



Bachelor/Master Thesis

Estimating a Cost Curve for CO₂ Transport Infrastructure in Germany

Achieving carbon neutrality by 2045 will require a combination of decarbonization strategies, with Carbon Capture, Utilization, and Storage (CCUS) playing a crucial role, particularly for hard-to-abate sectors such as cement, steel, and chemicals (EWI/ITG/FIW/ef.Ruhr, 2021). While CO₂ storage remains essential for deep decarbonization, utilizing captured CO₂ for industrial applications (CCU) offers an additional opportunity to mitigate emissions. However, one of the key challenges for the widespread adoption of CCUS is the development of CO₂ transport infrastructure, which is currently lacking (JRC, 2024).

Several studies have attempted to quantify the need for CO₂ transport infrastructure in Germany and Europe (VDZ, 2024; JRC, 2024), typically using scenario-based approaches that vary the amount of captured CO₂. However, a systematic cost assessment of this infrastructure is still missing. This thesis aims to fill this gap by deriving a cost curve for CO₂ transport infrastructure in Germany, linking infrastructure costs to transport demand across different scenarios. In the case of a Master Thesis, a quantitative numerical model is developed which computes CO₂ infrastructure pathways for various scenarios. The results will contribute to a better understanding of cost drivers, investment needs, and policy implications for future CO₂ transport networks.

Key tasks and objectives of the thesis

- Comprehensive Literature Review: Review existing studies on CO₂ infrastructure costs, including pipeline networks, transport costs, and scenario-based modeling approaches.
- Development of scenario-based Cost Curves: Derive a cost curve that links CO₂ transport infrastructure costs to different transport volumes and distances.
- Analysis of Cost Drivers: Identify and assess the major determinants of infrastructure costs, such as pipeline length, capacity, terrain, regulatory frameworks, and economies of scale.
- Policy and Investment Implications: Discuss the results in the context of CCUS deployment in Germany and the EU, focusing on regulatory, economic, and technological barriers.

Your profile

- Student in Economics and general knowledge in the field of Energy Economics

Literature

- EWI/ITG/FIW/ef.Ruhr (2021). dena pilot study - Towards climate neutrality. Climate neutrality 2045 - Transformation of the end-use sectors and the energy system. English summary. Published by the German Energy Agency GmbH (dena)
- JRC (2024): Shaping the future CO₂ transport network for Europe
- VDZ (2024): Anforderungen an eine CO₂-Infrastruktur in Deutschland

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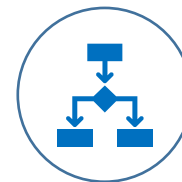
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Topics



- Carbon Capture and Storage/Utilization
- CO₂-infrastructure
- Costs of energy transition

Methods



- Literature review
- Cost analysis