**Lehrstuhl für Wirtschaftliche Staatswissenschaften,
insbesondere Energiewirtschaftslehre**

Bachelor Thesis

CO_2 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 CO_2-storage remains an essential component, utilizing captured CO_2 for industrial applications presents an additional opportunity to reduce emissions. However, the necessary infrastructure for CO_2-transport is not yet in place, making its development a key element for future planning (JRC, 2024).
In this context, so-called CO_2-hubs, i.e. clusters of industrial CO_2 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 CO_2-hubs could emerge and what influence they could have on infrastructure planning. For this purpose, the most important industrial sources of CO_2-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 CO_2-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 CO_2-infrastructure, ensuring that captured carbon can be efficiently transported and utilized where it is needed.

Key tasks and objectives of the thesis

- Mapping major CO_2 emission sources in Germany and identifying industrial sectors or processes that could serve as potential sinks for captured CO_2
- Development of a quantitative methodology to geographically match carbon sources and sinks
- Identify CO_2-hubs and discuss its implications on CO_2-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

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Topics

- Carbon Capture and Storage/Utilization
- CO_2-hubs

Methods

- Geo-matching, clustering
- Potential analysis