

# Sustainability of strategic metals for the energy transition

## Context and problem

The energy transition necessary to reach carbon neutrality generates an ever-increasing demand for specific metals. Canada's underground is particularly rich in critical and strategic metals (CSM), but the socioeconomic and environmental impacts as well as the management of the social acceptability of mining projects are currently poorly understood and mastered. The objective of the project is to improve our understanding of future sustainability issues around the development of the CSM's sector in Canada and around the world. Specifically, the project aims first to assess the demand in strategic metals for Canada's net-zero transition based on its technology deployment choices. Then, we want to estimate Canada's ability to answer the global demand as well as its own, and potential barriers to develop these capacities, in order to estimate the socio-economic and environmental risks and opportunities for the country of different metal exploitation strategies. The project aims to improve understanding of the social, economic and environmental impacts of the extraction and consumption of strategic mineral resources for Canada and around the world. This understanding will ultimately fuel debates around policy orientations and mining practices' excellence in terms of sustainability and social acceptability of mining, providing recommendations to minimize adverse effects and maximize benefits for this sector towards net-zero.

## Description of the positions

### Postdoctoral fellowship « Sustainability & CSM »: assessing the holistic sustainability of the production scenarios of CSM for Canada, and worldwide burden-shifting

This 24-month (negotiable) postdoctoral project consists of: (1) exploring net-zero and decarbonization scenarios and existing CSM demands in Canada and around the world (2) evaluating the socio-economic and environmental impacts of CSM production scenarios responding to the main net-zero scenarios in Canada, (3) producing recommendations in support of (a) public policies relating to the development of the mining sector in Canada as well as (b) the mining industry to stimulate sustainable production practices of excellence, (4) coordinating the various CIRAIG projects on CSMs and organizing two seminars to communicate the work carried out for the Canadian public.

The skills and areas of expertise ideally sought are as follows: data analysis, prospective analysis, energy systems and metals, industrial ecology, public policies, coordination and project management.

### Postdoctoral fellowship « EEIO & CSM »: analyzing the environmental impact of critical and strategic metals (CMS) by refining their representation in input-output models with environmental extensions (EEIO)

This postdoctoral position, over a period of 12 months (24 months negotiable with a project extension), consists of: (1) disaggregating the strategic metals necessary for the transition towards Canada's carbon neutrality in EXIOBASE, to subsequently compare the environmental profile of CSMs extracted in Canada versus elsewhere, and quantify the environmental consequences of several types of supply for Canada; (2) disaggregating CSM in the open-access Canadian tool OpenIO-Canada and make the tool more reliable for multi-criteria environmental assessments of Canadian consumptions and economic productions.

The skills and qualifications ideally sought are as follows: industrial ecology (EEIO, LCA, MFA), optimization and programming, knowledge of the mining sector (asset).

## Supervision and conditions

Supervision : the project is supervised by:

- Anne de Bortoli, Ph.D., M.Sc., M.Eng.: postdoctoral fellow at CIRAIG, Polytechnique Montréal, research affiliate at Ecole des Ponts ParisTech, [anne.debortoli@polymtl.ca](mailto:anne.debortoli@polymtl.ca)
- Guillaume Majeau-Bettez, Ph.D., M.Sc.: Professor at Polytechnique Montréal, CIRAIG, [guillaume.majeau-bettez@polymtl.ca](mailto:guillaume.majeau-bettez@polymtl.ca)

Location : CIRAIG, Polytechnique Montreal, 3333 Queen Mary Road, Montreal, Canada.

Period: the project will start in September 2023

## Application

Interested candidates can send their application, including a CV and a cover letter to [anne.debortoli@polymtl.ca](mailto:anne.debortoli@polymtl.ca) and [guillaume.majeau-bettez@polymtl.ca](mailto:guillaume.majeau-bettez@polymtl.ca). Applications will be considered in chronological order and recruitment remains open until positions are filled.

## Equity, diversity and inclusion

We welcome and encourage applications from racialized persons/visible minorities, women, Indigenous persons, persons with disabilities, ethnic minorities, and persons of minority sexual orientations and gender identities, as well as from all qualified candidates with the skills and knowledge to engage productively with diverse communities.

## About CIRAIG

Established in 2001, the International Reference Center for Life Cycle Assessment and Sustainable Transition (CIRAIG) is recognized worldwide for its work and initiatives built on a solid scientific foundation. CIRAIG supports industries, governments, organizations, and consumers in their transition to a sustainable society supported by a scientific approach. Its research and expert services focus on the development and implementation of knowledge and tools related to life cycle assessment, both environmental and social, the circular economy, the analysis of trajectories towards carbon neutrality and the analysis of complex systems to inform decision-making. CIRAIG's main research unit is the International Research Consortium on Life Cycle Assessment and Sustainable Transition, which brings together the expertise of two universities in Montreal, Canada - Polytechnique Montreal and UQÀM -, as well as HES-SO and EPFL in Switzerland. CIRAIG is also a very friendly, inclusive research group which offers a very supportive environment to excel in your research, and an active community which offers many team building and extra professional activities. More info: <https://ciraig.org/>