Mercator Research Institute on
Global Commons and Climate Change gGmbH

Carbon removal

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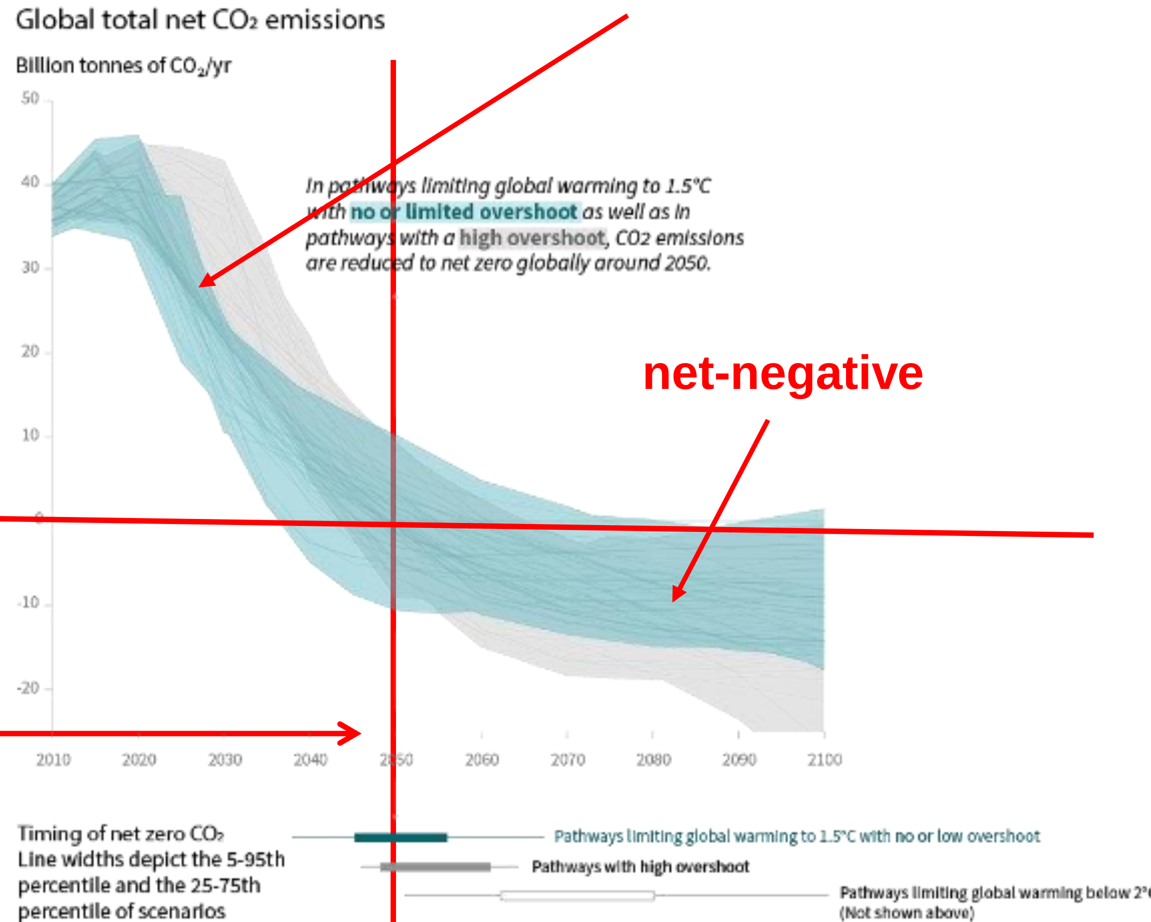
Young Energy Forum: Opportunities and challenges of CC(U)S

World Energy Council, 11 December 2020

Global Emissions Pathways IPCC SR1.5

Rapid und deep emissions reductions already before 2030

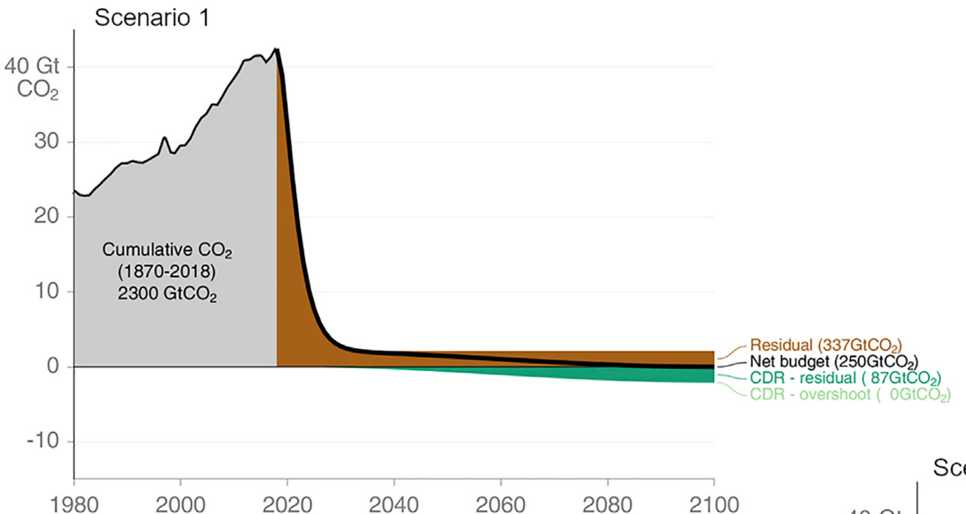
Accelerate transformation by 20 years compared to 2°C target.



Global CO_2 neutrality ca. 2050

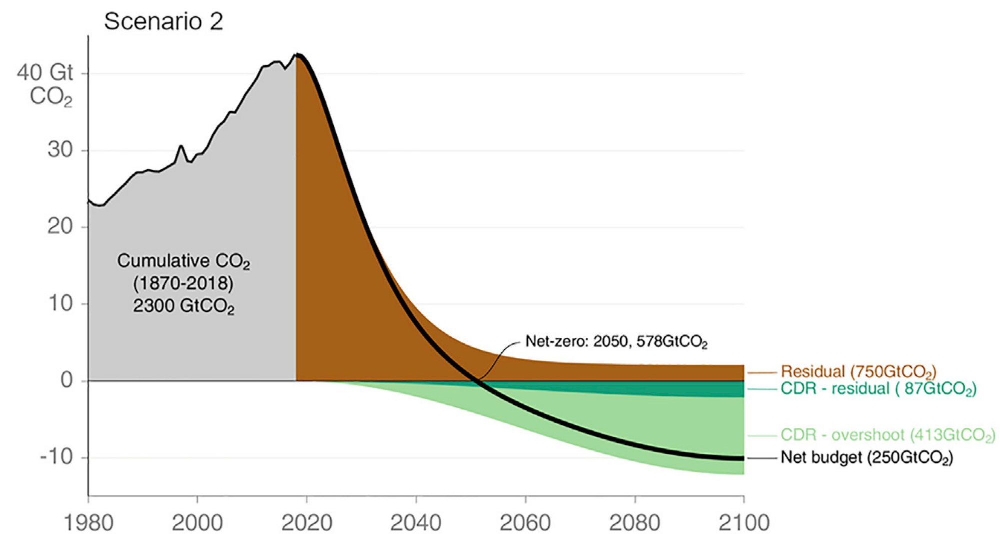
Source: IPCC SR1.5 (2018)

Different pathways & mitigation strategies could limit warming to 1.5°C



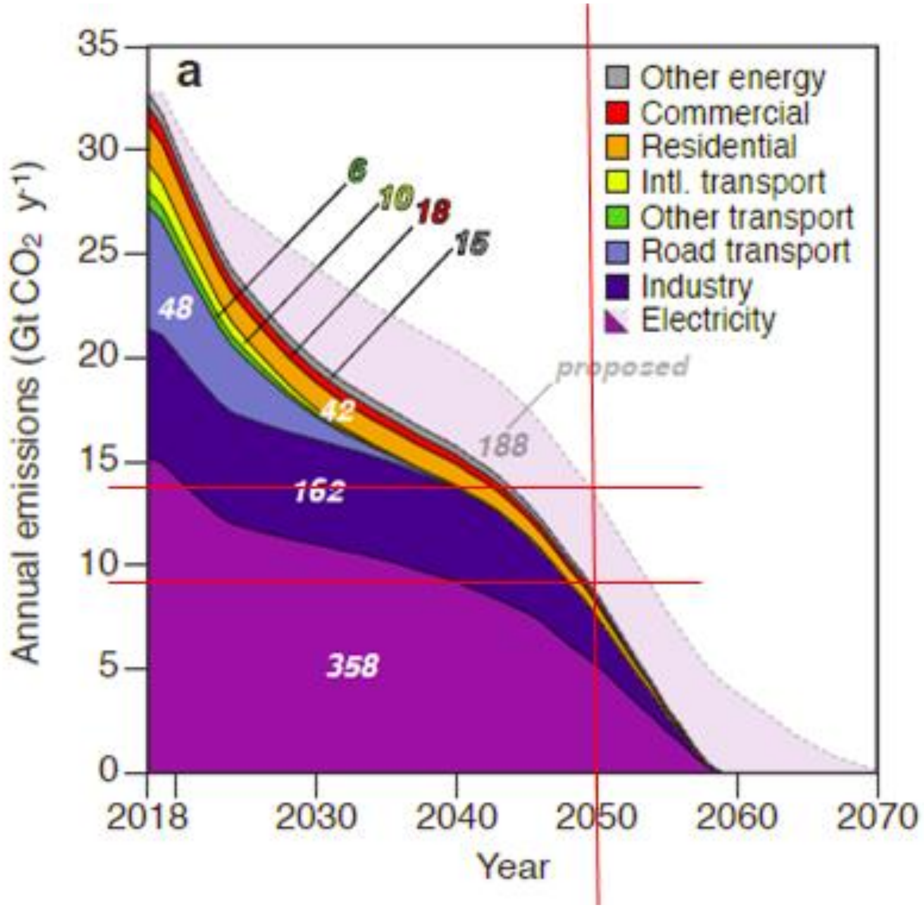
Scenario 2: greater (positive) emissions result in larger CDR and higher overshoot before the temperature increase declines to 1.3C–1.4C in 2100, still with drastic CO_2 emission reductions in the next two decades.

Scenario 1: negative emissions offset residual (positive) emissions, resulting in little CDR and drastic and immediate emission reductions.



Source: Fuss et al. *One Earth* (2020)

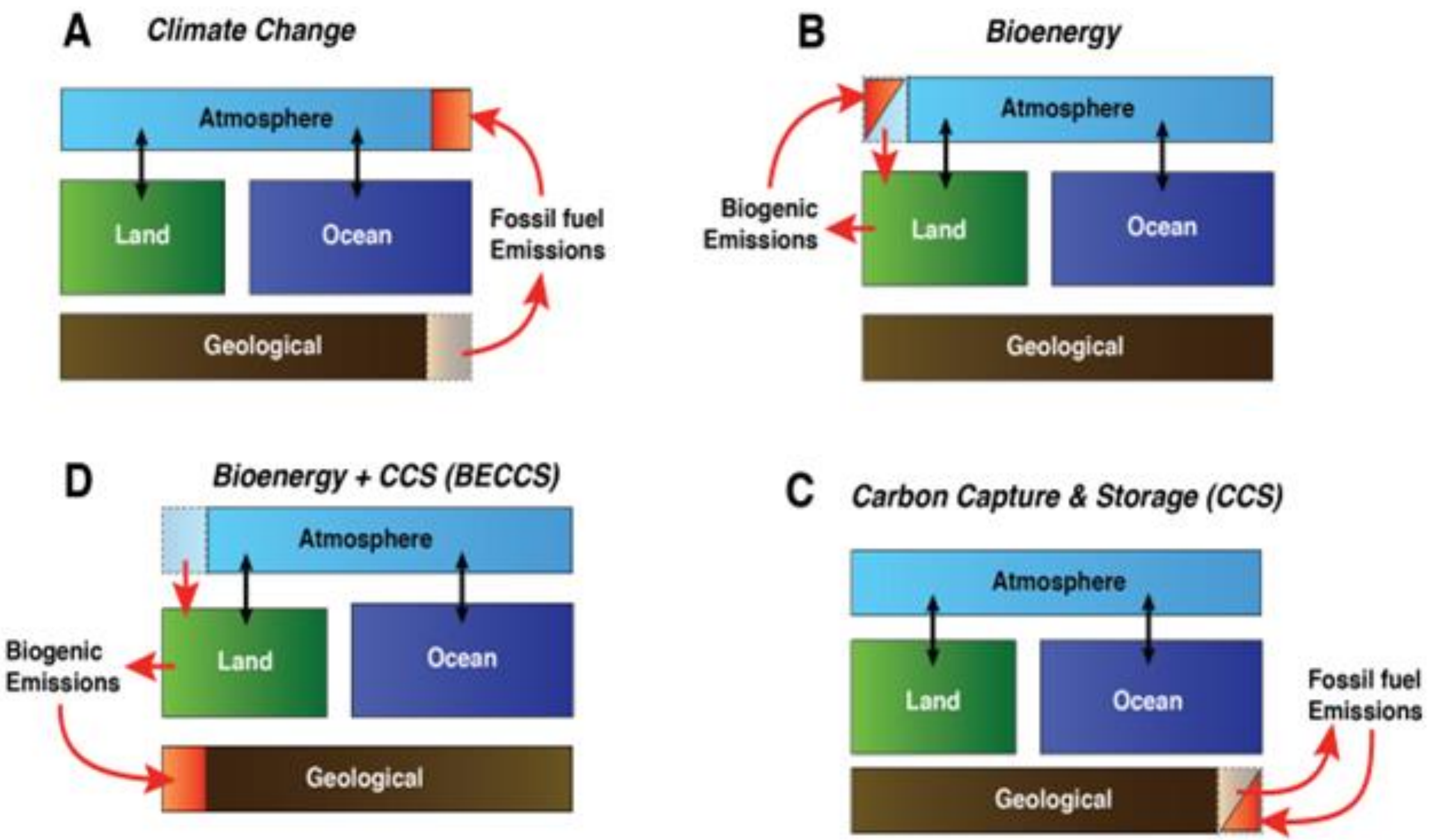
Committed carbon



"Committed emissions from existing and proposed energy infrastructure would consume the entire remaining carbon budget if mean warming is to be limited to 1.5 °C with a probability of 50–66%."

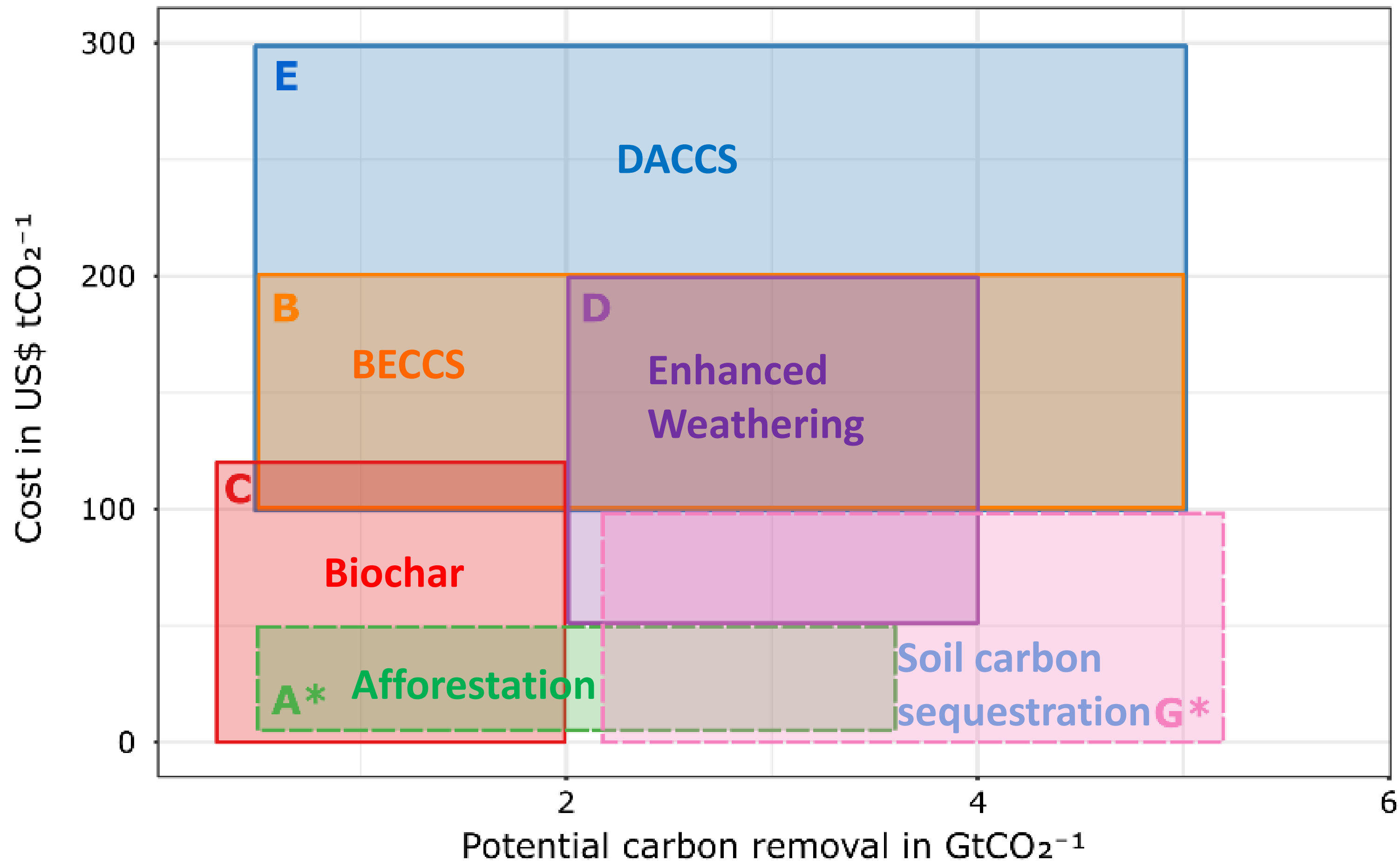
Source: Tong et al. *Nature* (2019)

Carbon cycle impact of CO_2, CCS, bioenergy and BECCS



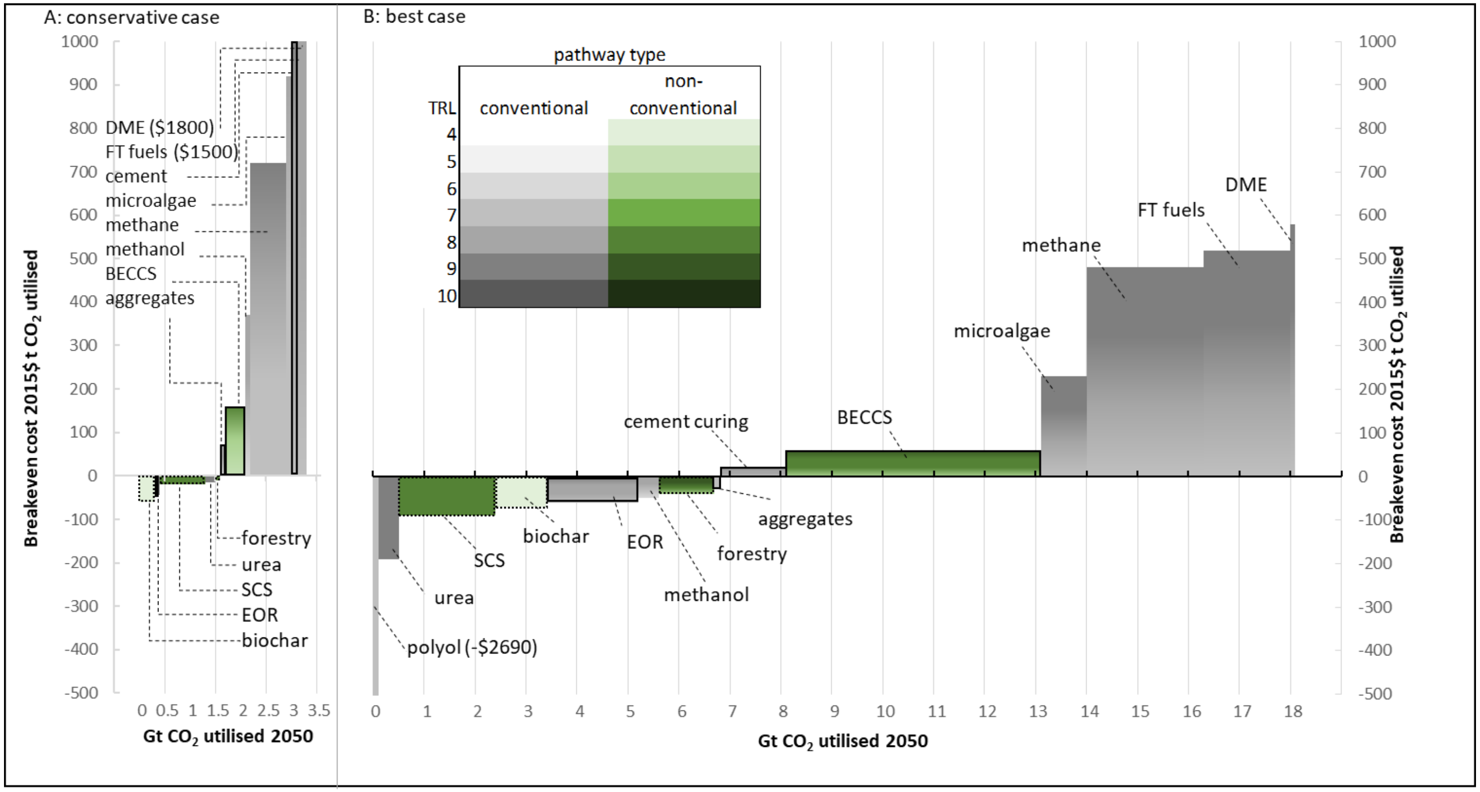
Source: Smith et al. *Nature Climate Change* (2016)

2050 costs and potentials of removal options



Source: Fuss et al. *ERL* (2018)

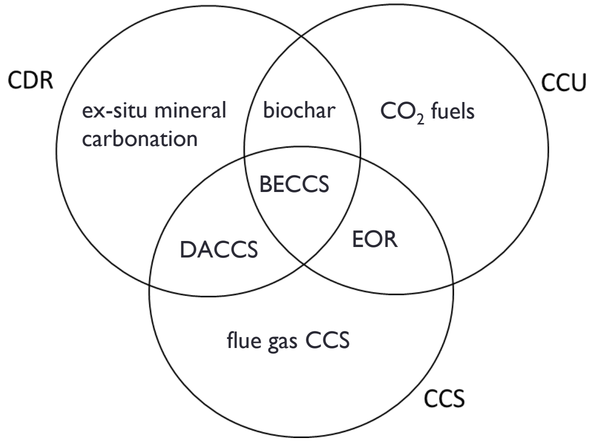
A speculative CO2 utilization curve



Source: Hepburn, Adlen et al. *Nature* (2019)

Rationales for CO_2 utilisation

- Why utilise CO_2?
  - Potential reduction of net costs of emissions reductions or removals
  - Potential facilitation of CCS technologies
  - Use a cheaper/cleaner feedstock than conventional hydrocarbons
- Not all processes utilising CO_2 necessarily contribute to addressing climate change! → See diagram
- CO_2 utilisation can:
  1. increase CO_2 emissions (e.g. through non-decarbonised energy input, potentially EOR)
  2. have no net impact on CO_2, but increase GHG emissions (potentially urea)
  3. reduce CO_2 emissions without removing CO_2 from the atmosphere on a net basis (potentially fuels)
  4. remove CO_2 from the atmosphere on a net basis (potentially BECCS)



Takeaway messages

- Reaching net-zero is a necessary condition for reaching the Paris climate goals.
- Carbon removal will play a role (especially with further delays in increasing the emission reduction ambitions), though it cannot substitute for radical and swift emissions reductions.
- Which pathway is ultimately chosen - including the extent and type of carbon removal – will also be a societal choice.
- It is important to distinguish between CCS, CCU(S) and CDR.
- ‘Net-zero’ legislation should consider CO_2 utilisation and storage incentive frameworks, but incentivisation should be on CO_2 storage and emission reduction *via* utilisation - not utilisation *per se*