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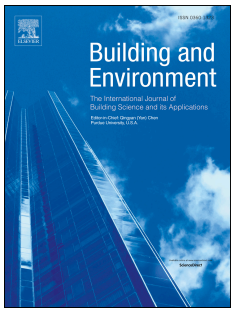

The impact of climate change on the overheating risk in dwellings—A Dutch case study

Mohamed Hamdy, Salvatore Carlucci, Pieter-Jan Hoes, Jan L.M. Hensen

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The impact of climate change on the overheating risk in dwellings—a Dutch case study

Abstract

Overheating in buildings has been identified as an essential cause of several problems ranging from thermal discomfort and productivity reduction to illness and death. Overheating in buildings is expected to increase as global warming continues. The risk of overheating in existing and new buildings can be reduced if policy makers take decisions about adaptation interventions quickly. This paper introduces a methodology for supporting such decisions on a national level. The methodology aims at (i) quantifying the impact of climate change on the overheating risk, (ii) ranking and characterizing the various building types in terms of their overheating risk and sensitivity to climate change, and (iii) assessing the potential of ventilative cooling to mitigate the effects of climate change. In the case study the overheating risk is evaluated in thousands of *dwelling cases* (i.e., 9216 possible combinations of several design and operation strategies) consistent with the characteristics of the Dutch dwelling stock built between 1964 and 2013. The overheating risk is assessed for four climate scenarios, which represent historical and future scenarios developed by the Royal Netherlands Meteorological Institute. Computational analyses are carried out using the detailed building performance simulation program IDA-ICE, assisted by a postprocessing calculation model developed in MATLAB®.

The results show that most of the Dutch dwelling types can effectively suppress the effects of global warming. However, poorly ventilated dwellings are vulnerable to overheating and are the most sensitive to climate change, particularly if their windows are not well protected against direct solar radiation.

Keywords

Overheating risk, climate change, residential building stock, thermal Comfort, resilience, and new metrics.