Developing two benchmark models for post-world war Belgian residential buildings

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ABSTRACT

The aim of this study is to develop an energy performance data set and two building performance simulation benchmark models for post-world war II residential buildings in Belgium. The study presents the results of a field survey of detached houses built between 1945 and 1990. An analysis of energy consumption was also carried out for the period of occupation 2015-2019. Two building performance simulation models are created in EnergyPlus and the energy performance of these models is determined. The validity of the estimate is checked against public statistics, actual consumption data and owners' bills.

KEYWORDS

reference building, field survey, residential building, energy efficiency, energy consumption, simulation models

PROBLEME

The Belgian residential sector is composed of 75% of dwellings built before the 1980s, energy-efficient housing. Combined with climate change and the inevitable decrease in fossil fuels, there is a real need to reduce energy consumption in the residential sector, which also has great potential for renovation.

OBJECTIVE/HYPOTHESIS

- **Develop renovation strategies for building built between 1945-1990 in Belgium**
- Select more than 1000 Belgian free-standing houses built between 1945-1990 in Belgium
- Carry out field surveys on a national scale to collect data from the 1000 houses selected
- Develop a database including the data of 1000 houses
- Develop an energy performance data set and two building performance simulation benchmark models with Energy Plus
- Validate the model by comparing the results obtained with real consumptions and public statistics

AUDIENCE

Confederation construction in Belgium, Walloon, Flanders, Brussels-Capital Regions, Scientifics, Building owners

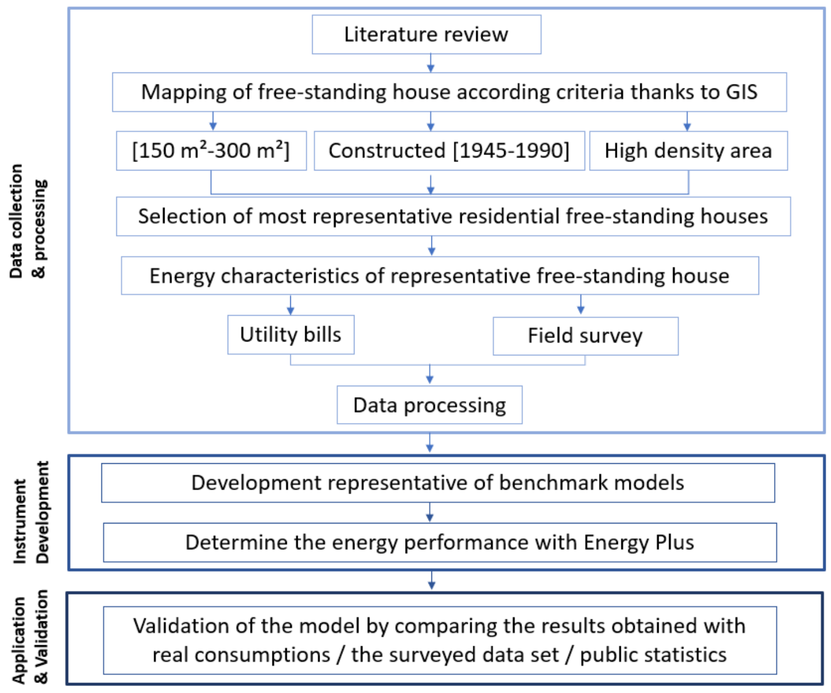
RESEARCH PROBLEM

Is there a real potential for renovating Belgian houses built between 1945 and 1990 that would allow a significant reduction in their energy consumption?

ORIGINALITY

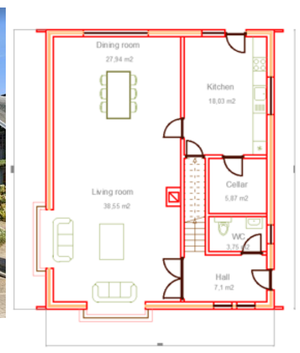
- This work aims to combine the occupant's behavior and the building characteristics deeply to create a representative model
- The research wasn’t investigated before in Belgium on a sample at the national level (more than 1000 houses)
- The study is based on real behaviour and not on a statistical study, involvement of the occupants

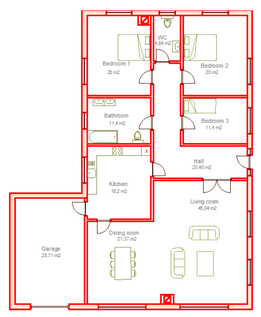
METHODOLOGY



RESULTS

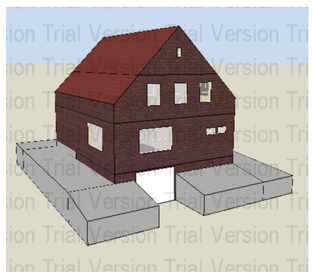
- Selection of the reference model and plans made with Autocad





Typologie A **Typologie B**

- Development representative of benchmark model with Design Builder



- Results:

Typology A	Gaz consumption	Electricity consumption
Monitoring data	147,75 KWh/m²/year	16,76 KWh/m²/year
Simulation data	150,05 KWh/m²/year	17,22 KWh/m²/year

Typology B	Gaz consumption	Electricity consumption
Monitoring data	137,14 KWh/m²/year	16,85 KWh/m²/year
Simulation data	136,99 KWh/m²/year	16,32 KWh/m²/year

CONCLUSION

- The study allowed to determine the energy behaviour of Belgian free-standing houses built between 1945 and 1990, taking into account the habits of the occupants and the characteristics of the building.
- The study shows that there is great potential for renovating post-war houses to increase the energy efficiency of the building. These are often buildings with very little insulation.

RESSOURCES

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