

Geological Net Zero

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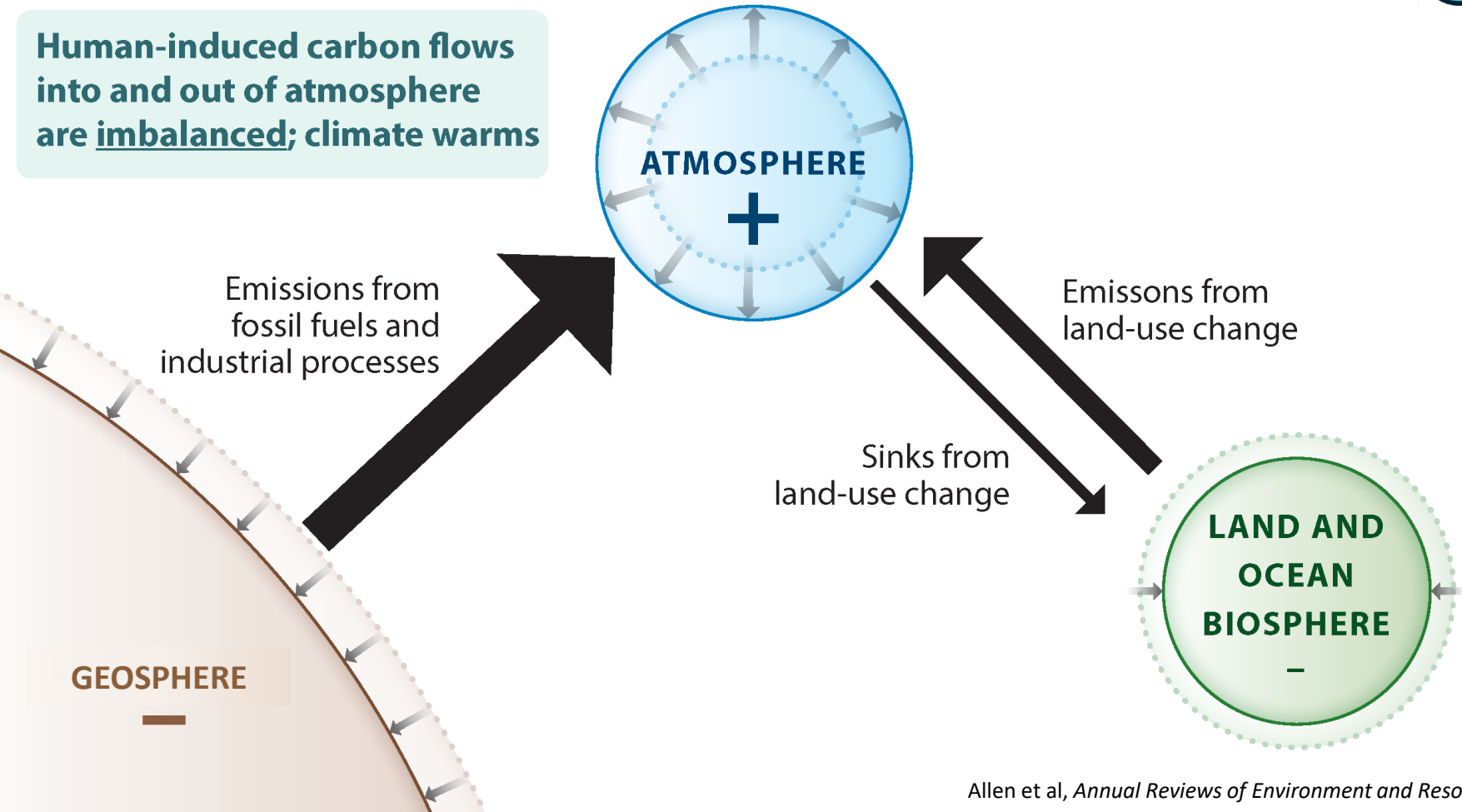
Oxford Net Zero

IEF/KAPSARC roundtable



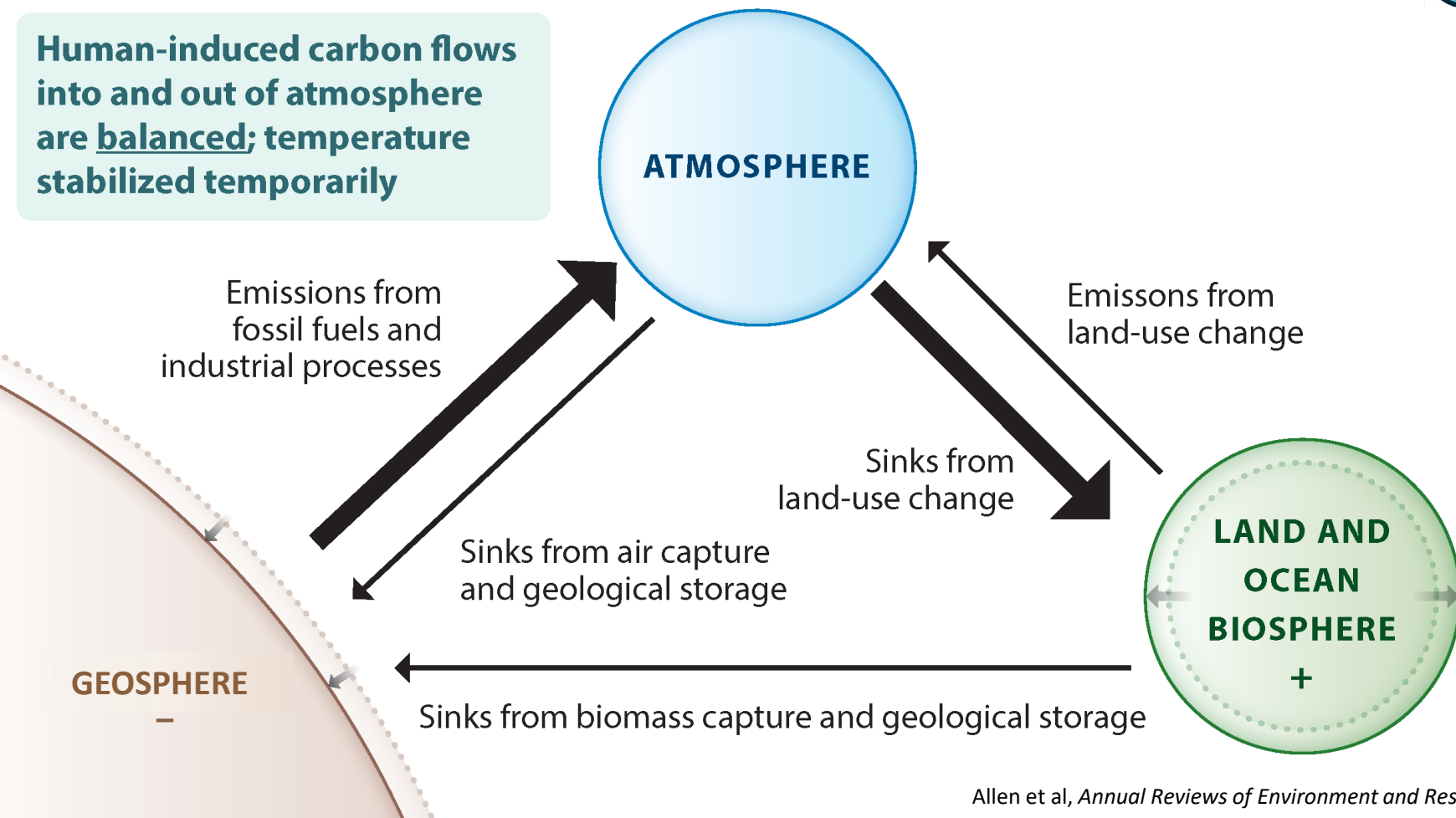
a Current situation

Human-induced carbon flows into and out of atmosphere are imbalanced; climate warms



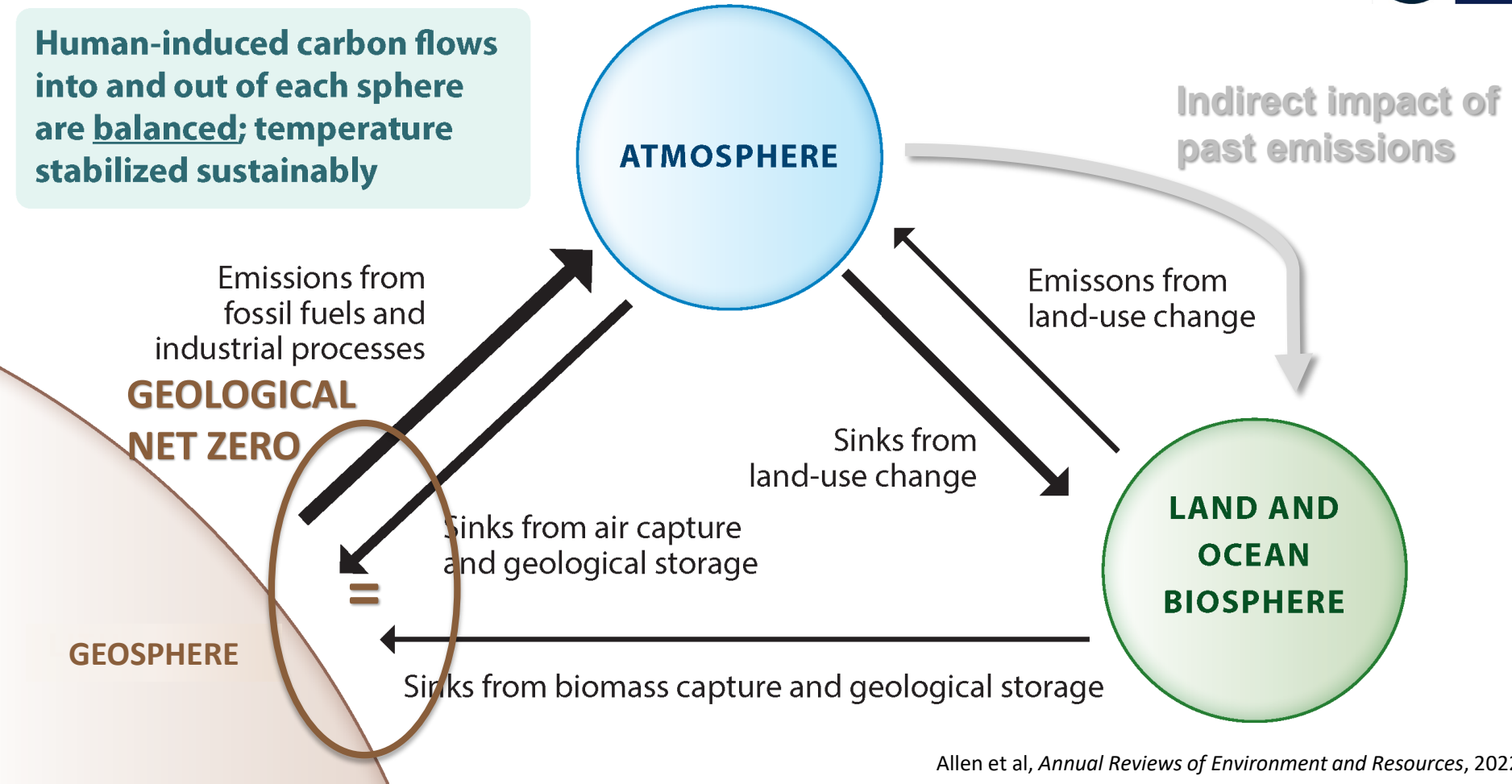
b Net zero

Human-induced carbon flows into and out of atmosphere are balanced; temperature stabilized temporarily



C Durable net zero

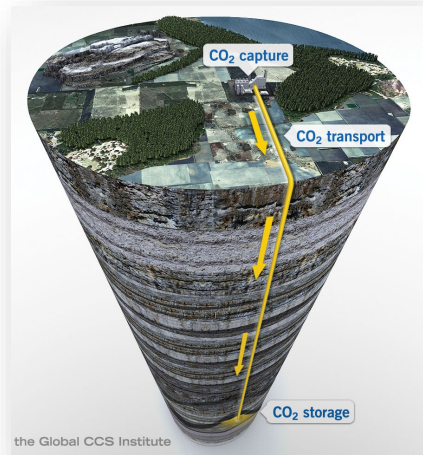
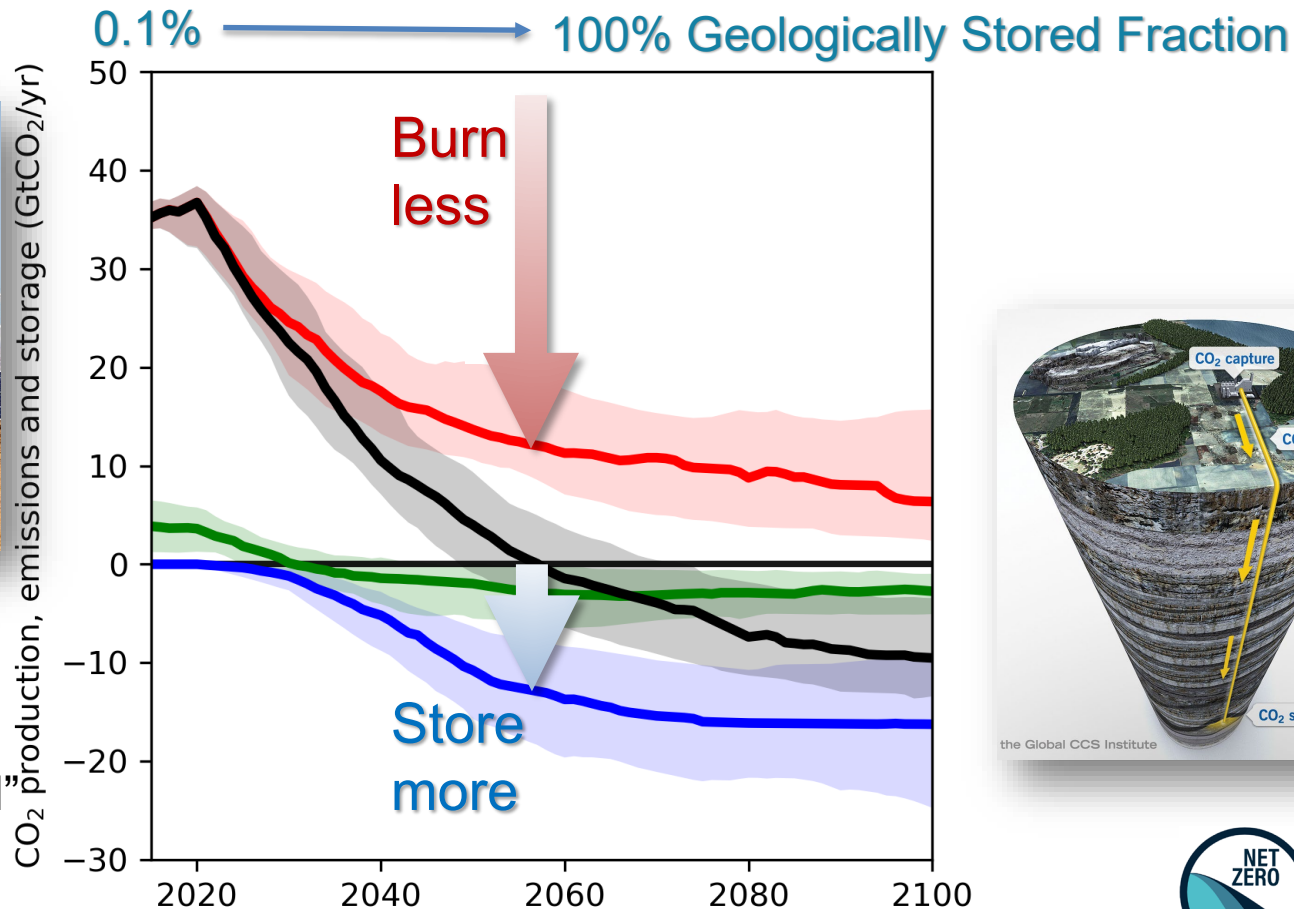
Human-induced carbon flows into and out of each sphere are balanced; temperature stabilized sustainably



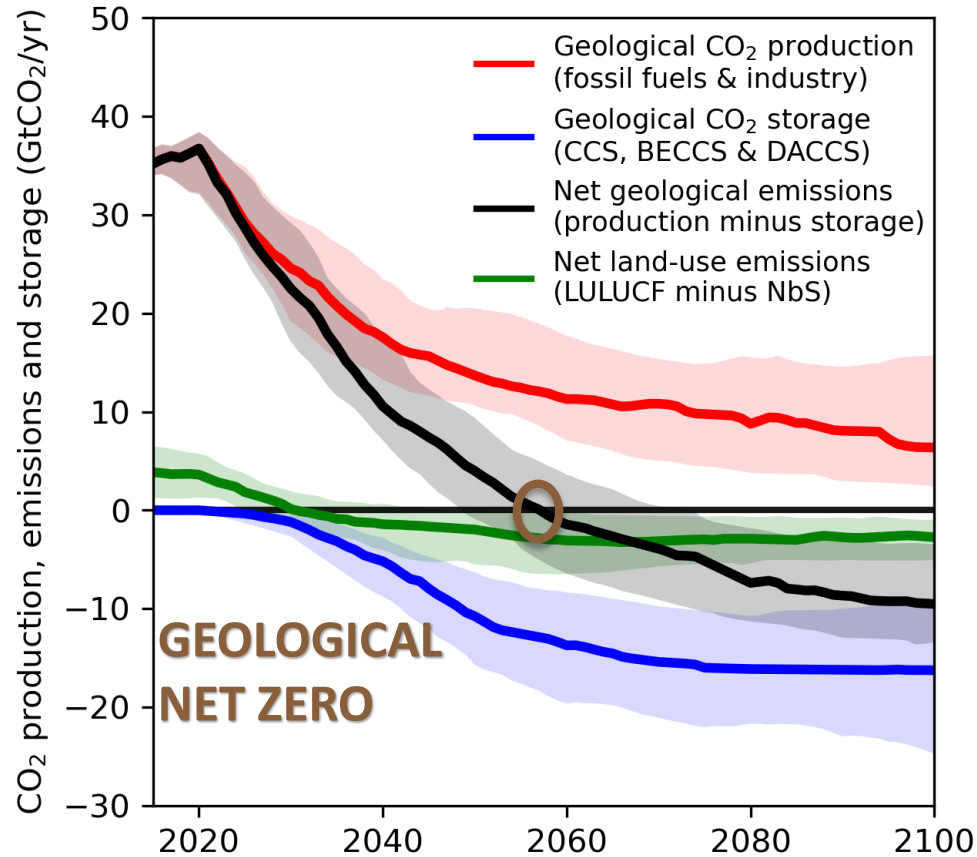
How to stop fossil fuels from causing global warming



Industrial CO₂ production and storage in median “technology neutral” 1.5°C scenario.



How to stop fossil fuels from causing global warming



The case for Geological Net Zero

- Net zero is a helpful goal but, if based on offsetting fossil fuel emissions with biological removals, only a temporary solution.
- The only durable solution to ongoing fossil use is like-for-like compensation with geological storage.
- **Geological net zero is a simple & unambiguous concept:** an ongoing balance between CO₂ produced from fossil sources and CO₂ returned to geological storage.
- Recognizing the need for geological net zero would help guide national and corporate strategies towards a durable net zero.



The case for Geological Net Zero

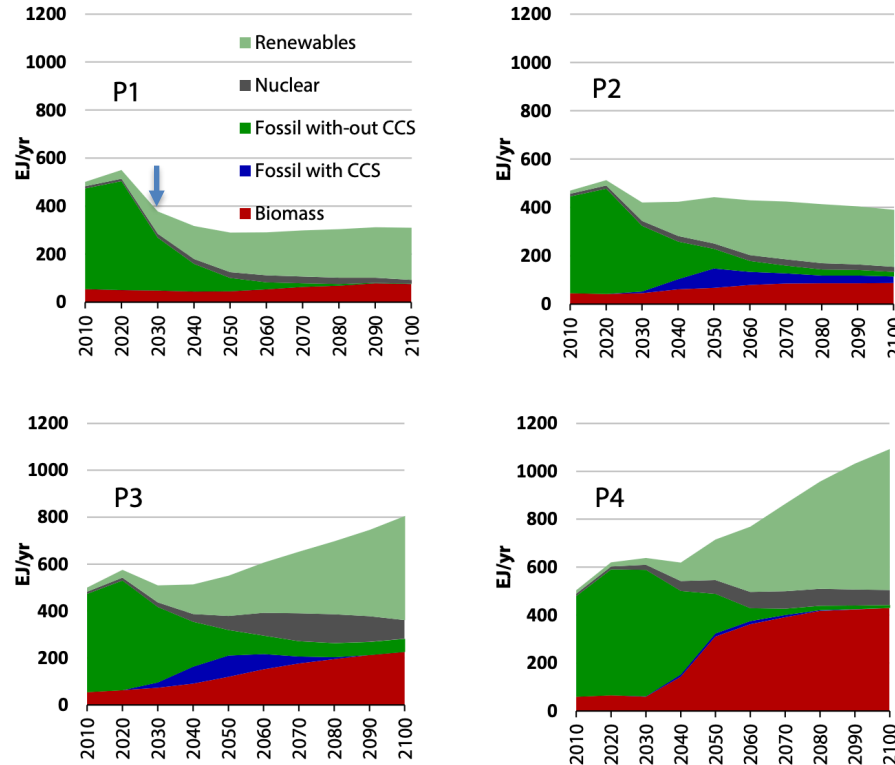
- “The deployment of carbon dioxide removal (CDR) to counterbalance hard-to-abate residual emissions is unavoidable if net zero CO₂ or GHG emissions are to be achieved.”
- “The removal and storage of CO₂ through vegetation and soil management can be reversed by human or natural disturbances; it is also prone to climate change impacts. In comparison, CO₂ stored in geological and ocean reservoirs (via BECCS, DACCS, ocean alkalisation) and as carbon in biochar is less prone to reversal. (*high confidence*)”
 - IPCC WG3 SPM 2021



The case for Geological Net Zero

1.5°C scenarios that do *not* require geological net zero (P1) instead require immediate substantial reductions in primary energy demand

Figure 3.3. Global primary energy in the four archetype 1.5°C scenarios set out by the IPCC



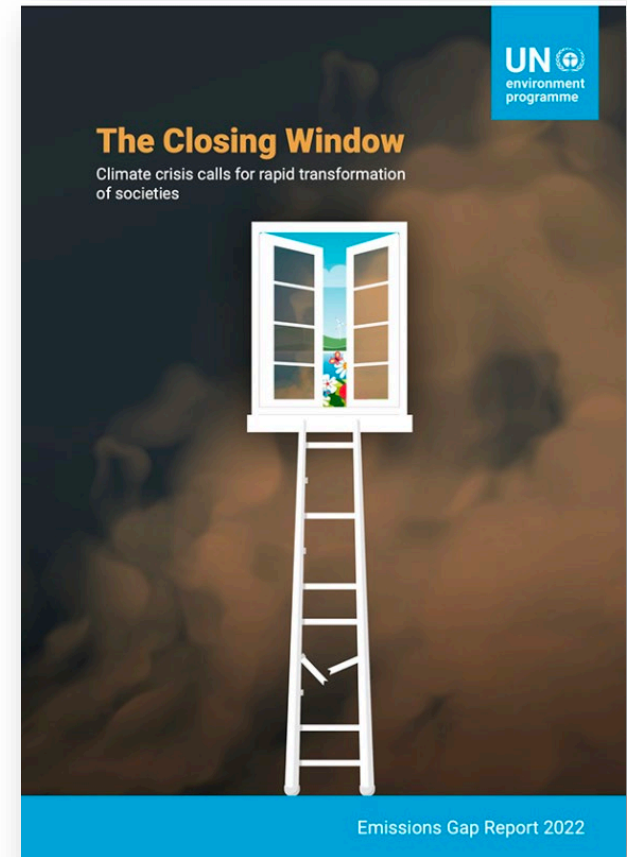
UK CCC 2019
from SR1.5
database



The case for Geological Net Zero

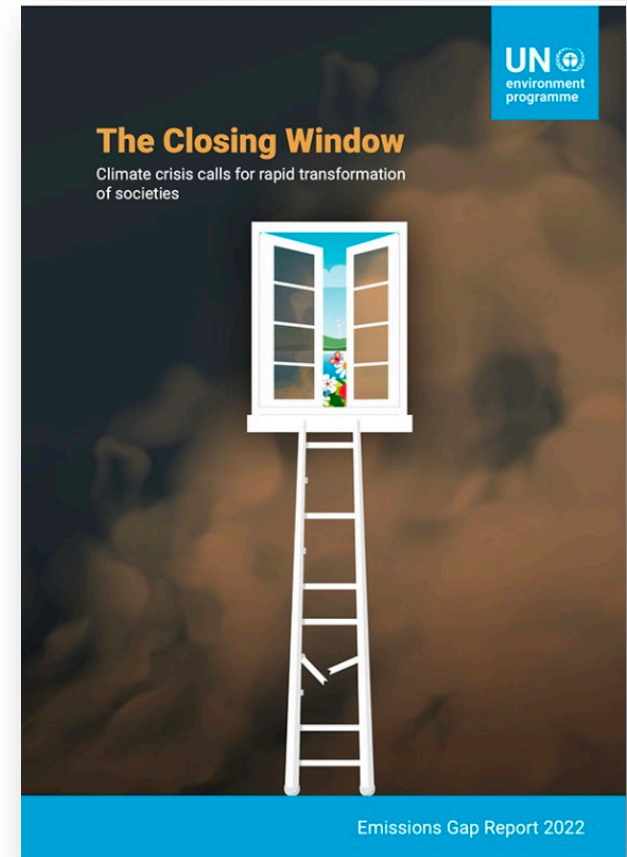
Only an urgent system-wide transformation can avoid climate disaster.

UNEP Gap Report, 2022



The case for Geological Net Zero

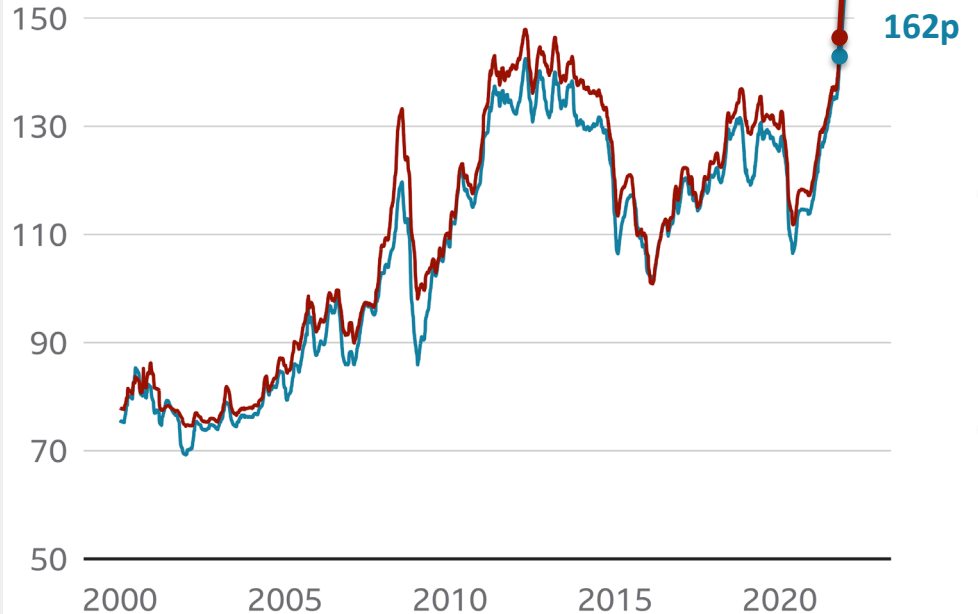
Only an urgent system-wide transformation
or rapid scale-up of geological CO₂ storage
can avoid climate disaster.



The case for Geological Net Zero

UK fuel prices

Diesel and petrol at the pump, pence per litre



Source: Experian. Last update: 25 October 2021 Approximately updated

BBC

Cost of 100% direct air capture and geological storage, only required by 2050, is less than petrol prices have risen since 2000



The case for Geological Net Zero

Geological net zero

Government should **consider setting fossil fuel producers operating domestically a 10% storage obligation target to restore carbon dioxide to the geosphere by at least 2035**, separate to any investment on nature-based solutions.

Government should **recognise the importance of geological net zero and work to align international ambitions toward geo zero by 2050**, in line with net zero.

From Chris Skidmore, “Mission Zero: Independent Review of Net Zero”, 2023



An Alliance for Geological Net Zero

- Acknowledge the need for global geological net zero to meet the long-term temperature goal of the Paris Agreement.
- Report progress towards geological balance through the **Geologically Stored Fraction:**
$$\frac{\text{CO}_2 \text{ committed to geological storage}}{\text{CO}_2 \text{ generated from geological sources}}$$
- Commit to increase the geologically stored fraction over time, in line with circumstances & support others to do the same.



An Alliance for Geological Net Zero

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- Report progress towards geological balance through the **Geologically Stored Fraction:**
$$\frac{\text{CO}_2 \text{ committed to geological storage}}{\text{CO}_2 \text{ from fossil fuels produced + imported} - \text{exported}}$$
- Commit to increase the geologically stored fraction over time, in line with circumstances & support others to do the same.



Some final thoughts

- The Stone Age didn't end because we ran out of stones.
- The Oil Age won't end because we run out of oil.
- Global Warming won't end because we stop using fossil fuels.
 - To achieve the goals of the Paris Agreement, we must stop fossil fuels from causing further global warming before the world stops using fossil fuels.
 - And the only way to do this is safe and permanent disposal of 100% of the carbon dioxide they generate.
 - Which is Geological Net Zero.



