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Carbon Capture and Storage (CCS)

A Climate Change Mitigation Strategy

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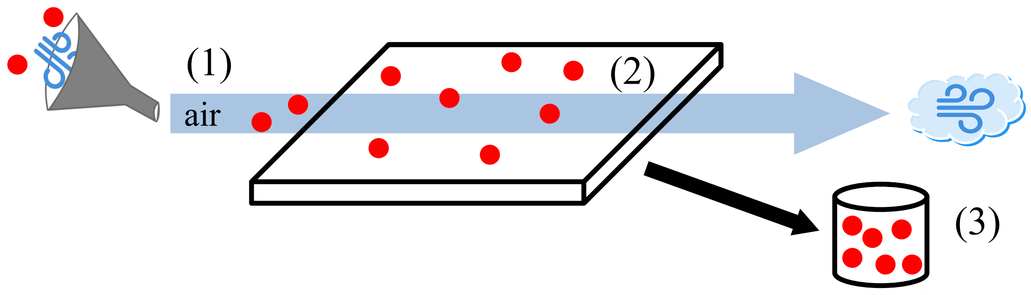
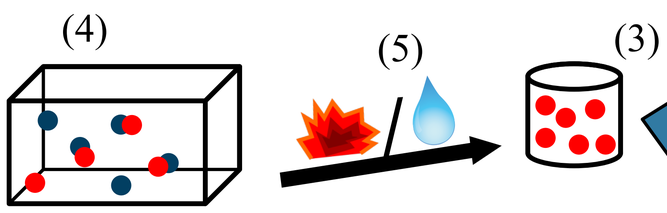
IPPC 2022: "Carbon Dioxide Removal (CDR) is necessary to achieve net zero CO_2" [1]

Direct Air Capture (DAC)

I. *Physisorption* – adsorption of CO_2 from an air stream (1) via weak physical forces (2) and intermediate storage (3) [2]



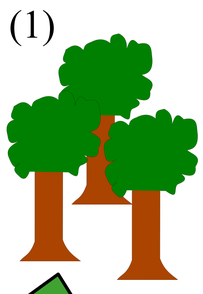
II. *Chemisorption* – reaction with an agent (4), separate CO_2 from agent with heat or moisture (5) and intermediate storage (3) [2]



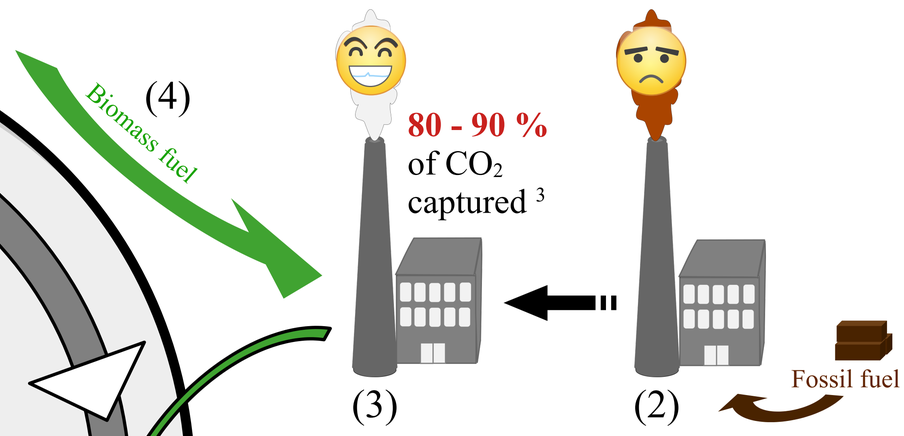
19 Gt until **2100** expected with DAC [1]

Bio Energy Carbon Capture (BECC)

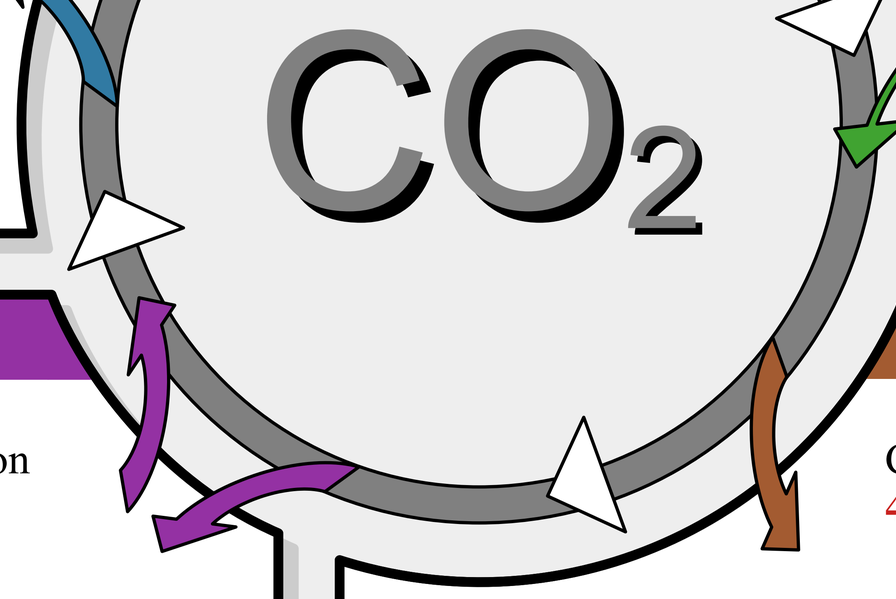
I. Natural CO_2 capture via plants (1)
→ high land & water demand for plants [4]



II. Fossil-fuelled power plants (2) capture CO_2 instead of releasing it into air (3) [3]
→ biomass can fuel power plants (4) [4]
→ high energy demand for CO_2 capture [5]



291 Gt until **2100** expected with BECC [1]



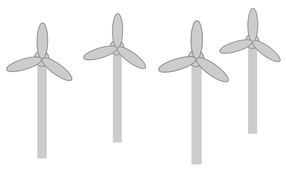
Short-term Storage

Captured carbon replacing fossil carbon in the industrial production. [5]

- basic chemicals [5]
- fine chemicals [5]
- polymers [5]

- cement & concrete [6]
- road construction [6]

Temporary storage delays climate change effects [7], but long-term low-carbon electricity is necessary [5]

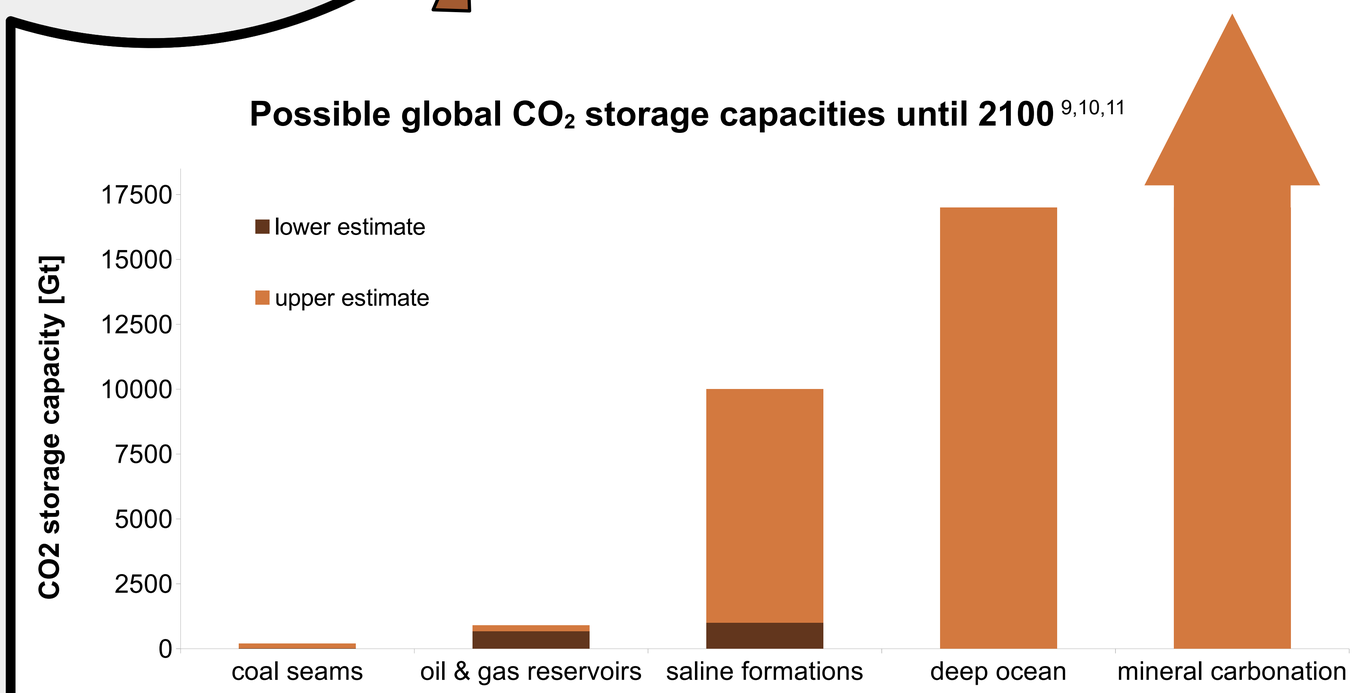


Potential of reducing annual greenhouse gas (GHG) emissions by up to **3.5 Gt** CO_2-eq in **2030** via short-term storage. [5]

Long-term Storage

Current long-term storage projects can store **441 Gt** CO_2 until 2100. [8]

Possible global CO_2 storage capacities until 2100 [9,10,11]



To stay < 2°C until **2100** we need to store **2700 Gt** CO_2 with CCS. [8]

CCS is a bridge technology, not a final solution. [12]
CCS needs massive increase to stay < 2 °C global warming. [1]
High costs of CCS are still lower than future mitigation costs with no CCS. [13]

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