DS²BE

Doctoral Seminars on Sustainability Research in the Built Environment

Sustainable design of housing in Wallonia : proposition for a multicriteria analysis method.

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CONTEXT

Among the current standards in Walloon Region, the EPB (Energy Performance of Building) has one of the most important impact on the architectural design process. Though this standard is only focused on one issue: buildings energy consumption during their use phase. However, currently, if the reduction of this energy is a need, other important issues are to be considered: for instance, the grey energy consumption in regard of its impact on ecology, the implemented materials potentially affecting the health of the occupants, or the cost repercussion generated by some sustainable options.

If this observation is true for housing understood as an independent system, it's also valid by considering housing in its close context. The design decisions made in relation to this context have economic and environmental impacts but they also affect energy consumption and have an influence on the health and the well-being of the inhabitants.

Fig. 1: Research scope

QUESTIONS AND GOALS

Applied to the housing stock in the Walloon region, this research is dedicated to the development of a multicriteria analysis method to optimize the sustainable architectural design of housing in Wallonia. In this perspective, four axes, on the entire building life cycle, have been chosen: energy, ecology, health (including well-being) and economy. The building setting (including localisation, orientation and neighbourhood) will be evaluated as the typology of the building, its size, its construction method and the choice of the materials and systems implemented. In order to be able to compare all the criteria and to evaluate their impacts, the analysis results will be converted in a common value, the financial cost.

According to the user's optimum criteria choices, this multicriteria analysis method will provide some recommendations to optimize the energy and environmental performance, the influence on the user's health and the total cost of the building on the entire life cycle.

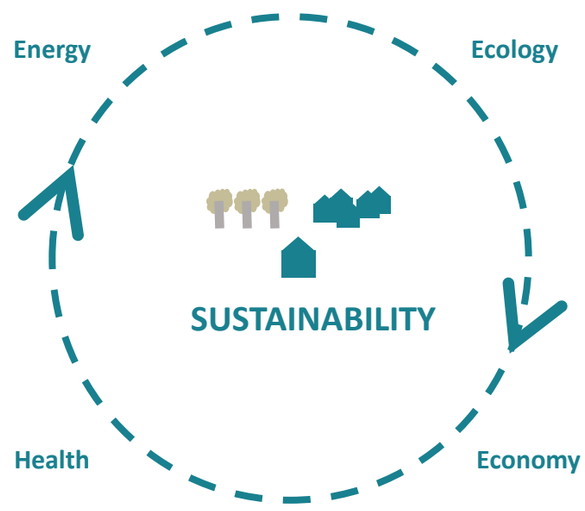

Fig. 2: Conceptual framework diagram

METHODOLOGY

The methodology establishes three important phases for this research : first defining criteria and key values for the four chosen axes, then developing a dedicated multicriteria analysis and finally applying this analysis on case studies chosen from typical residential Walloon buildings.

The aim of the first phase consists of establishing relevant criteria among normative and scientific field for each of the four axes defined above. Every criteria will be given a "basis value" and an "optimum value". Those two values will be deducted first from legal imposition and second from some surveys, in situ measurements or statistical analysis. The key values will also encompass the standards of sustainable architectural design.

Then a multicriteria analysis method will be developed to evaluate each criteria and their impact according to the user's sustainable priorities. Practically, the goal is to provide the possibility to reach one or more criteria to their optimum while respecting not less than the basis value for the other criteria. Though for a given project and a chosen optimized domain, the optimal design solution could be defined, especially at the early stages of architectural design.

Finally, in order to create a useful database for the housing in Wallonia, this method will be applied to some typical residential Walloon buildings. This final test will provide, in first instance, some recommendations for a sustainable architectural design of housing in Wallonia dedicated to project owners, architects or policy makers.

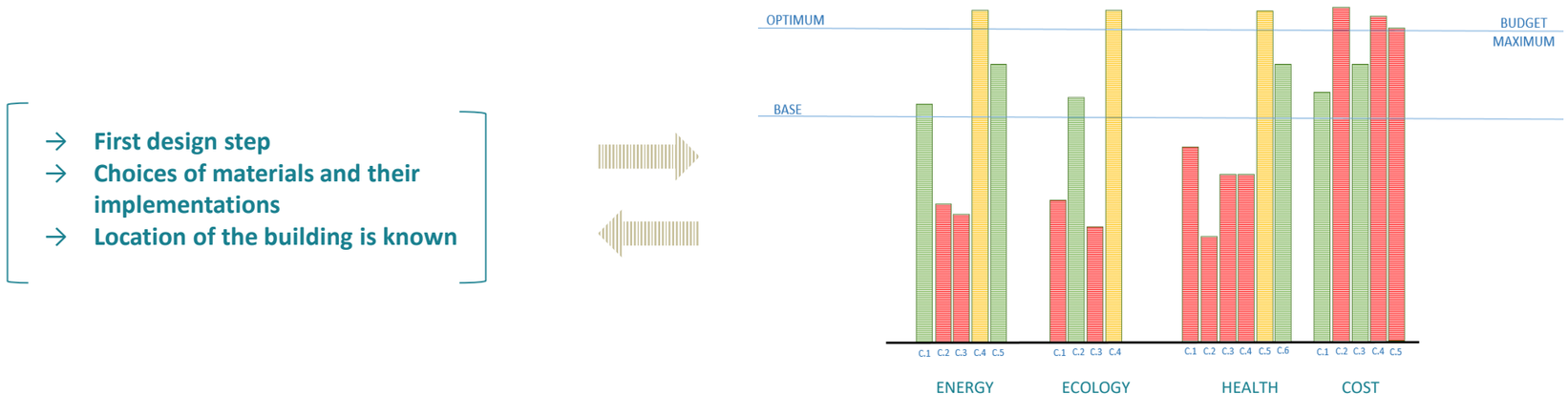

Fig. 3: Methodology diagram of the multicriteria analysis method