The Government has set an ambitious target to cut the UK’s carbon emissions by 80% by year 2050. To meet these targets, action is needed in the residential sector with 27% of the UK’s CO₂ emissions coming from energy use in homes. While working towards zero-carbon new homes, refurbishment of the existing housing stock to advanced, low-carbon standards is essential. In this process the involvement of all stakeholders and behavioural change of occupants to low-carbon life styles are primary factors. This paper presents the findings of an Engineering and Physical Sciences Research Council Public Engagement project (2009–2010) carried out to promote low-carbon home adaptations and behaviour change among the elderly. A number of engagement events were held to increase the awareness of environmental upgrading of homes, energy-efficiency measures, financial support available and low-carbon life styles. A feedback process collected information on sustainable actions taken by the attendees 3–6 months after the initial events. A coding method was designed to analyse the questionnaire responses. The results illustrated that many had made changes in their lives since attending the events, are planning to change or have encouraged someone else they know to make a change in their lives to be more sustainable.

Keywords: public engagement; older community; behavioural change; low-carbon homes; focus groups; sustainable living; home adaptations

1. Introduction

Climate change is perceived as one of the major global challenges faced in the twenty-first century. The Climate Change Act 2008 stipulates that the net UK carbon account for the year 2050 is at least 80% lower than the 1990 baseline (Department of Energy and Climate Change [DECC], 2008). The UK housing sector accounts for approximately 28% of total UK energy demand (Palmer & Cooper, 2011), which accounts for 27% of the total UK CO₂ level (DECC, 2012a). Notwithstanding the government’s plan to increase the UK housing stock by 240,000 homes a year, approximately 80% of today’s dwellings will still be standing in 2050 (Boardman, 2008). Improving the energy efficiency of UK existing housing stock has been made a priority within the UK Government’s Energy White Papers (Department of Trade and Industry [DTI], 2003, 2007) as an effective, clean, safe and cost-effective approach to meet the carbon-reduction targets. However, the uptake of effective energy-efficient strategies within the UK is currently slow and not sufficient to achieve the necessary CO₂ reduction targets (DECC, 2009).
It is now accepted that changing to low-carbon lifestyles will only occur if technical initiatives are supported by a change in behaviour among UK households (DTI, 2006). It is people, their attitudes and behaviour towards low/zero-carbon living that will ultimately be critical to the success of the low-carbon agenda (Boardman, 2008). In this process the involvement of all stakeholders and behavioural change of occupants to low-carbon lifestyles are primary factors. It is illustrated that ‘behaviour is influenced in complex ways by factors such as price, awareness, trust and commitment, including a sense of moral obligation’ (Devine-Wright & Devine-Wright, 2004). A recent EU report on behaviour change and energy use illustrated that up to 20% of the energy currently consumed can be saved through changing behaviour (EEA, 2013).

The current demographic challenge is known to be a rapidly increasing ageing population and the number of people aged 65 and above in the UK is predicted to increase by 81% or from 9.3 million in 2000 to 16.8 million in 2051 (Wittenberg, Comas-Herrera, Pickard, & Hancock, 2004). Although this group is fragmented, it does tend to form segments around social networks. Such networks involve charities, clubs and societies, religious organisations and tend to focus locally within the community. An ageing population will affect the amount of energy that is consumed in the home. Any strategy to combat climate-change effects must take into account these predicted demographic changes.

This paper presents the findings of an Engineering and Physical Sciences Research Council Public Engagement project (2009–2010) carried out to promote low-carbon home adaptations and behaviour change among the elderly. A number of engagement events were held to increase the awareness of environmental upgrading of homes, energy-efficiency measures, financial support available and low-carbon lifestyles, and a feedback process collected information on sustainable actions taken by the attendees 3–6 months after the initial events. The results illustrated that many had made changes in their lives since attending the events, are planning to change or have encouraged someone else they know to make a change in their lives to be more sustainable.

2. Background

The condition of English housing is assessed against four criteria (housing health and safety rating system, thermal comfort, repair and modern facilities), failure of any one of which results in the dwelling being categorised as ‘non-decent’. In 2010, approximately 5.9 million (26%) of the 22.4 million dwellings in England were categorised as non-decent and, of these, 2.2 million homes failed the thermal comfort criteria (DCLG, 2012). Improving the thermal performance of English housing (as measured through the Standard Assessment Procedure – SAP) (BRE, 2009) remains a key priority for the UK Government. Although the SAP rating of English dwellings has increased (DCLG, 2012), the improvement has been largely due to passive measures. Cavity wall insulation has risen from 35% of the stock in 2001 to 54% in 2010: loft spaces with more than 150 mm of insulation rose from 24% in 2003 to 43% in 2010: double-glazing rose from 30% in 1996 to 74% in 2010. At the same time, central heating (mainly gas powered) rose from 75% in 1996 to 87% in 2010, of which 32% of all dwellings had either condensing or condensing combination boilers compared with only 2% in 2001.

What has been less effective has been the uptake of renewable energy measures, with only approximately 2% of English homes having renewable energy generation installed (DCLG, 2012). However, it is estimated that 17.8 million dwellings could potentially benefit from one or more energy-efficiency improvement measures at a cost per dwelling of approximately £1100 (DCLG, 2012). Even with these improvements the mean SAP rating would only increase by 7 points (to 66) resulting in a theoretical reduction of 20% in CO₂ emissions across the whole stock. If a greater reduction in CO₂ emissions was required, more major changes to the existing housing stock would be needed.
Public attitudes have come to be seen as crucial in the choice of energy futures and attitudes to particular technologies as well as responses to specific development proposals have been of interest. Two themes that are becoming increasingly popular in the sustainability sector are effective communications and behaviour change. To embed behaviour change and awareness, the right knowledge and a supportive environment is needed. Many factors such as age, beliefs, culture, social norms, individual preferences and habits, economic situation and market strategies influence consumer behaviour, and effective behavioural changes are achieved by involvement and engagement, governed by the tools used and the reasons for doing so.

The importance of community actions in combating climate change has been widely recognised and has been increasingly informing government policy and academic inquiry in the last decade. Effective community engagement is located primarily in the concept of ‘social capital’ (Halpern, 1999) as the features of social organisation that enhance society’s productive potential. Research has suggested that it is possible to strengthen and augment a community’s levels of social capital through the encouragement of collective action on climate change (Ebi & Semenza, 2008). Insights from social research and theories suggest there are benefits from tapping into the cohesion and motivational drives, which can be improved in already established social networks and community groups (Peters, Fudge, & Sinclair, 2010, quoting Halpern, Aldridge, & Fitzpatrick, 2002; Jackson, 2005; Petty & Cacioppo, 1986). According to Peters et al. (2010), ‘trust and knowledge have been seen as crucial to the diffusion of social signals in promoting patterns of behaviour’.

Recent research (EC FP7 Project-Changing Behaviour, 2010) and literature (Heiskanenn, Johnson, Robinson, Vadovies, & Saastamoinen, 2010; Owens & Driffield, 2008; Peters et al., 2010) have shown that individuals can be more effective at the community level in changing energy-related behaviour. In the area of energy consumption and related behaviour, there is a need to take account of the physical, social, cultural and institutional contexts that shape and constrain people’s choices. Community initiatives have the potential to establish ownership and responsibility for actions to improve environmental footprint/energy efficiency, even in situations where individuals may otherwise feel that their contribution is insignificant. Shove (2003) argues that there is evidence that routine consumption is controlled to a large extent by social norms, and is profoundly shaped by cultural and economic factors. One of the main conclusions stemming from this research is that instead of keeping the focus on individual consumption one should concentrate on the emergence and transformation of collective conventions (social norms) as they are key in locking us into consumption patterns with different consequences for resource consumption and the environment. In most of the studies reviewed, community-based initiatives were considered successful in both motivating change and maintaining this motivation over a prolonged period of time.

In 2008 Department for Environment, Food and Rural Affairs published a framework for pro-environmental behaviours (DEFRA, 2008) where an analysis of the population sought to position each segmental group on a grid of willingness to act against potential to do more. The analysis also identified the main drivers and support mechanisms required by each segmental group. ‘Positive Greens’, ‘Concerned Consumers’ and ‘Sideline Supporters’ required enabling strategies and effective engagement. ‘Waste Watchers’ and ‘Cautious Participants’ required encouragement, examples and enabling strategies, while the ‘Stalled Starters’ and the ‘Honestly Disengaged’ required encouragement and enabling strategies if they were to effectively participate in pro-environmental living. The outcome of the analysis was the four Es model of pro-environmental behaviour: enable, engage, exemplify and encourage. While Department for Environment, Food and Rural Affair’s (DEFRA’s) segmental analysis did not specifically consider the impact of age on environmental attitudes, two segment groups were biased towards the older generation. The segment ‘Waste Watchers’ had the oldest age profile (34% aged over 65) and also had a high
number on low incomes who were retired and who were likely to be homeowners. This segment
group classed themselves as generally environmentally friendly and were happy that they were
doing everything they could in this area. The segment overwhelmingly agreed that they demon-
strated ‘a waste not, want not’ approach to life and this attitude drove their behaviours. The
second segment where the over 65s were highly represented were ‘Stalled Starters’. This
segment, which also contained a high percentage of young people, demonstrated the lowest
socio-economic profile of any segment and had the highest levels living in rented (private and
social) accommodation. This segment was much less likely than average to save energy and
water in the home or to give much thought to sustainable living.

Recent work (Owens & Driffield, 2008) also points to the need for more deliberation and better
communication between all stakeholders. Interesting examples can be found in the field of dom-
estic energy consumption where, in spite of successive campaigns (Hinchliffe, 1996; Owens,
2000) the uptake of energy-efficiency measures has been disappointing and behaviours have
often become more energy-intensive. An international review of the effectiveness of initiatives
aimed at changing behaviour towards the environment has developed an analytical framework
that position the mechanisms employed to achieve behaviour change in an individual, social or
material context (Southerton, Meekin, & Evens, 2011). These initiatives include economic incen-
tives, actively promoting environmentally friendly alternatives including nudge theory and infor-
mation campaigns aimed at changing attitudes. The interventions seek to reframe the social
context of behaviour through: the social institutions the people associate with; all the cultural
tastes that people share and challenge personal norms through community-based initiatives
located around social networks. The material context focuses on the design of goods that
support consumption. Through an analysis of 30 international case studies, the research identified
three specific lessons for stimulating behaviour change: target multiple contexts and moments of
lifestyle transition; address a specific sector, domain or consumption; and use low-profile or non-
pro-environmental messages to affect change.

A study conducted by the Energy Saving Trust (EST, 2007) examined the dynamics behind
social networks of the elderly in order to more effectively focus their advice regarding energy-
saving measures. Two of the community segments are directly relevant to this engagement
project. The ‘Discerning Elderly’ are professional couples on the cusp of retirement that have
worked hard to attain their standard of living and take great pride in their home, which tends
to be large and consequently expensive to heat. According to EST (2007), this group offers a sig-
nificant opportunity for energy saving, as they are generally interested in environmental issues
and at a point in their lives where they have few ongoing financial commitments. They are
among the highest energy users and account for 5% of UK households. The ‘Restful Retired’
are elderly people, often widowed who are still living independently or have moved to housing
that caters for the elderly. For those living independently, the key driver for change in behaviour
is likely to be financial. This segment is most likely to qualify for grants to implement energy-
saving changes. This group accounts for 6% of total UK households. Allied to this group are
those elderly who are living in fuel poverty. In 2003, there were 1.0 million vulnerable households
in fuel poverty, increasing to 2.8 million in 2010 (DECC, 2012b). The number of fuel-poor house-
holds has more than doubled across all household age groups with the largest increase seen in the
group where the household reference person was aged 60–74. According to Help the Aged (now
AgeUK, 2007), one in five older people in the UK live in one room to keep warm and save costs.

Based on the EST model (2007) it was hypothesised that the main differences in opinion
across the target group would coincide with age and wealth differences (Figure 1). Within the
retired population there were at least two distinct generations identified as ‘younger old’ and
the ‘older old’. The younger old were more mobile and active, and had perhaps been exposed
to the sustainability debate and related issues through their work and media. The ‘older old’
had more mobility problems and, depending on the options that have been available to them, were slightly more isolated from the current political and social agendas. Across this age range there were also differences in the disposable income of individuals: residents over 65 who were living in fuel poverty and elderly with plenty of disposable income.

3. Research methodology

Focus groups and a variety of engagement methods were implemented to promote a dialogue with the elderly. An attempt was made to include a sample from each identified segment in the focus groups as well as the engagement process as each group had a different set of priorities and needs.

- Younger old (poor) living with fuel poverty: <75 years old.
- Younger old (financially independent/comfortable) who have got the resources to carry out actions: <75 years old.
- Older old (poor) living with fuel poverty: >75 years old.
- Older old (financially independent/comfortable) who have got the resources to carry out actions: >75 years old.
- 65+ years old residents in care homes (mainly for behavioural changes as they are not able to physically adapt to their accommodation).

3.1 Focus groups

To ensure that the engagement was timely, useful and effective, five focus groups were conducted in four different locations, typically consisting of 6–8 participants. These sought to identify the topics within the sustainability agenda that were of most interest and concern to the older community as well as engagement formats that were desirable. The questioning route was specifically designed for the elderly and the methods employed to order and prioritise information changed a number of times to accommodate specific requirements like mobility, disability and ease of understanding. Given the heterogeneous nature and the range of ages and affluence of this target group, it was important to make sure that all segments identified in the research methodology were included in the focus groups. Five volunteer groups were selected from different locations and covered the range of age groups and wealth.

Groups 1 and 2 – Older old people with a range of affluence.
Group 3 – Younger old people with a majority of people more to the ‘well-off’ wealth range.
Group 4 – Elderly from a varied range of ages and affluence.
Group 5 – Older old and generally very well-off.
Table 1 and Figure 2 illustrate the ages and occupation determined wealth of the 38 focus group participants. Fifty-eight percent of the participants were 75 years or over, while 31% were under 75. Eleven percent declined to give this information but from observations the majority of those who declined were under 75 years, thus leading to an almost even split across the age groups being achieved. Defining wealth through occupation is an established socio-logical statistical technique but many methods exist to quantify this socio-economic status. The method used here was described by Raftery (2000) and has been used to split the participants by their main occupation into one of the four categories: upper non-manual, lower non-manual, upper manual and lower manual. Upper non-manual would include doctors, lawyers and managing directors. Lower non-manual included all non-manual work with no management component. Upper manual covered manual work where training or qualifications were required such as plumbers or electricians. Lower manual included all workers on a minimum wage such as cleaners. The fifth category of farm was eliminated. Instead homemaker/housewife was included as a separate category. This new category was created due to the number of participants who gave this as their occupation but also due to it not being possible to include this response in any of the other categories. Homemakers could be either very affluent so were not required to work or less well-off but from a generation where it was more usual for women to stay at home.

The female participants’ number was three times more than that of men. This is a common factor when dealing with the over-65 age group and can be explained by the Office of National Statistics (2012) observation that there are significantly more women than men in the over-72 population. In the over-60 population, women do currently outnumber men though this trend is decreasing in strength as male life expectancy increases and the effect of the male mortality rates during the World Wars are removed from the system. As a range of ages and wealth groups were covered and topics were being repeated by the fifth focus group, it was unlikely that many different opinions would have been found if more groups had been conducted.

Table 1. Demographic profiling of the focus group participants.

| Age group | %   | Profile group          |
|-----------|-----|------------------------|
| Under 55  | 5   | Younger old group 31%  |
| 55–64     | 18  |                        |
| 65–74     | 8   |                        |
| 75–84     | 26  | Older old group 58%    |
| Over 85   | 32  |                        |
| No data   | 11  |                        |

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Figure 2. Wealth profiling of the focus group participants.
(Krueger, 1998). Krueger and Casey (2009) described this concept as ‘saturation, the point where you have heard the range of ideas and are not getting new information’.

The aims of the focus groups were to discover, first, the aspects of sustainability that were of most interest and use and, second, the format in which they would prefer to receive any relevant information. The questioning route opened with all participants introducing themselves before the introductory question of ‘What does sustainability mean to you?’ The participants as a group attempted to place a selection of potential sustainable actions into a preference order, a tool often used within focus groups to expand discussions. This exercise was not effective due to decreased mobility and difficulty of understanding technical terms. An alternative approach included individuals nominating which of the actions that they ‘always do’, ‘sometimes do’ or ‘never do’ seemed to be more effective. Methods of obtaining and communicating relevant information were discussed. The group discussed which methods they generally prefer in communicating information both from the options given and from other paths they regularly employed. The data were recorded and content analysis was carried out to identify the aspects of sustainability that were highlighted as important in their lives. The results are presented in Table 2.

3.2 Public engagement

During the year-long initiative the following engagement events were conducted with the aim of stimulating behavioural change, collecting ideas for sustainable actions and identifying optimum engagement methods for people over 65 years: focus groups (38 people), 38 presentations (1125 people), 12 information sessions/stands (479 people) and 6 discussion groups (79 people). From the attendees who voluntarily gave information, it was illustrated that all age groups (542 respondents) and wealth segments (323 respondents) identified were covered by the engagement. The majority of the attendees were in the 65–85 age category (Table 3) and belonged to the lower and upper non-manual wealth spectrums (Figure 3). Some respondents stated ‘retired’ for previous/current occupation.

In addition to face-to-face engagement, articles in newsletters and publications aimed at the older community such as the Age Concern London ‘London Age’ magazine were used to disseminate research information on sustainability issues to a further 15,050 people. The initiative included a project website and the publication of information leaflets that were distributed through Age Concern centres and libraries across London. Through these varied methods a total of 17,720 people were engaged with. Table 4 illustrates the number of people engaged or reached through a variety of methods. To conclude the project, a booklet of information and suggestions of sustainable actions was published and 3000 copies distributed among the elderly free of charge. Each booklet also contained a questionnaire to complete and return, which measured the extent of the engagement and related behaviour change. The success of the engagement in stimulating behavioural change was measured through a questionnaire posed to 354 event attendees by post or telephone depending on the attendee’s preference. This follow-up engagement occurred at least 3 months after the initial contact and collected information on the sustainable actions taken by the attendees since the initial event.

3.2.1 Presentations

The focus group attendees showed an interest in a wide range of topics in the sustainability debate and a presentation was created to address these, at least briefly. The same presentation was to be repeated to maintain continuity throughout the engagement. Attendees were encouraged to ask questions during and after the talk, allowing more time to be spent on the topics contained within the talk that were of interest to each individual group. Notes were made on the topics...
Table 2. Results of the focus group discussions.

| Understanding sustainability | All ages and wealth spectrums | Older old |
|-----------------------------|-------------------------------|-----------|
|                             | • Lack of awareness of the term ‘sustainability’ | • More focus on personal aspects and issues of sustainability that had more local impact |
|                             | • Recycling and wastage are key issues | • Less aware of the term ‘sustainability’ |
|                             | • Clear symbols and communication needed regarding products recycling | | |
|                             | • Improvement of waste and recycling collections by the local councils needed | | |
|                             | • Energy-saving light bulbs not popular as they emit a hue | | |
|                             | • Ceiling and cavity wall insulation making a big difference to heating bills | | |

| The motivators for change | Younger old | Older old |
|---------------------------|-------------|-----------|
|                           | • Awareness of global implications of food distribution and transport systems | • Local community issues and improving local life important |
|                           | | • Saving money, improving comfort and security while maintaining independence |
|                           | | • Saving energy is useful but not to interfere with daily life or habits |
|                           | | • Trust and follow government advice readily |

| Financial support in upgrading homes | Younger old | Older old |
|-------------------------------------|-------------|-----------|
|                                     | • Interested in making substantial changes to homes | • Resistant as grants are perceived as hand-outs |
|                                     | • Receptive to receiving support and financial grants | • Exceptions were grants available as reduction in council tax for people living on their own or energy upgrades that were carried out by the local councils |

| Preferred methods of communication | | |
|------------------------------------| | |
| • Information leaflets and booklets to refer back | | |
| • CD or DVD was not popular other than in communal use | | |
| • A single point of contact for information | | |
| • One-to-one discussions with trusted people or agencies | | |

Table 3. Demographic profiling of the engagement participants.

| Age group | % | Profile group |
|-----------|---|---------------|
| Below 55 years | 2 | Younger old group 52% |
| 55–64 years | 12 | |
| 65–74 years | 40 | |
| 75–84 years | 37 | Older old group 47% |
| Over 85 years | 10 | |
on which questions were raised to gather further information of interest areas and opinions of the older community. A 30-minute presentation was created starting with an explanation of sustainability as a concept linked to some basic information on the subject of climate change. The talk extended further to more practical advice presented as suggestions for consideration or prompts for the attendees to adapt to their own lives. The energy saving and general lifestyle suggestions were small everyday actions that most people should be able to undertake such as using energy-saving light bulbs and using public transport where possible. The home-adaptation suggestions were larger, potentially more challenging tips such as considering double-glazing and insulation to raise the thermal comfort of the home. Information on the costs of these larger actions and grants to help in paying for these types of works was also included. The talk was trialled on an audience of 45 people and the feedback included: some information already known; information not relevant to sheltered accommodation tenants having limited control over the fabric of their home. The master presentation was thus changed to suit the attendees in different

Table 4. Number of people reached or engaged with.

| Method                      | Number of people engaged with |
|-----------------------------|-------------------------------|
| Focus groups                | 38                            |
| Presentations               | 1125                          |
| Information stands          | 480                           |
| Discussions                 | 79                            |
| Articles                    | 3340                          |
| Advertisements for sessions | 12,210                        |
| Website                     | 387                           |
| Leaflets                    | 561                           |
| Booklets so far             | 2000                          |
| Total                       | 20,220                        |

Figure 3. Wealth profiling of the engagement participants.
venues. This format allowed the flexibility to give the same information to each group while also allowing the group to focus on the particular areas that they were interested in.

3.2.2 Information sessions/stands
The information session format was utilised when groups were not used to formal presentations or when already established groups met to debate current affairs. In such cases a short introduction to the topic was given and the discussion progressed around sustainability issues with answers to questions and addressing confusions. In these events the participants determined the content of the session themselves. Information stands were held at a variety of events where groups of older people were attending. A larger audience was reached in this manner and awareness was raised of sustainability issues that might exist in their lives. Day centres, clubs, street fairs and health fairs were attended with a suite of free informative material.

4. Feedback in relation to behavioural change
The success of the engagement in stimulating behavioural change was measured through a questionnaire posed to 354 event attendees by post or telephone depending on the attendee’s preference. The follow-up feedback process, 3 months after the initial contact, collected information on the sustainable actions taken by the attendees since the initial event. This feedback, analysis and evaluation process ensured that all behavioural changes were captured in a systematic manner.

4.1 Feedback analysis
A coding method was designed to analyse the questionnaire responses in a way that the impact of the engagement in terms of stimulating interest and actions in sustainability could be quantified. Four categories of impact were chosen, namely: none = 0, weak = 1, strong = 2 and very strong = 3. The answers given to questions 1–5 on the feedback questionnaire were coded to place each respondent in one of the four categories for each question (Table 5). If a respondent fell between two categories, the lower impact option was chosen.

The numeric values of each category for each respondent were summed to create the final impact coding value. The final coding categories were: none = 0–2, weak = 3–5, strong = 6–8 and very strong = 9–12. Percentages of respondents that fall into each category were calculated according to this coding. The results show that it is mainly the 65–85 age category, a combined middle segment of the younger old (<75) and the older old (>75) that has responded to the engagement and taken actions or changed behaviour. From these two segments, the younger old have responded in a positive manner making substantial changes coupled with behavioural changes (Figure 4).

The feedback results (Table 6) illustrate that the awareness of sustainability has increased since the event attendance and actions have been taken in relation to this awareness. Some made changes in their lives since attending the events, some were planning to change something specific in the future, some had encouraged others to make a change in their lives to be more sustainable and 62% of the people encouraged definitely made the change suggested.

The individual actions taken (Figure 5) show that energy saving and reducing wastage were the most common actions taken by the event attendees. The pattern of ‘65–85 age group being the most pro-active’ is again repeated and most popular actions (saving electricity and water, etc.) are always money savers. The same coding method was implemented to assign overall impact values to each completed questionnaire response. From the coded data it can be illustrated that 70% of the questionnaire respondents felt that the impact of the engagement was very strong or strong (Figure 6).
Table 5. Questionnaire coding criteria.

| Question                                                                 | Category | Response                                                                 |
|--------------------------------------------------------------------------|----------|--------------------------------------------------------------------------|
| Q1. Have you thought about any of the issues spoken about in the talk and discussion session since the talk? Do you have any further comments? | None     | No to Q1 and no further comments given                                  |
|                                                                           | Weak     | Yes to Q1 and no further comments given or no and many comments given   |
|                                                                           | Strong   | Yes to Q1 and comments given                                              |
|                                                                           | Very strong | Yes to Q1 and detailed comments about wider implications of climate change |
| Q2. Have you changed anything in your life to be more environmentally friendly since the talk? If yes what? | None     | No                                                                       |
|                                                                           | Weak     | Done one or two easy changes, e.g. change one light bulb                 |
|                                                                           | Strong   | Done lots of little things or some small structural or behavioural change |
|                                                                           | Very strong | Large structural change or behavioural change, e.g. new boiler or getting rid of car |
| Q3. Are you planning to change anything in your life to be more environmentally friendly? | None     | No                                                                       |
|                                                                           | Weak     | Yes but none specified or no but mentioned looking for new things to do   |
|                                                                           | Strong   | Yes but only small actions specified                                     |
|                                                                           | Very strong | Yes and large action specified                                             |
| Q4. Have you encouraged anyone else to change anything?                   | None     | No to both questions                                                     |
|                                                                           | Weak     | Yes to encouragement but no to action. Action was a small action          |
| Q5. Did the person you encouraged actually make the change you suggested? | Strong   | Yes to encouragement but no to action. Action was a large action          |
|                                                                           | Very strong | Yes to both questions                                                     |

Figure 4. Age profiles in relation to sustainability actions and behavioural changes.
5. Discussion

The engagement achieved many environmental, social and economic benefits. Environmentally, information and tips given to the attendees were simple and easy to carry out actions that save energy, save money and contribute to green living habits. Socially engaging in debates, focus groups, discussions and seminars related to sustainability and climate change provided the

| Question                                                                 | Yes  | No  | Do not know |
|--------------------------------------------------------------------------|------|-----|-------------|
| Q1. Have you thought about any of the issues spoken about in the talk and discussion session since the talk? | 84%  | 16% | 0%          |
| Q2. Have you changed anything in your life to be more environmentally friendly since the talk? | 54%  | 46% | 0%          |
| Q3. Are you planning to change anything in your life to be more environmentally friendly? | 47%  | 53% | 0%          |
| Q4. Have you encouraged anyone else to change anything? | 57%  | 43% | 0%          |
| Q5. Did the person you encouraged actually make the change you suggested? | 62%  | 18% | 20%         |

Figure 5. Individual actions taken after attending the engagement according to the age groups.

Figure 6. Overall impact of engagement.

5. Discussion

The engagement achieved many environmental, social and economic benefits. Environmentally, information and tips given to the attendees were simple and easy to carry out actions that save energy, save money and contribute to green living habits. Socially engaging in debates, focus groups, discussions and seminars related to sustainability and climate change provided the
elderly a platform to express their views about the current issues. Economically, the project aimed to educate the elderly in energy-saving and energy-efficient technologies as well as minimise fuel poverty where relevant.

Throughout the engagement activities, a number of cross-cutting themes emerged. Generally the older community were keen to engage with the subject and in many cases believed that they had valuable life lessons the younger community could benefit from. In particular they felt their life experiences, especially from times of war, were very useful in finding solutions to the current socio-economic problems. They also felt that their experiences were often unvalued by modern society and many expressed an interest in actively engaging in the debate with the younger generation, especially their children and grandchildren. A resistance to accept grants and financial support was also prevalent in this group unless it was offered via tax rebates or home upgrades initiated by the local authority.

The younger old members were more aware of global implications of sustainable living such as global food distribution and transport systems while the older old tended to be more concerned about local community issues and improving local quality of life. This was illustrated with the older age group being more willing and able to take the lead on sustainable issues in their social groups and wider communities through independently forming groups and initialising schemes that could prove to be a hugely valuable resource in addressing sustainability that could be utilised more often by the sector. Contrary to the older old, this group was more willing to accept grants and financial support in assisting their home upgrades.

The engagement directly encouraged independent changes within the operations of the groups providing examples for the segments identified in the DEFRA (2008) study:

- Instigating recycling systems that increased recycling rates and reduced the cost of waste disposal – Waste Watchers.
- Shifting to buying reusable plates and cups instead of throw-away varieties – Concerned Consumers.
- Formed ‘Green’ groups in churches and local communities – Positive Greens.
- The project offered events to smaller groups than would not normally be targeted, even in cases where English was not the primary language spoken by the attendees (Somalian and Ethiopian groups). The feedback illustrated that these smaller groups gained most from the engagement. These groups highlighted the quality of the engagement and appreciations of the opportunity to clarify long held questions on sustainability (according to DEFRA, 2008 grouping – Sideline Supporters).

The engagement has further strengthened the four Es model of pre-environmental behaviour (DEFRA, 2008): enable, engage, exemplify and encourage.

6. Conclusions
The aim of the study was to measure the impact of public engagement in the sustainability debate on behaviour among the older community. A second aim was to assess whether there was a difference in impact between the younger old and older old communities.

Effective dialogue and engagement of research knowledge and information in clear simple communication methods can achieve adaptive behavioural changes. Of the people directly engaged by the study, 54% made actual changes to their lifestyle, 47% are planning to make changes and 57% have encouraged others to make changes. This trend does not appear to be related to the age of the citizen with both the younger old and older old demonstrating similar behaviour change patterns.
Where age does appear to play a part is in the focus that the older community have on the focus of the sustainability debate and on their willingness to accept financial support in the form of grants to enable change. The younger old appear to adopt a more global view of sustainability, citing issues associated with global food distribution and transportation while the older old take a more local view over quality of local life. The younger old also appear more inclined to take advantage of grants to support a change in lifestyle while the older old do not. These conclusions are useful in targeting information to different age groups. The reluctance or inability of the older old people to be given or accept grants is an issue that should be considered when advertising these schemes, as presently there are more grants available for the older old people who from the results of this study would be less likely to apply for them. Making grants more available to the younger old could gain a higher take-up rate and could lead to the next generation of older old people being more receptive to energy-saving financial help. The engagement has stimulated interest in and resulted in low-carbon behavioural change as this stakeholder group is both vulnerable to climate change and is in a position to have an impact on CO$_2$ emission levels.

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