Life Cycle Assessment of the future telescope AtLAST

Name of supervisor(s)
Associate Professor, Marianne Zeyringer, Energy systems modeller
Postdoc research fellow, Guillermo Valenzuela, Energy system modeller
Postdoctoral research fellow, Paola Velasco Herrejón, Social Scientist.

Preferred background of the candidate:
Anyone with a background in environmental science, materials science, physics, or from the Faculty of Mathematics and Natural Science. Experience with LCA databases (e.g., Ecoinvent, GaBI) is a plus but not required.

Number of available projects
This is a project for two students.

Preferred project period
Part-time May-October

Brief abstract
The Atacama Large Aperture Submillimeter Telescope (AtLAST) is a planned astronomical facility to be located in the Antofagasta region, Chile. This new telescope will revolutionise the study of a wide range of astrophysical objects through its next-generation 50-meter class single-dish astronomical observatory powered by a renewable energy system. From the beginning, AtLAST has aimed to incorporate sustainability, starting with the design of a renewable energy system for the telescope and the exploration of energy solutions that involve local communities. For the former in particular, AtLAST explored different energy scenarios from a techno-economic perspective and subsequently incorporated environmental aspects (greenhouse gas emissions, water use, and material resource depletion) through a Life Cycle Assessment (LCA) associated with this system. Although the inclusion of the LCA was a key element in evaluating the AtLAST energy system from a sustainability perspective, its scope did not consider the entire research facility (telescope and supporting infrastructures). In the new phase of this project, we aim to study the long-term sustainability of the research infrastructure, including its full life cycle.

Expected outcomes/deliverables
In the project, you will work with your supervisors and other researchers involved in the project to collect an inventory of the impacts related to the entire astronomical facility. Additionally, students will review relevant literature and databases of similar LCA projects.
Expected deliverables that students will contribute to:

1. Literature review on the LCA methodology, relevant case studies, recommended impact categories, and databases.
2. Comprehensive inventory of materials, energy, water, operational flow, and end-of-life assumptions for the complete facility.
3. Calculation of LCA, considering some impact indicators (e.g., Global Warming Potential, Water Use, Resource Depletion) for the system.
4. Brief report, considering the most relevant results and future works.