Bachelor / Master thesis

Topic:

Screening and Prioritisation of CO_2 Point Sources in NRW/Germany for Carbon Capture, Utilization and Storage (CCUS)

Background and content of the thesis:

Achieving climate neutrality in industry requires more than renewable energy and efficiency improvements. In sectors such as cement, lime, and waste treatment, some CO_2 emissions are unavoidable. Captured CO_2, however, can be reused for chemicals or synthetic fuels, supporting a circular carbon economy. To plan future CO_2 infrastructure effectively, relevant CO_2 point sources must be identified, characterised and prioritised.
This thesis focuses on identifying and analysing major CO_2 point sources in North Rhine-Westphalia (NRW) and/or Germany using public datasets (e.g., EU-ETS, PRTR). The analysis considers factors such as emission volumes, location, distance to potential CO_2 hubs or storage sites, and approximate costs for capture, transport, and storage. Key criteria for the evaluation include emission volumes, geographic location, proximity to potential CO_2 hubs or storage sites, and simplified cost estimates for capture, transport and storage. These criteria are combined in a simple and transparent scoring method to rank sources for early CCUS deployment.
The goal is to identify promising ("no-regret") CO_2 sources that could support future CO_2 infrastructure in Germany. Depending on the scope, sensitivity analyses (e.g., CO_2 price, transport cost, capture efficiency) can also be included.

Within this context, the thesis may address the following research questions:

- Which CO_2 point sources in NRW/Germany are most important in terms of emissions and location?
- How can technical, economic, and spatial factors be combined into a clear ranking approach?
- Which sources remain suitable under uncertainty (e.g., CO_2 price, transport distance, capture efficiency)?
- What do the results imply for future CO_2 transport and utilisation infrastructure?

The thesis is preferably written in English, as supervision is provided in English.

Requirements:

- **Content:** Interest in the energy transition, climate policy and industrial decarbonization
- **Methodological:** Basic skills in data analysis and interest in modelling or quantitative evaluation methods

Beginning:

Available immediately to interested students.

Contact person:

Further information is available on request by Samiul Huq.
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If you are interested, please send your application documents (CV, transcript of records) to the email address mentioned above.