DS²BE
Doctoral Seminars on Sustainability Research in the Built Environment

Dynamic Renowave

Dynamic energy simulation of building renovation strategies

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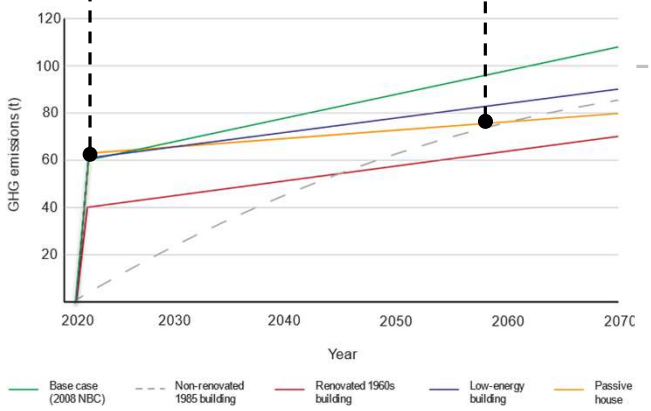
PROBLEM STATEMENT

Need for a **life-cycle approach**

GHG emission spike

High level of **uncertainty** of renovation scenarios



OBJECTIVES

A **parametric** and **dynamic** life cycle assessment **model** for residential buildings' retrofitting that **couples** embodied and operational GHG emissions

Data-driven parametrisation and simulation of **renovation scenarios**

A **dataset** of different renovation scenarios for residential buildings

A series of **case studies** to validate the model

Apartment | Single-family house | Row house

What is the optimal renovation scenario for residential buildings, considering its economic, thermal comfort and life cycle environmental impacts?

How to choose the most appropriate refurbishment strategy according to the location and the building type?

METHODOLOGY

1. Characterisation and Parametrisation of Study Variables
2. Devising Renovation Scenarios
3. Elaboration of the Dynamic Energy Model
4. Creation of the integrated decision-support system
5. Validation and demonstration of the decision-support system through case studies
6. Dissemination

Researchers (e.g., IEA 89); Future professionals; Government, Municipalities, Regulatory bodies; Homeowners and House tenants.

ORIGINALITY

Including **multiple parameters** in the model: climatic conditions, building geometry, materials and construction systems, envelope and systems performance, onsite renewable energy sources and energy mix.

Including **time** in the model, to compare single step and stepwise renovation, and consider the variation in climate and energy mix scenario, the replacement with more energy-efficient systems and biobased insulation materials.

Coupling Life Cycle Assessment (**LCA**) and Building Performance Simulation (**BPS**).
Introducing **bottom-up** and **top-down** approaches.

The effectiveness of the renovation strategies will be evaluated using **three indicators**:
Operational energy [(kWh/m^2)/year], GHG emissions (E+O) [(kgCO_2eq/m^2)/year], Cost [€/m^2]

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