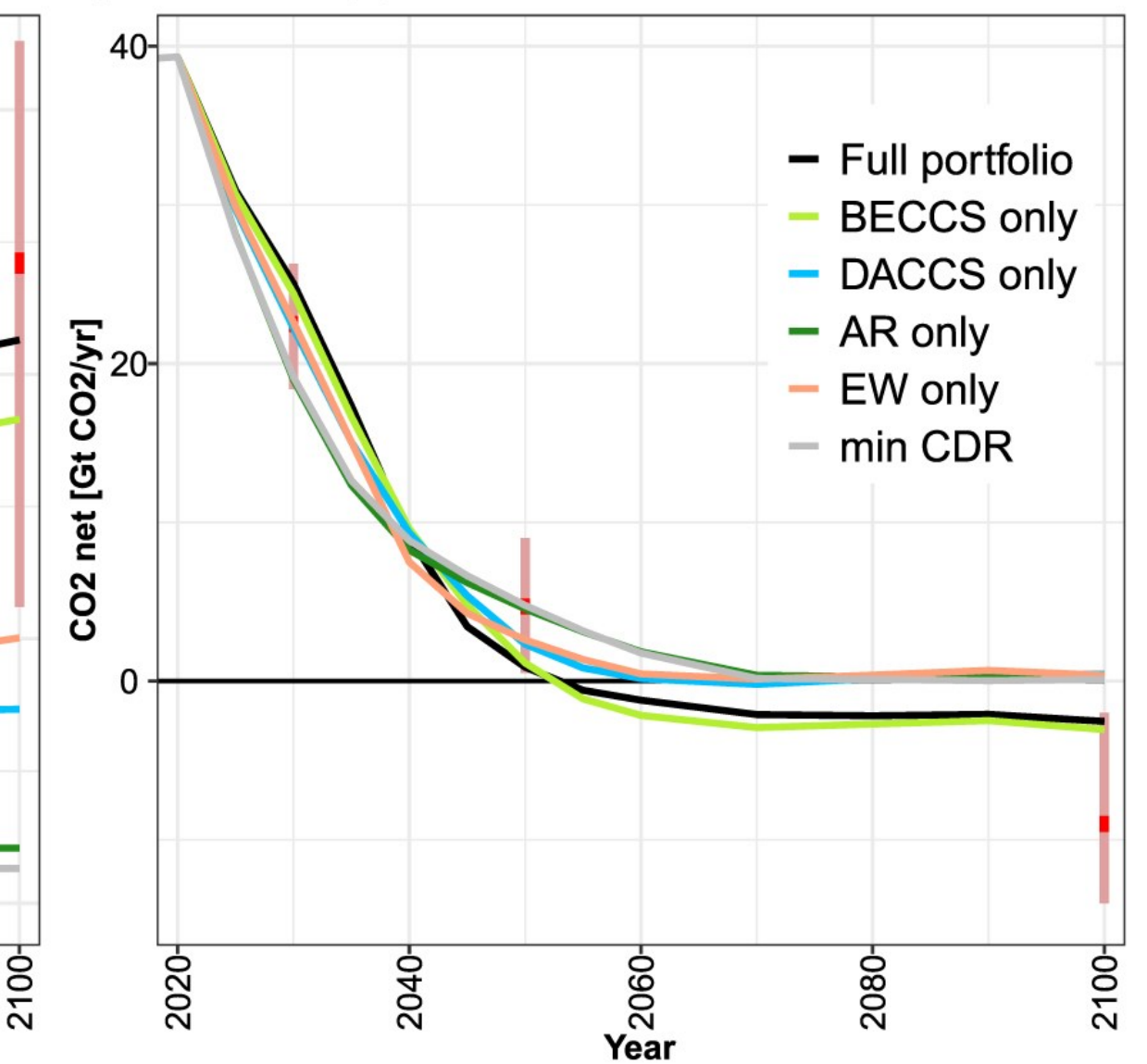
- Increases overall CDR potential
- Reduces costs

Strefler et al. (2021) Carbon dioxide removal technologies are not born equal. [doi:10.1088/1748-9326/ac0a11](https://doi.org/10.1088/1748-9326/ac0a11)

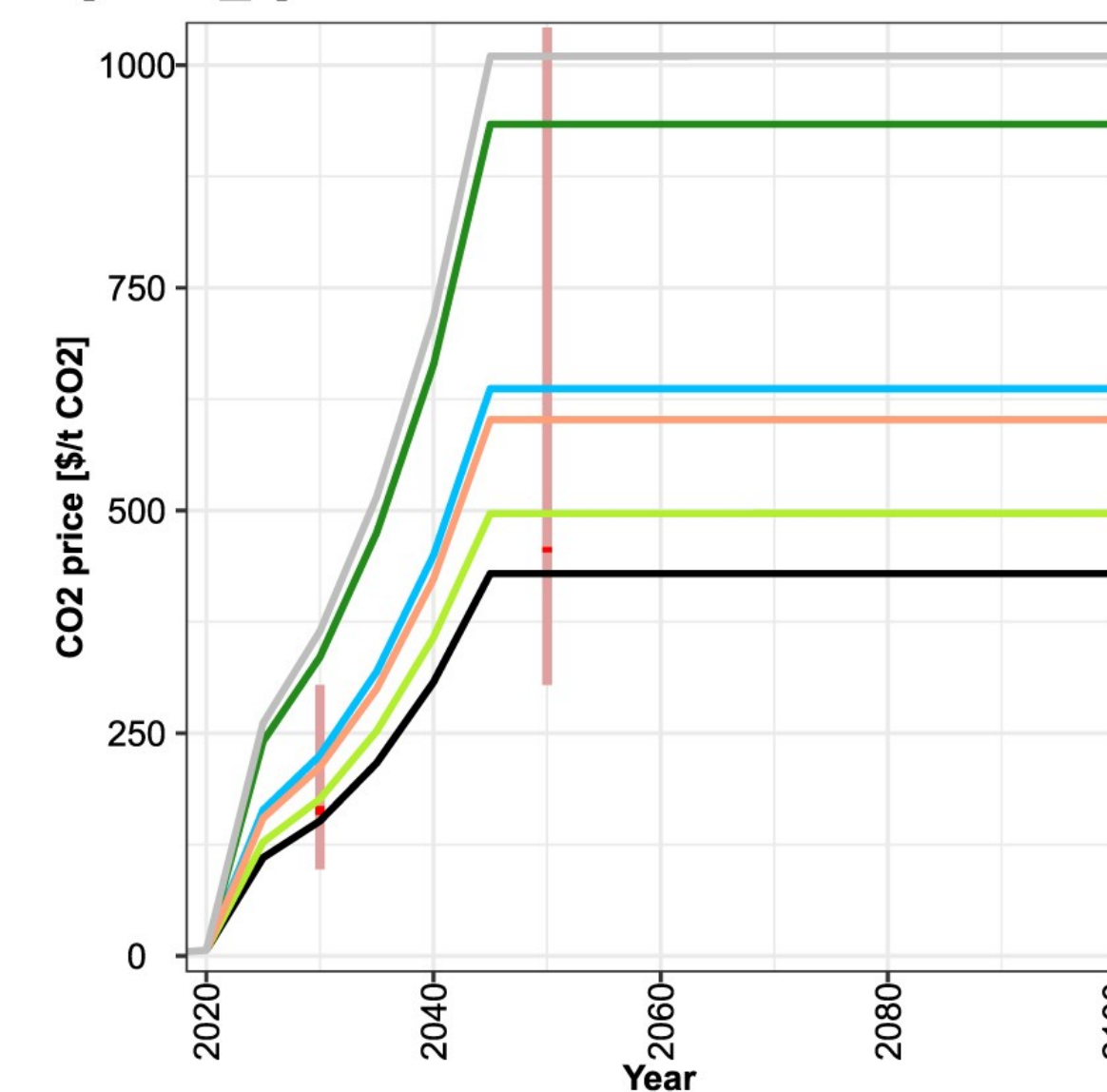
A) Total CDR



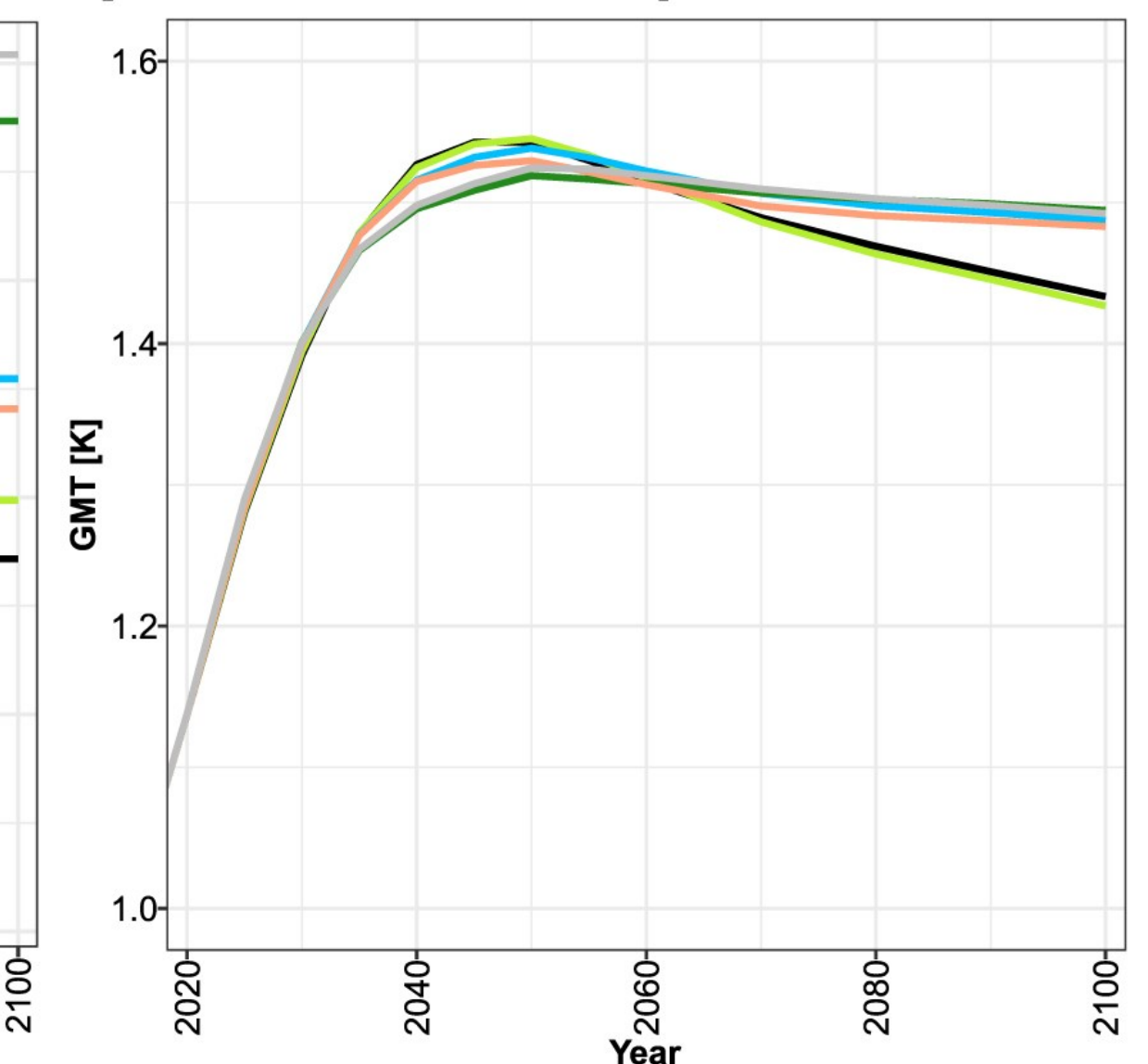
B) Net CO₂ emissions



C) CO₂ price



D) Global mean temperature increase





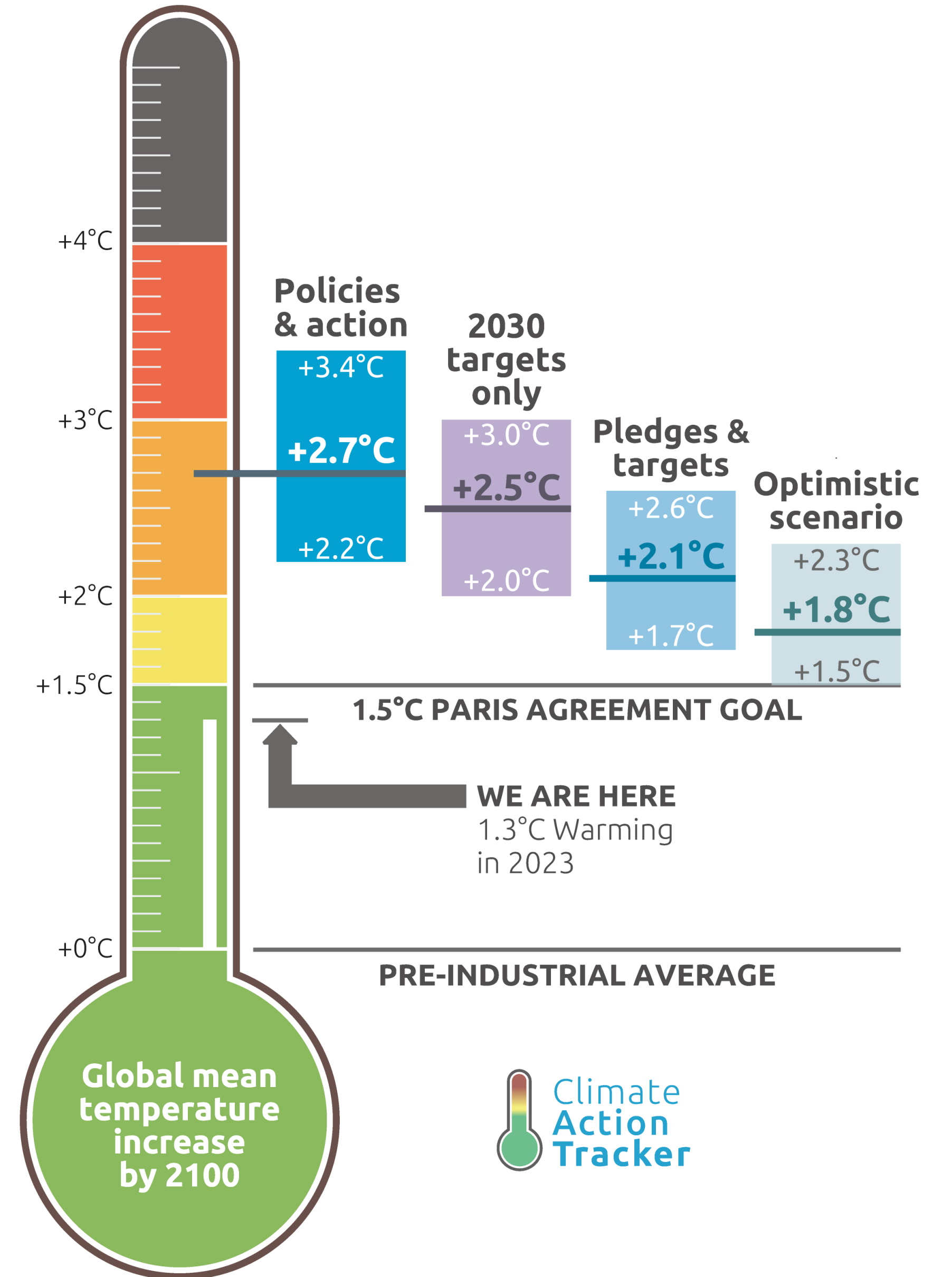
Ecosystem service	Parameter	Biochar impact	Impact description
Carbon sequestration	Soil C	✓	Increases
Greenhouse gas fluxes	CO ₂	✓	Often increases
	CH ₄	?	Inconsistent effect
	N ₂ O	✓	Reduces
Soil biology	Microbial biomass	✓	Increases
	Soil fauna	?	Unclear
Water erosion	Runoff	✓	Often reduces
	Sediment loss	?	Mixed or no effect
	Nutrient loss	?	Mixed or no effect
Wind erosion	Soil loss	?	Mixed or no effect
Nutrient leaching	Nitrates	✓	Reduces
Available water	Available water	✓	Increases
Soil fertility	Nutrients	✓	Improves nutrient use efficiency
	Acidity	✓	Reduces
Crop yields	Degraded or low fertility soils	✓	Increases
	High fertility soils	?	Mixed or no effect
	Temperate regions	?	Mixed or no effect
	Tropical regions	✓	Increases

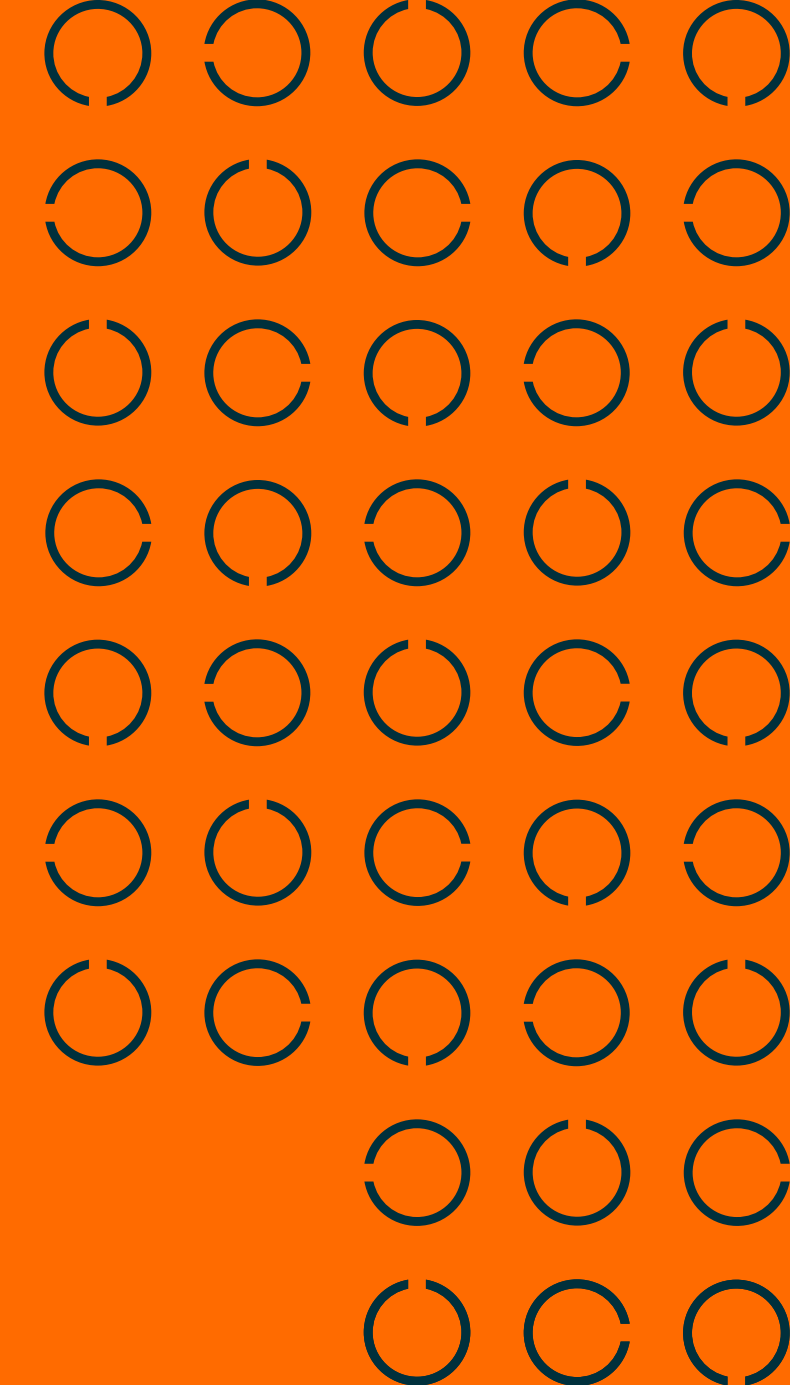
3. Carbon isn't always the only benefit



Blanco-Canqui (2020) Does biochar improve all soil ecosystem services? [doi:10.1111/gcbb.12783](https://doi.org/10.1111/gcbb.12783)

4. Essential for net negative





Thank you

<https://www.co2re.org>

@CO2REhub

stephen.smith@smithschool.ox.ac.uk