Project title: Quantifying biodiversity impacts of bio-based systems

Project subtitle: Advancing Life cycle assessment methods

Department: Sustainable development
Research group: Energy & Resources
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Project description

A transition toward a bio-based economy, while essential for reducing fossil dependency, may result in environmental trade-offs. As the demand for bio-based products grows, competition for land to produce biomass feedstocks intensifies, placing higher pressures on ecosystems and biodiversity. Land-use and land-management changes (LUC and LMC) , driven by the production of feedstocks such as woody biomass, can influence biodiversity through, for example, changes in habitat extent or suitability and fragmentation.

Life Cycle Assessment (LCA) is a widely used tool to assess environmental impacts of products along (bio-based) value chains. Yet, current LCA approaches often rely on static, non-spatial input that fails to capture how LUC and LMC affect biodiversity. Existing biodiversity indicators in LCA include the Potentially Disappeared Fraction (PDF) of species, which determines potential loss of species due to environmental pressures including land use and climate change. The LANCA framework, on the other hand, focuses on land-use impacts on soil-related ecosystem functions, such as erosion resistance, filtration capacity, and groundwater recharge, providing valuable insights into land system functioning but only indirectly reflecting potential effects on biodiversity. Recent approaches (e.g., Global Guidance for Life Cycle Impact Assessment Indicators and Methods - GLAM) have advanced the inclusion of biodiversity impacts into LCA by introducing spatially explicit biodiversity characterization factors, which better capture regional differences in land-use-driven biodiversity impacts.

Activities of the MBA

The MBA is expected to explore how different biodiversity impact assessments in LCA capture the impact of land use and land management on biodiversity, focusing on bio-based value chains. Using a case study on a bio-based value chain, the study will compare existing biodiversity assessment approaches in LCA including PDF, LANCA fand GLAM, and identify limitations and potential for improvement.

This project is executed in the context of a large European project ESCIB: https://www.escib.eu/ The team of Utrecht university consists of several PhD, (assistant/ associate and full) professors.

Job requirements

- Some experience with Life Cycle Assessment, quantifying biodiversity impacts, GIS is a plus
- Some knowledge about the biobased economy
- High analytical qualities, highly motivated, can work independently, result oriented

Selected references for context:

1. https://doi.org/10.1007/s11367-021-02003-y
2. https://doi.org/10.1021/acs.est.3c04191?urlappend=%3Fref%3DPDF&jav=VoR&rel=cite-as
3. https://doi.org/10.1016/j.eiar.2023.107134