

## **A Study of the Implications for the Health and Wellbeing of Energy-Efficient House Occupants: A UK-Based Investigation of Indoor Climate and Indoor Air Quality**

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**Abstract :** Policies related to the reduction of both carbon dioxide and energy consumption within the residential sector have contributed towards a growing number of energy-efficient houses being built in several countries. Many of these energy-efficient houses rely on the construction of very well insulated and highly airtight structures, ventilated mechanically. Although energy-efficient houses are indeed more energy efficient than conventional houses, concerns have been raised over the quality of their indoor air and, consequently, the possible adverse health and wellbeing effects for their occupants. Using a longitudinal study design over three different weather seasons (winter, spring and summer), this study has investigated the indoor climate and indoor air quality of different rooms (bedroom, living room and kitchen) in five energy-efficient houses and four conventional houses in the UK. Occupants have kept diaries of their activities during the studied periods and interviews have been conducted to investigate possible behavioural explanations for the findings. Data has been compared with reviews of epidemiological, toxicological and other health related published literature to reveals three main findings. First, it shows that the indoor environment quality of energy-efficient houses cannot be treated as a holistic entity as different rooms presented dissimilar indoor climate and indoor air quality. Thus, such differences might contribute to the health and wellbeing of occupants in different ways. Second, the results show that the indoor environment quality of energy-efficient houses can vary following changes in weather season, leaving occupants at a lower or higher risk of adverse health and wellbeing effects during different weather seasons. Third, one cannot assume that even identical energy-efficient houses provide a similar indoor environment quality. Fourth, the findings reveal that the practices and behaviours of the occupants of energy-efficient houses likely determine whether they enjoy a healthier indoor environment when compared with their control houses. In conclusion, it has been considered vital to understand occupants' practices and behaviours in order to explain the ways they might contribute to the indoor climate and indoor air quality in energy-efficient houses.

**Keywords :** energy-efficient house, health and wellbeing, indoor environment, indoor air quality

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