

A circularity evaluation framework for office buildings design in Belgium

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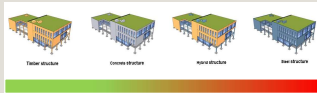


OVERVIEW OF THE PROJECT

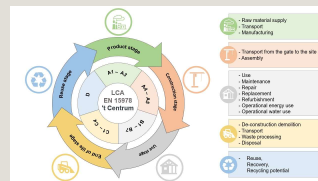
Circular building design is a concept that is gaining great interest from architects, construction professionals, and their clients but is still rarely adopted in practice. One of the earliest design decisions architects and developers should make to design a circular building is to determine the building's construction system and materials. In this project, a circularity evaluation framework will be developed to set an audit sheet including criteria to help the designers to choose the material and construction systems to build circular and carbon-neutral projects in the early design stages.

1. ABSTRACT

The project focuses on developing an evaluation framework that ends with an audit sheet to guide architects during the design stages towards the circular design paradigm and empower Belgian architects to embrace and integrate the principles of circular design in an innovative way in their design practice by adopting the circular design criteria that the project focuses on. This project facilitates the leadership towards the European sustainability targets and sets the foundation for future development in education, research, and practice within a new paradigm and for knowledge know-how in relation to the circular economy. The research expected outcome visualizations will be an electronic audit sheet which is setting standards of circular building design for scientific researchers, students, and architects.



2. PROBLEM STATEMENT



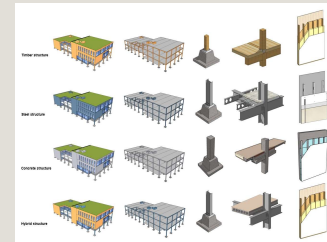
There is no clear evaluation framework to support architects when designing buildings within a circular paradigm so far, there are problems related to:

- Tedious calculation of material quantities (average 3 weeks for a mid-size project 2000 m²)
- Cumbersome use of Life Cycle Assessment software for materials.
- Complicated evaluation workflow of building materials selection.

3. RESEARCH QUESTIONS

The main research questions are:

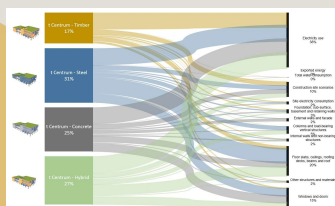
- How to evaluate circular building construction during early design stages from a life cycle thinking approach?
- How to design energy-efficient and material-efficient buildings?
- How to inform designers about the impact of circular structures and the impact of circular materials choices?



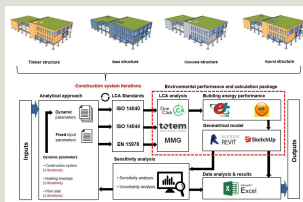
4. OBJECTIVES

This project aims to:

- Close the knowledge gap in the practical application of circular design in general.
- Inform architects and building materials manufacturers of the potential of circular design.
- Development of an evaluation framework for circular design.
- Providing an overview and recommendations for circular building design in Belgium.



5. METHODOLOGY



In this PhD, literature review, case study analysis, quantitative research (energy performance simulation, LCC, and LCA), qualitative research (interviews, workshops), and research by design are the main research methods. The evaluation framework of circular design that will be developed within this PhD will be used to evaluate the circularity of the projects. The evaluation framework will be applied to case study projects to know to what extent these projects are circular and carbon neutral through the life cycle assessment according to EN 15978, ISO 14040, and ISO 14044 standards.

6. RESULTS

- Quantitative and qualitative circularity criteria for building design during early design stages.
- Develop an audit protocol to evaluate the circular buildings in collaboration with the ISSO committee in The Netherlands.
- Participating in The Belgian Building Research Institute (BBRI) to develop the Belgian national standards BBRI/E35001 "Circular Economy in the Construction Sector".

