



Characterization of the building energy performance of post-World War II residential buildings

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ABSTRACT

In the context of the European carbon neutrality targets, the residential sector is one of the key issues for consuming less. CO₂ emissions from this sector represented 32% of Belgium's total emissions in 2019. Indeed, houses built before the entry into force of the first environmental standards constitute a major stake to meet our commitments.

KEYWORDS

Belgian residential sector, Energy use profiles, Reference Building, Energy performance

PROBLEM

Most of the buildings in Belgium were built between the end of World War II and 1990. But these buildings show high energy consumption. Thus, these types of buildings are the best candidates for future renovation programs in order to reduce energy consumption.

OBJECTIVE / HYPOTHESIS

The goals of the Study are to characterize representative building energy data sets and benchmark models for the Belgian residential sector and evaluate future nearly zero-energy target's energy efficiency.

AUDIENCE

This project is intended for construction engineers, architectural engineers, project managers, and researchers in these fields. It is also intended for the authorities who oversee issuing building permits, in Wallonia: the department DG04.

This project is studied for renovation companies, real estate companies, and owners of the building. In our case, mainly families who can occupy these buildings.

RESEARCH QUESTION

How to develop a standardized dataset that can allow us to characterize those buildings?

What are the building performance characteristics of post-World War II residential buildings in Belgium?

What are the occupancy type and profiles?

ORIGINALITY

This study has not been done on these archetypes of buildings in Belgium.

This study creates descriptive statistical descriptions of buildings' envelopes and systems to predict future emissions.

This project presents the relationship between occupancy profile and energy use for these archetypes.

METHODOLOGY

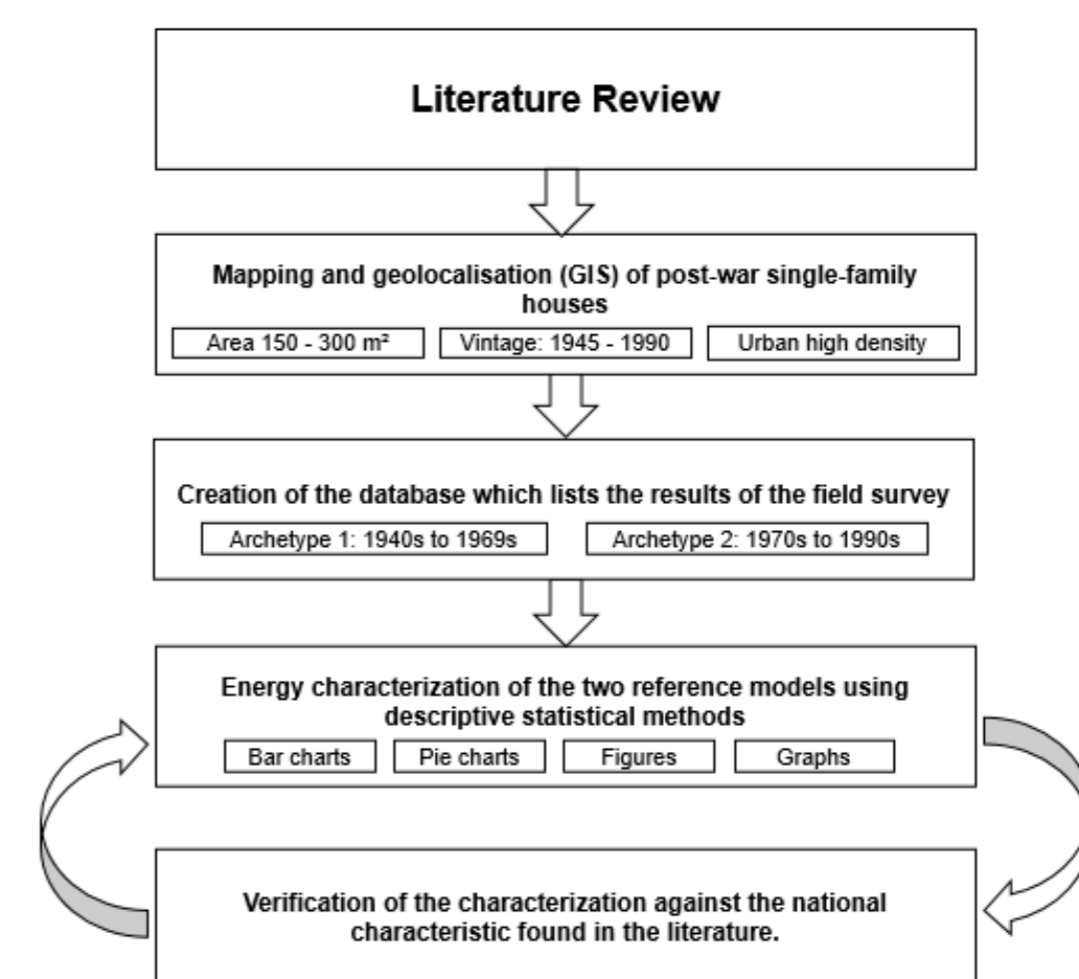
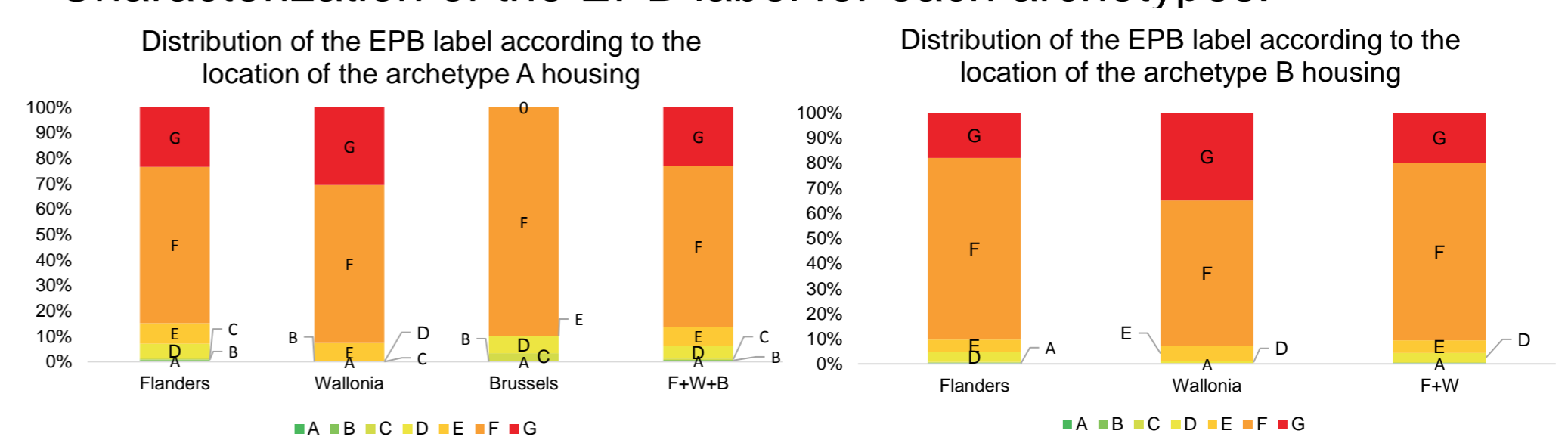


Fig 1: Conceptual framework for the study methodology

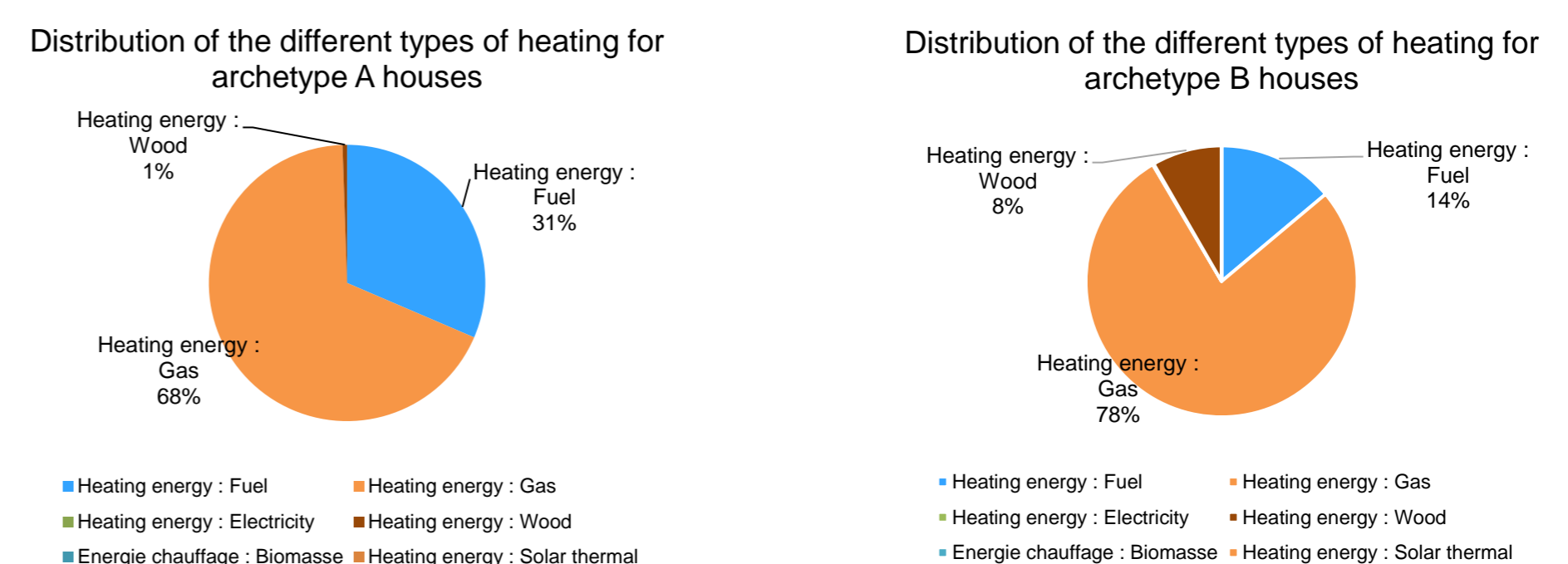
RESULTS

- Characterization of the EPB label for each archetypes:



Most of the houses in our study are classified as F or G, which means that these houses consume at least 331 kWh/m² per year and per inhabitant. These low performances make them serious candidates for renovation to respect the objectives of CO₂ emission reduction.

- Characterization of the type of heating used by each archetypes:



Historically, fuel was used in Belgium for heating and DHW, so it seems logical that this heating method is still used. Most of the houses using fuel oil either F or G, which shows that this method is too old to meet the environmental commitments that Belgium has set itself.

CONCLUSION

This study analyzes the created database and describes the energy use and energy consumption of the two archetypes. It also characterizes the behavior and the comfort of the residents.

This study also shows the poor performance of these buildings and the necessity to renovate them.

Resources

Attia, S., Mustafa, A., Giry, N., Popineau, M., Cuchet, M., & Gulirmak, N. (2021). Developing two benchmark models for post-world war II residential buildings. *Energy and Buildings*, 244, 111052. <https://doi.org/10.1016/j.enbuild.2021.111052>

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