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Using the Homes Energy Efficiency Database as a research resource for residential insulation improvements

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HIGHLIGHTS

- The Homes Energy Efficiency Database's (HEED) integrity and role is investigated.
- HEED biases exist due to reactive and longitudinal data collection strategies.
- Biases contribute to differences with Census and English Housing Survey.
- Its high resolution and national coverage can bring local context to the fore.
- It can play a substantial role in shaping residential energy efficiency policies.

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ABSTRACT

In devising viable energy efficiency policies that can reduce the greenhouse gas emissions of existing dwellings (e.g. UK's Green Deal), data are required on current insulation levels and its influences. One such data source is the seldom used UK Energy Saving Trust's Homes Energy Efficiency Database (HEED), which this paper investigates using Norfolk UK local authorities as a case study. The HEED's reactive and longitudinal data collection strategies contribute to underlying biases, which is the likely reasoning for its differences with the English Housing Survey and UK 2001 Census. These differences had a cascading effect in that they manifested themselves in the indicative financial and carbon assessments undertaken. Similarly, sampling concerns also implicated correlations surrounding influences of current dwelling insulation levels. Providing one is transparent about potential biases and data concerns, the HEED can play a substantial role in guiding policy decisions and understanding dwelling stock characteristics (e.g. what makes dwellings 'Hard to Treat'). In particular, its vast (national) geographic coverage yet high resolution enables local context to be explored: a factor that this study shows to significantly shape insulation levels.

1. Introduction

The UK Climate Change Act legislated for a carbon reduction target of 34% by 2020 and 80% by 2050 from 1990 levels (OPSI, 2008). In 2009, domestic energy consumption was responsible for approximately 40% and 25% of UK energy demand and greenhouse gas emissions respectively (DECC, 2011b). UK domestic space heating summed 64.0MtCO_2e for 2009 (DECC, 2012), accounting for over 11% of total UK emissions. Current UK dwellings are estimated to form 88% of the 2020 (CCC, 2008) and 75% of the 2050 stock (Ravetz, 2008), thus efficiency improvements to existing dwellings are essential if future carbon targets are to be achieved. Where practically possible, the UK Government intends for all lofts and cavity walls to be insulated by 2015, with 1.8 million dwellings subjected to 'whole house' energy efficiency packages including solid wall insulation by 2020 (HM Government, 2009). In addition, "the Government anticipates all social housing with solid walls will have had SWI [solid wall insulation] installed by 2018" (ACE, 2011: 3). Domestic energy reduction through insulation provision has thus become an integral feature of national energy policy.

To reduce residential emissions, the UK Government has begun to move away from placing carbon reduction obligations on energy companies, which were predominantly achieved through

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Table 1
Key HEED UK data sources (as of 01/06/2010).

Data category (Source)	No. of data items	No. of dwellings	Stated date range
Energy suppliers:			
Energy supplier data	1,340,901	1,268,869	Apr 2005–Mar 2008
EEC1	4,522,817	595,237	Apr 2002–Mar 2005
Home Energy Check (HEC):			
Energy Saving Trust	50,200,436	3,908,455	Jan 1999–Nov 2008
Local Authority:			
Nottingham City Council[a]	48,713	17,519	Oct 2000–Jan 2006
Fuel Poverty Scheme:			
Warm Front	15,812,585[b]	1,903,810[b]	Mar 2001–Feb 2006
Warm Homes	268,255	26,961	Mar 2000–Dec 2005
Home Energy Efficiency Scheme	317,226	24,164	Mar 2001–Mar 2006
Central Heating Programme	2,339,992	152,467	Apr 2004–Jun 2005
Scottish Community & Householder Renewables Initiative	8,267	1,948	Sep 1998–Dec 2001
Other sources:			
Cavity Insulation Guarantee Agency (CIGA)	4,767,840	1,453,210	Jan 2000–Oct 2008
Council of Registered Gas Installers (CORGI)	22,817,900	2,971,026	Jul 1997–Mar 2007
National Register of Social Housing (NROSH)	3,081,498	764,440	Apr 2005–Mar 2007
Clear Skies (CSKIES)	38,383	6,012	Jan 2004–Aug 2008
Low Carbon Buildings Programme (LCBP)	30,240	6,229	Uploaded Apr 2008[c]
Northern Ireland Sustainable Energy Database (NISED)	5,585,012	660,431	Uploaded Mar 2010[c]
Northern Ireland Energy Efficiency Levy	26,918	3,780	Apr 2002–Oct 2008
Northern Ireland Housing Executive	345,930	101,892	Sep 1998–Mar 2007
Other	112,175	85,969	Uploaded May 2003[c]

[a] Local Authority (LA) is a relatively ad-hoc data source. It comprises of initiatives that LAs have undertaken and provided data to the HEED for. Currently very few LAs have such data, with Nottingham being the only LA to provide sizeable information at the time of enquiry. The EST targets this data category as an area for expansion.
[b] Warm Front figures are cumulative totals covering March 2001–December 2008. However, the March 2006–December 2008 element of this had not been uploaded at the time of data collection.
[c] Period of coverage for data was unknown. The date provided instead shows when the data were uploaded into the HEEDonline.

insulation provision (e.g. Carbon Emissions Reduction Target (CERT, running over 2008–2012), and Energy Efficiency Commitment (EEC, running over 2002–2008)), in favour of the Green Deal (2012 onwards). This lending framework allows the capital costs of residential energy efficiency improvements to be repaid through a post-installation energy bill charge. The Green Deals were available from autumn 2012, helping to lower the space heating load of 'Hard to Treat' (HTT) dwellings that are unable to accommodate one of the three most cost effective efficiency improvements: gas central heating, cavity wall insulation, or loft insulation.

Information on insulation levels and the built environment is essential if policy-makers are to understand the scale of the refurbishment task and how best to achieve its challenging energy transformation targets (Skea, 2012). Previous studies have relied on national data from the English House Condition Survey and/or the Survey of English Housing for its analysis (e.g. Dresner and Ekins (2004), Roberts et al. (2007), Utley and Shorrock (2008)). In 2008, the Department for Communities and Local Government (DCLG) combined the two surveys to create a new evidence base, the English Housing Survey (EHS). Using the preceding 2 years of statistically representative data collected through interview surveys ('full household sample': 17,500 per year) and property inspections ('dwelling [sub]sample': 8000 per year), the EHS now provides a household and dwelling stock overview on an annual basis. It is the dwelling sample that is referred to in this paper. The EHS samples are drawn at random from a list of postcode address files.

An alternative data source for exploring the condition of UK dwellings is the Homes Energy Efficiency Database (HEED). There has been relatively little research on the HEED and its potential applicability as a research resource, despite its potential to provide insight on the current levels of domestic insulation and improvement opportunities. However, to inform the allocation of scare resources, it is important that the underlying data and its assumptions are robust, transparent and geographically representative. The practical applicability of the HEED in appraising and targeting domestic insulation improvements must also be realised, in the context of these underlying constituents and biases in relation to other available data sources.

The aim of this paper is to investigate these concerns, using a case study (Norfolk, UK) to specifically assess the following objectives within the core of the paper:

1. Examine the constituents of the HEED and consider its impact on the representation of dwellings using comparisons with the EHS and Census;
2. Explore current domestic insulation levels, based on a comparison with the EHS;
3. Consider the carbon and financial implications of domestic insulation improvements;
4. Examine local socio-demographic and dwelling-specific influences on existing domestic insulation levels.

Investigating the capabilities of the HEED will also yield useful information regarding the scale of the UK low carbon retrofitting challenge, which combined with the transparent assumptions inevitably supplied by HEED data interrogations, provides a useful by-product of this paper.

This paper begins by summarising the HEED in terms of its purpose, history, constituents, and primary uses (Section 2). The above four objectives then form the foundations of the core of the paper, structuring the following methodology (Section 3) and case study results (Section 4) sections. Salient issues are explored through an overarching evaluation of the HEED (Section 5) and the paper's conclusions (Section 6), in particular relating to using the HEED in policy-making. Using the Norfolk case study as the basis for the discussion and illustration, a relatively pragmatic stance is adopted with critique of both HEED shortcomings and opportunities provided.

2. Context: Homes Energy Efficiency Database (HEED)

2.1. HEED background

The HEED project was initiated in 2001, with data first available through the HEEDonline portal in 2005. Developed by the Energy