

Evaluating Upfront Embodied Emissions in Building Construction – A Case Study Using LCA

The environmental assessment of building projects has traditionally focused on operational energy. However, a significant share of total carbon emissions occurs upfront, during the construction stage (A1, raw material supply; A2, transportation of raw materials; A3, manufacturing of product; A4, transportation to the construction site; and A5, construction and installation process). These emissions are immediately released into the atmosphere and therefore highly relevant to short-term climate mitigation targets. Despite their importance, upfront embodied emissions are less studied in practice.

This thesis will evaluate the upfront embodied emissions of a selected building project by conducting a Life Cycle Assessment (LCA). The study will identify major contributors among materials and processes and provide a quantitative overview of their environmental impact. The results will be contextualized with relevant benchmarks and literature to highlight the magnitude of upfront emissions in relation to whole-life building performance.

The thesis can be carried out using LCA software tools such as OneClickLCA, OpenLCA, or Excel-based models.

Main Tasks

1. Introduction to the concept of upfront embodied emissions and their significance for climate targets.
2. Selection and documentation of a suitable building case study (residential or non-residential).
3. Collection of material quantities, construction process data, and background information.
4. Implementation of a Life Cycle Assessment (LCA) focusing on modules A1–A5.
5. Evaluation of Global Warming Potential (GWP) and other selected environmental impact categories.
6. Identification of emission hotspots in materials and processes.
7. Contextualization of results with relevant literature and benchmarks.

Details

- Start: Available immediately
- Level: Bachelor or Master (scope to be defined with student)
- Supervisor/Contact: Dr. Ali Amiri
Email: ali.amiri@tu-darmstadt.de (Or: ali.amiri@aalto.fi)
Phone: 06151 16-21382 (Or: +358 403211200)

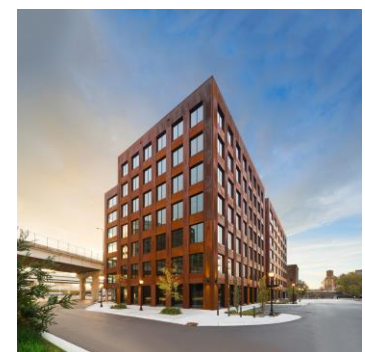
Institut für Konstruktives Gestalten
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Prof. Stefan Schäfer



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