

LCA and BIM in early design

24.09.2026 Construction City – BIM meets LCA

Who are we?

Patricia Schneider-Marin, Architect, PHD

- Associate Professor in Life Cycle Assessments and Material Use in Architecture
- Department of Architecture and Technology
- Faculty of Architecture and Design
- Head of program:

MSc in Sustainable Architecture

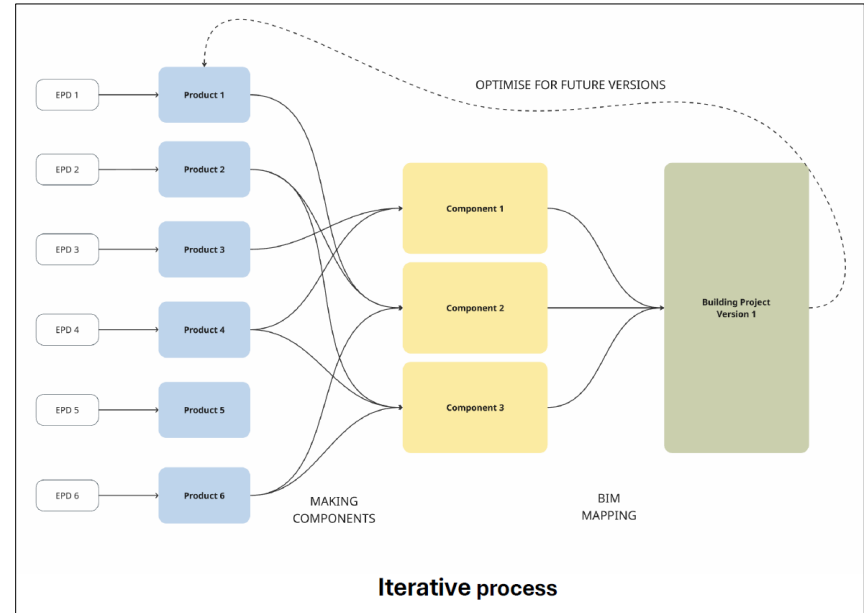
- 2-year international master's program
- for Architects and Engineers
- focus on science based sustainable design
- Systematic teaching of digital and hands-on tools for design support



Photo by Disha Arora, Scientific Assistant in Sustainable Architecture, NTNU

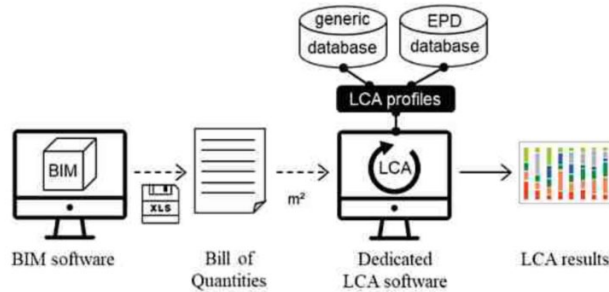
Emissions as Design Drivers

- **Theory unit** teaches LCA and developments in research and practice about zero emission / climate positive building
- Studio course «**Circular Studio**»: Students work in teams with their respective specialization on the **transformation of an existing building**
- Emissions as Design Drivers students design and calculate **greenhouse gas (GHG) emissions** and **material flows**
- Systematic use of a **central BIM model** in the process

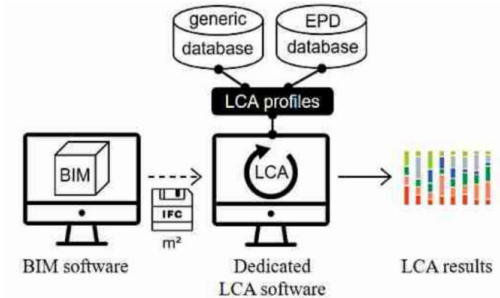


Process diagram by Disha Arora, Scientific Assistant in Sustainable Architecture, NTNU

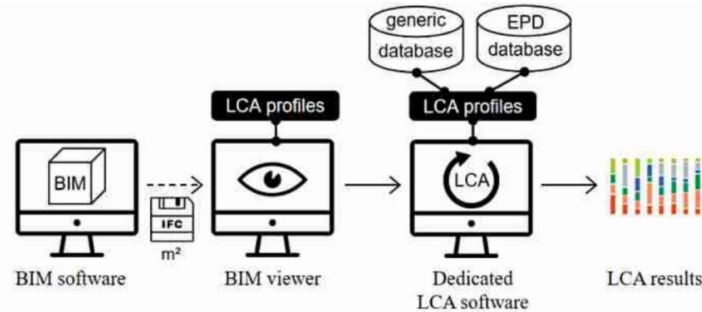
BIM2LCA integration



1 Bill of quantities (BoQ)
2022 / 2023



2 (IFC) import
2024



3 LCA profiles associated with geometry
2025 / 2026

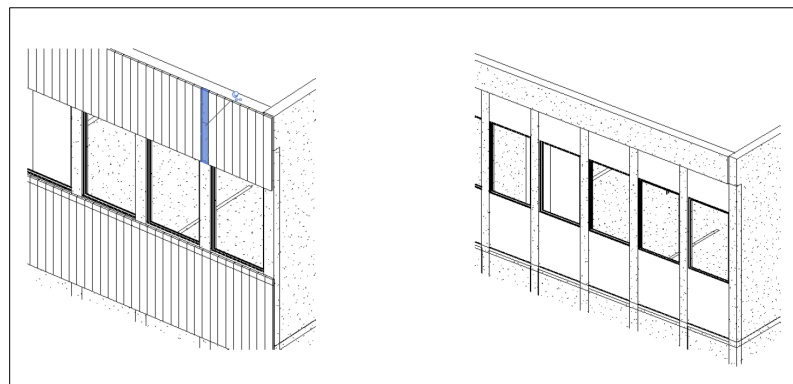
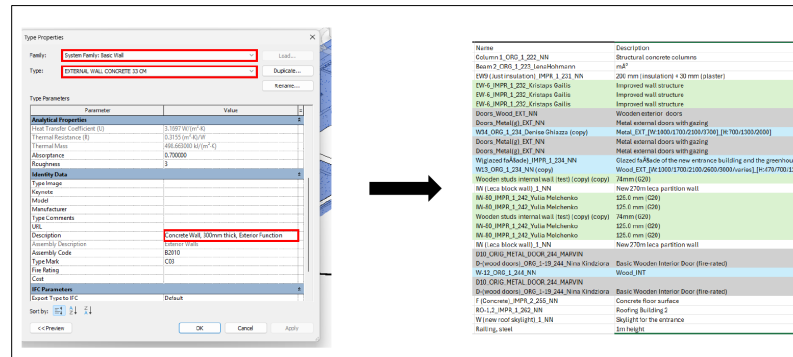
Wastiels, L.; Decuyper, R. (2019): Identification and comparison of LCA-BIM integration strategies. In: IOP Conference Series: Earth and Environmental Science 323 (2019). SUSTAINABLE BUILT ENVIRONMENT CONFERENCE 2019 (SBE19 Graz), Bd. 323, S. 12101.

Central BIM model

- **Revit model** of the existing building is assembled by the whole class.
- Each student focuses on **one component type** (e.g., windows, interior walls, etc.).
- Model management crucial for **collaboration**

Challenges:

- Incomplete and uncertain data on **existing building** and materials contained in it
- Historic building materials have to be **approximated** by today's EPD
- Alignment of **units / quantities** Revit and Reduzer



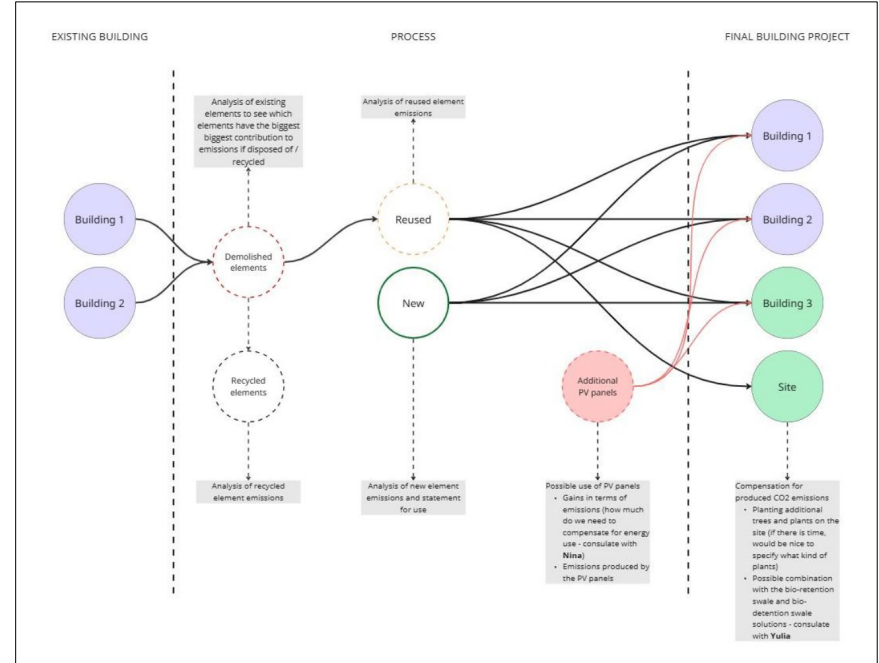
Illustrations by Kristaps Gailis, MSc Sustainable Architecture

BIM model – connection to Reduzer

- Each student team copies the BIM model and reconnects to Reduzer
- Proposed changes by each design team generated in BIM for **variant evaluation**

Helpful features and processes:

- **Phasing** in Revit
- **Average data** from EPDs for material / element types
- **Export** of schedules and data for further processing



Process diagram by Kristaps Gailis, MSc Sustainable Architecture

GHG emissions reduction process



	Foundation	Load-bearing systems	External walls	Internal walls	Slabs	Roof
MASS:	759.46 t	34.47 t	368.04 t	153.7 t	1147.04 t	702.86 t
GWP:	6.2 %	0.6 %	16.6 %	10.1 %	30.4 %	36.1 %

Figure 16



	Foundation	Load-bearing systems	External walls	Internal walls	Slabs	Roof
MASS:	759.46 t	24.58 t	358.04 t	153.7 t	376 t	1215.56 t
GWP:	10.4 %	1.0 %	28 %	16.9 %	15.2 %	28.6 %

Figure 17

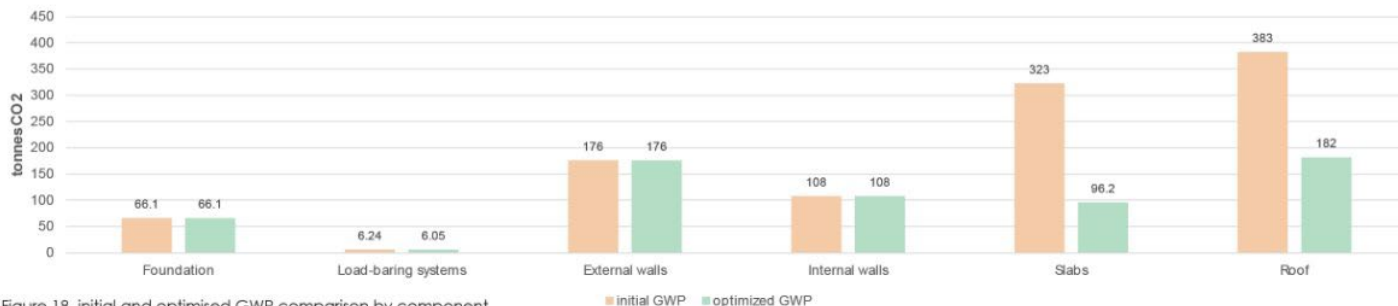
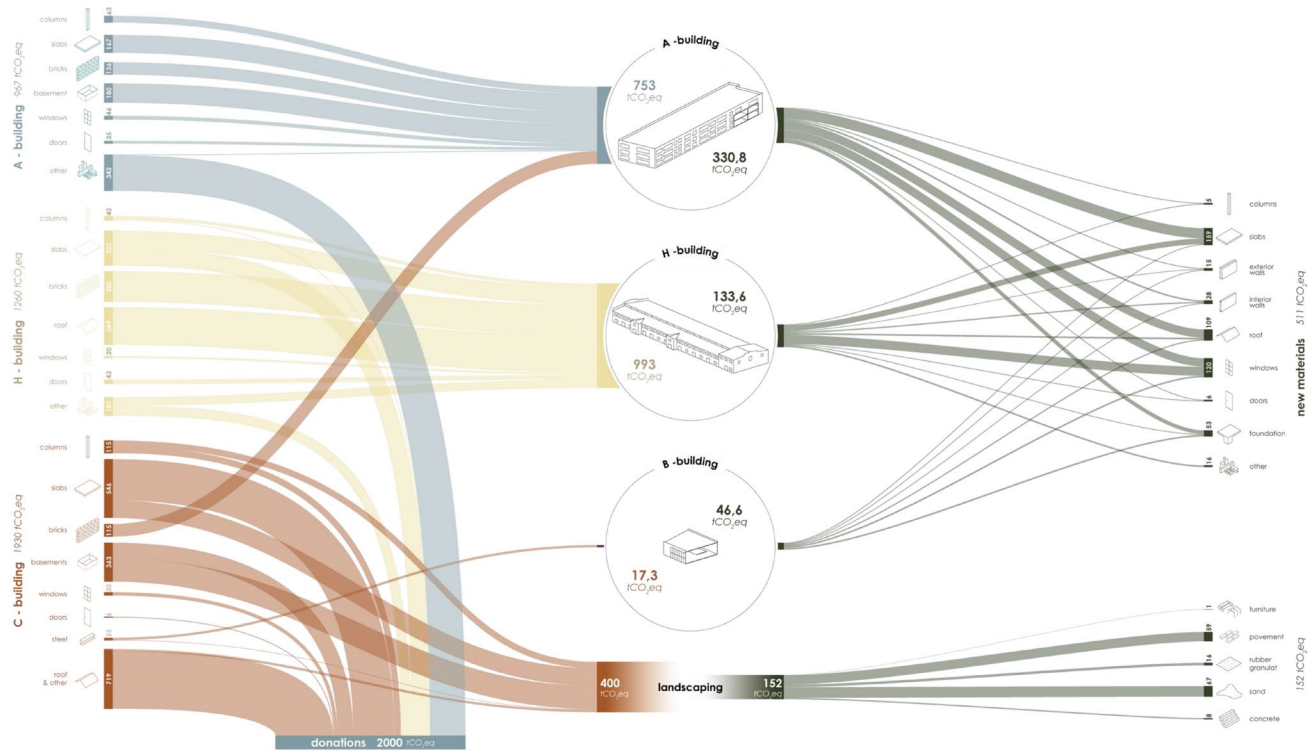


Figure 18, initial and optimised GWP comparison by component

Emissions as design drivers spring 2023: Miriam K. Kolstad, Alberto S. Montagut, Nikoo Hamidi, Krzysiek Michalik

Material flows



Emissions as design drivers spring 2023: Jaap Asmussen, Jennifer Behrendsen, Gina Ringnes, Magdalena Ryszkowska, Nel Visser

Thank you!

