CALL FOR APPLICATIONS

Research project – Assessing the environmental impacts of deployment scenarios for electric vehicle charging facilities in Montreal using LCA

Context and problem

The world faces a severe triple planetary crisis: climate change, biodiversity loss, and pollution. Transportation plays a significant role in exacerbating the triple planetary crisis, as it is a major contributor to greenhouse gas emissions, pollution, landscape fragmentation, and the loss of habitats. Consequently, there is a growing body of literature focusing on mobility and its environmental implications. The electrification of vehicles is viewed as a promising technological solution to achieve road mobility carbon neutrality by mid-century. But the lack of charging facilities has shown to be a major brake to electric vehicle (EV) adoption. Thus, the density of chargers on the territory, but also their respective charging speed, impact the adoption of the different EV technologies by households and organizations, as well as user travel routes and more generally travel patterns. Building these charging infrastructures, replacing internal combustion engine vehicles (ICEV) by EV, and modifying travel patterns, modify the environmental performance of the transportation system, and modeling these impacts requires coupling different tools. On the environmental assessment side, life cycle assessment (LCA) of electric mobility has gained considerable attention, but most studies fail to consider charging infrastructure within their system boundaries, or their understanding of the life-cycle impact of charging facilities is extremely limited, and they systematically fail at understanding the link between charging facilities and EV penetration. The objective of our study is to fill this gap.

Description of the project and tasks

To reach the objective of the project, the following tasks will be conducted:

- Critical Literature Review on LCAs of Charging Infrastructure
- Development of an LCI Database on Charging Infrastructure in the Montreal Context
- Recommendations on Developing a Similar Database for French Contexts
- Adaptation of Existing LCIs for EVs and Internal Combustion Engine Vehicles (ICEVs) in Montreal
- Calculation of Environmental Impacts according to scenarios of infrastructure deployment generated in a parallel project in Prof. Ciari's team
- Analysis of Potential Burden-Shifting with the LCA tool

Deliverables

- A detailed descriptive report on the tasks conducted (word format)
- A presentation of the study at CIRAIG and potentially to industrial partner(s) (ppt format)
- Modeling files (XLS, codes, etc.)
- Participation to the preparation of a scientific article, with co-authorship of the intern, if applicable

Supervision and conditions

Supervision: the project is supervised by:

- Dr. Anne de Bortoli: research associate at CIRAIG, Polytechnique Montréal, invited researcher at Ecole des Ponts ParisTech. **anne.debortoli@polymtl.ca**
- Prof. Francesco Ciari: Professor at Polytechnique Montreal, Department of mining and civil engineering. **francesco.ciari@polymtl.ca**

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

Internship grant: 1750$/month

Duration: 6 months

Application: Interested students must send an application file including a CV, a transcript (bachelor and master) and a cover letter to **anne.debortoli@polymtl.ca** and **francesco.ciari@polymtl.ca**. Applications will be reviewed in chronological order and positions remain open until suitable candidates are found.

Skills and qualification

Qualification implies having taken an advanced LCA course, as well as a good level in English.

Desired skills of the applicants are as follows:

- Life cycle assessment
- Literature review
- Data analysis
- Ability to hierarchize information and summarize
- Rigor
- Ability to work in team

Following knowledge are an asset, by order of importance:

- Python coding