PhD Position on developing Life Cycle Sustainability Assessment indicators for the bioeconomy

– An application to bio-based solvents –

Profile

The Life Cycle Group ‘CyVi’ at the Institute of Molecular Sciences (ISM), University of Bordeaux looks for a PhD candidate on Life Cycle Sustainability Assessment (LCSA) indicators for the bioeconomy, in particular to develop dynamic life cycle criticality assessment for the case of bio-based solvents in the context of a circular economy. The PhD candidate will work within a Nouvelle Aquitaine Region funded project (LICYDYN) led under the direct scientific responsibility of Maïder Saint Jean (GREThA) and Philippe Loubet (ISM). The thesis will be co-financed by the Region and ADEME (the French Agency for the Environment and Energy Management).

The thesis will be conducted under the supervision of Professor Guido Sonnemann, as the head of the CyVi Group, and co-supervised by Philippe Loubet and Maïder Saint Jean. The CyVi group is specialized in life cycle assessment (LCA) and related approaches for chemical substances and products. Key issues thereby are the application of sustainability assessment in the areas of chemical synthesis and material science, and the enhancement of related methodologies and data. Currently, the CyVi group consists of a full professor, an assistant professor, three postdoctoral researchers and eight PhD students, some of them in co-direction with other researchers. See http://www.ism.u-bordeaux.fr and http://cyvigroup.org/ for more information. The working place is at the University of Bordeaux, with potential stays abroad, in particular with project and collaboration partners. The University of Bordeaux is located in Talence, France, and easily accessible with public transportation.

Project context

The need to design an adequate metric for evaluating biomass sustainability has recently become a central issue to boost the bioeconomy’s development. The LICYDYN project, for which a PhD position will be created, aims at: 1) Identifying and combining key sustainability performance indicators based on environmental, resource and socio-economic criteria and allowing to assess the criticality of a project, product or sector for the bioeconomy; 2) Building an original agent-based model (ABM) including the interactions of demand and supply factors underlying substitution decisions but also able to address their dynamic changes over time and related impacts along the product life cycle. The LICYDYN project focuses on the case study of the green and bio-based solvents.

The PhD student will support the implementation of this project, initially focusing on point 1) i.e. the identification and development of key life cycle based sustainability indicators, including criticality aspects of raw materials, for green and bio-based solvents and making them dynamic working with other researchers (point 2) at a later stage. More particularly, this includes:

- Identification of relevant environmental indicators from life cycle assessment
- Identification of relevant socio-economic indicators
- Development of criticality indicators for bio-based raw materials including geopolitical dependency, the vulnerability linked to their economic importance and their substitution potential.
- Development of circularity indicators to be used in life cycle sustainability assessment for bio-based raw materials

This will be done with data found in the literature and from interest group interviews. The PhD student will also work closely with the other partners of the multidisciplinary LICYDYN project: chemists from IC2MP
(Poitiers) specialized in bio-based chemicals, LCA experts from INRAE (Montpellier) specialized in territorial LCA and LCA of bio-based materials and APESA (experts on circular economy in Nouvelle Aquitaine region). The PhD student will also work closely with other researchers of the project to integrate the indicators into an agent-based model (point 2 of the project).

Work assignments

- Take a crucial role in the scientific advancement of developing a dynamic biomass sustainability assessment in a challenging multi-years project that aims at integrating and further upscaling the development of an integrative and complex system-analytical method in the area of bio-based chemistry and bio-economy as well as life cycle assessment and criticality assessment.
- Carry out a literature review and interest group interviews of industry and other actors on the current state of business implementation and its uptake in sustainability assessment methods.
- Develop criticality and circularity indicators for industrial use within LCSA by developing a matrix of sustainability criteria for green and bio-based solvents, with a focus on the Nouvelle Aquitaine region and fully integrated and documented datasets.
- Develop a multi-metric approach relevant to the Green Chemistry community and expected to gain grounds in the near future, able to include resource and socio-economic impact criteria into the existing LCSA indicators framework.
- Work on LCSA with solvent producer and user companies to implement best practice and refine indicators according to business interests.
- Disseminate the results by publications in scientific journals and other means.
- If the PhD student is interested, the PhD position may include an educational component.

Requirements

- Knowledge and experience in sustainability assessment methods such as life cycle (sustainability) assessment, raw materials criticality or circularity assessment, with a Master diploma preferably in chemical process engineering, chemistry, economics in energy and environment or agronomy
- Interest in interdisciplinary high-level research on sustainability assessment methods
- Pleasure to get involved in the development of the research & innovation group on life cycle approaches for chemical products and materials with the possibility to contribute to the supervision of Master and Bachelor students
- Willingness to contribute to the management tasks of the research group and the project funding the PhD thesis, including event preparation
- Experience in modelling, using Python, MATLAB, R or another programming language and agent-based modelling software such as NetLogo, Swarm, or Laboratory Simulation Development platform, in particular for application to social and natural sciences is an asset
- Knowledge in innovation management, environmental economics, integrated resource management, sustainable value chains, eco-design is also a strength for the application
- Excellent English (French knowledge is of advantage)

Starting date: 1 October 2020 (3 years contract until October 2023)

Application

Deadline for application: 25 February 2020. Interested and highly motivated applicants should provide their application files (Motivation letter, CV, publication list and up to 3 potential referees with address, phone number and email) in electronic form in one pdf file, if possible, by the end of the deadline to:
- Guido Sonnemann (guido.sonnemann@u-bordeaux.fr)
- Philippe Loubet (philippe.loubet@u-bordeaux.fr)
- Maider Saint-jean (maider.saint-jean@u-bordeaux.fr)