

TOWARDS A SEMI-AUTOMATED ASSESSMENT OF RENOVATION SCENARIOS FOR RESIDENTIAL BUILDINGS

The case of post-war Walloons detached houses

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Abstract

The construction sector is responsible for around 40% of the global GreenHouse Gas (GHG) emissions. This makes it a critical sector for reaching the 2050 climate neutrality target of the Paris Agreement. In Europe however, the building stock consists mostly of buildings that are reaching the end of their primary life cycle and need to be renovated.

Renovating a building is an opportunity to decrease its operational energy demand, which is directly linked to the emission of GHG. This improvement comes at the cost of high performance materials, whose production emits more GHG. The optimal solutions to this trade-off depends largely of the type of building studied.

This project aims to study the life cycle GHG emissions of Belgian residential buildings built between 1950 and 1970, to which a panel of different renovation strategies is applied. This PhD is part of the Dynamic Renowave project, that additionally aims to involve time-dependent variations in the electricity mix and the climate.

The expected outcomes of this project are a parametric approach for the Life Cycle Assessment (LCA) of renovated buildings, a database of renovation scenarios with their associated GHG emissions, and guidelines for the renovation of the studied building archetypes.

Methodology

The approach used relies on a panel of building archetypes that are parametrised to generate variants. The parameters used are the constructive systems, the materials used to execute them, and the building systems (eg. HVAC). Renovation strategies are applied to the initial situations generated to create renovation scenarios by combining different renovation measures. The types of measure considered are the installation of thermal insulation and the improvement of the building systems. Then, a LCA is performed on each renovation scenario defined. The results obtained undergo a sensitivity analysis to evaluate the influence of each parameter.

