

Job opportunity - 18 months post-doctoral position TBI-INSA Toulouse

Understanding trajectories for nitrogen treatment and recovery in the framework of the new urban wastewater treatment directive

- **Context**

This 18-month postdoctoral position is dedicated to actor networks analysis, with the aim to understand the impact of the new institutional urban wastewater treatment directive (EU 2024) on the future strategies of actors for wastewater nitrogen treatment and recovery.

This position is part of the Red-SuN project: Sustainable Nitrogen management under the Revised directive on urban wastewater treatment, funded in the Water4All Joint Call 2024 “Circular economy” (2026-2028).

- **The Red-SuN project**

The limitations of current urban wastewater treatment systems to solve nitrogen issues are becoming increasingly apparent. Whereas nitrogen and phosphorus removal are costly and impactful in terms of green house gas, there is a growing need to provide nutrients for agriculture. In this context, more circularity in the management of nitrogen and phosphorus from domestic wastewater should be considered.

In this regard, the revised directive on urban wastewater treatment imposes new objectives for improving the quality of rejected water with simultaneous objective of zero-net energy demand, as well as incentive for nutrient recovery. As a consequence, the water sector should adapt their operational management and infrastructures in the following decades. However, regarding the list of new constraints, conflicting objectives could appear and make it difficult to find the more sustainable strategies for stakeholders. In addition, the initial regional situations are highly heterogeneous among Europe and this could make diverse the routes to reach a more sustainable management for nitrogen resource and pollution. Wastewater derived nitrogen fertilizers could be produced by either side stream (sludge) technologies, mainstream techniques, or source separation approaches. Choosing between

solutions so as to meet the revised EU directive will require the development of new assessment tools that combine multiple criteria and provide both innovative and sustainable technical solutions.

The objective of the Red-SuN project is to foster innovative and sustainable routes for nitrogen removal and recovery from wastewater within the European revised urban wastewater treatment directive. Red-SuN involves a wide range of partners (research laboratories, local authorities and utilities) from four European countries: Belgium, France, Finland, and Poland. The partners will make a benchmark of sustainable techniques for nitrogen removal and recovery from wastewater. The project aims to develop and validate a methodology to select the best solutions to be drawn up, in order to upgrade or redesign existing facilities, with a particular focus on identifying when, how and to what extent nitrogen recovery is both economically, environmentally and socially viable. The criteria to be included in the evaluation as well as the identification of the relevant case studies will be established in strong collaboration with stakeholders, i.e., water authorities and utilities.

- **Working environment**

The position will be located in France at [TBI](#) (INSA of Toulouse). You will work with Tanguy Fardet (complex systems scientist) and Mathieu Sperandio (Professor in wastewater engineering) in a multidisciplinary team with people from various disciplines related to wastewater and waste management in a circular bioeconomy context.

- **Research objectives and activities**

This work aims at developing a better understanding of the implementation of innovation trajectories for nitrogen recovery from both research and stakeholder perspectives.

Work will be based on literature analysis, workshops, interviews and surveys with a circle of stakeholders (utilities, regulators, users) to understand their perspectives and concerns on the use of wastewater-derived nitrogen recovery routes. The first emerging questions are:

- What are the obstacles and driving forces currently facing institutional and operational actors in the development of N recovery?
- Opinions regarding wastewater derived fertilizers and new supply chains? (market vs local)
- How does prospective scenario modelling can help in their decision?
- Which information and new indicators can be developed to support decision?

Regarding these questions, a methodological framework for assessing transitions through socio-technical configuration analysis (STCA) could be used. The post-doc will coordinate interactions between partners in a work package of the Red-SuN project. One goal is to provide an actionable overview and understanding of the current socio-technical configurations surrounding the selected case-studies helping the emergence of solutions adapted to each context.

- **Training and required skills**

- PhD in environmental studies with a background in social sciences (qualitative sociological studies, semi-structured interviews, textual data analysis).
- Interest in collaborative methods and familiarity with interdisciplinary setting
- Basic skills in social network analysis or computational social sciences are required, advanced skills will be considered a bonus.
- Fluency in English

- **Relevant literature**

Heiberg J., B. Truffer, and C. Binz. 2022. Assessing transitions through socio-technical configuration analysis – a methodological framework and a case study in the water sector. *Research Policy*, vol. 51, no. 1, p. 104363

Śniatała, B., Al-Hazmi, H.E., Sobotka, D., Zhai, J., Mąkinia, J. 2024. Advancing sustainable wastewater management: A comprehensive review of nutrient recovery products and their applications. *Sci. Total Environ.* 173446.

Starck, T., Fardet, T., Esculier, F., 2024. Fate of nitrogen in French human excreta: Current waste and agronomic opportunities for the future, *Science of The Total Environment*, 912:168978.

- **Remuneration**

Remuneration based on the INSA's current pay scale and experience.

- **Research unit**

TBI (Toulouse Biotechnology Institute, Bio & Chemical Engineering) INSA/CNRS/INRAE

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INSA holds the Human Resource Excellence in Research award (EURAXESS).

<https://euraxess.ec.europa.eu/hrexcellenceaward>

- **Contacts**

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Candidates should send us their C.V., a summary of their thesis, and a cover letter.

- Deadline for applying: 30th June 2026
- Starting date: September 2026