

JOB OFFER

Post-doc in agent-based modelling for Regional Land Planning Support

2-year post-doc position on agent-based modelling in integrated Life cycle modeling

We offer

In the framework of the funded FNRS PDR project “Life cycle and system thinking to support long-term regional land planning” (*Lisy plan*), we offer a **2 yr 80% FTE post-doc position** (or 21 month full time), held in the Université Libre de Bruxelles (ULB) (The francophone Free University of Brussels, Belgium), in collaboration with the Swiss Federal Institute of Technology in Zurich (ETH Zurich, hosting a 1 FTE PhD scholarship on the same project)- The project focuses on coupling agent-based modelling (ABM), Multi-regional Input output assessment (MRIO) and life cycle assessment (LCA) for dynamic modeling.

The aim of this project is to propose and develop a new integrated modelling framework to enhance the regional political decision support of land planning, i.e., life cycle and system thinking to support long-term regional land planning. The main focus of this project is on the agricultural sector. Providing society with multiple goods (e.g., food, feed, fibre, fuel) and services (e.g., regulating, supporting, and cultural services), the agricultural territory plays a critical role in the global transition towards the bioeconomy. For example, a low-carbon scenario of the Belgian agricultural sector foresees an increase in indigenous biomass-for-energy (by up to 30% more) and a reduction in meat production (by up to 43% less) by 2050 to achieve the target of GHG emission reduction. Achieving such a large-scale transition requires multi-level decisions, ranging from the regional government (e.g., planning and subsidies) to farmers' decisions (e.g., adopting a new (energy) crop). These decisions are connected in a complex system in which various factors make the future effects of planning uncertain and complex, and can cause multi-dimensional impacts concerning social, economic, and environmental aspects crossing various sectors over different regions, and might lead to land use expansion in biodiversity hotspot areas. The *Lisy plan* project tackles this issue by first developing a hybrid model that allows to **capture the dynamics of the complex systems while accounting for individual choices across the system over simulation time (i.e., ABM)**. The dynamic system is then assessed with the life cycle approach, i.e., assessing environmental and sustainability impacts raised from the products or services produced on the territory by tracing commodities throughout value chains that are embedded in global economy (i.e., territorial life cycle assessment (territorial LCA) and multi-regional input-output (MRIO)).

The post-doc will **lead the development of the ABM side of this hybrid model**, which will then be linked to territorial LCA and MRIO, developed by the collaborating PhD candidate at ETH Zurich, who started in Summer 2024. As such, the integrated model, linking ABM, LCA, and MRIO could help to (1) Understand how key components of the systems are interconnected over time. (2) Explore sustainability performances of alternative scenarios over time, which can foster dialogue and stakeholders' engagement during policy formulation.

The post-doc will be part of the research team of [Prof. Wouter Achten](#) (ULB). He or she will collaborate closely with a PhD student in the team of [Prof. Stephan Pfister](#) (ETH Zurich).

We look for

The ideal candidate

- holds a **PhD** (after defence) in Engineering, Computer science, Bio-science engineering, Environmental Science and Management, Environmental Engineering, Agricultural Sciences or any other project relevant domain, which was obtained since **max 3 years** before the starting date of this position.
- Strong background in agent-based modelling.
- Proficiency in Python or other programming languages.
- Demonstrated ability to work in interdisciplinary teams and engage with stakeholders.
- has knowledge on, or experience with **LCA** and system dynamics.
- has knowledge on **land-based/biological production systems** in general (e.g., agriculture, forestry, biomass production, etc.), and more specifically on biomass-for-energy systems.

Further, the candidate has strong analytical skills, has a quantitative reflex, can approach complex issues in a systematic way and has the capacity to work autonomously towards objectives and deadlines. The candidate should be fluent in written and spoken English, and have good communication (written and oral) skills and be able to work in group and guide junior researchers, specifically the PhD candidate at ETH Zurich linked to the *Lisy plan* project. Active knowledge of French is considered an added value, but not a prerequisite.

The post-doctoral researcher is further expected to be prepared to contribute to the further development and daily activities of the research group (e.g. contribute to building related project proposals, e.g. to extend the funding after 2 year of 0.8 FTE, follow up of project related master thesis and doctoral thesis students, participating in seminars, etc.).

Work environment

Founded in 1834, Université libre de Bruxelles (<http://www.ulb.ac.be>) has a long tradition of excellence in Research with four scientific Nobel Prizes, one Fields Medal, three Wolf Prizes and two Marie Curie Excellence Awards. It is one of the largest and best Research Universities in Belgium, with 40 undergraduate programmes and 250 graduate programmes, 6 Erasmus Mundus. It partners 20 Doctoral schools, with almost 1,600 PhD in progress. ULB has considerable experience with European funding programmes, and it has obtained 53 Grants (26 Starting, 13 Consolidator, 11 Advanced, 1 Synergy and 2 Proof of Concept Grants) from the European Research Area (ERC) over the past few years. It coordinates or takes part in a number of cooperative programmes funded as part of the European Union's framework programmes (Horizon Europe, Horizon 2020, FP7, etc.).

The research group of SOcio-eNvironmental dYnAmics (SONYA) (<https://sonya.sciences.ulb.be/>) is part of the Environmental Management and Land-use Institute (IGEAT) of the ULB Department for Geosciences, Environment and Society (DGES) (<https://sciences.ulb.be/departement-geosciences-environnement-et-societe>). It brings together different perspectives and disciplines to study the links between society and the environment. SONYA aims to contribute to empirical and fundamental research on socio-environmental dynamics in order to participate in a transformation towards a sustainable society through teaching and participation in societal debates. We use a wide range of methods (both quantitative and qualitative) and approach from a systemic and holistic perspective that combines the micro and the macro. Our research focuses in particular on environmental governance, transitions towards fair and sustainable societies, environmental mobilizations, land use planning, life cycle analysis, environmental impact, and ecological economics.

The research group around Prof. Wouter Achten (2 post-docs and 4 PhDs) focuses on life cycle thinking research and has activities on life cycle sustainability assessment, social LCA, Input-Output LCA, spatio-temporal LCA, land use and ecosystem services in LCA etc., and this in the context of food systems, waste management, circular economy and bio-based production systems. Prof. Stephan Pfister is the chair of the Ecological Systems Design Group at ETH Zurich. He and his team work extensively on regionalized LCA including water stress and land use related biodiversity loss impacts, MRIO, social LCA, optimization, and system dynamics.

Apply

For further information on the position or the research project you may contact Wouter Achten (wouter.achten@ulb.be). To apply, you should send

- a **motivation/cover letter** stating your motivation, and past experiences with which you can contribute to the project.
- an **extensive scientific curriculum vitae** (including list of publications, presentations, acquired funding, ...) and contact details of 3 references.
- a **full-text digital copy of your best scientific output** so far.

to wouter.achten@ulb.be no later than **August 22th, 2025**. Job interviews will be planned in the **second half of September**. The starting date: as fast as possible, but negotiable

Keywords

Land Use, Agent-based modelling; Life cycle thinking; Sustainability; agricultural production, dynamic models