The **Climate Finance and Policy (CFP) Group** offers a

Master project: Directions of innovation for the decarbonization of platform chemicals

Research field and tasks

The chemical industry contributes 5% to global greenhouse gas emissions as well as 4% to global GDP, and production volumes are expected to increase even further. To reach climate neutrality, the chemical industry has to reduce its own emissions and can enable other sectors in their transition by providing low-carbon platform chemicals. While many options to reduce emissions are not specific to the chemical industry (e.g., electrification of heat generation or carbon capture and storage), it is still unique in its heterogeneity of products and process routes, non-energy related process emissions, and the huge potential for circularity.

Despite the plethora of existing basic and applied technical research on the decarbonization of chemical production, a rigorous analysis allowing for high-level claims on the momentum of different and potentially competing decarbonization pathways is missing to date.

To address this gap, this project aims to distill key decarbonization options focusing on platform chemicals. The project's machine learning (ML)-based approach will structure existing research systematically and aims at also quantifying the relevance of the identified fields and associated decarbonization pathways.

Particularly, the student's task will include among others:

- Create a systematic mapping of academic research using a Python-based topic modelling approach described in [1] for different groups of platform chemicals, e.g., olefins building blocks, aromatics building blocks, methanol, ammonia [2], [3]
- Complement the existing topic modelling by other ML-based approaches, and validate their performance

Requirements

We are looking for an excellent student with an interest in climate change mitigation, industrial technologies and programming. We are open in terms of disciplinary background and master's program – (chemical) engineering, however, would be most obvious. Some experience with data analysis and Python programming is an asset. Fluency in English is required.

Conditions

The project will be part of NCCR Catalysis. The student will be primarily supervised by researchers from the Climate Finance and Policy (CFP) Group at D-GESS, but will also collaborate with members of the Advanced Catalysis Engineering (aCe) Group and Sustainable Process Systems Engineering Lab (SUPERLab) at D-CHAB. Remote work is possible to some extent. Ideally, the start would be around end of April 2024.

Your application

Your application documents should include a short letter of motivation that includes a description of the relevant experience (max. one page), a CV, and transcript of records (with grades). Please send your complete documents by e-mail to: Paul Tautorat (pault@ethz.ch). The review of applications will start immediately after publication of this ad and will continue until the position is filled.

References

[1] doi.org/10.1016/j.jclepro.2023.137055

[2] doi.org/10.1016/j.oneear.2023.05.006

[3] doi.org/10.1016/j.oneear.2021.04.001