Toulouse Biotechnology Institute
Bio & Chemical Engineering

Internship offer (Research, 6 months, Master 2 or equivalent)

Time-dependent characterization factors for climate change: status and recommandations

Background

The internship position is part of the INRAE Professor Chair on Sustainable Bioeconomy Transitions, led by Dr. Lorie Hamelin, and the Horizon Europe ALIGNED project (2022 - 2025), aiming to advance the scientific field of life cycle analysis (LCA) when applied to the bio-based sector, in close collaboration with representative of industries of five sectors, namely: construction, woodworking, textile, pulp & paper, and bio-based chemicals. The transition towards a sustainable economy is dependent on consistent and comparable environmental assessments of bio-based products. However, in practice today the methods to assess the impact of bio-based products give incomparable results, thus confusing decision-making. The models and tools developed in ALIGNED will allow to perform high-quality assessment studies across the bio-based sectors, with industrial relevance and interoperability. The main objective of the internship is to review, assess and compare the different time-dependent characterization factors and metrics to evaluate the potential climate change impacts when performing LCA.

Description

Despite its importance in guiding public policy making, there is still a lot of debate within the scientific community about how to quantify climate impacts, especially when it comes to products and services stemming from the bioeconomy. Such debate includes: how to quantify biogenic carbon and which characterization factors to use, how to address the time-dependency of emissions from bioeconomy products/services (especially relevant with bio-based products having long lifetime such as furniture, building, etc.), which metric to use (GWP, GTP, GWP*, CGTP), and more importantly, what are the implications of these choices.

With this research internship project, we propose to formulate recommendations for LCA practitioners and decision-makers on which indicators to use and when (that is, for which studied system) to avoid distortions in the evaluation of climate change impacts. First, a review of existing time-dependent climate change characterization factors will be performed, unravelling their key differences. Then, a panel of representative case studies from bio-based industries with different emission profiles will be selected (construction, energy, food and feed, etc.) to illustrate the influence on the climate change impacts metric chosen on the conclusions and recommendations stemming from it. A particular emphasis will be put on the comparability of the different metrics, their operationality (easy handling and incorporation in existing LCA calculation tools), and their context- or sector-dependent usefulness for decision-making, compared to, for example, static indicators. Tools and methodology to be mobilized are available within the team and involve access to scientific literature and LCA software (here, Brightway 2.0). Depending on selected candidate's affinity, the design and implementation of the different case studies, as well as the comparison of the different calculation methodologies can be elaborated through Python.

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Required qualification

- Being enrolled as a Master 2 student or equivalent (corresponds to a Master thesis project)
- Domains: Process or Environmental or Biochemical or Industrial engineering, or Agricultural science
- Willing to learn, proactivity, autonomy, rigor, curiosity
- Either proficiency in French and/or English (both not required)
- Python/R coding is an asset, but not mandatory, the same applies for previous LCA knowledge (theory and practice)

Application procedure

To apply, please submit your updated **CV and cover letter** describing your interests in, and fit for, the position to javourez@insa-toulouse.fr using in the subject line of your email: [Dynamic CF Intern Application – *your name*].

Applications will be reviewed on a rolling basis until the position is filled, but those received by **January 10th, 2024** will be guaranteed full consideration. Only short-listed applicants will be contacted.

Period:	**6 months, starting from 1st of March 2024 (or at latest 1st of April)**
Place:	**Toulouse Biotechnology Institute (TBI), INSA Toulouse, 135 Avenue de Rangueil, 31400 Toulouse**
Benefits:	**4.05€/h (35h/week). 50% of public transport fees refunded.** **Office equipment including a laptop is provided during the internship.**
Contact:	**Dr. Ugo Javourez (javourez@insa-toulouse.fr), Post-doctoral fellow in the team** **Main supervisor: Prof. Lorie Hamelin (hamelin@insa-toulouse.fr), lead scientist**

More about our Bioeconomy group

The research group is led by Prof. Lorie Hamelin, who holds the Professor Chair on Transition towards low fossil carbon awarded by the *French National Institute for Agriculture, Food and Environment* (INRAE). The group carries out research on Sustainable Bioeconomy Transitions at the *Department of Sustainable Process Engineering* of INSA Toulouse. Within our work, the environmental efficiency of >100 bioeconomy conversion pathways has been assessed towards the horizon 2050. The vision is to contribute to the most comprehensive and integrated bioeconomy strategy in Europe. A YouTube Channel of the group is available here. We are well acknowledged nationally and internationally, as reflected by our involvement in several large national projects related to bioeconomy (FairCarboN) or bio-based materials (B-BEST), as well as European projects (ALIGNED, LCA4BIO). Our postdocs, PhDs, visiting PhDs, and master students come from all over the World. This all provides a unique dynamic international and multi-disciplinary environment to carry out meaningful and frontier research experience.