# Housing and carbon reduction: Can mainstream 'eco-housing' deliver on its low carbon promises?


## Abstract

Energy policy is being driven by two predominant themes: climate change; and energy security. In response, the built environment needs to develop sustainable, decarbonised, low energy systems and approaches that are socially acceptable and economically beneficial. The UK mainstream house construction industry is being driven, through policy and regulation, towards achieving this end without evidence of how these new systems of provision are used by passively adopting households. This thesis considers the outcomes of this policy drive and questions the ability of the approaches taken to meet policy targets in the real world.

A case study, comprising 14 newly constructed low energy affordable homes in Norfolk, is used to evaluate the real world energy and carbon outcomes of the house building industries response to policy. The interdisciplinary study included: the embodied energy and carbon of construction; energy and consequential carbon from occupation; the influence of household attitudes and behaviour; and how passively adopting households adopt and adapt to new technologies. Four different energy technologies and design approaches were compared: conventional high efficiency gas boiler; active solar (thermal and photovoltaic); passive solar design and mechanical ventilation with heat recovery; and ground sourced heat pumps.

The study found there were significant savings compared with conventional housing. This was attributed to the improvements in built fabric and the technical aspects of the homes. Yet, there was a significant performance gap between design and actual. The occupants were found to be a critical factor in determining the energy and carbon emissions.

The findings pose significant questions on the capacity of policy to deliver the projected reductions in emissions of $CO_2$. Ultimately, it is how these new homes and technologies are used that will become increasingly important in the successful implementation of low carbon aspirations.