

Department of Energy

Biden Administration Launches \$3.5 Billion Program To Capture Carbon Pollution From The Air

MAY 19, 2022



150 YEARS
FEATURING
FUTURE
1872 - 2022

UNIVERSITY OF NATURAL RESOURCES AND
LIFE SCIENCES, VIENNA

Warum CO₂ Abscheidung aus der Luft nicht kommt

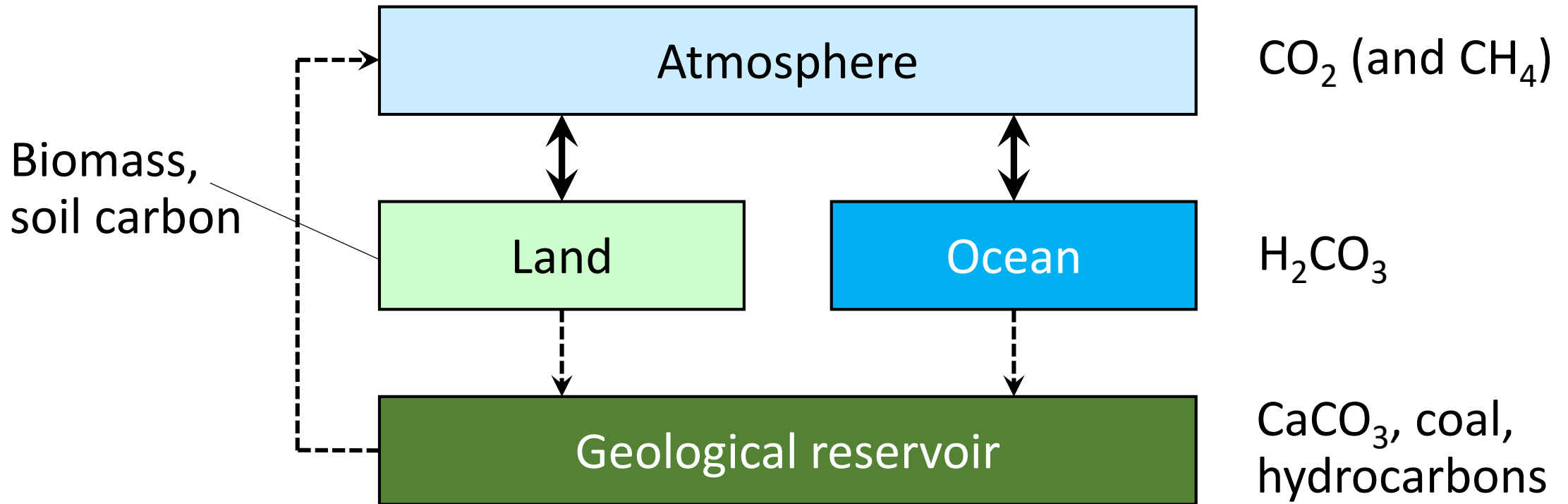
Tobias Pröll

University of Natural Resources and Life Sciences (BOKU),

Vienna, Austria

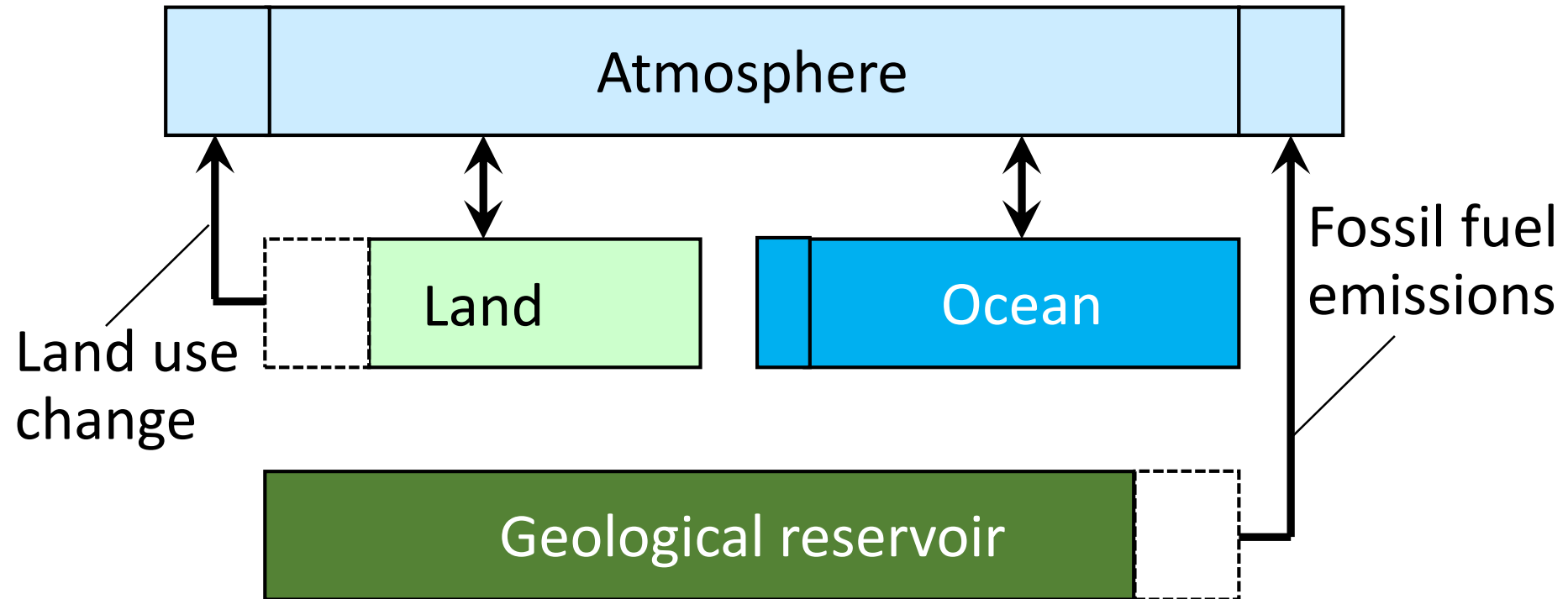
tobias.proell@boku.ac.at

Unperturbed carbon cycle – without human activity



- **Bold arrows indicate active equilibria (short-term cycle)**
- **Broken-lined arrows indicate slow geological processes**

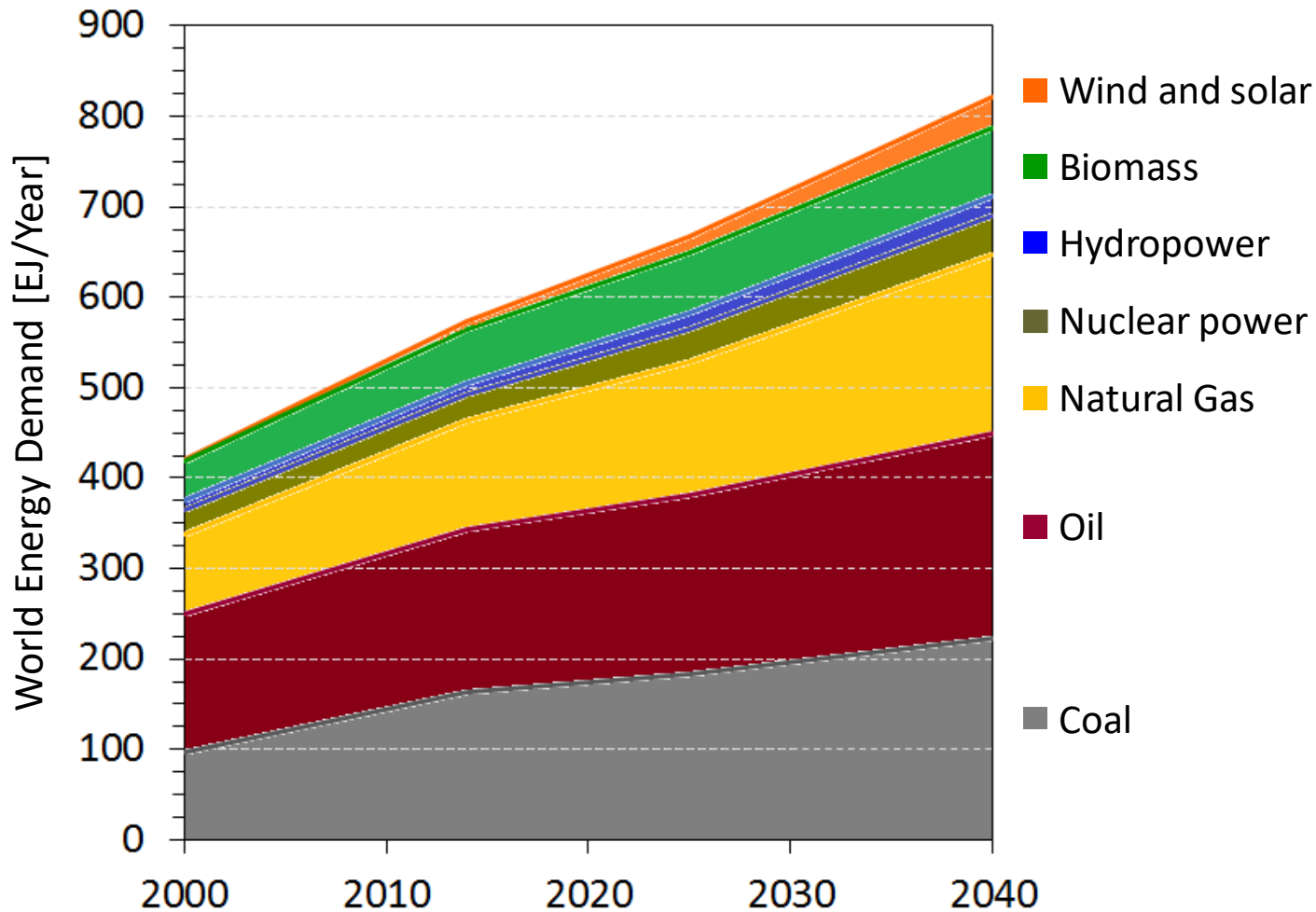
Currently: Land use change and fossil fuels



→ Increasing CO₂ concentration in the atmosphere

→ Increasing CO₂ concentration in the ocean via equilibrium

The World's Primary Energy Supply 2000-2040



- **World: 80% Fossil**
(value unchanged for last 30 years!)
- **Austria: Still 65% Fossil**
- Increasing energy demand outperforms newly built renewables

Climate crisis = Energy crisis

[IEA World Energy Outlook 2016 – iea.org]

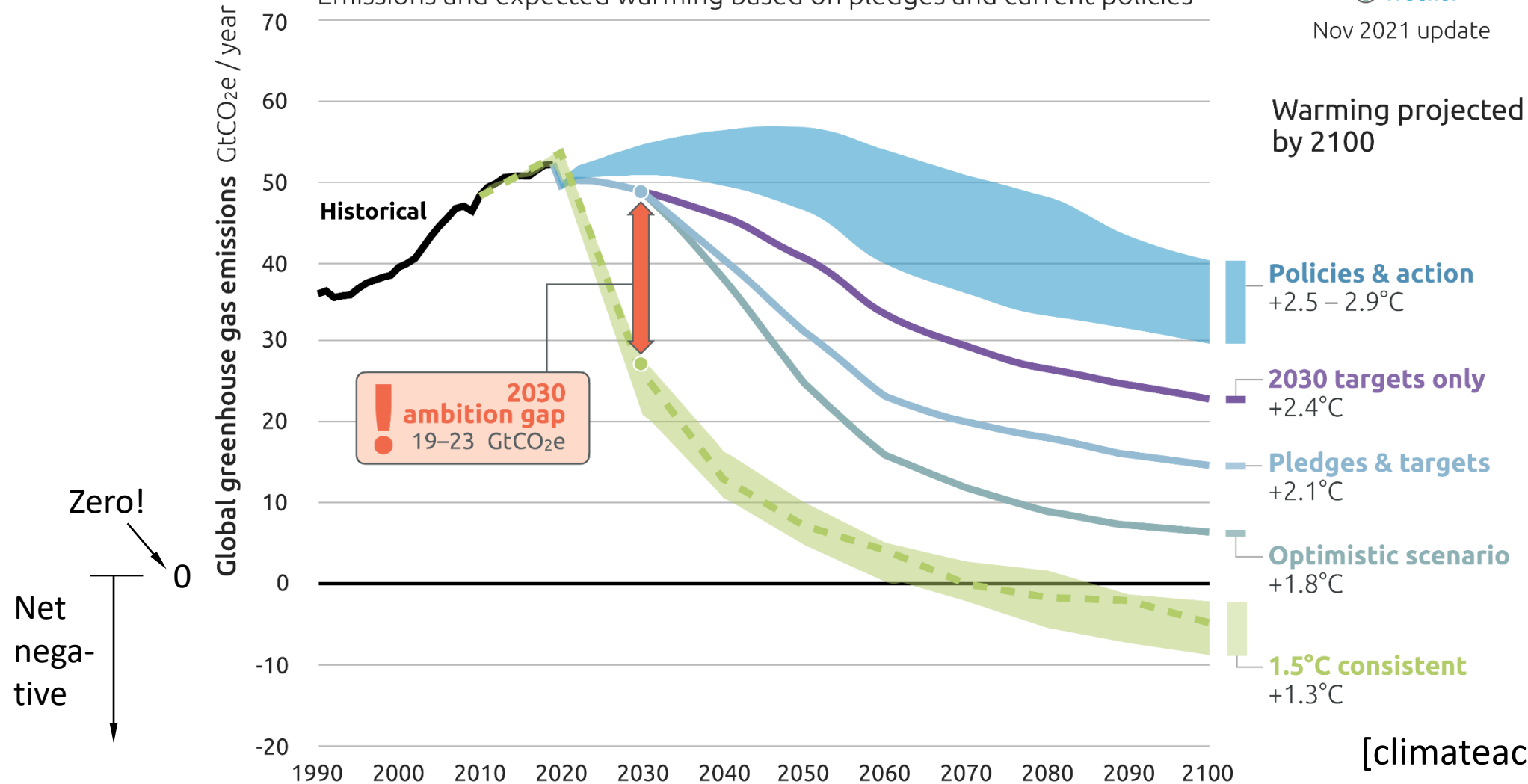
Where we should go to: CO₂ emission budget for +1.5°C

2100 WARMING PROJECTIONS

Emissions and expected warming based on pledges and current policies



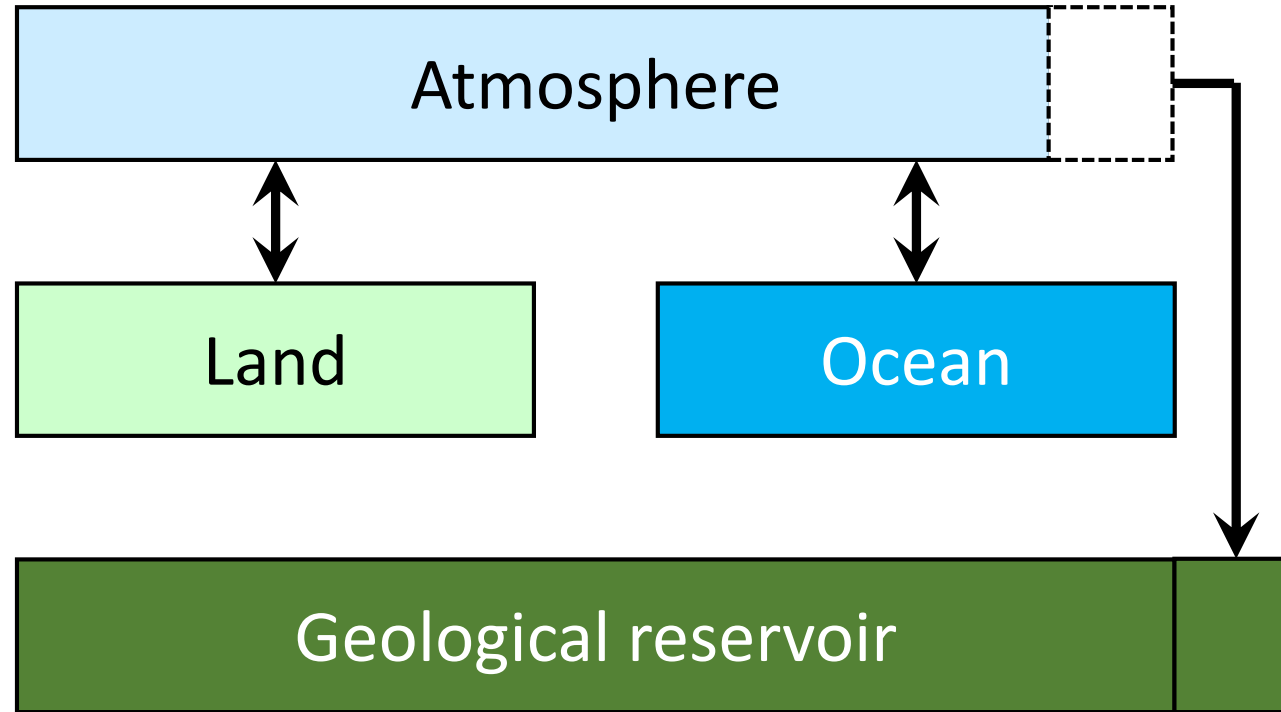
Nov 2021 update



[climateactiontracker.org]

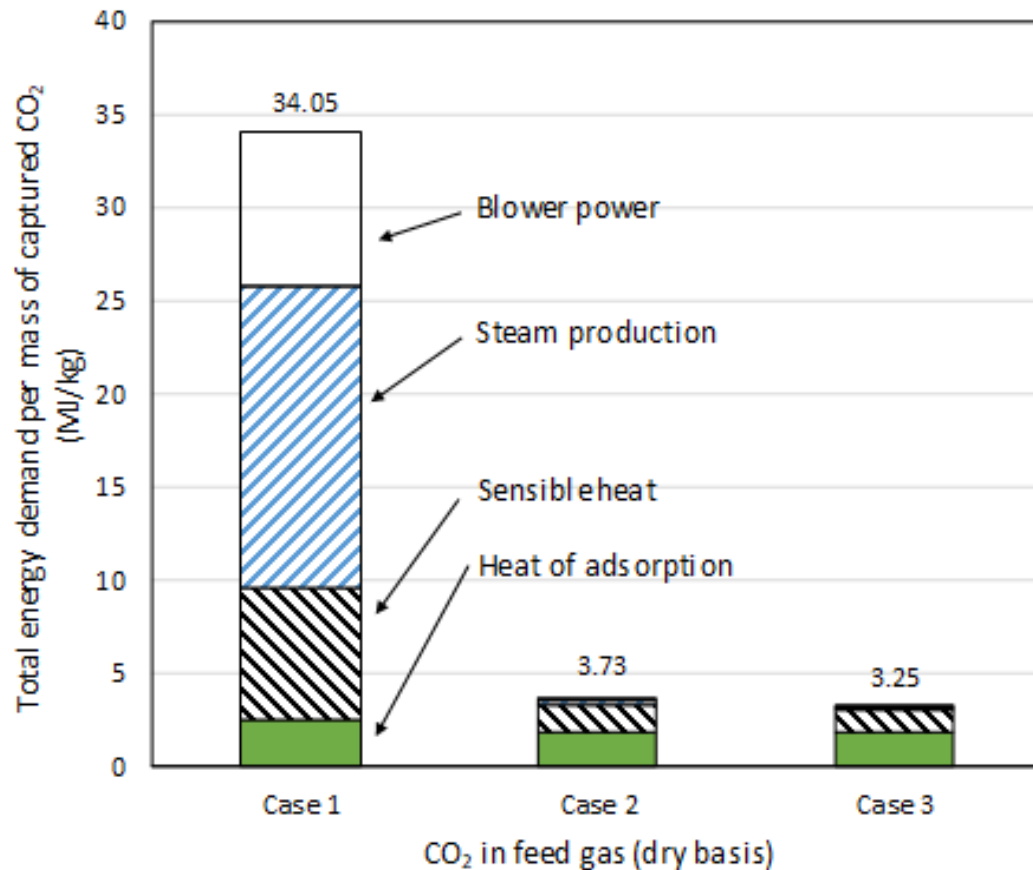
Copyright ©2021 by Climate Analytics and NewClimate Institute. Free for non-commercial use.

Direct air capture and storage (DACCS)



- CO₂ technically separated from ambient air (e.g. by adsorption)
- CO₂ concentrated to 100% (e.g. by desorption into steam)
- CO₂ compressed for transport and storage

Comparison DACS versus (BE)CCS



Continuous temperature swing adsorption (TSA)

CO₂ concentration in source gas:

Case 1: 0.04 vol% CO₂ (air)

Case 2: 4 vol% CO₂ (gas turbine)

Case 3: 10 vol% CO₂ (solid fuel)

[Zerobin&Pröll (2020) Ind. Eng. Chem. Res. 59, 9207-14.]

→ **DACS requires about 10 times more energy than CCS from flue gas**

→ **DACS comes with tremendously higher equipment costs**

Take-home message

The solution to a problem caused by our energy demand

cannot and will not

be found in a technology with a ridiculously high energy demand.

(Not to speak here about the capital costs for direct air capture plants.)

Watch: <https://www.youtube.com/watch?v=Q13bczVkSQc>

(DACS treated from minute 21 onwards)