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Abstract: Against a background of growing international and national carbon reduction legislation, the UK government introduced the "Green Deal" to deliver a significant increase in housing energy efficiency and reduction in carbon emissions. This paper reflects on one English local authority's experience delivering a programme intended to foster local interest in the Green Deal. Drawing on social surveys and pre and post Green Deal intervention interviews with five demonstrator homes (households that applied to receive a Green Deal package fully funded by the scheme, providing a test bed for the Green Deal recruitment and installation process), this paper shows that awareness and understanding of the Green Deal scheme is low. There is opposition to the cost of finance offered but a strong interest in improving household warmth and for funding improvements through payments added to the electricity bill. Demonstrator home residents perceived Green Deals had improved the warmth and quality of their home, but saving money was the primary motivator for their involvement, not increasing warmth. Whilst Green Deal has not delivered the level of success that was hoped, much can be learned from the scheme to improve future energy efficiency schemes that will be necessary to deliver emission reduction commitments.

Delivering Energy Efficiency and Carbon Reduction Schemes in England: Lessons from Green Deal Pioneer Places.

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Abstract

Against a background of growing international and national carbon reduction legislation, the UK government introduced the “Green Deal” to deliver a significant increase in housing energy efficiency and reduction in carbon emissions. This paper reflects on one English local authority’s experience delivering a programme intended to foster local interest in the Green Deal. Drawing on social surveys and pre and post Green Deal intervention interviews with five demonstrator homes (households that applied to receive a Green Deal package fully funded by the scheme, providing a test bed for the Green Deal recruitment and installation process), this paper shows that awareness and understanding of the Green Deal scheme is low. There is opposition to the cost of finance offered but a strong interest in improving

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2 bill. Demonstrator home residents perceived Green Deals had improved the warmth and
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14 *Green Deal; Energy Efficiency; Carbon reduction; Housing; Fuel Poverty; Retrofit*
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Delivering Energy Efficiency and Carbon Reduction

Schemes in England: Lessons from Green Deal Pioneer

Places.

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1 Introduction

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As part of a wider international effort to reduce global CO₂ emissions the UK Government is committed to an 80% reduction in CO₂ emissions by 2050 relative to 1990 levels (Climate Change Act, 2008). In addition, the UK is bound by the EU 20-20-20 targets which require a 20% reduction in EU Greenhouse Gas (GHG) emissions, 20% of EU energy consumption to be produced from renewable resources, and a 20% improvement in the EU's energy efficiency, all by 2020.

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25% of the UK's total CO₂ emissions are accounted for by the residential sector (DECC, 2014a) making it a key area to target for carbon emission reductions through reducing energy consumption (Utley and Shorrocks, 2008). The domestic sector has historically been ignored by UK legislature when compared to regulations and incentives applied to the industrial sector (Scott et al., 2014), however the increasing evidence base surrounding the environmental impact of the UK's housing stock in terms of carbon emissions and energy consumption intensity is the key driving force behind increased awareness for the need of implementing residential energy and CO₂ reduction policies

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Having gone fully live on 28th January 2013 the Green Deal is the Government's "flagship piece of legislation, which will deliver energy efficiency to homes and buildings across the land" (Hough and White, 2014). By March 2014, Ed Davey, Secretary of State for Energy and Climate Change admitted that "the story so far has been, let's face it,

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disappointing” (Vaughan, 2014). By March 2015, 26 months after the programme’s launch, 501,906 Green Deal assessments had been lodged but only 5,964 Green Deal Plans were considered ‘live’, that is to say “all the measures have been installed in the property, the information required to disclose the Plan to future bill payers has been attached to the Plan and the energy supplier has all the information required to bill Green Deal charges.” (DECC, 2015a, p18).

Coinciding with the launch of the Green Deal, the UK Government developed a local authority competition in 2012 supporting three funding streams around the themes of energy; Fuel Poverty fund, Green Deal Pioneer places (GDPP) fund, and ‘Cheaper Energy Together’: Collective Switching Fund (DECC, 2012a).

Barnsley Metropolitan Borough Council (BMBC) (a local authority in the north of England) brought together a partnership of organisations in late 2012 to bid for funding through the Department for Energy and Climate Change’s (DECC) Local Authority Fund. Specifically the consortium sought to receive funding from the GDPP fund which supported “ambitious approaches to kick starting Green Deal activity in both the domestic and non-domestic sectors” (DECC, 2012a, p2). BMBC built a consortium that included: a local regeneration company as installation partners, a community organisation, and a university as monitoring and evaluation partners. BMBC was ultimately successful in securing funding with a programme focussing on three main components:

1. Promotion of the Green Deal and encouraging consumer uptake
2. Delivery of demonstrator homes and installation of Green Deals
3. Monitoring and Evaluation

1 The scheme aimed to deliver 250 Green Deal assessments, with 75 households signing
2 up to a Green Deal package of interventions as well as five demonstrator homes installed
3 with a package of interventions. Reflecting the poor conversion from assessments lodged to
4 “live plans” nationally, despite 96 enquiries to the scheme, no households in Barnsley agreed
5 to a Green Deal assessment or the installation of a Green Deal package. Against this
6 background, this paper reports on the experiences, development opportunities and practical
7 outcomes from the programme in Barnsley as part of the GDPP Fund. The scheme provided a
8 good test bed for the Green Deal and delivered many points of learning, developing insights
9 that can contribute to enhancing future energy efficient retrofitting schemes.
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22 **2 Literature Review**

23 **2.1 Energy efficiency in the English housing stock**

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25 The English housing stock is relatively old in comparison with many other European
26 countries with 41% of housing built before 1945 (Maliene and Malys, 2009). It is only since
27 1965 that thermal considerations were included in building regulations for housing in the UK,
28 yet 56.4% of English homes were built prior to the introduction of these regulations (DCLG,
29 2014), and insulation was only required within the building fabric from 1974 (Boardman,
30 1991). A focus on damp reduction, space and air movement up until 1974, rather than warmth
31 has had a significant impact upon the current English housing stock which can be seen as
32 “one of the oldest and least efficient housing stocks in Europe” (Boardman et al., 2005, p.
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51 Central heating was installed in only 16% of UK homes in 1964, but had risen to 88% of
52 homes by 1996 (Rudge, 2012). This increase in the prevalence of central heating and a
53 climate driven prolonged heating period from October to April (Hulme, Beaumont and
54 Summers, 2013) has led to energy consumption from space heating rising from 57% of total
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1 energy consumption in 1970 to 65% in 2013, while total domestic energy consumption has
2 also risen from 36.9 million tonnes of oil equivalent (mtoe) in 1970 to 43.8 mtoe in 2013
3 (DECC, 2014d). With the right building regulations and design policies, it is possible to
4 reduce the length and intensity of this heating period and therefore reduce energy
5 consumption and carbon emission outputs. There is scope to retrofit existing housing stock to
6 make deep cuts in CO₂ emissions but this is not a trivial task. Solutions for reducing CO₂
7 emissions from the housing stock must account for the variety in age, size, quality,
8 composition, function, and social value of the physical buildings, as well as the different
9 needs, expectations, and budgets of home owners and occupiers (Dowson et al., 2012).

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23 Domestic fuel consumption is strongly related to the size and composition of the
24 household, as well as the type and structure of the property itself (Baker and Rylatt, 2008;
25 Gough, 2013). Whilst the UK appears to be performing strongly in meeting its carbon
26 reduction and GHG targets overall, trends in domestic energy consumption and GHG
27 emissions have been erratic since 2009. Although consumption is below the peak
28 consumption levels of 2004 and is now broadly on a downward trend, there has been an
29 overall increase in domestic energy consumption over the period 1970 to 2012 of 16%, as
30 well as an increase in levels of fuel poverty (Palmer and Cooper, 2014; Guertler, 2012). This
31 is despite energy consumption in individual homes falling since 1970, which has been
32 cancelled out by demographic and social trends towards lower household occupancy rates
33 and a greater absolute number of houses.

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51 If the UK is to continue to meet its legally binding targets, energy efficient retrofit of the
52 housing stock will be essential. Improving thermal standards of new housing alone is
53 insufficient with roughly 85% of the current housing stock projected to still exist in 2050
54 (Palmer et al, 2006). Failure to adequately insulate and upgrade the thermal quality of the UK
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1 housing stock could present a major stumbling block in meeting the 2020 and 2050 targets.
2 Pertinent to policy implementation is the fact that energy efficiency measures can be
3 introduced as a measure to reduce energy consumption within the home (and therefore carbon
4 emissions), to save money, or to improve the thermal comfort of the home (Blackhurst et al.,
5 2011). These types of policy therefore can be used as a method to reduce levels of fuel
6 poverty¹ as well as Greenhouse Gas emissions.
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15 Since 2004 the number of households living in fuel poverty has increased as rises in
16 energy prices have outstripped growth in income and household energy efficiency levels
17 (Seyfang, 2010; Guertler, 2012; Petrova et al., 2013). The implications of poor quality
18 housing are a significant contributor to fuel poverty and are strongly linked with increased
19 public health issues including the prevalence of asthma amongst children, respiratory illness,
20 and mental health issues (Liddell and Morris, 2010). Housing can be seen as a critical part of
21 healthy communities, both in terms of physical health and in terms of the psychological and
22 social attitudes towards particular areas (Maliene and Malays, 2009; Brown et al., 2014). In
23 addition, large scale energy efficiency retrofitting schemes can, if successful have the
24 potential to help develop the local economy with jobs, education, new product opportunities
25 and reduction in local energy consumption (Genovese et al., 2013; Killip, 2013). Therefore
26 there is much environmental, economic, and social justification for improving the UK's
27 housing stock (Shove, 2010; Rosenow, 2012; Gough, 2013).
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48 A well designed policy with strong community engagement can aid Local Authorities in
49 providing the types of interventions that are the most appropriate for their residents in order
50 to reduce fuel poverty and household energy demand. To date community engagement is
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56 ¹ Fuel poverty is a phenomenon where households are unable to afford the energy costs required to heat their
57 homes to suitable internal temperatures. This is usually defined as spending 10% of household income on
58 energy costs. The 2011 Hills Review redefined this so that households are in fuel poverty if their fuel bills are
59 above the national median and their remaining income is below the official poverty line (DECC, 2013).
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lacking in the policy arena. Scott et al. (2014) found from a survey of 279 households receiving energy efficiency measures as part of a ‘whole community’ scheme the majority of residents believed that the physical changes being made to their homes would lead to significant savings on their energy bills and that residents experienced benefits relating to improved appearances of their neighbourhoods and increased sense of pride in their local communities. Haines and Mitchell (2014) identified from a study of 33 households living in solid wall properties in the East Midlands region that, despite the variation in motivation and engagement towards energy efficiency schemes, there is the potential for energy efficiency schemes to be used as a method to improve household value, improve internal comfort, improve social standing, and as a mechanism to climb the property ladder. These studies demonstrate the justifications for implementing energy efficiency measures in the home from a policy perspective but these reasons are not necessarily shared by those receiving these measures.

2.2 A changing policy landscape

Following the 2010 General Election, a Conservative party-led coalition was formed with the Liberal Democrats. The new Prime Minister, David Cameron, announced that he wanted the new Government to be ‘the Greenest Government ever’ (Randerson, 2010). Two new schemes were quickly announced, the Green Deal, and the Energy Company Obligation (ECO), designed to improve residential energy efficiency, replacing the schemes that had previously been in operation, Warm Front, CERT, and CESP (see Mallaburn and Eyre (2014) for a comprehensive discussion of previous UK energy efficiency policies).

The Energy Act 2011 (Energy Act, 2011) made provisions for the Government’s Green Deal proposal, to provide a market framework to improve the energy efficiency and reduce the CO₂ emissions from the UK’s home and businesses (Guertler, 2012). The Green Deal

1 was intended to provide energy efficiency measures that would feed into the wider targets
2 enshrined in the UK's Climate Change Act 2008 (Climate Change Act, 2008). The scheme
3
4 was designed to incentivise households to improve the energy efficiency of their homes at
5 zero upfront cost, provided that installed measures met the 'golden rule', whereby the
6
7 expected financial savings from reduced energy bills, must be equal to or greater than the
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The final impact assessment of the Green Deal (DECC 2011a) announced that the Green Deal and ECO schemes would support three Government objectives:

- Reduction of GHG emissions
- Address the drivers of fuel poverty
- Maintain the security of the UK's energy supply

However there were many objections to Green Deal. Experts did not expect it to aid reductions in fuel poverty, particularly in households that are 'under-consuming' energy (Guertler, 2012), and instead may increase fuel poverty (Hills, 2012). Similarly, the associated Energy Companies Obligation (ECO) intended to provide further support for low income households and the fuel poor (DECC, 2012a), has been seen as a regressive policy, as the costs of delivering the schemes are passed directly to consumers, which account for a larger proportion of income for those already on low incomes (Gough, 2013).

The analysis of the uptake of conventional energy efficiency measures by Shorrocks et al. (2005) highlights that certain retrofitting measures have more scope for installation than others arising from economic and technical feasibilities. Uptake in solid wall insulation

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measures seem unlikely to reach saturation over the next few decades due to slow adoption and high capital costs, which must be reduced to around £2500 (for the whole house) for the procedure to become cost effective. It is unclear that the mechanisms for funding in the Green Deal will overcome this capital barrier due to the lack of subsidies and a reliance on creating private markets (Dowson et al., 2012).

After disappointing initial Green Deal uptake, the UK Government was compelled to introduce further ‘nudge’ mechanisms such as council tax holidays and voucher schemes (Hobson, 2013). Nudge approaches seek to “alter people’s behaviour in a predictable way without forbidding any options or significantly changing their economic incentives” (Thaler and Sunstein, 2008, p.6). To further promote uptake, the Green Deal Home Improvement Fund (GDHIF) was launched in June 2014. The scheme offered up to £7600 cash back to householders installing approved measures from the Green Deal (DECC, 2014b). Limited funds were made available in different time-limited funding waves. At a local level, schemes were in operation that took advantage of the key drivers of behavioural change of occupiers to encourage uptake of energy efficiency measures, going beyond financial incentives. These incentives were based on changing individual values and attitudes to drive behaviour and choices (Brown et al., 2014). These types of schemes are what Shove (2010) terms as ‘I will if you will schemes’, whereby values and behaviour are shaped by influencing individual behaviour as well as financial incentives.

2.3 Local housing characteristics in Barnsley

This study focussed on Barnsley Metropolitan Borough Council (BMBC) in the South Yorkshire area of England. Barnsley has a population of 231,221, according to 2011 census statistics. The Barnsley MBC Home Energy Efficiency Strategy 2011-2015 provides a succinct analysis of the current housing situation within the region (BMBC, 2011). From both

1 a fuel poverty and general energy efficiency perspective there was a potential for a large
2 market for Green Deal and ECO supported interventions within Barnsley. The composition of
3 the housing stock within the Borough poses a particular challenge for insulating, primarily
4 due to the large number of solid wall properties. Many council-owned properties had been
5 improved through the Decent Homes scheme; therefore the average SAP² score for a
6 Barnsley council owned property by the end of 2010/11 was 72, which is 27 points higher
7 than a solid wall privately owned property in the Borough. Within Barnsley there are
8 estimated to be around 23,000 homes built before 1919 and the vast majority of these were
9 constructed with solid wall houses. This type of housing represents around 28% of private
10 sector homes with an average SAP score of 45. To date, despite the council investing heavily
11 in private sector homes, the average SAP rating in private sector homes in Barnsley is a
12 meagre 57, below the target of 65 or above, which is seen as a proxy for the household being
13 free from fuel poverty.
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32 According to the Fuel Poverty statistics for 2012, Barnsley had 102,956 homes in the
33 Local Authority area, of which 16,724 were deemed to be living in fuel poverty based on the
34 traditional 10% measure, representing roughly 16.2% of the local authority's homes (DECC,
35 2014e). The figure is lower than the regional average for Yorkshire and the Humber of 17.4%
36 but higher than the national average of 14% (DECC. 2014c). Two lower super output areas
37 (LSOAs) around central Barnsley, have significantly higher levels of fuel poverty, and
38 therefore were the focus for the GDPP.
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54 ² SAP is the Standard Assessment Procedure based on estimates of annual energy consumption for the
55 provision of space heating, domestic hot water, lighting and ventilation. It assesses how much energy a
56 dwelling will consume, when delivering a defined level of comfort and service provision. The assessment is
57 based on standardised assumptions for occupancy and behaviour and enables a like-for-like comparison of
58 dwelling performance (UK Government, 2015).
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3 Methods

Two distinct modes of enquiry were designed in order to respond to aims one and two of the scheme. A residential survey was designed in consultation with delivery partners that examined multiple aspects of the Green Deal and surrounding home improvement/energy efficiency attitudes to assess the effectiveness of Green Deal promotion and examine how to encourage further consumer uptake (aim one). In responding to aim two, the delivery of demonstrator homes and installation of Green Deals, semi-structured interviews with demonstrator home residents were held prior to the installation of Green deal packages in the property and one month after completion of building work.

3.1 Resident survey

The intention of the survey was to build an understanding of the levels of awareness of the Green Deal, energy efficiency attitudes more generally and home improvement intentions from a broad cross-section of Barnsley residents. This data was intended to provide a more expansive background to the Green Deal barriers and opportunities in the locality, complementing the more detailed yet narrower range of evidence that would be collected from the interviews with residents of the five demonstrator homes.

Questions for the survey were informed by DECC commissioned Green Deal research completed prior to the launch of the Green Deal (DECC, 2011c, 2012b), along with policy, third sector papers, and academic literature (c.f. Jenkins, 2010; Dowson et al. 2012). Utilising this existing evidence base allowed the project to build upon the extant research in the field and to develop an understanding of the realities of Green Deal implementation following the launch of the scheme.

The survey was designed to take around ten minutes to complete and consisted of 12 questions (see table 1) plus demographic profiling information. In order to maximise

1 response, the survey was delivered across multiple platforms utilising digital (on-line) and
2 traditional paper copies of the survey. The survey was publicised on-line on the council web-
3 site and residents' forums, via social-media, at official council resident support events,
4 through email distribution lists, and through Green Deal Pioneer Places roadshows run by the
5 project team in libraries throughout the Borough.
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16 Limited response questions were designed to facilitate ease of response with open ended
17 'other' categories provided for relevant questions. Question one offered six potential
18 descriptions of the Green Deal scheme, the option to declare the respondent was not aware of
19 the scheme and an open response 'other' category and sought to understand scheme
20 awareness as well as perceptions of the scheme's intent from energy efficiency improvement
21 or fuel poverty reduction to a home improvement loan. Respondents were free to choose all
22 options they felt relevant with all options plausible descriptions of one or more aspect of the
23 scheme. A similar format was followed for question two, how information on the Green Deal
24 had been received, and three where a non-exhaustive list of nine broad energy efficiency
25 interventions was presented to respondents, all of which were available under the Green Deal.
26 They represented the most common energy saving interventions that were being highlighted
27 by Government produced Green Deal supporting leaflets at the time of going to print.
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46 In order to understand residents' perception of the Green deal, questions four and five
47 presented lists of possible benefits or concerns raised in the pre-launch market research
48 (DECC 2011c, 2012b). Respondents were asked to rate how important each one was to them,
49 on a five point Likert scale from "not important at all" to "very important". The section
50 concluded with three questions examining financial aspects of the scheme, with respondents
51 asked to highlight a single choice from a limited range of potential responses.
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1 Section B of the survey focussed more generally on household improvement intentions
2 and sought to examine residents' household energy efficiency improvement intentions and
3 how they would choose to finance and complete any improvements. Furthermore, the survey
4 asked where householders would seek advice on undertaking home improvements from in
5 order to understand the locations and individuals that would be best placed to help promote
6 the Green Deal scheme.
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10 **3.2 Pre and Post building work Interviews**

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18 In order to develop a detailed understanding of the Green Deal process from assessment
19 to installation, five demonstrator homes were recruited by the community organisation and
20 local regeneration company project partners. Demonstrator homes received an occupancy
21 assessment (OA) and recommendations as per stage one and two of the Green Deal customer
22 journey (DECC, 2010), with the OA completed by an accredited assessor employed by the
23 local regeneration company. They were free to select which of the recommended
24 interventions they wished to receive. These were installed free of charge to the residents' by
25 the local regeneration company funded by the scheme, and as such no Green Deal finance
26 package was arranged with the households.
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41 The demonstrator homes were spread across the target wards of the GDPP project and
42 offered a number of different types of construction including traditional solid wall terraces,
43 semi-detached solid walled homes and more recently constructed and subsequently extended
44 cavity wall homes. A brief summary of the demonstrator homes and their basic characteristics
45 is listed in table 2.
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54 **Insert Table 2 here**

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57 In August 2013, prior to the commencement of building work, in-depth interviews were
58 held with the residents of the five project demonstrator homes. In order to allow interviewees
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the opportunity to develop ideas and expand upon topics raised by the interviewer, and for the interviewer to ‘probe’ interviewees’ responses, a semi-structured approach was adopted (King 2004; Denscombe, 2007). The interview explored four main topics:

1. About the home – likes/dislikes, energy efficiency and energy bills
2. Being a demonstrator home – Why? How were they recruited? Experiences so far.
3. The installation process – Have they felt informed? Do they foresee any impacts on their daily lives?
4. Expectations / outcomes – What do they think / hope will result from the work.

To supplement the interview data, a video-tour of the home was undertaken with the residents providing an audio description of the home, what they liked, what their frustrations were and any changes they had already made to them

Following the installation of each household’s Green Deal interventions, researchers returned to complete post intervention interviews in October 2013. This meant that households had lived with their improved home for around one month prior to the second interview. Again, a video tour of the home was completed in order to capture the changes to the home. This was followed up with another semi-structured interview exploring:

1. Installation process – Evaluation of the professionalism of tradespeople. Were instructions given for new equipment? Were the participants kept informed throughout?
2. Effects and Outcomes – Did work meet expectations? Ease of use for any new technology? Did the participants make any changes to way they use the home?

1 What were the householder perceptions of effects on household bills? Did the
2 interventions cause the respondents to make any more energy efficiency changes
3 to the home?
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8 3. Overall Process – What difference did the interventions make to the home/life of
9 the participants? Would the participants have paid for this through a “Green
10 Deal”? Would the participants recommend it to others?
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16 The audio recordings of both pre and post intervention interviews were transcribed
17 verbatim and thematically analysed in NVivo utilising an inductive coding approach,
18 informed by the interview question schedule. This was used to identify commonalities and
19 differences between the demonstrator homes residents’ experiences, motivations,
20 expectations and outcomes, adding strong contextual data to support or contrast the analysis
21 of the broad residential survey.
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31 **4 Results and Discussion**

32 **4.1 Resident Survey**

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35 In total 165 surveys were completed by residents from across the local authority. Due to
36 the multi-modal distribution method it was not possible to calculate the overall response rate.
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38 51% of respondents were male and 49% female with 95.3% of respondents classifying
39 themselves as white, 2.7% of mixed white and black backgrounds and 2% who preferred not
40 to declare. Further monitoring statistics are provided in table 3. The modal wage was £20,000
41 - £39,000, broadly encompassing the average UK wage of £27,200 (ONS, 2014), however
42 only 39% of respondents identified themselves as in full time employment, compared to a
43 UK employment rate of 71.7% in October 2013 (ONS, 2013). The findings of the survey
44 should therefore only be seen as indicative rather than statistically representative of the
45 general population. However the survey provides a number of insights regarding residents’
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1 perception of the Green Deal that could be useful for improving future iterations of the
2 programme.
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6 **Table 3 Here**
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9 **4.1.1 Green Deal Knowledge**
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11 **Figure 1 Here**
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15 The survey asked respondents what they knew about the Green Deal without having
16 provided them with any explanation of the scheme. As can be seen in figure 1, the most
17 common answer “I haven’t heard about the Green Deal” demonstrated a distinct lack of
18 general awareness. Pearson’s correlations were calculated to compare responses with
19 profiling characteristics including age ($r(150) = -.025, p > .05$), ethnicity ($r(149) = .002,$
20 $p > .05$), employment status ($r(144) = -.156, p > .05$), household income ($r(142) = .006, p > .05$),
21 tenure ($r(148) = -.115, p > .05$) and accommodation type ($r(151) = -.087, p > .05$). No
22 significant results were returned, suggesting that awareness of the Green Deal was not related
23 to any demographic profiling characteristics and as such work should be undertaken to raise
24 awareness of the scheme generally rather than within any specific sub-section of the
25 community. A similar result was experienced when residents were asked how they had
26 received information about the Green Deal. As figure 2 demonstrates, the modal response
27 was “I was not previously aware of the Green Deal scheme”, selected by 36% of respondents.
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47 **Figure 2 Here**
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51 Internet sources (25%) and radio (16%) were the most common source of information on
52 the Green Deal, but there were only a small number of respondents citing newspapers (local
53 [8%] or national [5%]) as a source of information. The relatively poor response to
54 newspapers as a source of Green Deal information was unexpected as the press has been one
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1 of the few sources to present information and commentary on the Green Deal scheme, and the
2 local newspaper (the Barnsley chronicle) ran an advertising campaign promoting the scheme.
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5 A similar degree of confusion surrounded awareness of the types of improvements to the
6 home that could be supported by the Green Deal. When asked which of these interventions
7 were available under the Green Deal, the most common response (over 25%) was “I don’t
8 know”. Only 14 respondents correctly identified all nine forms of improvements available.
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10 Given the general lack of awareness of the Green Deal recorded, this survey suggests that
11 more must be done to increase consumer knowledge of the scheme, and what energy
12 efficiency improvements are available to be installed.
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23 ***4.1.2 Green Deal in Operation: Perceptions of Benefits and Concerns***

24 The results of the questions regarding perceptions of the potential benefits of Green Deal
25 are presented in figure 3.
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30 **Figure 3 Here**

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35 Generally, respondents found all potential benefits to be important or very important to
36 them, with only small numbers finding aspects of the potential benefits relatively
37 unimportant. Indirect benefits (such as improving community environment) were seen as less
38 important to respondents than personal benefits (such as improved household warmth) whilst
39 there was a spread of responses to the suggestion that the Green Deal could increase the value
40 of the home. Whilst retrospectively indirect benefits (such as neighbourhood enhancement)
41 have been valued in other energy efficiency schemes (Scott et al., 2014) their value as a
42 scheme promotion tool is not supported by our findings.
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56 As with perceived benefits of the Green Deal, respondents were asked to rate the
57 importance of ten potential concerns with the Green Deal. Again, respondents predominantly
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1 rated the potential concerns as important or very important (see figure 4), with a neutral
2 response the next most common answer. Given the spread of responses and the use of a five
3 point Likert scale, the results can be seen to be reliable, offering a central anchor of opinion
4 (Alwin and Krosnick, 1991). Much of the national commentary on the Green Deal saw the
5 need to pass a credit check to access the Green Deal loan as a major barrier to the Green Deal
6 supporting those in the greatest need. 27% of respondents had a self-declared annual income
7 less than £20,000 which would reduce their likelihood of qualifying for Green Deal funding.
8 Despite such a large number of lower income households responding to the survey, there was
9 a lower level of concern expressed about passing a credit check than may have been
10 intuitively expected.
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25 **Figure 4 Here**

26 **4.1.3 *Paying for an energy assessment***

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29 The Green Deal involves an initial Green Deal Advice Report (GDAR). Most commonly,
30 the cost of this assessment is passed on to the consumer, although some companies now offer
31 the service for free as long as the householder then utilises the services for provision and
32 installation of the recommended interventions. Survey respondents were asked about their
33 willingness to pay for a GDAR with seven payment levels available to choose from, between
34 nothing and £150+. Although 27.9% of respondents were unwilling to pay anything for their
35 GDAR, the most common response was a willingness to pay less than £50, taking 29.7% of
36 the responses (see figure 5). Very few respondents were willing to pay over £100 (5.4% of
37 respondents), suggesting that the current average GDAR cost of £120 is a significant barrier
38 to Green Deal uptake. These results suggest that the decision to include a rebate of up to £100
39 towards GDAR costs as part of the GDHIF (DECC, 2014b) since the completion of the
40 GDPP programme, is likely to enable a significant increase in interest around the Green Deal.
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Figure 5 Here

Another source of early criticism of the Green Deal was the interest rate associated with the Green Deal loan. The Government argued that the average interest rate would be the best high street interest rate (Hough and White, 2014) for an unsecured personal loan. The final rate set was 6.96% (which is actually between eight and ten% when administrative costs are included) and can be beaten by many home owners, who can access low interest loans through their mortgage provider (Hough and White, 2014). For households from lower income backgrounds, the interest rate is perceived to be a significant deterrent to Green Deal uptake (Briggs, 2014) amongst potentially some of the households that could benefit the most from energy retrofit. Respondents were asked what the highest interest rate they would be willing to agree to for a Green Deal loan; between one and ten percent, presented in one percent increments, the results can be seen in figure 6.

Figure 6 Here

The highest interest rate any respondent was willing to pay for a Green Deal loan was 6.9%, whilst the most popular answer was an interest free loan. A number of respondents were not sure what level of interest they would be happy to accept, though the reasons for this were not investigated. Interestingly, the second most common interest rate for a Green Deal loan response was an interest rate between 3.0% and 3.9% percent. This suggests that whilst the current interest rate is too high to entice most consumers to utilise the Green Deal payment mechanism, if providers or the government could reduce the interest rate offered to the levels offered by some high street banks to mortgage holders (Hough and White, 2014), there is a potential for increased uptake of the Green Deal scheme.

A number of questions explored the respondents' intention to make home improvements over the forthcoming year, where they would search for information related to these works,

1 who would undertake the work and how it would be financed. When asked how they would
2 prefer to fund a home improvement designed to increase warmth, almost half (49.3%) stated
3 they would prefer to pay through an extra charge on their electricity bill (see figure 7). This
4 suggests that development of this mechanism may provide a platform with which to
5 encourage and facilitate investment in domestic energy efficiency improvement.
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13 **Figure 7 here**
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17 Approximately a quarter of respondents stated an intention to undertake home
18 improvements to improve the warmth of their home over the next 12 months, whilst 56%
19 stated they had no intention. 19% did not know whether they would undertake improvements.
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21 If these results were representative of Barnsley's population, they would imply around 24,000
22 homes intended to undertake home improvements to increase warmth or energy efficiency
23 over the following year. Clearly there is an appetite to improve household warmth which
24 shows potential for Green Deal or similar mechanisms to succeed. By tackling the barriers
25 discussed above, the Green Deal could see a significant increase in uptake compared to
26 current levels and gain the required momentum to achieve the UK Government's stated aims
27 regarding reducing domestic energy consumption and fuel poverty levels.
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42 **4.2 Pre and Post Green Deal Demonstrator Home Interviews**
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44 **4.2.1 *Being a Demonstrator Home***
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47 All five of the demonstrator homes had a lower than typical energy cost according to the
48 occupancy assessments undertaken as part of the programme of work. This is partly due to
49 the participants heating their homes for far fewer hours per day than the average typical for
50 that type of household according to the occupancy assessment. For the demonstration of the
51 GDPP, partners were concerned that this would reduce the potential impact of any savings
52 that were made due to the interventions. When the demonstrator home residents were
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1 interviewed, discrepancies were found between the amount of heating declared on the
2 occupancy assessments and the time period of heating given by the occupants. For example,
3 residents of demonstrator home three stated that:
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8 “If you're talking winter months it would be on about two to two and a half hours in the
9 morning. Winter months from about half past three till ten, about six and a half hours.”
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13 In contrast the occupancy assessment for this demonstrator home suggested their heating
14 was on only 15 minutes per day, a notably different amount of heating to that declared by the
15 occupants. As a result the partners’ fears of not being able to demonstrate the benefits of the
16 Green Deal interventions were allayed as actual heating use prior to the installation of
17 interventions was greater than that calculated in the occupancy assessment, so the
18 interventions were likely to bring tangible benefits to the occupants. Nevertheless the Green
19 Deal occupancy assessment helps occupants decide whether they feel willing to take on a
20 Green Deal, and inaccuracy in the data provided may lead households to unfairly under or
21 overestimate the potential benefit of installing different energy interventions.
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36 Demonstrator home occupants were generally very energy aware, and had a good idea
37 what aspects of their home were inefficient. A common source of frustration amongst all the
38 solid walled properties was their inefficiency and the cost to householders in terms of heating
39 bills. For example, an occupant of demonstrator home one said:
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47 “In winter time, with having the cellar and all that, and having gable end house, and having
48 no cavity wall insulation in it, the heat just goes straight through it. So, no matter what, how
49 long you have the heating on for, you can turn the rad valve up to number five, up to full; that
50 wall will still be cold”
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57 Whilst demonstrator home occupants were aware of their energy usage and costs, they
58 were not major adopters of basic energy saving interventions. The use of energy saving light
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1 bulbs was limited to a few rooms if any, often citing issues to do with light levels. Some
2 chose to turn electrical devices off at the wall when not in use, though this was not the case
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4 with all homes. Demonstrator home two was owned by occupants who had benefited
5
6 significantly from a number of schemes aimed to support older households. Through these
7
8 earlier schemes they had received loft insulation and had received a new boiler a number of
9
10 years ago, both of which they felt had made a noticeable difference to their home. Residents
11
12 of demonstrator home four had introduced a partition wall in to their lounge, sacrificing
13
14 overall space in an attempt to increase warmth. Whilst this had made some impact the home
15
16 was still generally very cold and expensive to heat. They had gone further by installing
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18 insulation in the loft space at their own cost, but this was the most that any demonstrator
19
20 home occupants had undertaken at their own expense. Generally, interventions such as these
21
22 were seen as expensive and beyond the reach of the householders taking part. The consensus
23
24 from the occupants of the demonstrator homes was a recognition of the potential benefits of
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26 the interventions but a lack of willing or ability to fund this work themselves, hence their
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28 interest in the scheme.
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37 **4.2.2 Work completed on Demonstrator Homes**

38 **Table 4 Here**

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43 Not all occupants of the demonstrator homes agreed to the entire package of
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45 recommended interventions or were able to receive certain interventions due to space
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47 restrictions. The final interventions installed are summarised in table 4. Residents of
48
49 demonstrator home three ultimately decided to turn down a boiler replacement as they felt
50
51 their current boiler was good enough. In this property, due to access space their side wall
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53 could not be insulated and the resident chose not to accept internal insulation to the front wall
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due to the reduction in internal space. The occupants of demonstrator home four also rejected internal solid wall insulation to their property due to space reduction implications.

A key learning point for the project is the importance of individual choice and designing interventions that work with the householder's existing practices in the home (Judson and Maller, 2014; Shove, 2010). This could prevent rejection of potentially beneficial measures such as external wall insulation and internal wall insulation, which will have implications for the look and/or size of a property. Although householders stated a desire to reduce their bills, ultimately pride in their homes space and look could provide enough of a deterrent to prevent the most effective interventions from being installed.

4.2.3 The installation process and post-intervention benefits

Demonstrator homes were generally very pleased with the process of being involved in the project. Overall all households were very pleased with the work of the firm carrying out the interventions and were particularly complimentary of the Residents Liaison Officer (RLO) who kept them informed and updated throughout the project. Demonstrator home occupants that were in full time employment felt that it was sometimes frustrating to have to organise someone to be at home, or take time off work themselves at the last minute, in order to unlock their home. This practical aspect of installing energy efficiency measures, the "customer journey", could be improved in future delivery in order to allow residents to plan their time in advance to help ensure smooth project delivery. A resident of demonstrator home one summed up the balance between the inconvenience of the work and the ultimate benefits:

"If something's inconvenience like, you put up with it. 'Cos at the end of the day if it's better for you...And you're saving, then a little bit of inconvenience, it's nought. It's nothing, you just put up with it... So put up with, so we can sit here in December with our t-shirt on!"

1 This response also demonstrates further evidence of the well documented rebound effect
2 (Jenkins, 2010; Blackhurst et al., 2011; Druckman et al., 2011.), whereby a proportion of the
3 money saved from increased energy efficiency is utilised to increase the consumption of
4 energy in the home such that the expected level of bill reduction is not realised. In other
5 studies this has been shown to be around 30% (Milne and Boardman, 2000; Druckman et al.
6 2011.). It is important for this effect to be considered in the design of GHG reduction
7 schemes in order to maximise potential GHG reduction, whilst balancing the benefit of the
8 “takeback” (Milne and Boardman, 2000) in increased warmth to the householder.
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20 The return visit following the installation of the interventions was only around one month
21 following the completion of the intervention work due to the timescale for project delivery, in
22 October 2013. As such residents were not able to assess the impact of the interventions on
23 their energy bills and instead their subjective perception of the potential impact was explored.
24 Other than demonstrator home three which could not have the major insulation work
25 completed, all demonstrator homes agreed that their homes felt much warmer, would be
26 much warmer in the forthcoming winter and expected their bills to be lower. Demonstrator
27 home four and five who had both received a new boiler as well as insulation were particularly
28 happy that they now had instant hot water and in demonstrator home four’s case, a boiler that
29 had been classified as dangerous and immediately removed by engineers, had been safely
30 removed before anything serious had happened.
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48 Due to the project specification and funding, post-intervention SAP assessment of the
49 demonstrator homes were not completed and thus it is difficult to precisely quantify the
50 impact of the Green Deal interventions provided. This work would benefit from a follow up
51 study calculating the revised SAP score for the homes as well as analysis of household
52 energy bills to quantify efficiency improvements and rebound effects.
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Whilst the demonstrator homes did not pay for any of the work done to their homes, when asked if they would have had the work done as a Green Deal, four out of five homes said they would. Such was their pride in the work that had been done, residents of demonstrator homes one, two, four and five had shown off the work done to friends and colleagues and had become “ambassadors” for the Green Deal. The demonstrator home experience provided the programme with homes that had received major energy efficiency benefits as a direct result of the scheme. Not only had energy efficiency been improved, but so had useable space in the home, whilst in a number of cases reducing damp and increasing resident happiness. The demonstrator homes can be seen as a major success for the project in the short term, and hopefully the long term. All households provide a strong example as to how the interventions available in the Green Deal can offer improvement in quality of life and home energy efficiency. It is important in the future that these benefits are tracked to understand and quantify their benefits in terms of bill reduction and resident emotional and physical health to help demonstrate the long term potential benefits of such schemes.

5 Conclusions and Policy Implications

The Green Deal attempts to use a system of financial incentives to overcome economic barriers in order to solve technical problems (Dowson et al, 2012), as well as to attempt to overcome the inertia of householders through the use of nudge approaches (Thaler and Sustain, 2008) towards engaging with energy efficiency schemes.

The resident survey undertaken by this project confirms that the financing mechanism appears to dissuade the public from taking out measures at the scale required to enable the scheme to be a success, often due to the high interest rate attached to the scheme and the cost of the GDAR, although the principle of paying for energy efficiency improvements through the electricity bill was widely supported. The way in which the Green Deal is financed is

1 unlikely to be of benefit to vulnerable households, and therefore local authorities may find
2 that they have to consider bringing some capital resources of their own to the table, to
3
4 supplement ECO funding if the scheme is going to assist in a significant manner in the fight
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6 against fuel poverty. With local authority expenditure needing to fall by 21 per cent in cash
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8 terms by 2020 and an associated 43 per cent drop in funding for non-social care and waste
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10 services (LGA, 2014), the potential for local authorities to undertake such discretionary
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12 spending is incredibly limited.
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18 Although the Green Deal has been a difficult proposition to market and encourage
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20 uptake, there is a desire to reduce bills and increase home energy efficiency amongst home
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22 owners. Developing a more attractive financial offering and significantly increasing
23
24 awareness of the scheme amongst the community at a local, regional and national level could
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26 provide enough support to create a thriving energy intervention scheme that develops enough
27
28 momentum to sustain itself and achieve ambitious Government objectives relating to
29
30 improving domestic energy efficiency and reducing energy consumption levels. However, the
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32 experiences of the Green Deal Pioneer Places Scheme in Barnsley highlight a problem with
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34 the levels of awareness of the scheme; indeed most of the respondents surveyed had not heard
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36 of the scheme and had not received information on the scheme through any of the traditional
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38 media.
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45 To increase engagement and uptake of Green Deal, greater awareness is required, and
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47 emphasis should be placed upon the benefits to the home in terms of bill reduction and
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49 increased warmth that will outweigh the initial upfront investment and subsequent loan
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51 payback payments. Despite the ultimate benefits expressed by the demonstrator homes, our
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53 survey suggests that unless the upfront assessment costs and Green Deal finance interest rates
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55 are reduced, interest in the Green Deal is likely to remain low. Unless the public feel that they
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are getting value for money from the Green Deal finance package they are unlikely to join the scheme in the numbers required to generate the level of market demand that Government aspires to in its targets for the programme. Ultimately, saving money is still seen as a bigger driver for participation than saving energy (Dowson et al., 2012; Scott et al., 2014).

The Green Deal Pioneer Places project has been very useful in gauging the receptiveness of households to energy efficiency measures, and establishing the potential in developing widespread and wide-reaching energy efficiency policies for the residential sector. Over the five year period of the current Government, the Green Deal has failed to deliver the level of uptake desired, with interest acknowledged as “disappointing” and with the Labour party opposition promising to scrap the scheme if they were elected in May 2015 (Carrington, 2013). Given this background it is important to learn what we can from this project and the Green Deal more generally to inform and improve future energy efficiency schemes if the UK government is to meet the legally binding targets set out in the Climate Change Act (2008).

6 Acknowledgements

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Table 1

Table 1. Resident survey questions and response type.

	Question	Response type
Section A. Awareness of the Green Deal		
1	What do you know about The Green Deal?	Multiple response
2	How have you received information about the Green Deal?	Multiple response
3	What types of improvements do you think are covered by the Green Deal scheme?	Multiple response
4	How important are the following potential benefits of The Green Deal?	Single response from 5 point Likert scale
5	To what extent are each of the following a concern when considering The Green Deal	Single response from 5 point Likert scale
6	How much would you be willing to pay for an energy assessment of your home and advice regarding which measures could deliver the largest energy saving benefits for you?	Single response
7	If you wanted to reduce your energy bills by making a home improvement, how would you prefer to pay for it?	Single response
8	If you agreed to a Green Deal loan, what would be the highest interest rate you would be willing to agree to?	Single response
Section B. Home Improvement Intentions		
9	If you were to make improvements to your home, who would you go to in order to find out any information that you required?	Multiple response
10	Do you intend to make any improvements in order to improve the warmth of your home in the next 12 months?	Single response
11	How do you expect to pay for these improvements?	Single response
12	Who would you choose to complete these improvements?	Single response

Table 2

Table 2. Show home characteristics

Showhome	Area	Construction	House Type	Residents	Pre Green Deal SAP score
1	Central Barnsley	Solid wall	Terrace	4	33
2	Central Barnsley	Solid wall	Semi-Detached	2	64
3	Central Barnsley	Solid wall	Terrace	1	48
4	Central Barnsley	Solid wall	Terrace	2	61
5	Kexborough	Cavity-wall	Semi-Detached	2	56

Table 3

Table 3. Resident survey monitoring statistics

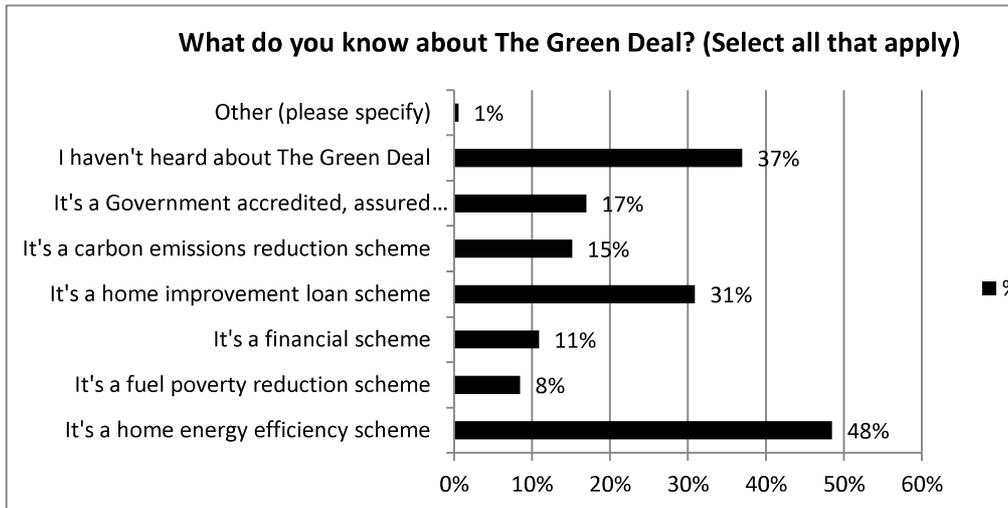
Monitoring statistic	Number	Percentage
Employment Status		
Self-employed	12	7%
Full time employed	65	39%
Part time employed	22	13%
Un-employed	13	8%
Economically inactive	0	0%
Retired	26	16%
Prefer not to say	6	4%
Missing	21	13%
Income		
Less than £20,000	44	27%
£20,000 - £39,000	59	36%
£40,000 - £59,000	12	7%
£60,000 - £99,000	4	2%
£100,000 and over	0	0%
Prefer not to say	23	14%
Missing	23	14%
Tenure		
Own it outright	46	28%
Live here rent free	6	4%
Rent it	26	16%
Part pay rent and part mortgage (shared ownership)	3	2%
Buying it with the help of a mortgage or loan	64	39%
Prefer not to say	3	2%
Missing	17	10%
Accommodation type		
Terrace/End terrace house	33	20%
Semi-detached house	44	27%
Bungalow	18	11%
Detached House	49	30%
Flat	6	4%
Bed-sit	1	1%
Missing	14	8%

Table 4

Table 4. Show Homes and the Measures Installed

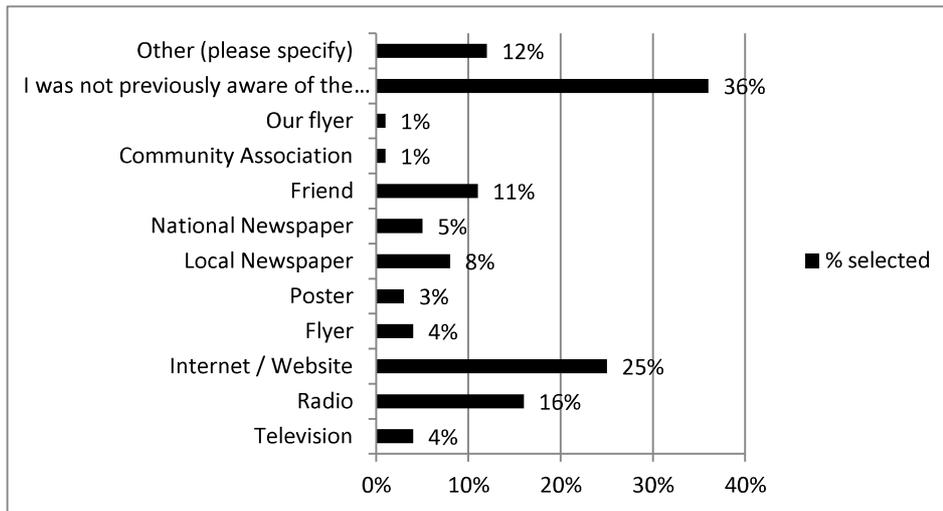
Show Home	Measures Installed
1	Front internal solid wall insulation Side and rear external solid wall insulation and render Low energy lighting Floor insulation Loft conversion insulation
2	External solid wall insulation and render Low energy lighting in kitchen Room thermostat
3	Ground floor, floor insulation Low energy lighting Thermostatic Radiator Valves to radiators External solid wall insulation & render to rear
4	Boiler replacement TRV's to radiators Thermostat to hot water cylinder Floor insulation Side and rear external solid wall insulation & render Loft conversion insulation
5	Flat roof insulation to lounge Boiler replacement Low energy lighting

Figure 1



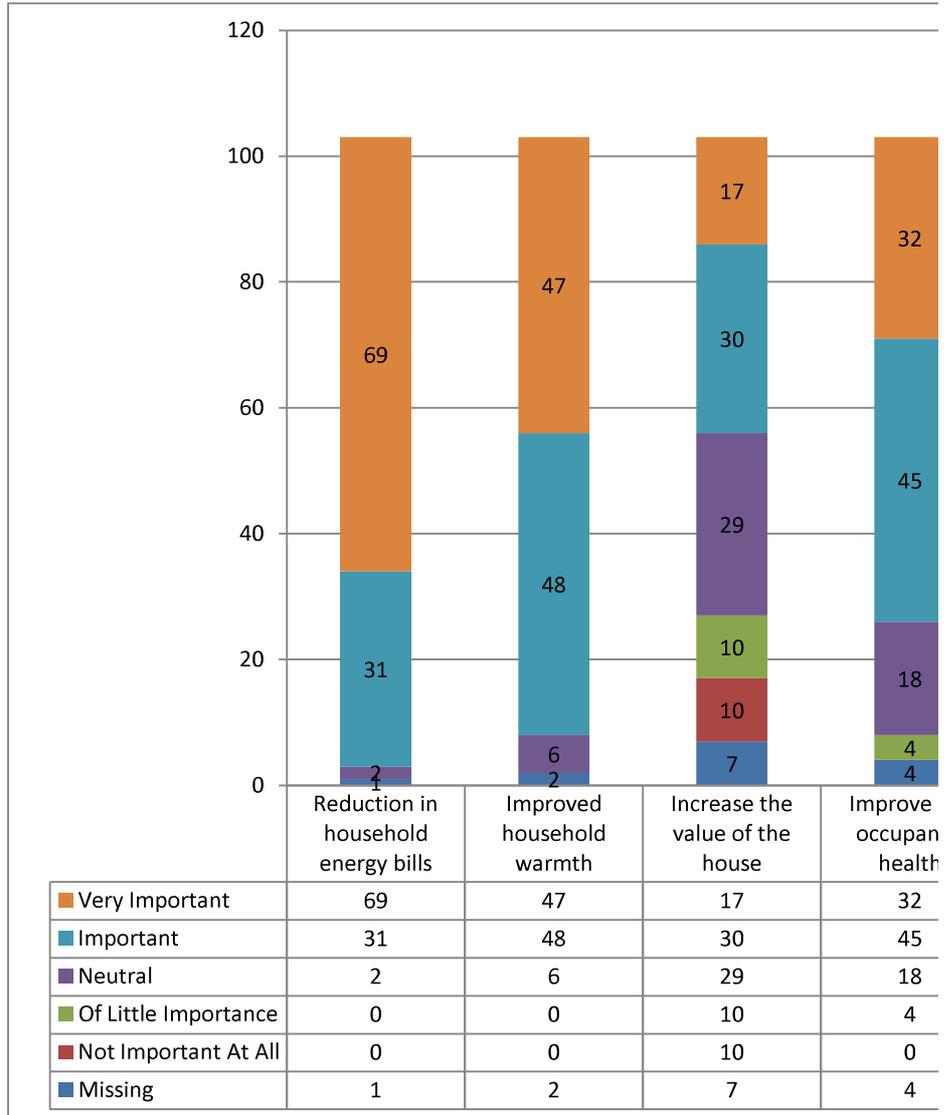
It's a home energy efficiency scheme 48%
It's a fuel poverty reduction scheme 8%
It's a financial scheme 11%
It's a home improvement loan scheme 31%
It's a carbon emissions reduction scheme 15%
It's a Government accredited, assured... 17%
I haven't heard about The Green Deal 37%
Other (please specify) 1%

Figure 2



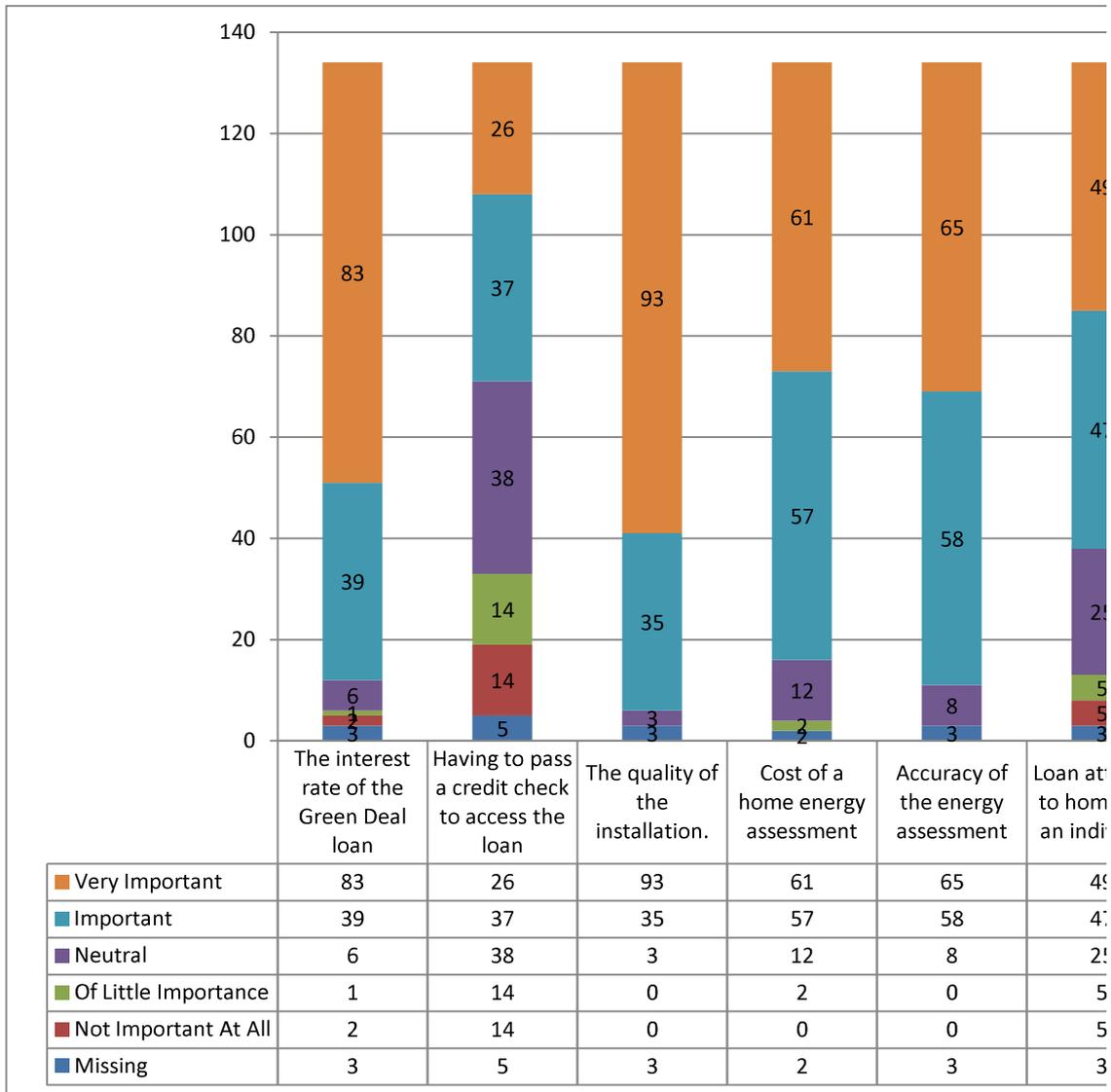
Television 4% Radio 16% Internet / Website 25% Flyer 4% Poster 3% Local News 8% National Newspaper 5% Friend 11%

Figure 3



Perceived Importance	Reduction in household energy bills	Improved household warmth
Missing	1	2
Not Important At All	0	0
Of Little Importance	0	0
Neutral	2	6
Important	31	48
Very Important	69	47

Figure 4



	The interest rate of the Green Deal loan	Having to pass a credit check to access the loan	The quality of the installation.	Cost of a home energy assessment	Accuracy of the energy assessment	Loan attached to home	Ongoing maintenance	Access to information
Missing	3	5	3	2	3	3	4	4
Not Important	2	14	0	0	0	5	2	1
Of Little Importance	1	14	0	2	0	5	7	1
Neutral	6	38	3	12	8	25	12	16
Important	39	37	35	57	58	47	59	58
Very Important	83	26	93	61	65	49	50	54

Figure 5

Value	Number of	Percentage	selected
Nothing	46	27.9%	
Less than £	49	29.7%	
£51 - £75	19	11.5%	
£75 - £100	25	15.2%	
£101 - £125	7	4.2%	
£126 - £150	1	0.6%	
£150 +	1	0.6%	
Missing	17	10.3%	

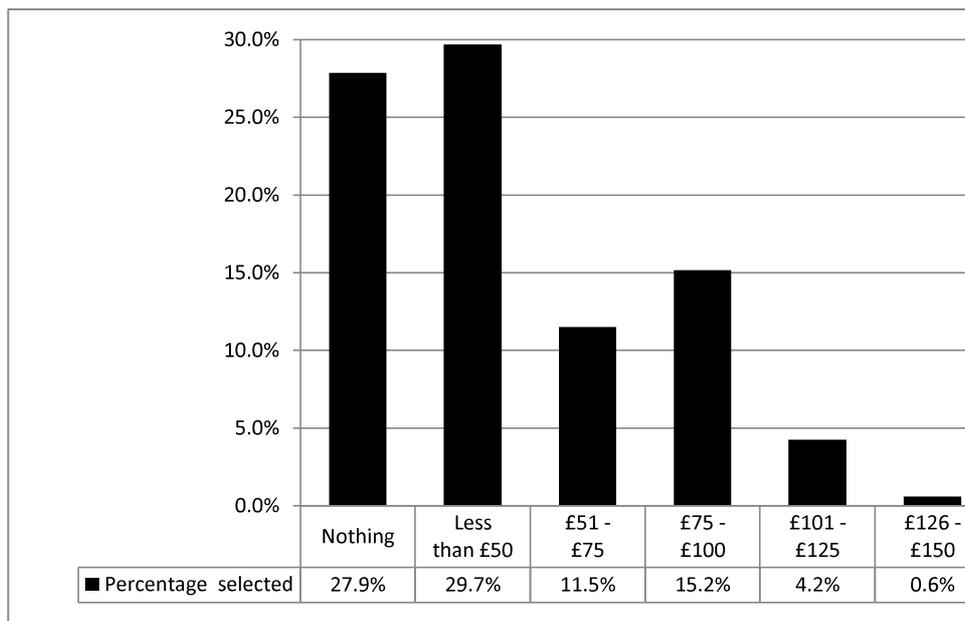


Figure 6

Interest rate Percentage Number selected

0	23.6%	39
0.1% - 0.9%	9.1%	15
1.0% - 1.9%	6.7%	11
2.0% - 2.9%	10.3%	17
3.0% - 3.9%	15.2%	25
4.0% - 4.9%	4.8%	8
5.0% - 5.9%	4.2%	7
6.0% - 6.9%	1.2%	2
I don't know	14.5%	24
Missing	10.3%	17

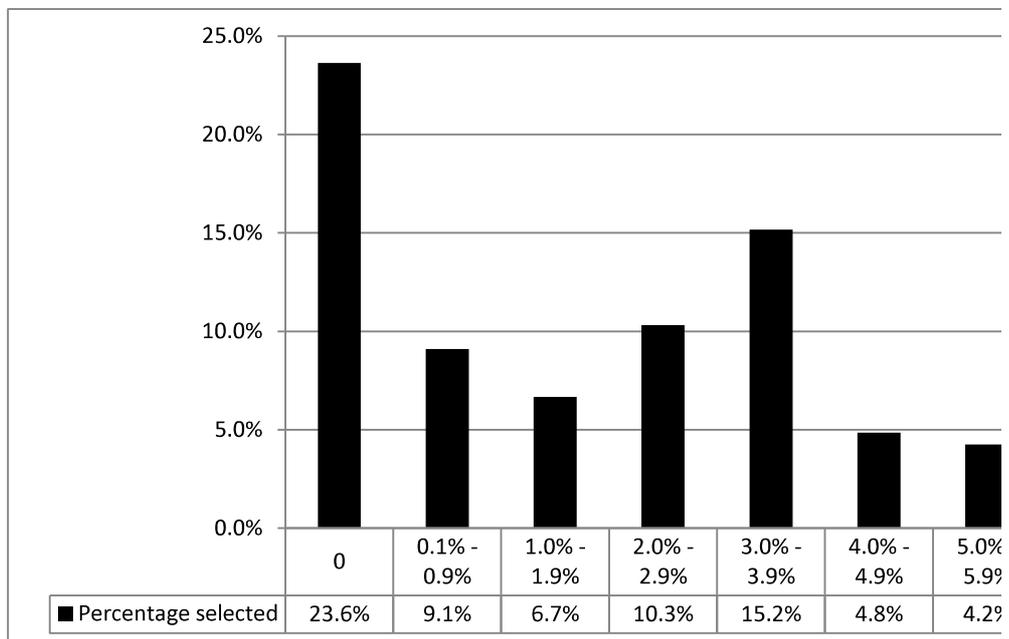


Figure 7

Form of pa	Percentage selected	
Other (plea	7.3%	12
Loan from :	9.7%	16
An extra ch	44.8%	74
Your perso	24.8%	41
On a credit	4.2%	7
Missing	9.1%	15

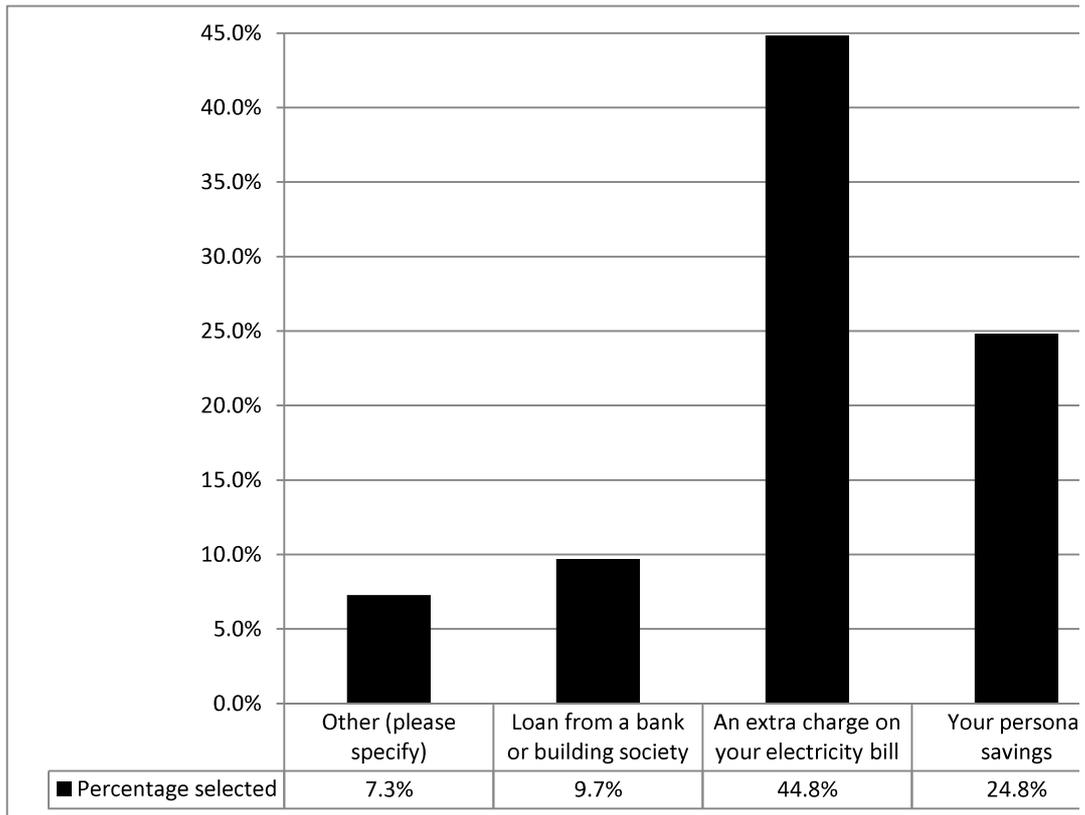


Figure captions

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Supplementary Interactive Plot Data Figure 1

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