Chair of Circular Economy and Sustainability Assessment
TUM Campus Straubing for Biotechnology and Sustainability
Technical University of Munich

Bachelor's or Master's Thesis:

Systematic Literature Review of the ECOMO Innovation Gates with focus on economic and environmental assessments

Background

The EU-funded project ECOMO (Electrobiocatalytic cascade for bulk reduction of CO2 to CO coupled to fermentative production of high-value diamine monomers) aims to develop innovative biotechnological pathways for converting carbon dioxide into valuable chemical products. The project explores three distinct Innovation Gates:

1. Gate 1: Electrobiocatalytic reduction of carbon dioxide to carbon monoxide
2. Gate 2: Microbial carbon monoxide conversion to acetate in a trickle bed reactor
3. Gate 3: Upgrading of acetate into diamines through microbial fermentation

To evaluate such an emerging pathway, Techno-Economic Assessment (TEA) and Life Cycle Assessment (LCA) are critical methodologies. TEA assesses the economic feasibility and scale-up potential, whereas LCA focuses on the environmental impacts across the value chain. Both methods are essential for guiding product development, implementation, and policy alignment of novel technologies.

Research Challenge

The central research challenge of this thesis is to investigate how TEA and LCA have been applied to the Innovation Gates of ECOMO and to explore the implications for future technological development. By systematically reviewing the existing literature, data, and policy documents, this work aims to address the research gap of evaluation approaches.

Your Tasks

- Review relevant EU legislation and policy documents to identify regulatory drivers and barriers affecting the development and deployment of novel chemical processes.
- Conduct a structured review of literature and statistics on TEA and LCA approaches applied to the Innovation Gates.
- Analyze methodologies by extracting key parameters, assumptions, and reported results
- Compare and critically assess differences, limitations, and gaps in the existing body of knowledge
- Provide recommendations for further research and methodological harmonization

Requirements

- Strong interest in reviewing scientific literature and analyzing statistical data
- Good knowledge of statistics is advantageous
- Being enrolled at SoM, SoLS, TUMCS
- High motivation and ability to work independently
- Capability to work target-oriented and reliably

Please send your application, covering a short motivation letter (max. 1 page), your CV and a transcript of records, to sarah.hasslacher@tum.de until **15.11.2025** the latest.
In case of any further questions, please use the contact information provided below.

Contact

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