



Bachelor Thesis

CO₂ Hubs and Infrastructure Planning in Germany: An Economic Analysis

Achieving carbon neutrality by 2045 will require a combination of strategies, with Carbon Capture, Utilization, and Storage (CCUS) playing a crucial role, as highlighted in various climate neutrality studies (EWI/ITG/FIW/ef.Ruhr, 2021). While CO₂-storage remains an essential component, utilizing captured CO₂ for industrial applications presents an additional opportunity to reduce emissions. However, the necessary infrastructure for CO₂-transport is not yet in place, making its development a key element for future planning (JRC, 2024).

In this context, so-called CO₂-hubs, i.e. clusters of industrial CO₂ sources and sinks in close spatial proximity, are of particular interest. Their existence could significantly influence infrastructure planning by offering an alternative to offshore storage and potentially reshaping transport network requirements.

The proposed thesis should investigate whether CO₂-hubs could emerge and what influence they could have on infrastructure planning. For this purpose, the most important industrial sources of CO₂-emissions as well as industrial processes that could serve as potential sinks are to be mapped building on EEA (2025). A subsequent central task could be the development of a quantitative methodology to geographically match sources and sinks, enabling the identification of locations where industrial CO₂-sources and utilization options are spatially concentrated. The identification and viability assessment of such hubs would provide valuable insights for the strategic development of a coordinated CO₂-infrastructure, ensuring that captured carbon can be efficiently transported and utilized where it is needed.

Key tasks and objectives of the thesis

- Mapping major CO₂ emission sources in Germany and identifying industrial sectors or processes that could serve as potential sinks for captured CO₂
- Development of a quantitative methodology to geographically match carbon sources and sinks
- Identify CO₂-hubs and discuss its implications on CO₂-infrastructure planning

Your profile

- Student in Economics and general knowledge in the field of Energy Economics
- Basic proficiency in widely used programming languages and GIS is a plus.

Literature

- EEA (2025) European Union Emissions Trading System (EU ETS) data from EUTL
- 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

Contact



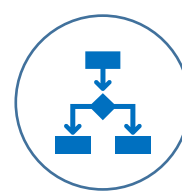
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Topics



- Carbon Capture and Storage/Utilization
- CO₂-hubs

Methods



- Geo-matching, clustering
- Potential analysis