CaCTUS

Austria's Climate Neutrality: An In-depth Evaluation of the Potential Contribution of CCU and CCS for the Austrian Long-term Climate Goals

Duration: 8/22 - 1/25

CaCTUS
CARBON CAPTURE, TRANSFORMATION, UTILIZATION & STORAGE

7 AFFORDABLE AND CLEAN ENERGY
13 CLIMATE ACTION
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
12 RESPONSIBLE CONSUMPTION AND PRODUCTION

Motivation

The **EU aims for climate neutrality by 2050, Austria even targets 2040**.

CO_2 emissions have to be reduced **but certain emissions will remain** from hard-to-abate industries.

Carbon is an important resource for various sectors (e.g., chemical & down-stream industries).

➔ **CO_2 Capture and Utilization (CCU) and Storage (CCS)** are an opportunity for a **Circular Carbon Economy** and to reach climate change mitigation goals.

Research questions:

- Austrian CO_2 emission now and 2050?
- Domestic sinks: industry & storage?
- Legal & regulatory aspects?
- Economic & environmental feasibility?
- Stakeholder perspectives?
- Viable "Source-to-sink" routes?

Project Structure

AP1 Project Management

AP2 Technical Resources & Demand Potential for CCU

AP3 Geological CO_2 Storage Potential in Austria

AP4 Impact Assessment

AP5 Stakeholder Involvement & Policy Recommendations

AP6 Communication & Dissemination

Methods

- Literature reviews
- Legal & regulatory assessments
- Bottom-up/top-down potential analysis
- Techno-economic evaluation
- Interviews, surveys, workshops

Outlook

- Finalization CCU/CCS use-cases
- Techno-economic assessment ongoing
- Environmental considerations ongoing
- Further stakeholder interaction
- Finalization of legal analysis and development of policy recommendations
- Communication & dissemination of results

Results (selection)

CO_2 availability

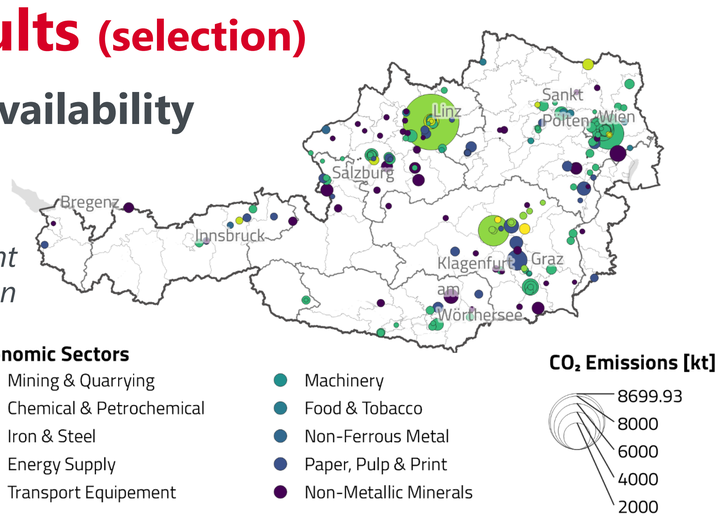


Fig. 1. Austria's CO_2 point sources in 2019

- Scenario-based evaluation of today's point sources and their development

CO_2 capture technologies

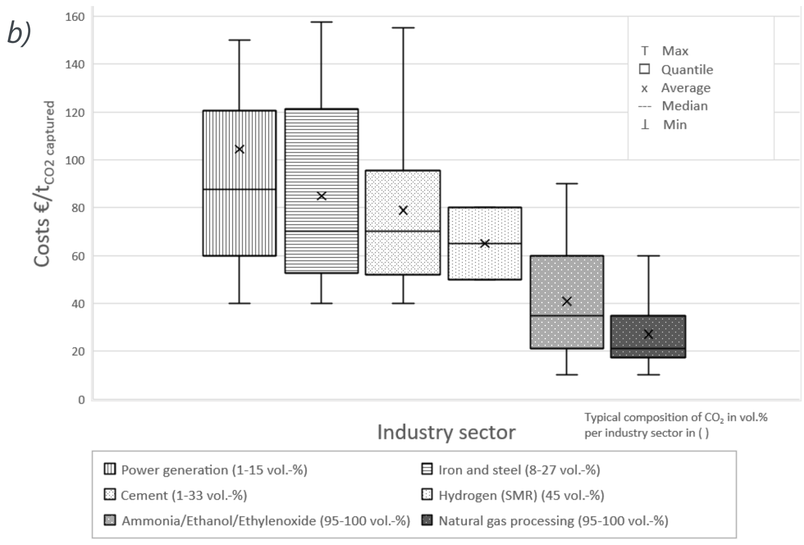
- Evaluation of technologies & characteristics feasible for capturing from identified sources

Fig. 2. Overview of carbon capture technologies a) energy demand b) cost ranges

a)

	Technology	Energy demand (th) GJ/t_{CO2}
	Absorption	**2,0 - 9,2**
Selection	MEA, DEA, MDEA, etc.	3,0 - 4,5
Selection	New/optimised solvents	2,1 - 2,9
Selection	Potassium carbonate	2,0 - 2,6
Selection	Chilled ammonia	2,0 - 2,9
Selection	Amino acid-based solvent	2,4 - 3,4
	Adsorption	**2,4 - 9,0**
	Amine-based adsorbents	1,3 - 2,0
	Metal-organic frameworks	0,4 - 0,8
	Membrane	**0,5 - 6,0**
	Cryogenic	**2,4 - 5,2**
	Solid Looping	**2,0 - 10,0**

b)



CO_2 sinks: utilization & storage options

- Chemical industry: methanol, olefines, fertilizers, melamine etc.
- E-fuels: methane, kerosene etc.

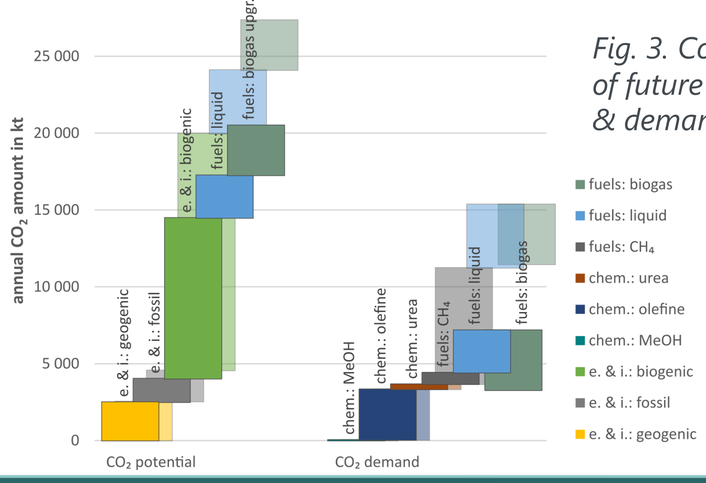


Fig. 3. Comparison of future resources & demands

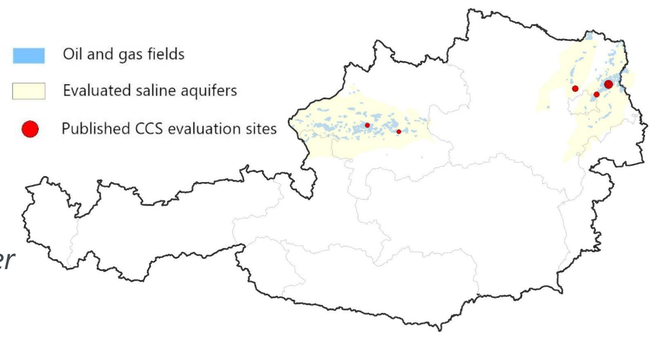


Fig. 4. Geological storage options under evaluation

- Identification of potential storage formations and corresponding capacities

Techno-economic & ecological impact

- Capture efforts and prioritization of sources
- Costs of individual utilization & storage routes

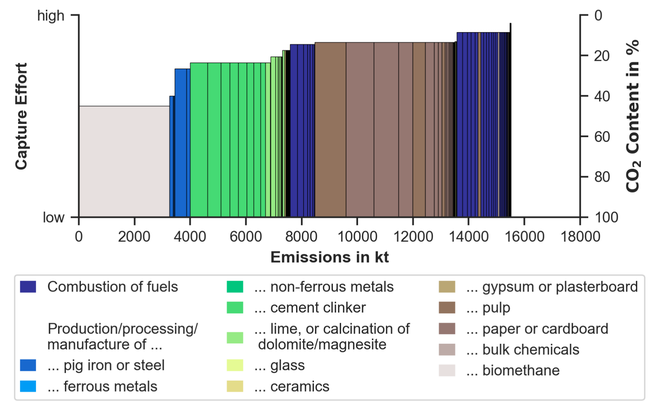


Fig. 5. Merit-order of identified long-term sources

- Emissions avoided + other impacts

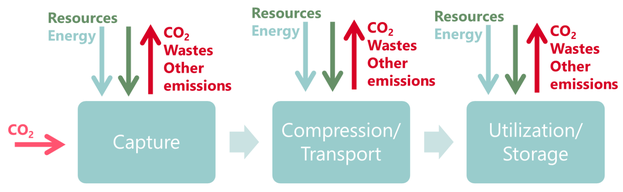


Fig. 6. Scheme of CCU/ CCS process chain

Stakeholder involvement

- CC, CCU, CCS online survey with 10 Austrian high-emitting corporations
- Workshop on insights in March 2023
- 1-on-1 interviews to deep-dive into drivers, obstacles and necessities
- Workshop on preliminary results in Q3/2024

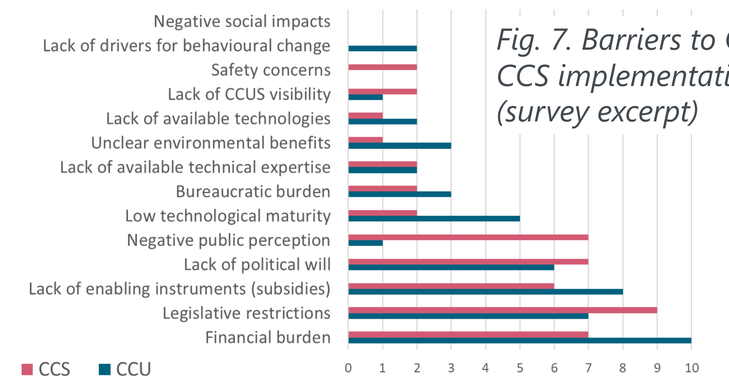


Fig. 7. Barriers to CCU / CCS implementation (survey excerpt)

Legal and policy aspects

- CCS forbidden in Austria → repeal of the ban under discussion
- EU ETS: no certificates for CCS, and for CCU where the CO_2 is permanently chemically bound in a product
- National Carbon Management Strategy for data-driven and cost-effective management of GHG capture, storage, transport and use

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powered by klima+ energie fonds

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