Interactions between summer and winter thermal comfort, effects of climate change on optimal renovation actions

André Mounier[1,3,4], Louis-Gaëtan Giraudet[2,3], and Philippe Drobinski[4]

[1]Agence de l'environnement et de la maîtrise de l'énergie (ADEME), Angers, France
[2]ENPC - Institut Polytechnique de Paris, Champs-sur-Marne, France
[3]CIRED – ENPC, AgroParisTech, EHESS, Cirad, CNRS, Nogent-sur-Marne, France
[4]LMD – IPSL, École Polytechnique - IPP, ENS - PSL , Sorbonne Université, CNRS, Palaiseau, France

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Abstract

Energy efficiency building renovation, particularly through thermal insulation, is a key factor in the transformation of the building stock to reduce greenhouse gas emissions and adapt dwellings to future climates. Thermal renovation of buildings is a particularly costly operation that rarely pays off for the person carrying out the work. In France, many renovation projects are financed in part by the state, and this funding involves targeting the most effective works. However, this efficiency is only measured in terms of heating needs, while the critical nature of the inadequacy of housing for future heat increases year on year. Taking account of climate change, its future evolution, and the need to adapt homes will therefore influence the optimum renovations to target as a priority now. Here we show that the displacement of the optimum differs according to the type of building and the intensity of warming, and according to the type of renovation work. This study presents a first way of considering dynamic, energy and economic optimisations, with RC modelling of building typologies. The conclusions are different depending on the type of action carried out: for example, the insulation of opaque walls does have an antagonistic effect on heating and cooling needs (but this is particularly visible in the coldest meteorological years and without night-time natural over-ventilation), but total energy needs are always decreasing. Thus, inter-annual variations in typology and weather play a decisive role in defining the optimum. The results call into question the selection criteria for subsidised renovations, as well as the renovations carried out in practice in France. The question of the interaction between summer and winter comfort has been raised in official reports in France, because adaptation is underdeveloped, and the majority of measures are focused on winter thermal comfort. We could ask the following (deliberately provocative) question: 'Do we need to renovate buildings on a massive scale if the French climate warms up significantly between now and the end of the century? The answer is yes, but not for all buildings or all regions in the same way.

Keywords – Thermal insulation, Heating and cooling needs, Adaptation, Mitigation

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(Loga et al. 2016)

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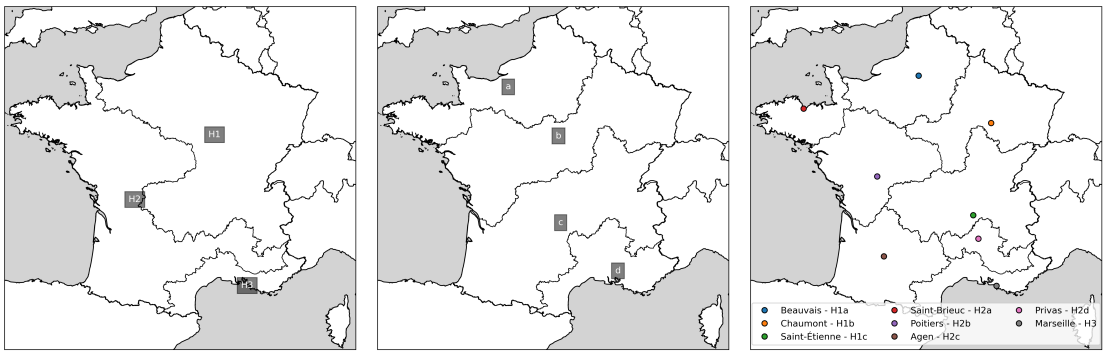

Figure 1: Maps of french climate zones.

(left to right) Map of "winter", "summer" and combined climate zones. The winter climate zones were defined in a 1988 decree on the thermal characteristics of residential buildings (JORF 1988). Corsica is part of region H3. Summer climate zones were defined in 2000 in parallel with new thermal regulation laws (JORF 2000). The 8 climate zones are a combination of the two zone types (JORF 2012) and the map shows the "central prefectures" used to define the meteorological data for each zone.

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