Proposal PhD fellowship in Economics

Keywords: Circular Economy, Recycling, Innovation adoption, Cost-Benefit Analysis, Environmental valuation, Critical metal.

Profile and competencies

The candidate will have a strong interest in the assessment of environmental impacts and on innovations in the field recycling activities. The candidate should have demonstrated skills in economic theory and modeling: s/he should have excellent academic qualifications. Interdisciplinary experience or prior experience in resource or recycling economics would be appreciated.

Proposal's context

The PhD student will be integrated in the PhD Program of Aix-Marseille School of Economics (https://www.amse-aixmarseille.fr/en/study/phd/phd-program), tailored for talented and passionate students.

The PhD will take place in the interdisciplinary RECALL (Sustainable RECovery of vALuable metaLs in bauxite residue, https://www.cerege.fr/fr/nos-projets/recall) project, a program funded by the ANR (Agence Nationale de la Recherche) which bring together several academic and non-academic partners: CEREGE[1] AMSE[2] , ICSM[3], HYMAG'IN[4] and ALTEO[5]. The aim of the RECALL project is to selectively recover critical metals and to valorize the iron in bauxite residues with the overall goal of reducing the pressure on natural mineral resources. A shortage of these materials could be a potential bottleneck to the deployment of a number of strategic technologies including electronic and renewable energies that contain a large number of critical metals including Rare Earth Elements (REEs).

To reduce the environmental footprint of the extractions, this interdisciplinary project will develop two sustainable processes as an alternative to traditional pyro- and hydrometallurgy processes and will value the economic impact of this technological change in terms of social welfare in which potential environmental and health impacts will be considered.

Based on the circular economy approach, the goal of the RECALL project is therefore to design a sustainable process of valorization of an industrial waste that will globally outcompete traditional approaches thank to better consideration of social well-being.

The AMSE PhD student will work in interaction with (and benefit from) another PhD fellow (Amidex - Aix-Marseille University foundation) started in June 2020 and working on the extraction of critical metals from bauxite residue at CEREGE.

[1] (https://www.cerege.fr/en)
[2] https://www.amse-aixmarseille.fr/en
[3] https://www.icsm.fr/
[4] https://www.hymagin.com/
[5] https://www.alteo-alumina.com/

PhD Missions

This PhD will be at the heart of the economic part of the project.

First, social well-being will be considered, that includes the externalities associated with the process (e.g. environmental and health impacts) and other sources of economic inefficiency (e.g. technological and economic uncertainties) that have an impact on welfare at the aggregate level. The PhD student will have to identify and model social welfare variations using new processes compared to traditional ones. The valuation of expected variations of social well-being associated with the adoption of these new processes will provide crucial information for entrepreneurs, policy makers and citizens.

The second task of the PhD Student will be devoted to the analysis of the economic conditions that will favor the adoption of the new technologies through a prospective analysis. Thus, the maturity of technologies will be studied to determine acceptable risk levels for society linked to technological, economic, and environmental changes. PhD student will be in charge to develop retroaction loops between "technological" and "economic" efficiency in a Social Cost Benefit Analysis (SCBA) approach. Beyond the previous two market failures that focus on consumer's and citizen's well-being, it must pay attention to governmental regulatory and fiscal actions. Geopolitical risks could be considered as well.

Because in the case of critical metals, the development of the proposed technologies will probably have a significant impact on relative prices, it will be deal with large-scale project evaluation methods and focus on technological uncertainty to determine a break point (or break interval) when the decision to adopt the new technology can be reversed for private firms or for policy makers. The impacts on the social welfare of different types of risks and uncertainties related to technological, economic, and environmental changes must be explored. To this end, a socioeconomic assessment method based on technology readiness assessment (TRA) using the Technology Readiness Levels (TRL) will be developed.

References

- Aghion, P.; Howitt, P., Growth with Quality-Improving Innovations: An Integrated Framework. In *Handbook of Economic Growth*, Elsevier.
- Bandarian, R., Evaluation of Commercial Potential of a New Technology at the Early Stage of Development with Fuzzy Logic', *Journal of Technology Management & innovation* **2007,** 2, (4), 73-85
- Florio, M.; Forte, S., et al. *Technological Forecasting and Social Change* **2016,** 112, 38-53.
- *GAO (US. Government Accountability Office), Technology Readiness Assessment Guide, Best Practices for Evaluating the Readiness of Technology for Use in Acquisition Programs and Projects. GAO-20-48G*; 2020.
- Johansson, P.-O.; Kriström, B., *Cost–Benefit Analysis*. Cambridge University Press: Cambridge, 2018.
- Wattage, P.; Smith, A., et al. *Impact Assessment and Project Appraisal* **2000,** 18, (1), 5-14.

Admission criteria

Applicants must hold a master's degree in economics with a solid theoretical background and quantitative and statistic techniques training.

How to apply?

The full application package must be sent as PDF files to the AMSE PhD secretariat:
Bernadette Vouriot : **bernadette.vouriot@univ-amu.fr**

- The subject of the mail must be "**YOUR_NAME_RECALL_AMSE PhD Application**".

The full application package must contain the following documents:

1. Letter of application.
2. A detailed CV.
3. A letter of motivation that highlights the adequacy between the applicant's background and the RECALL project as well as the ability of the applicant to integrate and contribute to the interdisciplinary team.
4. Detailed bachelor-and master-level grades (including official grades for the ongoing academic year, which can be sent directly to *the AMSE PhD program secretariat*, by the applicants' institution); Detailed transcript are required for student from foreign institution.
5. **The first four items must be included in a single PDF file, following the order given above.** The name of the zip file must be *"**YOUR_NAME_RECALL_application.pdf**"*.
6. Master dissertation (or equivalent research work). *The name of the master dissertation file must be "YOUR_NAME_RECALL_Master dissertation.pdf".*
7. At least two reference letters (from references who do not belong to AMSE), which must be sent directly and confidentially to Dominique AMI (dominique.ami@univ-amu.fr) and Frédéric RYCHEN (frederic.rychen@univ-amu.fr).

Recruitment calendar

- **Application deadline:** 8 September 8 2021, at 12:00 (noon, Paris time)
- **Interview for pre-selected candidates:** September 20 to September 30.
- **Decision:** October 1. (Because some applicants may decline a scholarship, it is possible that some applicants receive their notification of selection a week after the publication of results)
- **Contract start date:** as close as possible to the final decision and before January 1st, 2022.

Contacts

- ***Supervisors:*** Dominique AMI (dominique.ami@univ-amu.fr)
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- ***AMSE PhD program Secretary***: Bernadette Vouriot
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  Phone: +33 (0)4 13 55 25 83

General information

- Scholarship value: around 1,770 € (monthly gross salary)
- Expenses: applicants will pay the annual tuition fee (around 500 €).
- Tenure of award: 3 years.