Effects of retrofit insulation on space heating consumption in a high-rise social housing building. A case study in Newcastle upon Tyne.

Abstract

Current EU and UK policy (E. Commission, 2012) has placed an emphasis and large funding (E. Commission, 2015) on promoting building-focused energy efficiency measures so as to tackle climate change, energy security and fuel poverty concerns. In particular, low-income areas have been targeted by EU and UK building and energy policies. For example, ECO targets focused on the lowest 15% of the UK's most deprived areas (DECC, 2012). However, assessing the benefits of these initiatives (e.g. for climate change mitigation or energy consumption reduction) requires more than simply counting the number of dwellings retrofitted. Specifically, the role of occupant behaviour should be examined as several researchers have suggested that occupants may take part of the energy saving after retrofitting as increased internal temperature. Indeed, previous quantitative studies shows that temperature take-back is usually higher on low income dwellings as these dwellings are often not warm enough for occupancy (Milne and Boardman, 2000; Sorrell, 2007).

This study presents a two-year-long empirical study on the effects of imposed retrofitted insulation on a high-rise social housing building in Newcastle upon Tyne, UK. A 23-storey block with 157 flats underwent retrofitted insulation until February 2015. The study has followed an intervention design approach (Creswell, 2015), which combines a quasi-experimental (Sorrell *et al.*, 2009) and qualitative approach. The results and conclusions have been contextualised and discussed amongst current research assumptions. The main findings are: 1. This study has observed that the change in normalised space heating consumption, relative to a control group, was -34%. In addition, the mean air internal temperature change, with weather standardised at 5˚C external temperature, was +0.46˚C; 2. The empirical results do not support assumptions normally made about low-income dwellings 'taking back' energy savings as increased temperatures; 3. Physical factors play a more important role than occupant practices in enabling space heating saving consumption; 4. The effect known as saturation (Maxwell *et al.*, 2011) is taking place due to internal temperatures reaching a limit of maximum level of thermal comfort (e.g. 22.5°C). This supports Sorrel's assumptions that temperature take-back decreases owing to saturation effects when pre-intervention internal temperatures saturate (approaching 21ºC); 5. The findings also suggest that the change in 'use of space' is relatively small, and there is no evidence that occupants are using more intensively their homes; 6. The evidence also suggests low usage of heating (before and after the retrofit); 7. A possible risk of overheating is suggested since as a result of retrofit, occupants perceived a transition of thermal comfort from warm to very warm. Finally, this study also provides critical reflections of the research design that may have implications for future work in energy efficient studies in high-rise social housing buildings.

References

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