

PhD Position

PhD - Reconsidering damage to ecosystem quality modelling in Life Cycle Assessment (LCA)

The French National Research Institute for Agriculture, Food, and Environment (INRAE) is a major player in research and innovation. It is a community of 12,000 people with 272 research, experimental research, and support units located in 18 regional centres throughout France. Internationally, INRAE is among the top research organisations in the agricultural and food sciences, plant and animal sciences, as well as in ecology and environmental science. It is the world's leading research organisation specialising in agriculture, food and the environment. INRAE's goal is to be a key player in the transitions necessary to address major global challenges. Faced with a growing world population, climate change, resource scarcity, and declining biodiversity, the Institute has a major role to play in building solutions and supporting the necessary acceleration of agricultural, food and environmental transitions.

MISSION & ACTIVITIES

Are you looking to contribute to addressing the challenges raised by the ecological transition and the preservation of biodiversity? Do you have a strong taste for science, the production of knowledge, the search for sustainable alternatives to our lifestyles, and the prospect of deriving meaning from it in order to support sound decision-making? Then this is the offer for you!

Human activities are the source of a significant amount of environmental damage. The erosion of biodiversity currently observed is the result of multiple pressures grouped together under five major drivers by the IPBES¹. Quantifying the causes and assessing their respective importance is essential if effective action is to be taken. Life Cycle Assessment (LCA) is the standardised and internationally recognised method for quantifying these environmental impacts. The impacts are assessed according to cause-effect chain modelling, linking an environmental flow (an emission of polluting substances or a consumption of natural resources) to changes in the natural environment (e.g. acidification or eutrophication of the environment) resulting in damage to one of the three areas of protection in LCA: i) human health, ii) ecosystem quality and iii) resources.

The results of different life cycle impact assessment (LCIA) methods converge in showing that the impacts of human activities on land use, climate change and ecotoxicity are the main drivers of biodiversity loss ([doi: 10.1007/s11367-023-02169-7](https://doi.org/10.1007/s11367-023-02169-7)). However, closer examination shows that their contribution may vary from one method to another, due to different coverage in terms of environmental flows and divergence in the modelling of biophysical mechanisms and the consideration of spatio-temporal dynamics.

Within this PhD thesis, you will aim to reconsider the way in which damage to ecosystem quality is quantified in LCA by adopting an "inverse" modelling approach. Taking as a starting point the work summarised by the IPBES, classifying the main factors of biodiversity loss, you will be revisiting the modelling of damage for a better representation of the quality of ecosystems in LCA.

Your PhD research will allow analysis of the convergences and divergences between LCIA methods, and to propose a framework for assessing damage to ecosystem quality that is consistent with the IPBES findings. Particular attention will be paid to spatio-temporal aspects and to illustrating the work with practical cases.

¹ The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services

TRAINING and SKILLS

- Recommended training: Master or Engineering degree in environmental science
- Knowledge required in several of the following areas: environmental assessment methods, LCA, ecology, data processing and basic statistical analysis, programming tools (R, Python), Geographical Information System (GIS)
- Skills sought: organising, autonomy, interest in interdisciplinary work
- Excellent written and spoken English required (French not a prerequisite)

WORK ENVIRONMENT

You will be based in the ITAP research unit (joint INRAE - Institut Agro, Montpellier unit), on the offices of the Institut Agro de Montpellier (10 minutes by bike from the city centre and railway station), with the possibility of remote working up to 3 days a week.

The PhD will be supervised by Arnaud Hélias and Eléonore Loiseau (UMR ITAP). This PhD is part of the LCA-TASE project under the PEPR TASE programme (Advanced Technologies for Energy Systems), which brings together various academic partners (INRAE, BRGM, IFP Energies nouvelles, Mines ParisTech, ENSAM, CEA, CNRS, INP Bordeaux).

INRAE 's LIFE QUALITY

By joining our teams, you benefit from (depending on the type of contract and its duration):

- up to 30 days of annual leave + 15 days "Reduction of Working Time" (for a full time);
- [parenting support](#): CESU childcare, leisure services;
- skills development systems: [training, career advise](#);
- [social support](#): advice and listening, social assistance and loans;
- [holiday and leisure services](#): holiday vouchers, accommodation at preferential rates;
- [sports and cultural activities](#);
- collective catering.


↳ Terms and conditions

- Research unit: UMR ITAP
- Location: Montpellier
- Contract: PhD position
- Duration: 36 months
- Beginning: Autumn 2024
- Remuneration: 2,100€ gross monthly

↳ How to apply

Send a CV and motivation letter to:
Eléonore Loiseau & Arnaud Hélias

 **By e-mail** : eleonore.loiseau@inrae.fr & arnaud.helias@inrae.fr

 Application deadline: **21/06/2024**