

Willing to experience intersectoral, interdisciplinary and/or international research? Apply with Centrale Nantes to the MSCA Postdoctoral fellowship 2025 call for proposals and join us!

Project description

Supervisor: Yasamin ESLAMI / Thomas CORRE

Topic open: Investigating the Sustainability Impacts of Under Development Recycling Process Innovations and Transition to a Circular Economy

Background and Rationale

The recycling industry is undergoing significant transformation with the development of advanced processes that promise enhanced efficiency and sustainability. Notably, emerging methods avoid traditional liquid-state recycling, which is energy-intensive and prone to material loss, by leveraging innovative approaches to recover materials in solid or near-solid states. These advancements have the potential to revolutionize industrial applications by reducing energy consumption and minimizing waste. However, despite the promise of such technologies, there is a critical lack of comprehensive studies assessing their sustainability impacts. Understanding how these processes affect economic viability, environmental health, and social outcomes (the three pillars of sustainability) is essential to ensure their successful integration into industry and their alignment with circular economy principles.

This proposal aims to address these gaps by developing a systematic approach to model and evaluate the sustainability performance of novel recycling technologies. A case study of the aluminum sector, a mature and well-established industry, will provide a practical context for testing and validating the proposed framework.

Objectives

1. **Sustainability Assessment Framework:** Design a methodology to evaluate the environmental, economic, and social impacts of under development advanced recycling processes, emphasizing their role in fostering a circular economy.
2. **Case Study Application:** Apply the framework to assess the aluminum industry's transition to advanced-to-be-developed recycling technologies, focusing on energy savings, material recovery rates, and sectoral resilience.
3. **Scenario Analysis and Modelling:** Create and analyze various deployment scenarios to understand the broader implications of adopting these technologies, including potential trade-offs and synergies.
4. **Policy and Industry Recommendations:** Provide actionable insights for policymakers and industry stakeholders to facilitate informed decision-making and promote sustainable practices.

Research Approach

The project will employ a multi-method approach:

1. **Literature Review:** Conduct a comprehensive review of existing studies on recycling technologies, sustainability assessment methods, and circular economy models to identify gaps and best practices.
2. **Framework Development:** Build a robust framework incorporating life-cycle assessment (LCA), cost-benefit analysis, and social impact metrics to holistically evaluate recycling processes to be developed.
3. **Case Study Analysis:** Utilize the aluminum sector as a case study, collecting primary and secondary data on material flows, energy consumption, and production costs. The maturity of the aluminum industry provides a reliable baseline for evaluating innovations.

- Validation and Stakeholder Engagement: Validate the framework through expert consultations and workshops with industry stakeholders

Expected Outcomes

- A validated sustainability assessment framework adaptable to different sectors.
- Detailed insights into the aluminum industry's transition to advanced recycling methods.
- Policy and strategic recommendations for fostering a circular economy.
- Contribution to academic literature addressing gaps in sustainability assessments of recycling innovations.

Impact

This project will significantly advance understanding of how innovative recycling processes can contribute to sustainability. By providing a case-specific analysis and a generalizable framework, it will guide industries in making data-driven decisions to adopt sustainable practices, reduce their environmental footprint, and enhance resource efficiency in line with circular economy goals.

Conclusion

The proposed research will fill critical gaps in understanding the sustainability impacts of recycling process innovations. By focusing on the aluminum industry as a case study, it will provide a model for other sectors to assess and optimize their transition to circular economy practices, fostering a more sustainable and resilient industrial ecosystem.

Call information

Organisation	Ecole Centrale Nantes
Researcher Profile	R1 – First stage researcher or R2 – Recognised researcher
Country	France
Application deadline	31 March 2025
Type of contract	Temporary
Job status	Full-time
Hours per week	39
Offer starting date (estimated)	1 Apr 2026
Is the job funded through the EU Research Framework Programme?	Horizon Europe – MSCA European Postdoctoral Fellowship

Research environment

Centrale Nantes is a top-ranked institution recognized internationally for its excellence in research and education, particularly in engineering and technology. It is known for its leadership in fields such as **marine engineering**, **civil engineering**, and **mechanical engineering**, frequently appearing in the upper echelons of global rankings. For example, it ranks **125th worldwide in Mechanical Engineering** according to the **QS World University Rankings by Subject 2024**, reflecting its prominence in this area.

Additionally, Centrale Nantes is positioned in the **top 300 globally for Engineering**, and in the **top 500 for Physical and Computer Sciences** in the **Times Higher Education World University Rankings by Subject 2024**, highlighting its multidisciplinary strength.

Notably, Centrale Nantes was named **the top institution in France in the "Engineering Schools to Change the World"** ranking, compiled by **Les Echos START and ChangeNOW**, which evaluates schools based on their contributions to social and ecological transitions. This ranking showcases its dedication to sustainability and innovative solutions to global challenges.

Centrale Nantes' research extends beyond traditional engineering disciplines. It is recognized for pioneering work in **artificial intelligence** and **robotics**, often ranking among the **top 100 worldwide** in these fields. Its **computational mechanics** and **hydrodynamics** research centers are considered among the best in Europe, further cementing its status as a leader in cutting-edge scientific research.

Through strong global partnerships and innovative initiatives, Centrale Nantes continues to enhance its reputation as a world-class institution in scientific and technological research, with a strong focus on sustainability and impactful solutions for societal challenges.

Please take look at our institution before submitting your application: <https://www.ec-nantes.fr/>

Profile required

Eligibility criteria - Specific Requirements

- **You are a First-stage or an Experienced Researcher** eg. in possession of a doctoral degree at the time of the call deadline (10th Sept 2025) and a maximum of 8 years full-time equivalent experience in research (self-assessment tool [here](#)).
- **You comply with the mobility rule:** eg. you must not have resided or carried out your main activity (work, studies, etc.) in France for more than 12 months in the 36 months immediately before the call deadline (September 10th, 2025). All nationalities welcome!
- **You want to carry out an innovative research:** only the best proposals will be selected by the European Commission. All domains of research are eligible!
- **You already have great achievements in research:** Curriculum Vitae is an important criterion of MSCA application.

Conditions of employment

Duration	12 to 24 months
Salary	Around €6 000 (fully loaded cost of employment) per month Exact salary to be published in the MSCA PF call in April 2025.
Support to mobility and family	mobility allowance (€ 710 per month) + family allowance (€ 660 per month) if applicable - both allowances are fully loaded cost of employment
Secondment	An interdisciplinary and/or intersectoral mobility (3 months up to 1/3 of fellowship) is possible when relevant
Additional benefits:	- Teleworking possible - 75% transport reimbursement - Sustainable mobility bonus (if cycling or car-pooling)

Selection process

How to apply to MSCA Postdoctoral Fellowship with Centrale Nantes:

Step 1: Find a supervisor at Centrale Nantes (application before March 31st, 2025)

- *Select a pre-determined topic.* You apply in **English** to one or two research subject(s) provided by supervisors (please see table 2 below) :
 - Detailed Curriculum Vitae (including list of publications);
 - A concise statement of research's relevance to the selected topic/duration, along with a detailed proposal outlining your project idea for the MSCA Postdoctoral Fellowship;
 - Contact information of two references (not mandatory, recommended).

Please apply by sending your application to pauline.rouaud@ec-nantes.fr and yolaine.lebeau@ec-nantes.fr before **March 31st, 2025**. Please always include both contacts so that your request can be processed as quickly as possible.

If your application is retained (feedback at the latest: end of April 2025), then, the next step is to apply jointly to the MSCA PF (call launched by the European Commission - HORIZON-MSCA-2025-PF-01-01).

Step 2: Prepare the application to the MSCA PF

April-May 2025

- You receive an informative MSCA-PF starter package via an online meeting with advice on institutional aspects and horizontal issues (open science, gender, ethics and research data management...) - fellow + supervisors + EU project managers
- You elaborate jointly the research approach with your supervisor(s) (April 2025)

June 2025

- One joint meeting in Nantes. You receive a dedicated training session "Preparing for an Horizon Europe MSCA Postdoctoral Fellowship" advice on how to write your proposal - fellow + supervisors + EU project managers

July-August 2025

- Online meeting for proofreading - fellow + supervisors + EU project managers

September 2025

- Online meeting for administrative support for your MSCA PF application - fellow + supervisors + EU project managers
- We apply for you (deadline for the application: September 10th, 2025)

Please read this page to understand how MSCA PF works: <https://marie-sklodowska-curie-actions.ec.europa.eu/actions/postdoctoral-fellowships/6-steps-to-prepare-your-application>

Centrale Nantes is committed to equality and diversity. In line with our CSR commitments, this call is open to all.