



Professur Nachhaltiges Bauen
Univ.-Prof. Dipl.-Ing. Dr.techn. MSc
Alexander Passer

Technikerstraße 4/4
8010 Graz

Tel.: +43 316 873-5250
alexander.passer@tugraz.at
nhb.tugraz.at

UID: ATU 574 77 929

MSc Thesis - “Design vs. Reality in comparison: Life Cycle Assessment of buildings from concept to construction”

Background and goal

The building sector is responsible for around 40% of global greenhouse gas emissions. Assessing the methodological differences in life cycle assessment (LCA) is necessary to accelerate and expand the sector's transition to net zero carbon (WLC). The aim of the master thesis is to close the gap between theoretical and actual environmental impacts of buildings. Using an LCA approach, the study analyzes real buildings as case studies to compare the predicted environmental impacts calculated during the design phase with those measured in the “as-built” phase to reveal discrepancies and potential areas of improvement. This master's thesis offers collaboration with architects and engineers through a 6-month internship in Vienna.

Tasks

- Review current LCA-based tools and methods used in the construction industry (Scale, Madaster and LCANALYSE etc.).
- Create life cycle inventories (LCI) of real buildings at the early design, building permit and “as-built” detailed levels.
- Impact assessment and interpretation of results, analysis of differences in tools, methods, databases, scopes and levels of detail.
- It is strongly recommended to complete the following TU Graz courses at the Institute of Structural Design (1400):
 - 206.556 Sustainability assessment in structural engineering
 - 206.555 Life Cycle Assessment - Life Cycle Assessment
 - 219.254 Software-based structural modeling

Collaboration with the Building Group einszueins architektur ZT GmbH (Gleis21 project):

- Project website: <https://www.einszueins.at/project/baugruppe-hauptbahnhof-gleis-21/> (calculation, design, submission and execution) New European Bauhaus award.
- The project was to be modeled and LCA calculations were to be carried out with Scale, Madaster and LCANALYSE in the three phases: Design, Submission and As Built.
- 6-month paid internship at the Building Group in Vienna:
 - 3 months focusing on the Master's thesis
 - 3 months with focus on the work in the architectural office

Desired qualifications:

- Interest in sustainable construction
- Structured and independent way of working
- Experience with ArchiCAD
- Fluency in English and/or German
- Experience with Python, R (optional)
- General knowledge of life cycle assessment (optional)

Recommended as:

- Master's thesis for civil engineers, architects and environmental engineers

Organizational:

- **Start:** November 2024
- **Scholarship:** at least € 2.500,- for the successful completion of the Master's thesis.
- **Contact:** Alexander Passer (alexander.passer@tugraz.at +43 316 873 5250), Carlos Enrique Caballero Guereca (carlos.caballero@tugraz.at +43 316 873 5255)
- **Supervision:** Arbeitsgruppe Nachhaltiges Bauen am Institut für Tragwerksplanung.
- **Einszueins architektur:** <https://www.einszueins.at/>

If you are interested, please send a **one-page letter of motivation and CV** to the Institute of Structural Design at TU Graz, Technikerstraße 4/IV, 8010 Graz, office.nh@tugraz.at (Sonja Senekowitsch, cc Alexander Passer and Carlos Caballero) by October 1, 2024.



Photos by Herta Hurnaus