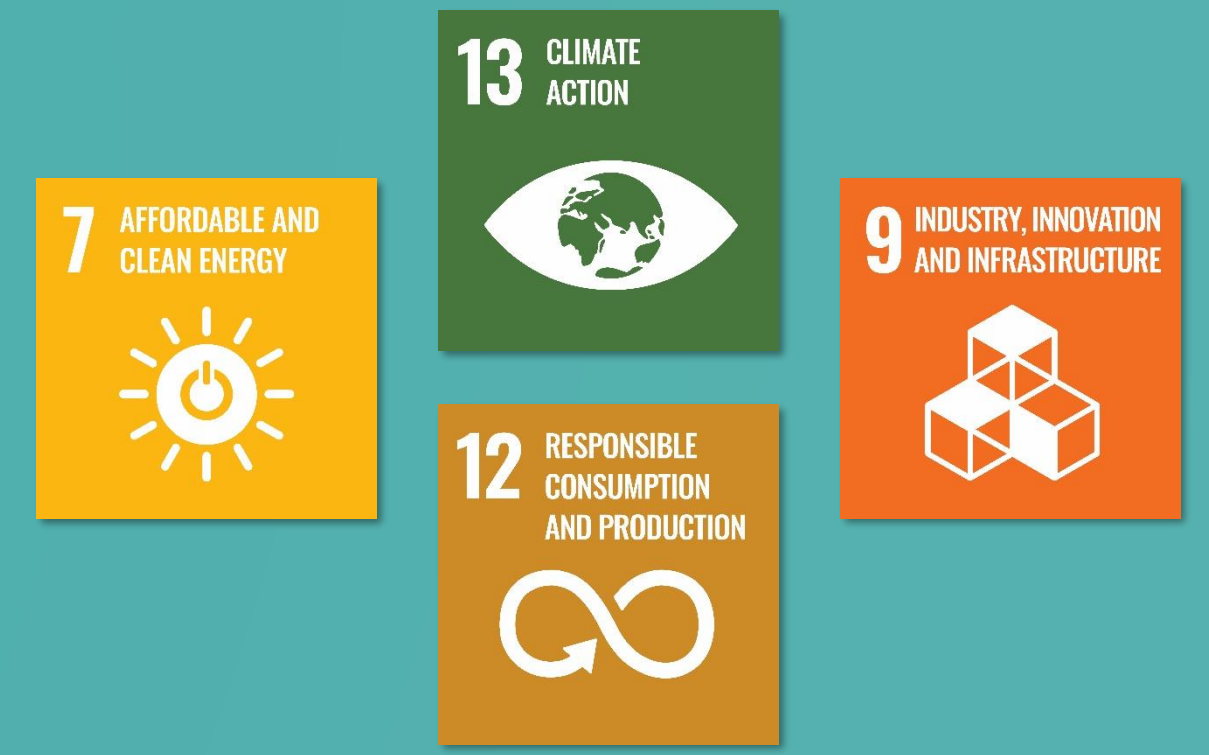


Austria's Climate Neutrality: An In-depth Evaluation of the Potential Contribution of CCU and CCS for the Austrian Long-term Climate Goals

Duration: 8/22 - 1/25



Motivation

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

CO₂ emissions have to be reduced **but certain emissions will remain** from hard-to-abate industries.

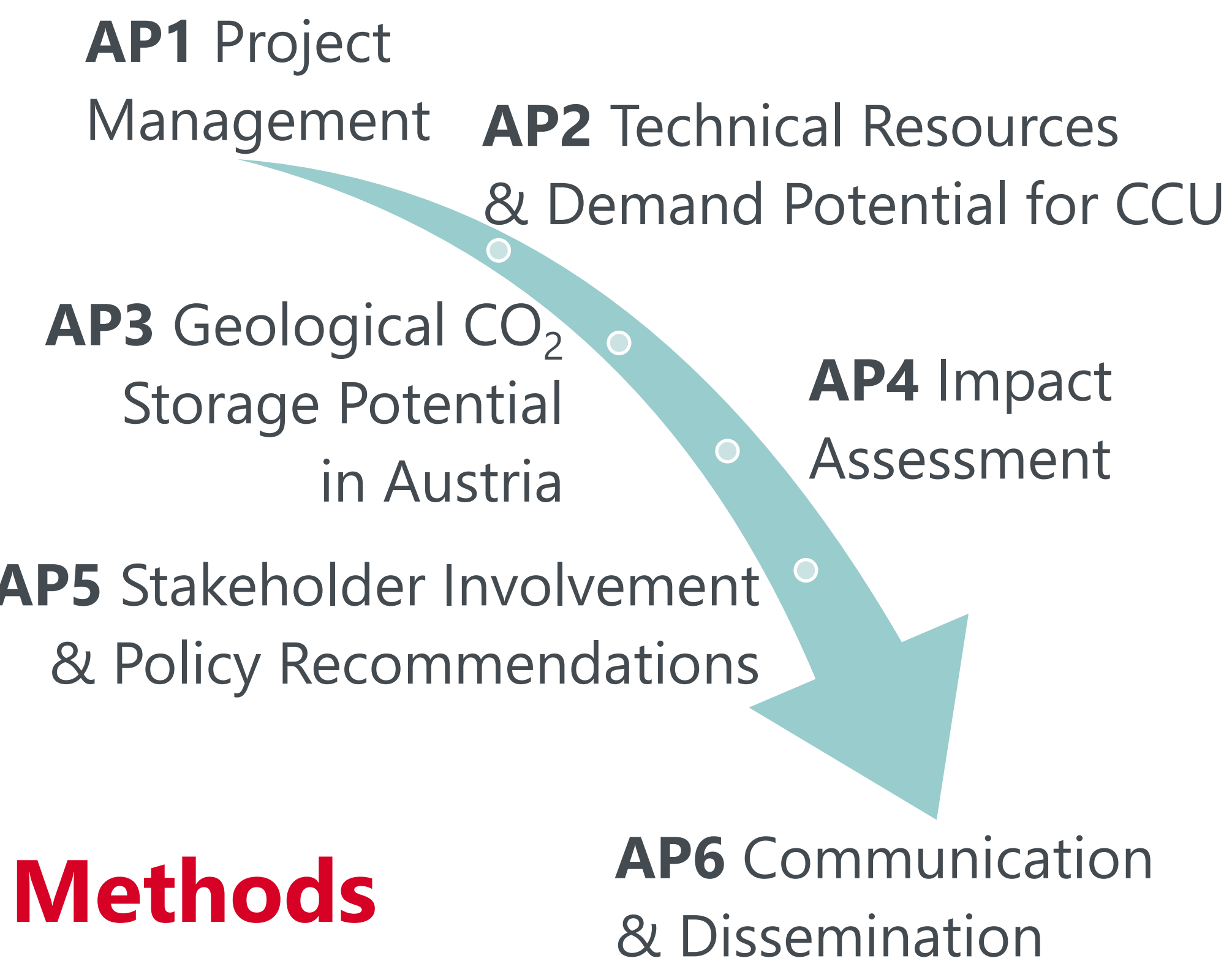
Carbon is an important resource for various sectors (e.g., chemical & down-stream industries).

→ **CO₂ 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 CO₂ emission now and 2050?
- ❖ Domestic sinks: industry & storage?
- ❖ Legal & regulatory aspects?
- ❖ Economic & environmental feasibility?
- ❖ Stakeholder perspectives?
- ❖ Viable "Source-to-sink" routes?

Project Structure



Methods

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

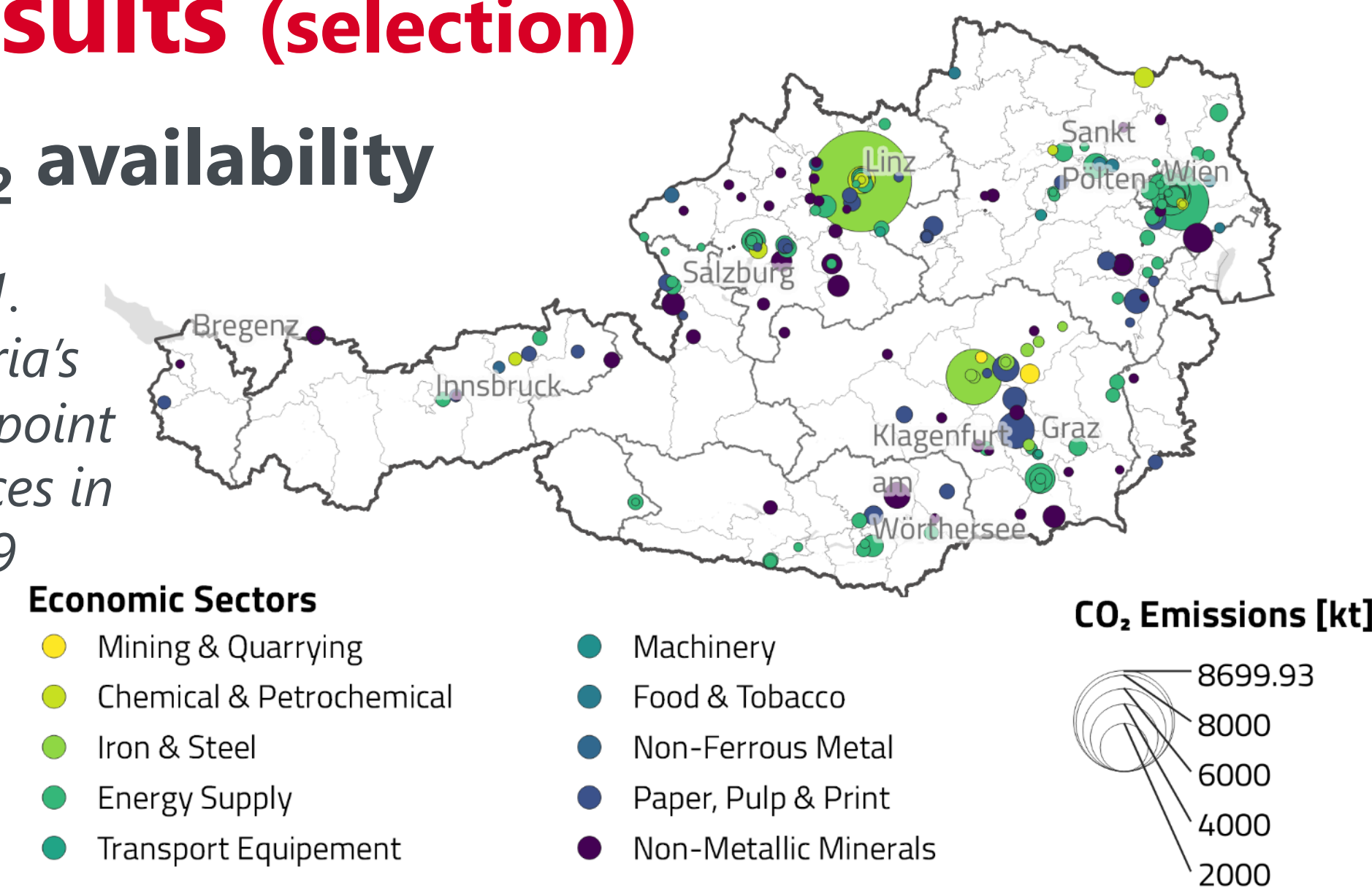
Outlook

- ❖ 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)

CO₂ availability

Fig. 1. Austria's CO₂ point sources in 2019



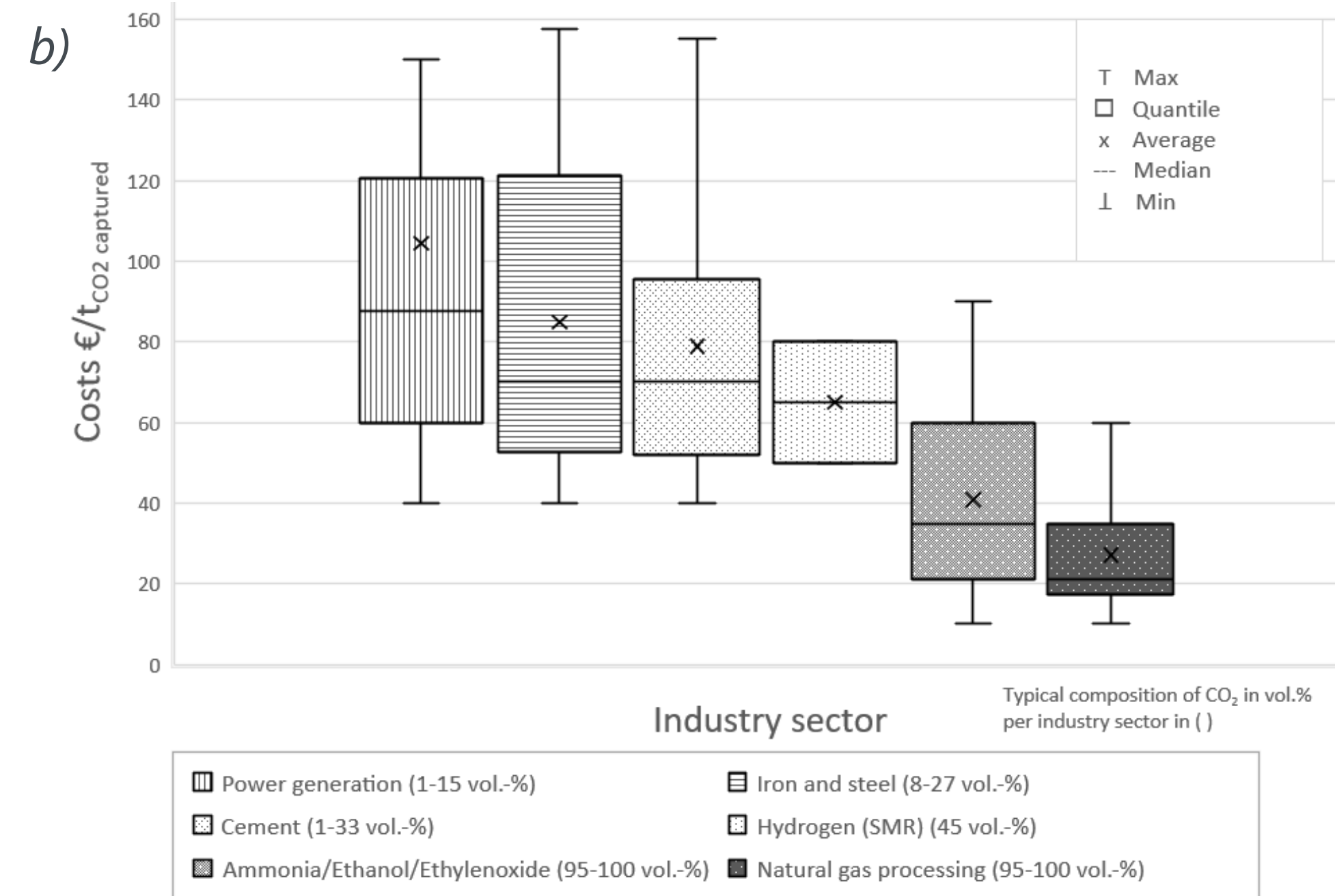
- ❖ Scenario-based evaluation of today's point sources and their development

CO₂ capture technologies

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

Technology	Energy demand (MWh) GJ/t _{CO2}
Absorption	2,0 - 9,2
MEA, DEA, MDEA, etc.	3,0 - 4,5
New/optimised solvents	2,1 - 2,9
Potassium carbonate	2,0 - 2,6
Chilled ammonia	2,0 - 2,9
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

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



CO₂ sinks: utilization & storage options

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

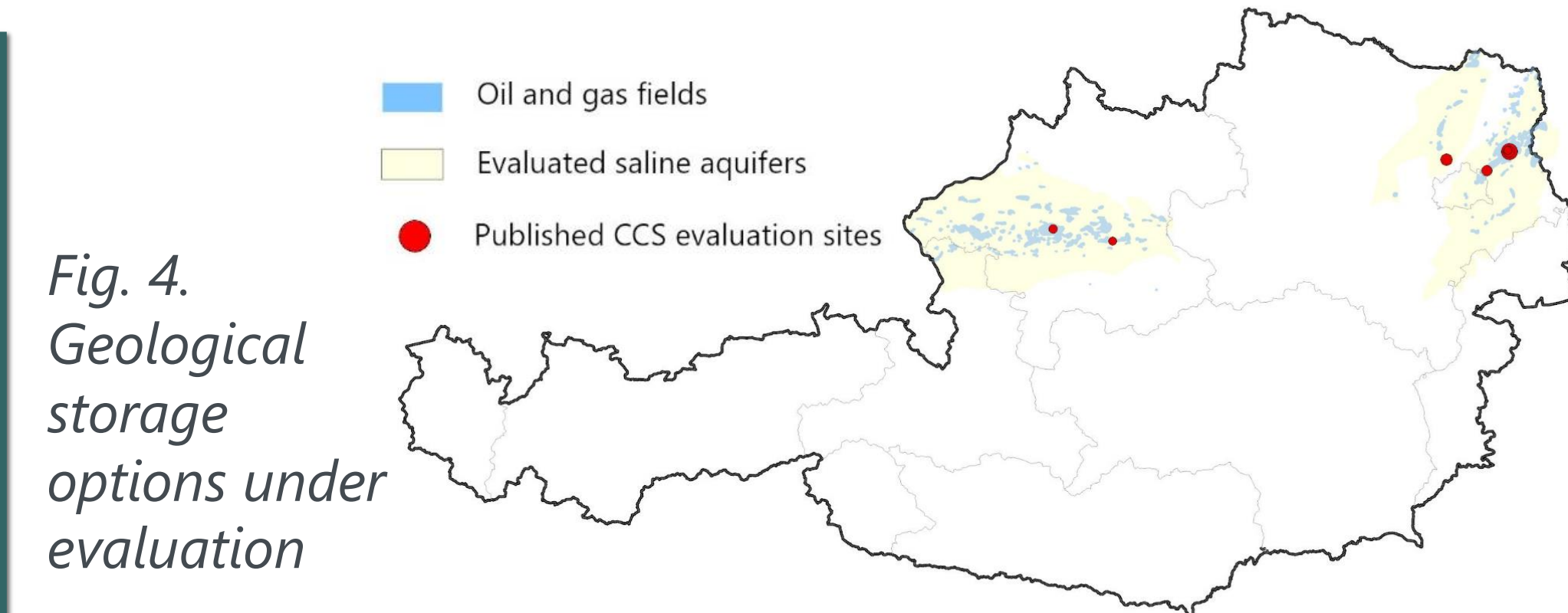
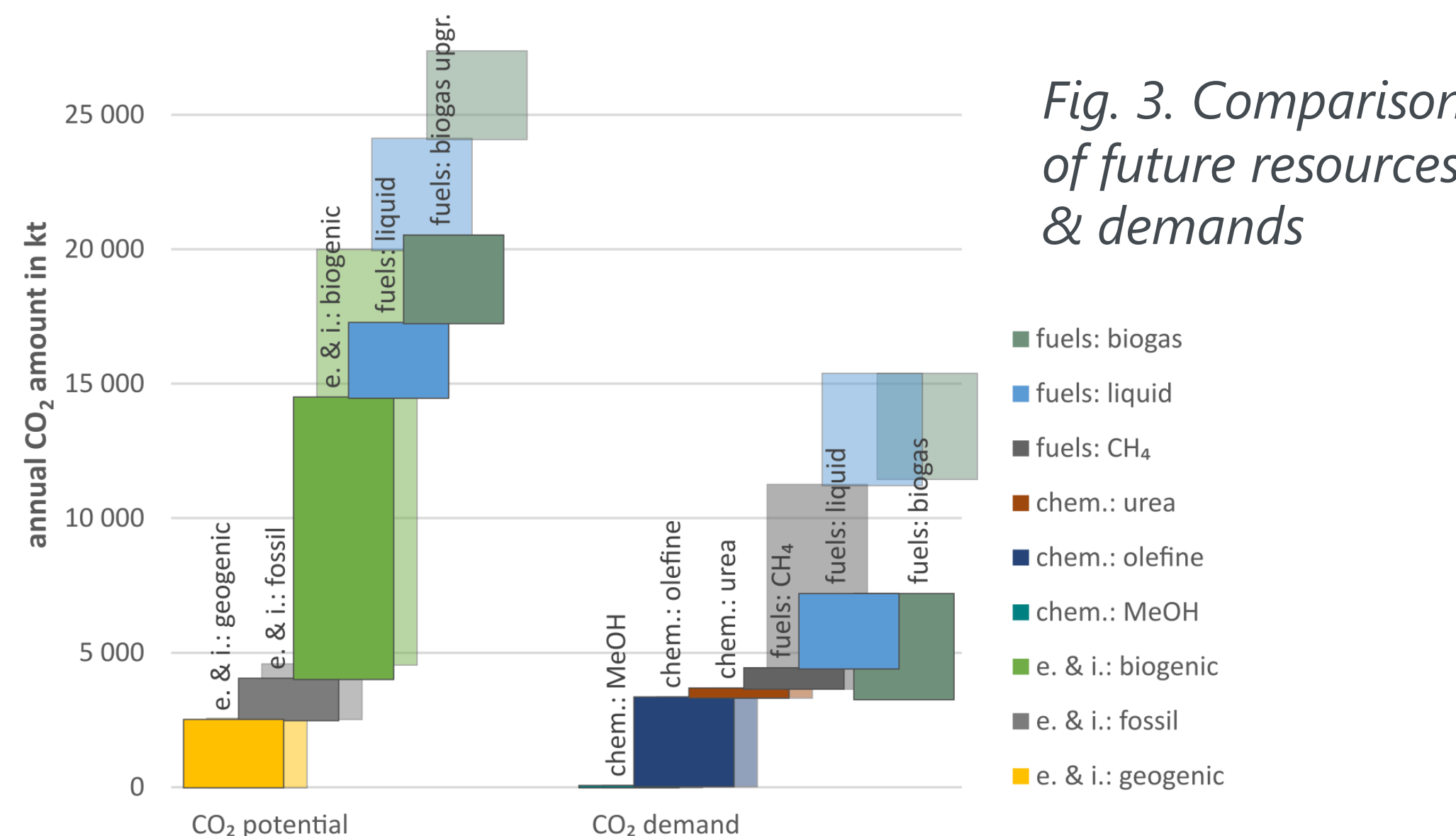
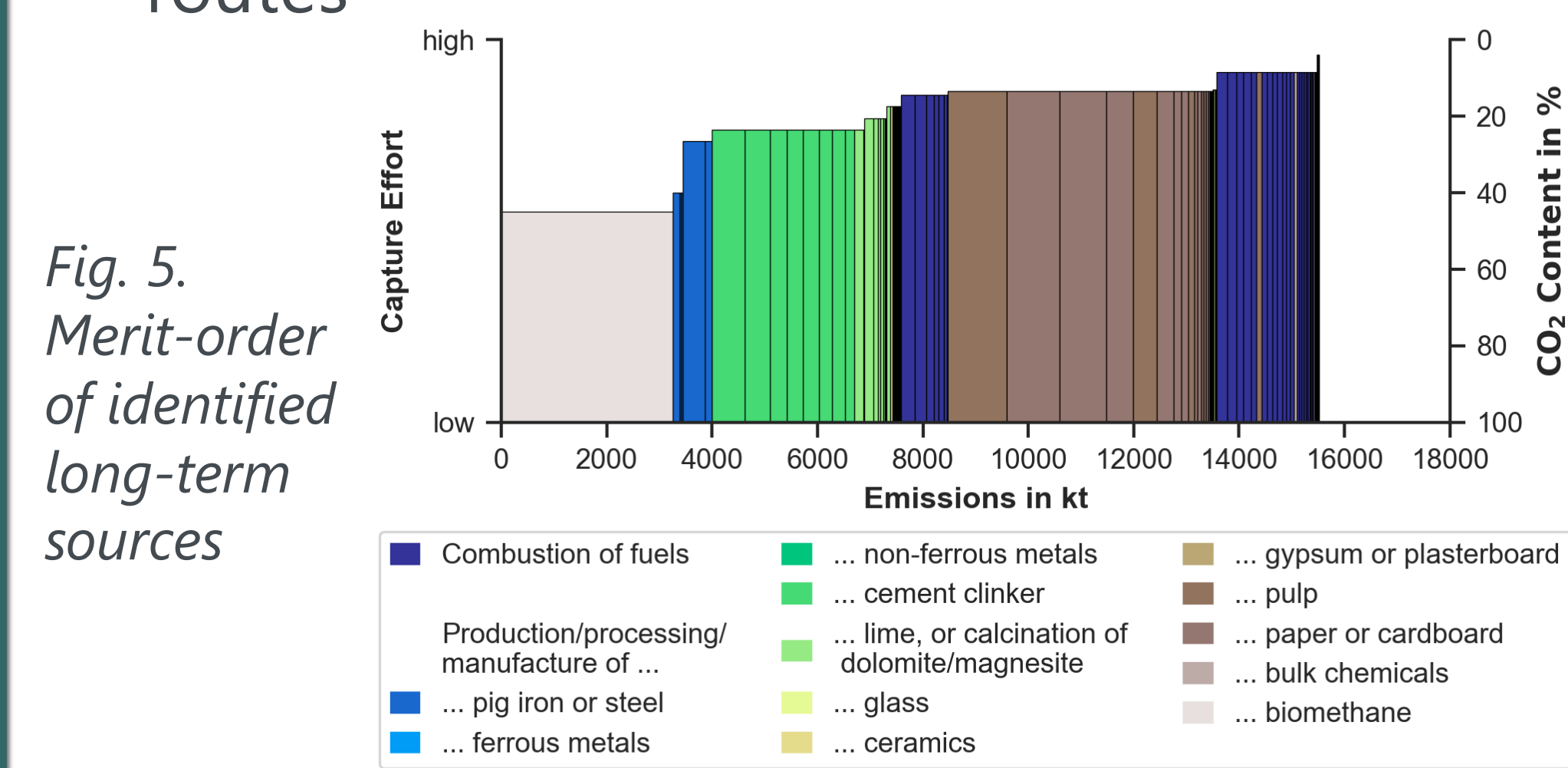


Fig. 4. Geological storage options under evaluation

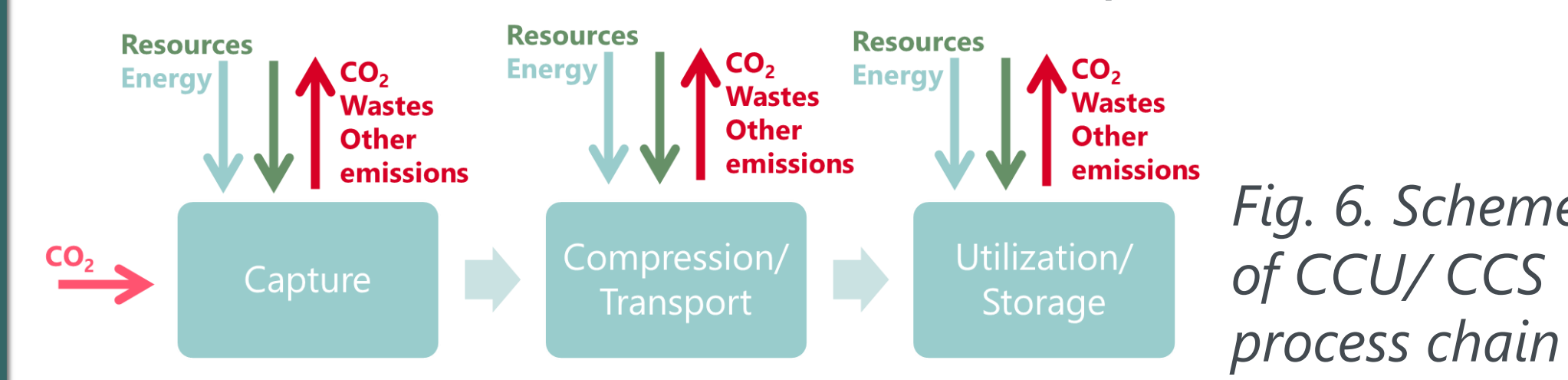
- ❖ Identification of potential storage formations and corresponding capacities

Techno-economic & ecological impact

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

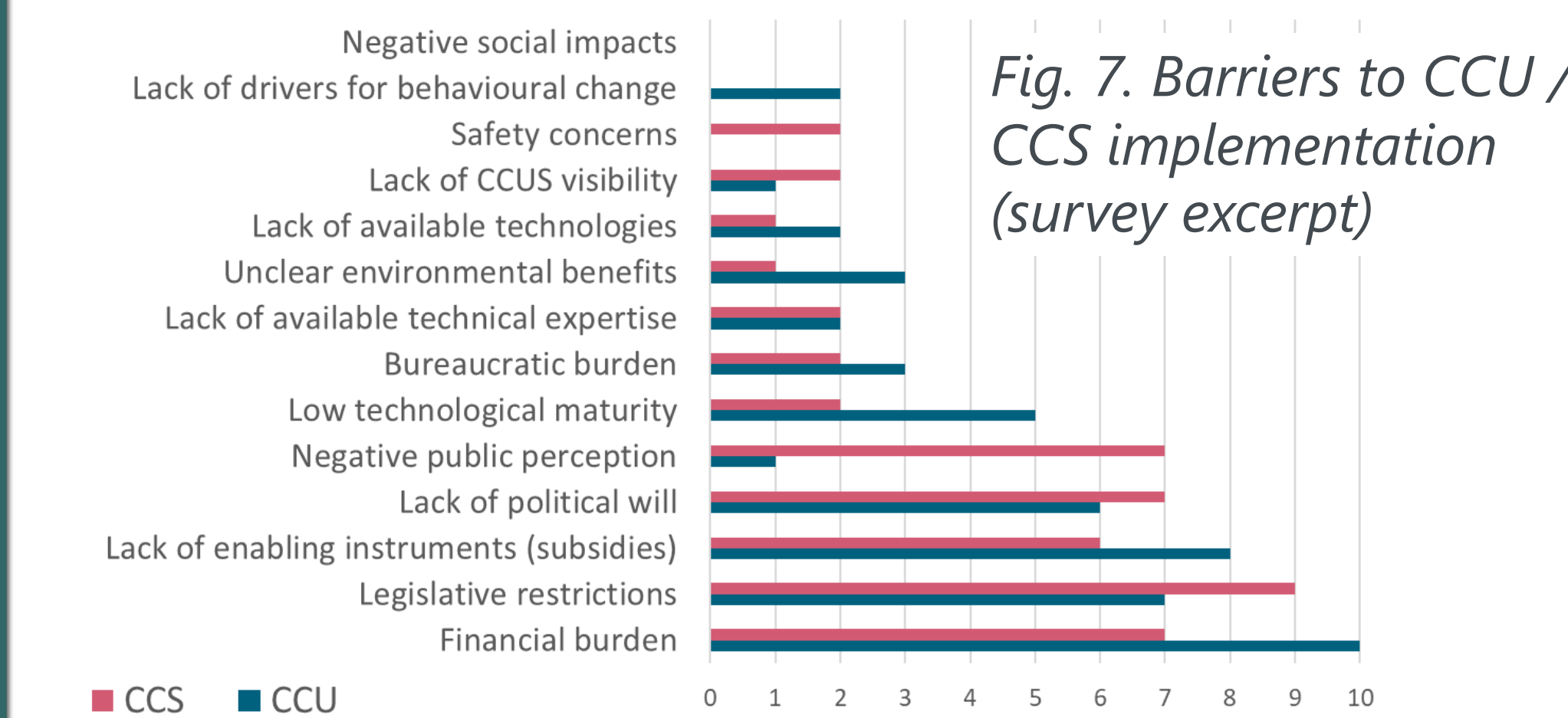


- ❖ Emissions avoided + other impacts



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



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 CO₂ 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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