Department for
Business, Energy
& Industrial Strategy

Transforming Heat – Public Attitudes Research

A survey of the GB public on the transition to a low-carbon heating future

BEIS Research Paper Number 2020/024

January 2020

TRANSFORMING HEAT – PUBLIC ATTITUDES RESEARCH

Findings from a survey of the GB public on the transition to a low-carbon heating future

A report for BEIS by NatCen

Acknowledgements

This independent research report was produced by Gianfranco Addario, Curtis Jessop, Marta Mezzanzanica and Martin Wood from NatCen Social Research with support from Eunomia.

We would like to thank Professor Christina Demski for her guidance in the development of the questionnaire and support in the analysis and reporting of the data.
We would also like to thank Harry Bradwell and the wider steering group at BEIS for feedback during the project and comments on the report.

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Executive Summary

This report explores public engagement with a future transition to low-carbon heating. It investigates the level of awareness and knowledge of:

- the contribution to greenhouse gas emissions of heat in domestic and commercial buildings;
- of UK emission reduction targets; and,
- of specific low-carbon heating technologies.

It considers how levels of awareness and knowledge vary by socio-demographic groups, types of home heating system, and by levels of concern about climate change. Crucially, it takes some initial steps towards understanding the level of support for a future heating transition and the acceptability of possible elements of such a transition.

The findings are based on a survey conducted in May 2019 of a general GB population sample of adults. The sample was taken from the NatCen Panel, a random-probability research panel recruited from the British Social Attitudes survey.

There was strong public support for carbon-reduction policies

The British public was consistently supportive of policies aimed at reducing carbon emissions and viewed the UK achieving a substantial reduction in carbon emissions to be important. Nine in ten people regarded targets for emissions overall, and heating specifically, to be important. There was some variation by socio-demographic groups, but levels of support were high across them.

But there was some disconnect with knowledge of heating's role

Self-reported knowledge/awareness, when focused specifically on heating, was relatively low. Analysis suggests the public did not know that heating in buildings is one of the very largest contributors to carbon emissions in the UK, and only a minority reported having heard of specific low-carbon heating technologies.

It is not clear that knowledge of heating's role in releasing carbon emissions, or of low-carbon heating technologies, is associated with levels of support for environmentally-friendly policies. Those who correctly identified heating as one of the three highest contributors to UK carbon emissions were not significantly more likely to think that a transition towards more environmentally-friendly heating technologies was important.

Instead, support for a transition was more strongly associated with attitudes to climate change

People who were more concerned about climate change, who engaged in significant 'green' behaviours, such as avoiding non-recyclable materials when shopping, and supported other

policies targeted at reducing carbon emissions were more likely to think the transition was important.

This was borne out in the analysis of an experiment that presented respondents with specific heating transition pathways: concern about climate change had a far larger effect on the acceptability of the transition scenarios than a person's demographic characteristics or variation in elements of the delivery of the transition.

Varying the elements of heating transition scenarios had a small effect on public acceptability

Analysis found statistically significant differences in levels of acceptability between elements of the heating transition scenarios. In order of the element's importance in relation to acceptability:

- Transition scenarios that involved low disruption were more acceptable than those that involved high disruption;
- National planning was more acceptable than local planning;
- Household control over timing more acceptable than no control.

However, while there was some effect, the size of this effect was small. The mean level of acceptability of the transition from the least to the most acceptable scenario ranged from 5.47 to 6.30 on a scale from 0 (not at all acceptable) to 10 (completely acceptable). This narrow range of differences in scores indicates that none of the elements had a substantial effect on the acceptability of a transition. This finding may in part reflect that, as there was lack of certainty about the eventual shape of any transition policy, the scenarios presented did not include details about costs to the household, and only illustrative detail on the nature of possible in-home works. The hypothetical scenarios used in this research represent a first step in gaining an understanding of the public's views of a heating transition and more concrete proposals in these areas may result in stronger effects on acceptability.

There was little variation by socio-demographic groups

More generally, socio-demographic characteristics were associated with knowledge and attitudes towards a transition to low-carbon heating and related areas. Younger people, those with degrees, and people with higher equivalised household incomes were more likely to be in favour of carbon reduction policies or think they were important. Older people, those with degrees, and people with higher equivalised household income tended to have higher knowledge/awareness of low-carbon heating technologies and carbon reduction policies. Nevertheless, socio-demographic characteristics could not explain how the acceptability of the concrete transition scenarios varied in the general population: indeed, this was better explained by attitudinal elements, such as levels of concern about climate change.

Patterns were similar between those on and off the gas grid

Looking specifically at those who were off the gas grid, their levels of awareness of the Government's ambition to eliminate nearly all emissions from heat in buildings, perceived importance of transitioning away from heating systems that use fossil fuels, or acceptability of a

transition scenario were not statistically significantly different from those reported by respondents who were on the gas grid. People who were currently off the gas grid using fossil fuel heating systems were, however, more likely to report knowing at least a little about air source and ground source heat pumps, than the rest of the population (50% vs. 23% respectively). When asked about certain hypothetical aspects of a switch to low-carbon heating systems, this group (people living off the gas grid with high-carbon heating systems) were generally positive. They expected an environmentally-friendly heating system would meet their heating needs and be affordable to run and maintain, that they could obtain reliable guidance about their options, and that they would get a high-quality installation. However, there was no such consensus on the up-front costs with as many people disagreeing that these would be affordable as agreeing, suggesting that this could be a key perceived current barrier to transition for this group.

Trusted sources of information

When all survey respondents were asked about who they would most trust for advice or information about low-carbon heating systems for their homes, non-governmental organisations were the most commonly selected trusted source, followed by a government-backed advice service, which in turn was followed by national government, or a tradesperson or professional. This distribution was found across socio-demographic groups and levels of concern about climate change. However, those who were sceptical about climate change or believed it to be caused by natural processes, were less likely to trust any of the sources, and the national government or a government-backed advice service in particular.

Introduction

In January 2019, the Department for Business, Energy and Industrial Strategy (BEIS), appointed the National Centre for Social Research (NatCen) and Eunomia to undertake a project to explore public engagement with a future transition to low-carbon heating, including awareness, understanding and attitudes towards various possible elements of such a transition.

The importance of exploring public engagement has been identified in several key reports. In December 2018, BEIS released a report entitled *Clean Growth – Transforming Heating* which presented a review of the evidence on the options to decarbonise heat[1]. In the context of developing a new policy framework for low carbon heating, the report identified the need to increase wider public awareness of low carbon heating and its importance for wider UK climate commitments. The report committed BEIS to explore options for engaging with stakeholders and the wider public in the development of heat policy. More recently, the Committee on Climate Change's (CCC) Progress Report to Parliament in 2019 also identified public engagement as a key issue in decarbonising buildings.[2] The report highlighted the low level of awareness of the need to move away from natural gas heating and what the alternatives might be. The report also highlighted a limited window to engage with people over future heating choices, to understand their preferences and to factor these into strategic decisions on energy infrastructure.

In that context, this report presents the findings from a survey designed to provide insight into current public awareness, understanding, and attitudes towards a future heating transition, as well as preferences and perceptions of certain specific elements of possible transition pathways.

Background

For over 40 years, the UK has relied primarily on natural gas supplied through the national grid to heat buildings. In its most recent Progress Report to Parliament (2019), the CCC identified that emissions from buildings were 88 $MtCO_2e$ in 2018. Buildings emissions in 2018 remained higher than 2015 levels on both an actual and temperature-adjusted basis. With 85% of UK homes currently on the gas network (and a further 5% relying on oil, liquefied petroleum gas [3], or coal as their primary source of heat), decarbonising heating requires a fundamental change to enable a transition away from a reliance on fossil fuels towards low-carbon energy sources. There is likely to be no single technological solution for this transition, and there are a range of different transition pathways available, both in terms of the mix of technologies and many other aspects of the process of the transition[4]. However, it is not yet clear which combination of technologies and routes to decarbonisation will work best at scale, cost-effectively or with the

[1] See: https://www.gov.uk/government/publications/heat-decarbonisation-overview-of-current-evidence-base
[2] Climate Change Commission (2019) *Reducing UK emissions: 2019 Progress Report to Parliament*, July 2019, https://www.theccc.org.uk/publication/reducing-uk-emissions-2019-progress-report-to-parliament/
[3] Throughout the report, liquefied petroleum gas is also referred to by its acronym 'LPG'.
[4] Department for Business, Energy and Industrial Strategy (2018) *Clean Growth - Transforming Heating* https://www.gov.uk/government/publications/heat-decarbonisation-overview-of-current-evidence-base

widest overall benefits. The decarbonisation of heat is expected to have considerable impacts on much of the population. This includes making some homes and other buildings more energy efficient and the installation of new technologies.

The transition to low carbon heating may require some consumers to change how they engage with their heating system. Recent research for BEIS[5] and for the CCC[6] that has attempted to understand public awareness and knowledge of this topic has revealed low awareness of low-carbon heating technologies and heat decarbonisation's role in reducing emissions.

In BEIS' Public Attitudes Tracker, the Wave 28 study indicated a 52% awareness of renewable heating systems. While 71% of respondents were aware of solar thermal panels as a renewable heating system, there was significantly lower awareness for biomass boilers, ground source heat pumps, and air source heat pumps at 38%, 33%, and 27% respectively[7].

The CCC study aimed to identify some of the challenges around public acceptability towards alternatives to natural gas heating. The research suggested that the public would be open to switching from natural gas to alternative low-carbon heating technologies in their homes, in order to help reduce carbon emissions and mitigate against climate change. However, awareness amongst the public of the need for switchover was low. With respect to alternative solutions, both heat pumps and hydrogen heating were perceived in qualitative research to offer no, or limited, additional consumer benefits when compared to current natural gas heating systems. The research also suggested that preferences were heavily influenced by how the information on alternative heating technologies is communicated [8].

Despite this initial research, there is a need to gather more in-depth evidence on the current levels of engagement and attitudes of the public towards a low-carbon heat transition, including exploratory research on attitudes towards various specific elements of possible transition pathways.

The policy context

The delivery of low-carbon heat is a critical component of UK climate and energy policy. As part of global efforts to avoid damaging climate change, the UK Government has ratified the Paris Agreement which sets out a global action plan to limit global warming to well below 2°C. Efforts to tackle climate change were also enshrined in UK law prior to the agreement. The Climate Change Act 2008 targeted an 80% reduction of carbon emissions by 2050 compared to 1990 levels. During the course of the survey period, this target has since been revised by Parliament

[5] Department for Business, Energy and Industrial Strategy (2018) BEIS Public Attitudes Tracker: Wave 28 Key Findings
[6] Madano (2018) *Public acceptability of the use of hydrogen for heating and cooking in the home*, November 2018, https://www.theccc.org.uk/wp-content/uploads/2018/11/Public-acceptability-of-hydrogen-in-the-home-Exec-Summary.pdf
[7] Department for Business, Energy and Industrial Strategy (2018) BEIS Public Attitudes Tracker: Wave 28 Key Findings
[8] Madano (2018) *Public acceptability of the use of hydrogen for heating and cooking in the home*, November 2018, https://www.theccc.org.uk/wp-content/uploads/2018/11/Public-acceptability-of-hydrogen-in-the-home-Exec-Summary.pdf

to a net 100% reduction by 2050, making the UK the first major economy to enact a net zero law to address the climate crisis[9]. As heat for UK buildings (space heating, hot water, cooling and cooking) make up more than 30% of energy consumption and over 20% of greenhouse gas emissions[10], the decarbonisation of almost all heat in buildings would make a substantial contribution to meeting the government's carbon reduction commitments.

The study context

This research has produced robust baseline findings, which if desired may be used for tracking how public knowledge and acceptance of heat decarbonisation changes over time. It is therefore important to note the context within which this research was carried out. Survey fieldwork took place between 23rd May and 16th June 2019. Prior to this period there were a number of activities that raised the profile of climate change in the public domain. In October 2018 the IPCC released its special report on the impacts of global warming of 1.5°C above pre-industrial levels. The report gave stark warning of the impacts and time required to limit global warming to 1.5°C. Following the release of the report, over half of the 408 principal local authorities in the UK have declared 'climate emergency' and strikes by school pupils protesting the lack of action on climate change also took place. Members of an environmental campaign group called 'Extinction Rebellion' staged multiple protests, including a 10-day protest from 15th to 25th April aimed at causing 'major disruption' across London to bring attention to the climate crisis. These events were both extensively covered by the media and may have had a short (or long-term) impact on public attitudes towards climate change and related policies.

Research questions

The survey aimed to explore four main research questions:

1. *What are the current levels of public awareness and understanding regarding the need and rationale for a heating transition, and of the technologies that might form part of it?*

2. *When different possible pathways are considered, what are the current levels of support for a future transition to low-carbon heating?*

3. *What attitudes exist towards low-carbon heating among people currently living in homes off the national gas grid using high-carbon heating?*

4. *Which sources do the public currently most trust to provide information, advice or recommendations about low-carbon heating technologies?*

[9] The legislation to amend the Act was in fact laid by the Government on 12th June 2019, towards the end of the fieldwork period for this survey. The Amendment was passed by Parliament and came into force on 27th June 2019.
[10] See: https://www.gov.uk/government/publications/heat-decarbonisation-overview-of-current-evidence-base

Methodology

Questionnaire development

The questionnaire was developed in collaboration between researchers from NatCen, Eunomia and BEIS, and was cognitively tested ahead of fieldwork[11].

Table 1 gives an overview of the questionnaire content by section. Alongside key questions of interest about a heating system transition (awareness, acceptability and trusted sources of information), questions on relevant related aspects were asked to understand how views may vary for different groups – for example how attitudes to a low-carbon heating transition vary by type of heating system currently used or level of concern about climate change.

Table 1 Overview of the survey sections and their specific aim

Substantive areas of interest	**Aim**
Heating transition policy rationale awareness	Measure *awareness* and *perceived importance* of government's targets for the reduction of carbon emissions.
Acceptability of the heating system transition *(Randomised vignettes experiment)*	Explore the potential relative importance of three specific elements of the switchover (the planning approach, the households' level of control over timing and the level of disruption of the in-home works).
Attitudes towards low-carbon heating among those off the gas grid with a high-carbon heating system	Assess the attitudes of the off gas grid population with a high-carbon heating system towards a transition to low-carbon heating.
Preferred source(s) of information	Identify the most trusted current source(s) for information about new heating technologies.
Relevant related areas of interest	**Aim**
Household heating system	Current main heating technology system of the household and satisfaction with different elements.

[11] A more detailed description of the methodology and the cognitive test can be found in Appendix A.

Table 1 Overview of the survey sections and their specific aim	
Household type & level of respondents' involvement in managing the heating system	Property type, tenure, level of involvement in managing the energy bills and in taking decisions about the home heating system.
Knowledge of low-carbon heating systems	Awareness of different low-carbon heating systems.
Environmental behaviours	Personal behaviours that relate to energy consumption and carbon emissions.
Attitudes towards climate change & related policies	Climate change scepticism and concern, and support for policies aiming at tackling it.

In accordance with the overarching aim of the project, this report focuses on the findings relating to the key questions and discusses other questions only in relation to those findings. For the sake of completeness and transparency, a full questionnaire specification is available in Appendix B, and population estimates for each of the survey questions are presented in Appendix C.

Vignettes experiment design[12]

The acceptability to the public of hypothetical transitions towards greener and more environmentally-friendly heating systems was explored using an experimental vignette approach. This involved presenting respondents with descriptions of possible transition pathways that included several elements, some of which were randomly varied. Using statistical modelling it was then possible to explore which factors could make the transition more acceptable to the public.

A challenge for the approach was that there is currently no determined or expected technological solution for a transition, and there are several different elements that can build up a potential pathway, such as the use of taxes and incentives, the pace of the transition, how it is planned, managed and governed, the duration and extent of community-level or household-level disruption, etc. The lack of specificity in some areas, for instance costs to the householder, make it more difficult to provide a compelling hypothetical scenario with which respondents can engage. Nevertheless, the approach could provide a first step towards understanding the relative importance of elements of a possible pathway and how this varies between groups of the population.

NatCen, in collaboration with Eunomia, worked with BEIS to pin down the analytical requirements and agree a set of key areas of interest for the vignette experiments, accepting that the range or complexity of any real-world scenarios could never be fully captured in such a

[12] For a more detailed account of the experiment design, see Appendix A.

process. The selection of the items aimed to balance different requirements: (a) explore as many dimensions of interest as possible; (b) keep the scenarios accessible to avoid over-burdening and confusing respondents; (c) ensure content is coherent; (d) avoid speculation on elements not yet understood (e.g. the associated costs of the transition[13]).

The attributes and their levels selected for the experiment can be summarised as:

- **the planning approach** – whether a nationwide switchover plan for the whole of the UK, or a series of locally developed plans towards an overall national target;
- **households' level of control over timing** – whether households were able to choose when to switch individually, or whether neighbourhoods would undergo a coordinated switchover on specific dates;
- **the level of disruption of the in-home works** – whether low (described as 2 to 3 days over a few months to replace heating appliances), or high (described as up to 8 consecutive weeks involving major works, such as installing new radiators and energy efficiency improvements).

With three attributes, each with two variants, there were eight (2x2x2) different scenarios to test in total.

The overall aim of the vignette experiment was to understand how the different variants of the three selected elements affect overall 'acceptability' of a transition as a whole, the relative importance of each in driving that acceptability, and whether this varied across different subgroups of respondents.

Sample design and fieldwork

A general population sample of adults aged 18 and over in Britain was recruited from the NatCen Panel, a random-probability research panel recruited from the British Social Attitudes survey. This random-probability approach, where each member of the population has a known and non-zero chance of selection for the study, means that the findings discussed in this paper can be inferred to the general British population.

Data was collected over a three-week fieldwork period with a mixed-mode fieldwork design: all panellists were initially invited to take part online, with those choosing not to, or unable to, complete online followed up by a telephone interviewer. As a probability-based sample, quotas were not used for this fieldwork. Since the incidence of the population not connected to the mains gas grid is relatively small (c. 13% of total households[14]), to increase the sample size for this group and enable more robust analysis of this group, a 'boost' sample of additional panellists identified as living in off-grid post-codes were issued.

[13] Participants were asked to evaluate the scenarios assuming that the costs to homeowners of the new system and running costs for households would be the same for all the options. This is discussed further in Appendix A.
[14] As per MSOA estimates as of 2017, available at https://www.gov.uk/government/statistics/msoa-estimates-of-households-not-connected-to-the-gas-network

The survey was completed by 2,706 of the panellists in the main sample and 201 of the panellists in the 'boost' sample. This represents 60% of main sample panellists and 72% of boost sample panellists invited to participate. More details on response rates at various stages of recruitment, and weightings for non-response, are included in Appendix A.

Analysis

The data used in the analysis for this report have been weighted[15] to be representative of the adult (18+) British population, adjusting for non-response bias and the boost sample of off-grid cases.

Each section of the report begins with an initial descriptive analysis to provide estimates for the general population, before turning to a bivariate analysis that looks at how these estimates varied between different groups of people. All findings have been tested for statistical significance, and all differences reported are statistically significant unless stated otherwise. Statistical testing was conducted at the 95% level[16].

The vignettes were analysed using multi-variate analysis. For more information about the analysis of the vignettes and the implemented regression model, see Appendix A.

Key sub-groups of interest

Some key sub-groups have been used across all the analysis to describe acceptability patterns. These were selected as being likely to be related to attitudes towards the transition and/or reflect the research aims and objectives:

1. Age (grouped into six categories: 18-29, 30-39, 40-49, 50-59, 60-69, 70 and over);
2. Country (England, Scotland and Wales)
3. Education (grouped into two categories: 'Has a degree' vs. 'Does not have a degree')
4. Equivalised household income;
5. Tenure (grouped into three categories: 'Owner occupied' vs. 'Private rented and other' vs. 'Social rented')
6. Type of heating system in the household (grouped into four categories: 'off-grid low carbon and other' vs. 'off-grid high carbon' vs. 'off-grid electric' vs. 'on-grid').

Heat in buildings and categories of heating systems

Although the concept of heating is commonly associated to space heating in buildings, it is important to stress this report focuses on the broader concept of "heat in buildings". This includes space heating but also covers other heat uses such as hot water, cooling and cooking.

[15] This weight adjusts the panel for non-response using the following variables: age and sex groups, GOR, BSA year, household type, household income, education level, internet access, ethnicity, tenure, social class group, economic activity, political party identification, and interest in politics. More details about the weighting strategy and the down-weighting of the boosted off gas grid population can be found in the Appendix A.
[16] This means that 19 out of 20 times the observed results (for example differences between groups) are 'real' and not caused by random variation in the sample.

The heating systems are categorised in this report using the structure below (more details are provided in Appendix A):

On grid gas | Respondents whose households are on mains gas, either using centralised or fixed heating systems, are included in this category. They are 85% of the British dwellings.

Off the gas grid, using high carbon heating systems | This category includes systems that are fuelled by oil, coal, bottled or tanked liquefied petroleum gas (LPG). These systems can be centralised (such as coal fuelled boilers), fixed (stoves) or portable. Approximately 5% of the dwellings in the UK fall in this category.

Off the gas grid, using electric heating systems | This category includes centralised systems using electric boilers, fixed storage or non-storage electric radiators and portable electric radiators. 9% of the UK dwellings are included in this category.

Off the gas grid, using low carbon or other heating systems | This category groups low carbon technologies, such as air or ground source heat pumps, centralised and fixed heating systems based on biomass solid fuel (such as wood), communal and district heating and other heating solutions. These households were grouped for analysis due to small base sizes.

Public understanding of the low-carbon heating transition and the policy rationale

This chapter addresses Research Question 1: *What are the current levels of public awareness and understanding regarding the need and rationale for a heating transition, and of the technologies that might form part of it?*

It first looks at the broader context, examining current levels of public awareness of the contribution of heat in buildings to carbon emissions, public support for a variety of energy policies, and knowledge of alternative heating technologies. The chapter then focuses specifically on awareness and support for a policy of transition to low-carbon heating.

Awareness of policy rationale

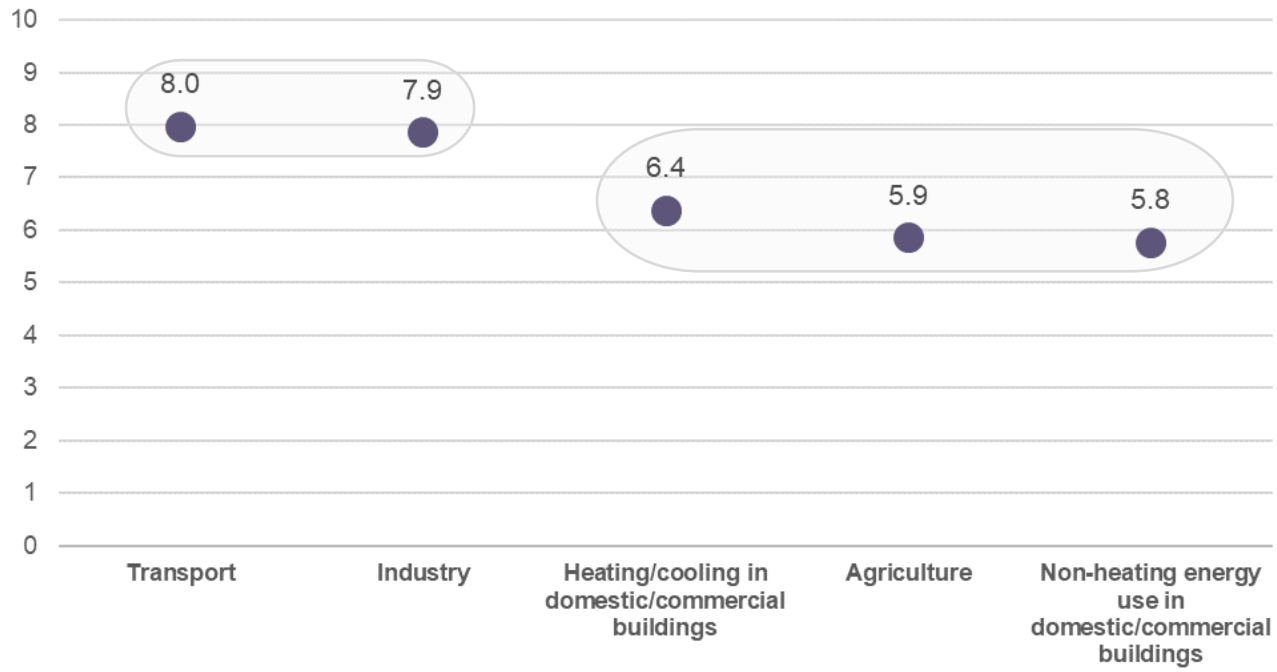
Public awareness of the relative contribution of different sectors to greenhouse gas emissions

UK annual greenhouse gas emissions vary from sector to sector and according to different uses of energy. Among the five largest: transport, industry, and heat in buildings each contribute between 20 to 25% of UK annual emissions; while agriculture, and non-heat energy use in buildings each produce around 10 to 15% of carbon emissions[17]. To understand public awareness of the relative contribution of heat in buildings to carbon emissions in the UK, respondents were asked to give a score for these five sectors, indicating the extent to which they thought each of them contributes to UK carbon emissions (with 0 meaning 'not at all' and 10 meaning 'a great extent').

Respondents rarely gave scores of less than five across the five sectors, indicating a general perception that all these areas contribute to carbon emissions in the UK. Overall, respondents reported thinking that transport and industry were the largest contributors, followed by heating/cooling in domestic/commercial buildings, and then agriculture and non-heat energy use in domestic/commercial buildings (**Figure 1**).

[17] BEIS analysis. See also: https://www.gov.uk/government/publications/heat-decarbonisation-overview-of-current-evidence-base

Figure 1: Perceived contribution of five sectors to UK carbon emissions – average score by sector



Base: British population aged 18+
[Transport (2,880); Industry (2,875); Heating/cooling in domestic/commercial buildings (2,871); Agriculture (2,870); Non-heating energy use in domestic/commercial buildings (2,855)].

This suggests that while the public overall recognises heating/cooling in buildings to be a significant contributor to carbon emissions, its role is not fully understood. **Figure 1** shows that heat in buildings is considered to contribute to carbon emissions at roughly the same (lower) level as agriculture and non-heating energy use, whereas in fact it is more similar to the higher-emissions transport and industry sectors. This pattern is reflected at the individual level, with less than half (46%) correctly identifying heating/cooling in buildings as one of the three highest contributors.

As **Table 2** shows, respondents identified only two of the three sectors with relatively higher contribution, failing to acknowledge the actual high impact of heat in buildings.

Table 2: Respondents' perception versus actual contribution of five largest sectors to the carbon emissions in the UK			
Sector	**Estimated UK emissions**	**Actual impact**	**Perception**
Transport	20% to 25%	*Top 3 contributors*	*Top 3 contributors*
Industry	20% to 25%	*Top 3 contributors*	*Top 3 contributors*
Heating energy use in buildings	20% to 25%	*Top 3 contributors*	*Other main contributors*
Agriculture	10% to 15%	*Other main contributors*	*Other main contributors*
Non-heating energy use	10% to 15%	*Other main contributors*	*Other main contributors*

The proportion identifying heat in buildings as one of the three highest contributors did not vary significantly between different age, education, equivalised household income groups, levels of concern about climate change, frequency of avoiding non-recyclable materials[18] or whether the respondents considered their current heating system environmentally-friendly.

The proportion of agreement with the statement '*My heating system is environmentally-friendly*' varied by current heating system. Those off-grid using a high carbon system expressed the lowest proportion of agreement (19%), followed by those using mains gas (28%), those off-grid using an electric system (36%) and, lastly, those off-grid using low-carbon or other systems[19] (57%). While the pattern was as expected, it is worth noting that almost a third of gas-users described their current heating system as 'environmentally-friendly'.

Public support for environmental policies

To understand overall levels of support for policies addressing climate change, respondents were asked the extent to which they were in favour or against four different theoretical measures that could be aimed at reducing carbon emissions: two specifically related to domestic gas use (phasing out gas boilers for more environmentally friendly heating systems, and phasing out gas cookers for electric ones); and two more general (subsidising renewable

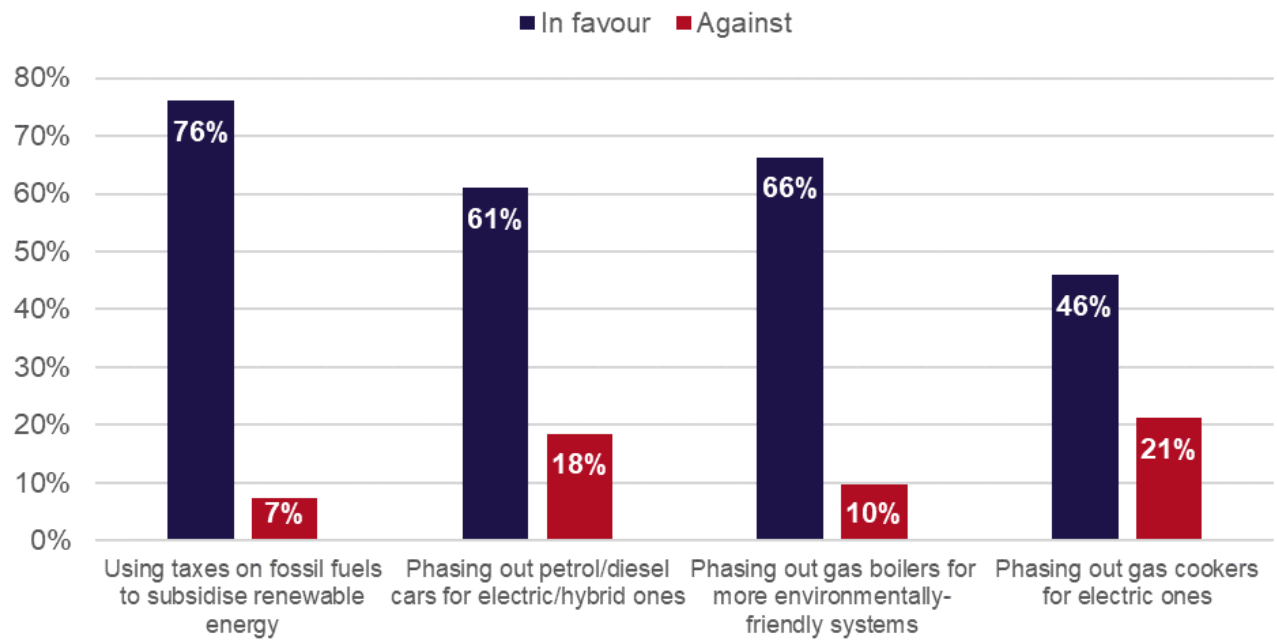
[18] Survey respondents were asked how often they engage in four environmentally-friendly behaviours: switching off the lights in rooms not in use, keeping rooms not in use at a cooler temperature, separating rubbish into recyclable and non-recyclable items, and, lastly, avoiding non-recyclable and single use materials. For the analysis, it was decided to use only the latter as proxy for the identification of people who actively engage in environmentally-friendly behaviours. The rationale behind this choice is twofold: the behaviour had to depend mainly on the individual and require a significative amount of effort. Avoiding non-recyclable and single use materials is a behaviour that can potentially be undertaken by everyone because it does not depend on macro-level aspects (in contrast, for example, with the separation of the household waste that depends on the recycling centre/policy of the area). Moreover, engaging in this behaviour requires an effort that is relatively higher than the efforts required by others such as switching off the lights. Figures about the other three behaviours not discussed in the body of the report can be found in Appendix C.

[19] These households were grouped due to small numbers for analysis.

energy through taxes on fossil fuels, and phasing out the sale of petrol/diesel cars for electric/hybrid ones).

In each instance, support for the policies was greater than opposition. However, the level of support varied by policy: respondents were most likely to be in favour of subsidising renewable energy through taxes on fossil fuels (76%), followed by phasing out gas boilers (66%) which in turn registered more support than phasing out petrol/diesel cars (61%), with the fewest people in favour of phasing out gas cookers (46%) (**Figure 2**).

Figure 2: Attitudes towards theoretical policy measures aimed at reducing carbon emissions



Base: British population aged 18+
[Tax on fossil fuels (2,900); Phasing out petrol/diesel cars for electric/hybrid ones (2,901); Phasing out gas boilers for more environmentally-friendly systems (2,897); Phasing out gas cookers for electric ones (2,895)]

Support for the different policies varied by demographic characteristics. People with a degree were more likely than those without to support using taxes on fossil fuels to subsidise renewable energy (81% compared to 73%), phasing out petrol cars (69% compared to 57%), and phasing out gas boilers (71% compared to 63%). While those with higher equivalised household incomes were more likely to be in favour of subsidising renewable energy (82% of those with equivalised household incomes of more than £2,000, falling to 68% of those with equivalised household incomes of less than £800) or phasing out petrol/diesel cars (69% falling to 54%), there was no statistically significant variation in support for phasing out gas boilers or gas cookers by income group. In contrast, age groups under 50 were more likely to report being in favour of both the policies specifically related to domestic gas use[20], while there

[20] 71% of 18-49 year olds were in favour of phasing out gas boilers compared to 61% of people aged 50+, and 52% of 18-49 year olds were in favour of phasing out gas cookers compared to 40% of people aged 50+

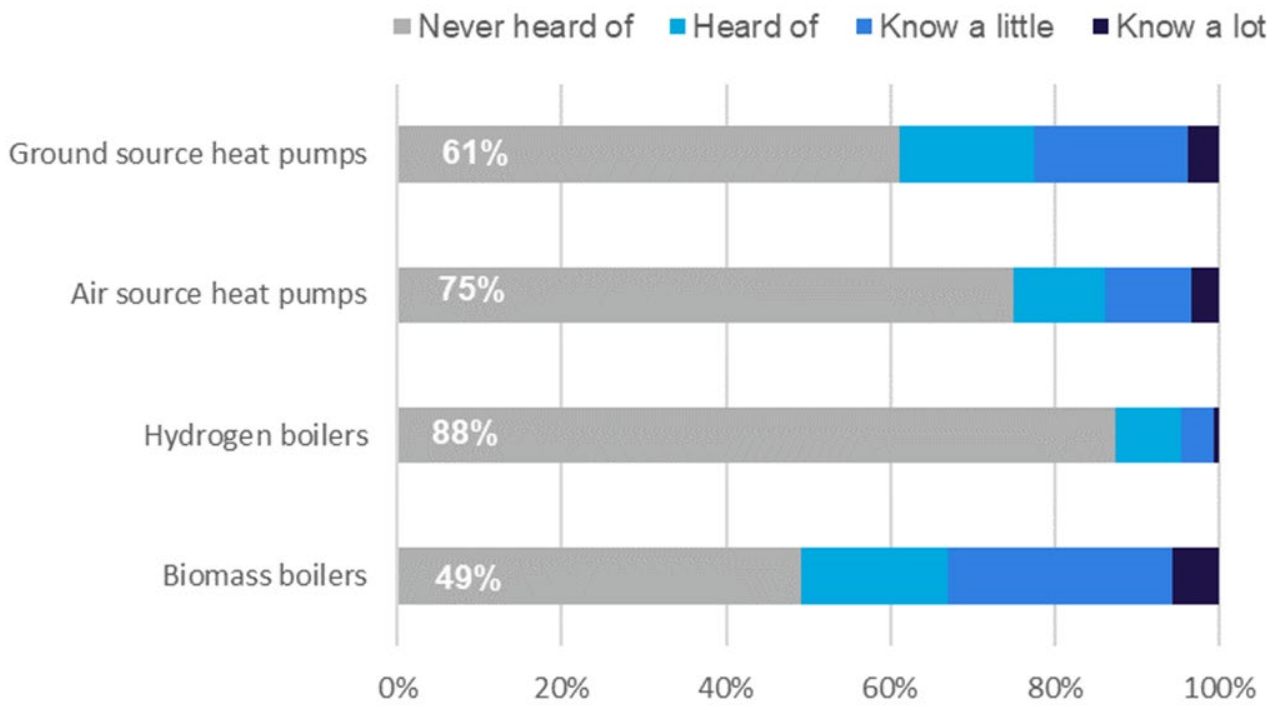
was no statistically significant variation by age in support for subsidising renewable energy or phasing out petrol/diesel cars.

As might be expected, support for the policies was associated with concerns about climate change and green behaviours: those more concerned about climate change and more frequently avoiding non-recyclable materials were more likely to be in favour of all the four policies.

Awareness and knowledge of low-carbon heating technologies

Respondents were asked if they had heard of and how much they knew about four different low-carbon heating technologies: biomass boilers, hydrogen boilers, air source heat pumps, and ground source heat pumps. Overall, there were low levels of stated awareness of these technologies, with most not having heard of them (**Figure 3**). People were most aware of biomass boilers, followed by ground source heat pumps, then air source heat pumps, with hydrogen boilers the least recognised. Lack of awareness and knowledge of hydrogen boilers is expected since this technology, while under discussion as a potential future heating technology among others, is not currently available on the consumer market. Looking at both types of heat pumps together: just 4% of people knew a lot about either air or ground source heat pumps; 20% knew something about one of them; and 76% had not heard of or did not know anything about both of them.

Figure 3: Levels of awareness and knowledge of low-carbon heating technologies



Base: British population aged 18+
[Biomass boilers (2,906); Hydrogen boilers (2,907); Air source heat pumps (2,906); Ground source heat pumps (2,905)]

People who were currently off the gas grid using high-carbon heating systems[21] were also more likely to report knowing a little or a lot about one of the heat pumps than those on the gas grid or using electricity for heating (50% vs. 23% respectively). Knowledge and awareness of air or ground source heat pumps also varied by other sub-groups: older people, people with higher educational qualifications, and people with higher equivalised incomes were more likely to know a little or a lot about one of ground or air source heat pumps than the rest of the population.

Finally, knowledge and awareness of air or ground source heat pumps was highest among the 10% of respondents who somewhat or strongly opposed the phasing out of gas boilers (38% vs. 23% among those in favour).

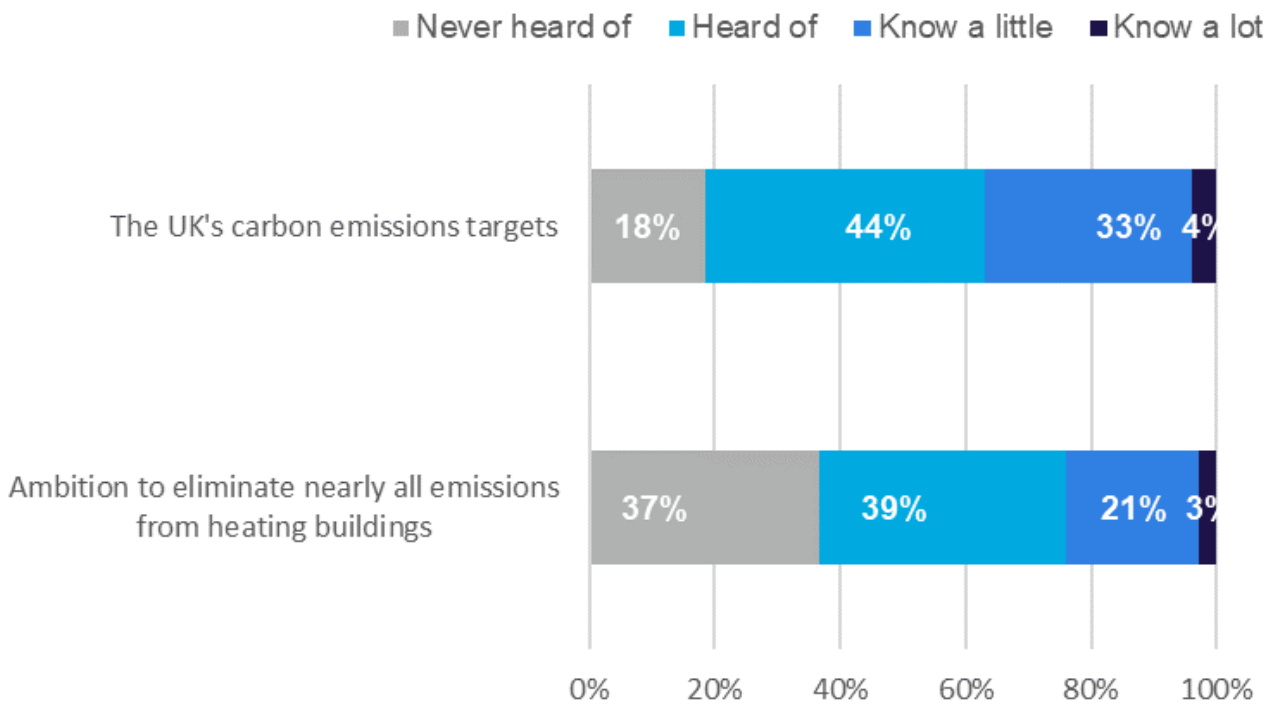
Heating transition policy awareness and support

Focusing more directly on energy and heating policy, respondents were asked how much they knew about the government's ambition to eliminate nearly all emissions from heat in buildings as part of meeting overall carbon emissions targets by 2050. To provide some benchmark for this, they were also asked about their knowledge of the UK's legally binding targets to substantially reduce carbon emissions by 2050.

A minority of people reported knowing something ('a little' or 'a lot') about the UK's carbon emissions targets (37%) and the ambition to eliminate nearly all emissions from heat in buildings (24%), with only 4% and 3% saying they knew 'a lot'. 18% reported never hearing of the UK's carbon emissions targets, and 37% reported not having heard of the ambition to eliminate nearly all emissions from heat in buildings, suggesting quite low levels of knowledge and awareness overall (**Figure 4**).

[21] Further details about this sub-group of the population are discussed in an ad hoc chapter (see page 43).

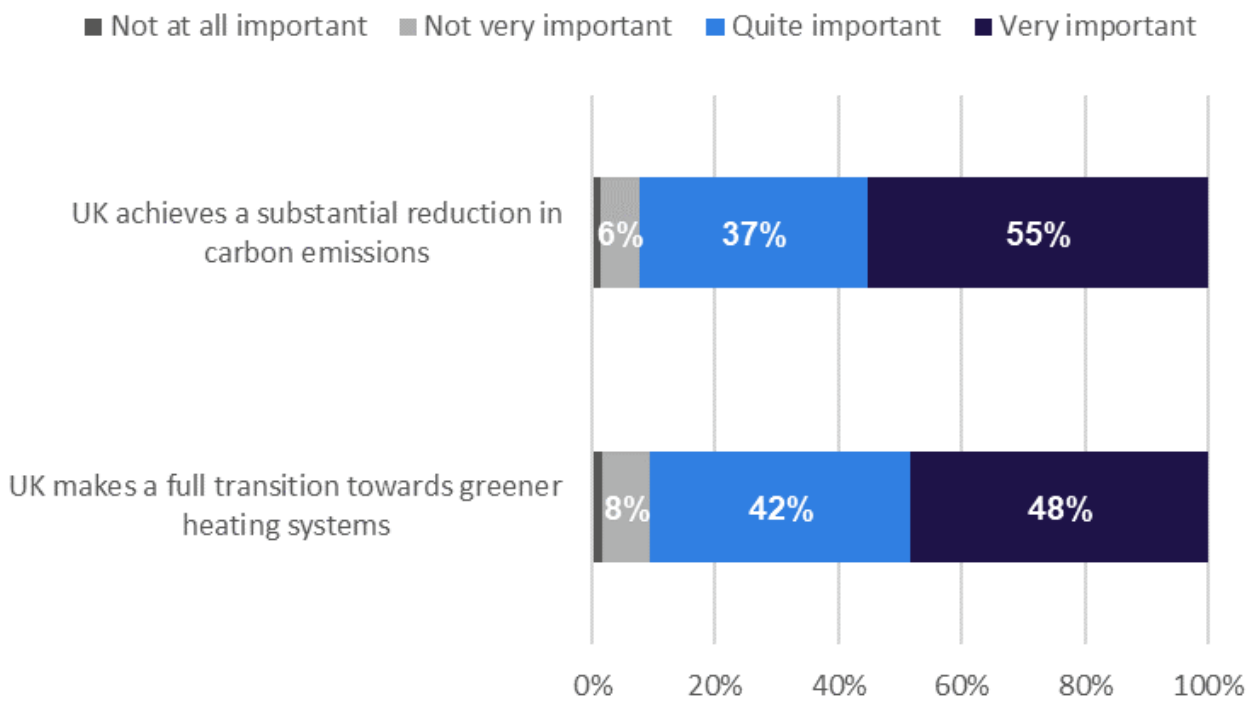
Figure 4: General population awareness of the government's carbon emissions targets



Base: British population aged 18+
[The UK's carbon emissions targets (2,906); Ambition to eliminate nearly all emissions from heat in buildings (2,904)].

Looking at public perceptions of the importance of transitioning away from heating systems that use fossil fuels, again relative to reducing carbon emissions overall, support for both was very high in the general population, with 92% saying it is quite or very important that the UK achieves a substantial reduction in carbon emissions, and 90% saying it is quite or very important that the UK makes a full transition towards greener heating systems (**Figure 5**). However, while these figures were similar, people were more likely to say that achieving a substantial reduction in carbon emissions was *very* important (55%) than making a full transition towards greener heating systems (48%).

Figure 5: General population support for the government's carbon emissions targets



Base: British population aged 18+
[UK achieves a substantial reduction in carbon emissions (2,901)); UK makes a full transition towards greener heating systems (2,896].

Awareness of the government's ambition to eliminate nearly all emissions from heat in buildings, and perceived importance of transitioning away from heating systems that use fossil fuels, varied by socio-demographic characteristics, concern about climate change and attitudes towards specific domestic gas use related policies:

Age, education & income | Older people, people with a degree, and those with higher equivalised household incomes were relatively more likely to have heard of this ambition. However, while the proportion thinking that the transition towards greener heating systems is quite or very important did not vary significantly by these groups, those with higher equivalised incomes or with a degree were more likely to say it was *very* important.

Tenure | Owner occupiers were most likely to have heard of the government's ambition to eliminate nearly all emissions from heat in buildings, followed by private renters and social renters (67% vs. 60% vs. 52% respectively) However there was no significant variation in the proportion thinking that the transition towards greener heating systems is quite or very important by tenure. .

Heating system | People who were responsible for paying energy bills and taking decisions about the heating system were more likely to have heard of the ambition to eliminate nearly all emissions from heat in buildings. There was no significant variation in awareness by the type of heating system currently used, whether or not it was perceived as meeting their heating needs or having acceptable running costs. However, participants who agreed it was environmentally

friendly were more likely to be aware of the ambition, followed by those who disagreed, and with those who neither agreed nor disagreed least likely to be aware of the ambition.

Similarly, there was no significant variation in the proportion viewing the transition as quite or very important by the type of heating system currently used, whether or not it meets their heating needs, nor whether or not they were responsible for paying energy bills or taking decisions about the heating system. However, people who disagreed that their current heating system was environmentally friendly were more likely to think the transition was *very* important than the rest of the population (65% compared to 43% among those who stated their current heating system was environmentally friendly), and so did those who found the running costs of their heating systems not acceptable (53% compared to 49% among those satisfied with the running costs of their heating system).

Concern about climate change and environmentally friendly behaviours | As might be expected, people who were more concerned about climate change, were more likely to have heard of this ambition (69% of the people who were extremely concerned heard of it, compared to 45% of those who were not concerned at all), and more likely to think that the transition was quite or very important (98% compared to 43%). The same trends were observed for those respondents who more frequently avoid non-recyclable materials: 72% of the people who always engage in this environmentally-friendly behaviour have heard of this ambition, compared to 50% of those who never avoid non-recyclable materials. Similarly, but with a less marked difference: almost all respondents (90%) who always engage in this behaviour considered the transition quite or very important in contrast to (only) 80% of those who never avoid non-recyclable materials.

Yet, there were clear distinct trends between those who considered the policy very important or quite important: those who considered the policy very important were also more likely to be more concerned about climate change.

Similar patterns could be observed by the frequency of avoiding non-recyclable material. Those who always or usually engage in this behaviour were more likely to consider the policy very important rather than quite important. However, those who occasionally engage in this behaviour had equal odds of considering the policy either very important or quite important.

Knowledge about heat in buildings and its role | There was no significant variation in awareness or perceived importance by whether or not people correctly identified heat in buildings as one of the three highest contributors to carbon emissions in the UK. However, people who reported knowing a lot about low-carbon heating technologies were less likely to think that the transition was quite or very important (79% compared to 91% of people who are not familiar with either ground or air source pumps).

Support for general domestic gas use policies | There was no significant variation in awareness of the government's ambition to eliminate nearly all emissions from heat in buildings by the level of support for the phasing out the sale of gas boilers or cookers. However, as might be expected, those who were somewhat or strongly in favour of phasing out the sale of gas boilers were more likely to view the transition to greener heating systems as quite or very

important (97% compared to 61% of those who were strongly against this policy). The same pattern was found also for those who were somewhat or strongly in favour of phasing out the sale of gas cookers (96% compared to 79% of those who were strongly against this policy).

As discussed, overall, respondents stated support for the heating transition target with almost half of them (48%) saying it is 'very important' and 42% saying it is 'quite important' that the UK makes a full transition towards greener heating systems. However, the majority of the general population had not heard of low-carbon heating technologies and almost a third of gas-users stated they were on 'environmentally-friendly heating'. Together, these findings suggest low levels of knowledge of what the transition might actually be *to*. Moreover, the level of support discussed here is for a *general abstract policy* out of a specific context and without reference to potential implications for consumers. While this figure may prove useful as baseline for future research and to monitor the general awareness of and support for the Government's carbon emission targets, it cannot by itself inform what priority areas of focus for future policy or public engagement might be. To further inform such thinking, it is necessary also to seek to put the transition into context and to explore if and how the stated support varies when the practicalities and disruptions associated with that change are made apparent; the analysis that is the focus of the next chapter sought to begin that exploration.

Understanding the acceptability of a heating transition

This chapter addresses Research Question 2: *When different possible pathways are considered, what are the current levels of support for a future transition to low-carbon heating?*

The question was addressed with a vignette experiment where respondents were asked how acceptable they found each of a set of hypothetical heating transition scenarios composed of randomly-varied elements. This experiment is introduced in the first section of this chapter and more extensive methodological notes can be found in the Appendix A.

The analysis uses a multi-level regression model to understand the extent to which different options within a heating transition approach have an effect on its overall acceptability. The first section considers the public's overall view and the second then considers acceptability for key sub-groups of the population.

The last section of the chapter tries to understand whether individuals' initial level of support for the policy of a heating transition in abstract was associated with a comparable acceptance of the more concrete transition approach presented in the hypothetical scenarios.

All the analyses reported in this chapter were carried out using statistical modelling methodologies. While the main findings are discussed in the body of this chapter, the complete model outputs are included in Appendix D.

The eight hypothetical transition scenarios

The transition scenarios presented to respondents gave the context that all households would need to switch to more environmentally-friendly heating systems to meet legally binding carbon emissions targets. They then varied in three elements, with two variants in each element (**Table 3**):

- **the planning approach** – whether a nationwide switchover plan for the whole of the UK, or a series of locally developed plans towards an overall national target;
- **households' level of control over timing** – whether households were able to choose when to switch individually, or whether neighbourhoods would undergo a coordinated switchover on specific dates;
- **the level of disruption of the in-home works** – whether low (described as two to three days over a few months to replace heating appliances), or high (described as up to eight consecutive weeks involving major works, such as installing new radiators and energy efficiency improvements).

These elements and their variants did not reflect actual strategies for a transition but hypothetical options. Key elements such as costs to households were not included (respondents were asked to assume that costs were the same across the scenarios). This analysis therefore represents a first step towards understanding aspects of public acceptability.

Each respondent was shown four of the eight possible scenarios and was asked how acceptable a transition in those circumstances would be on a scale of 0 ('not at all acceptable') to 10 ('completely acceptable').

Table 3: Vignette elements and their variants

Elements	Variants	
Element 1	**National plan**	**Local plan**
Planning approach	A nationwide plan would be developed for the whole of the UK.	Every local council area would develop its own heating plan, towards an overall national target.
Element 2	**Household choice**	**No household choice**
Households' level of control over timing	Households would have several years to arrange the necessary works at a time that suits them before this deadline.	All the properties in your neighbourhood would make a coordinated switchover together on specific set dates according to this local/national plan.
Element 3	**Low disruption**	**High disruption**
The level of disruption of the in-home works	Workers would need 2-3 days spread over a few months to carry out the works, which would only involve replacing the heating appliances.	Workers would need up to 8 consecutive weeks to carry out the works, which would involve major works in the home, such as new larger radiators and energy efficiency improvements (e.g. double-glazed windows and solid wall insulation) where not already in place.

Interpreting the models – a brief guide

The regression models predict the levels of acceptability of a transition to low-carbon heating (*dependent variable*) using the different transition elements, socio-demographics characteristics and levels of concern about climate change (*independent variables*).

The results are presented in the form of *regression coefficients*; these should be interpreted in relation to the *reference category* for each variable. For example, England was used as the refence category for country, therefore the model provides estimates of the effect of living in Scotland *versus* living in England and of living in Wales *versus* living in England), other things remaining equal. The regression coefficients are values on the 0-10 scale used in the questionnaire. For example, a regression coefficient of 0.2 for Scotland would mean that the model estimates that someone living in Scotland is estimated to be 0.2 points more accepting of the transition (on average) than someone living in England on the 11-point scale, other things remaining equal.

Each regression coefficient is presented with reference to its direction, size and statistical significance. While reading this chapter and consulting the charts, the reader should keep in mind the following three questions:

- *Does the (category of the) independent variable increase or decrease the level of acceptability of a transition to low-carbon heating?* The sign of the coefficient (positive or negative) indicates the direction of the effect and, therefore, whether the acceptability of the transition increases or decreases in comparison to the reference category. In the above example, living in Scotland increases acceptability compared to living in England (having a positive coefficient of 0.2).

- *To what extent does the (category of the) independent variable affect the level of acceptability of the transition?* The size of the coefficient (small or large) indicates the size of the effect on the level of acceptability of the transition, as compared to the reference category on the 0-10 scale. In the above example, living in Scotland increases acceptability by 0.2 points.

- *To what extent are we confident that the effect is present in the general population?* All findings have been tested for statistical significance[22], and all effects and differences reported are statistically significant unless stated otherwise. In the charts presented, statistically significant effects are marked as follows: '*(sig.)*'.

Looking at **Figure 8** as an example, we can infer that – *other things remaining equal* i.e. holding the effect of the other scenario elements and socio-demographic characteristics constant - a low-disruption plan is 0.57 points more acceptable on average than a high-disruption plan (the reference category) on a 0-10 scale. The difference is statistically significant, so we can be reasonably confident that it exists in the wider population, not just the sample of respondents.

[22] Statistical testing was conducted at the 5% significance level.

Impact on acceptability of the different pathway options

Overall, we found that:

- looking across the different scenarios for the transition process, the mean level of acceptability on the 0 to 10 scale was 5.88. This reflects a majority being neutral or towards the 'completely acceptable' end of the scale, although a significant minority gave scores of 0 to 3 (estimates ranged from 10% and 22% across the eight scenarios)
- the varying scenario elements (level of disruption, control over timing, planning approach) only had a small impact on the acceptability of the transition process. Indeed, each respondent assigned relatively similar scores to the scenarios they rated;
- we found more differences in the levels of acceptability when looking *between* respondents. Specifically, attitudes towards climate change had a substantial effect on the level of acceptability, with those more concerned about climate change more likely to find transition scenarios more acceptable. Socio-demographic characteristics explained less of the variation in acceptability.

Impact of elements of the transition scenario

The general acceptability expressed by the respondents for the transition process, without accounting for the different scenarios and their elements, was 5.88 on the 0-10 scale (mode 5, median 6).

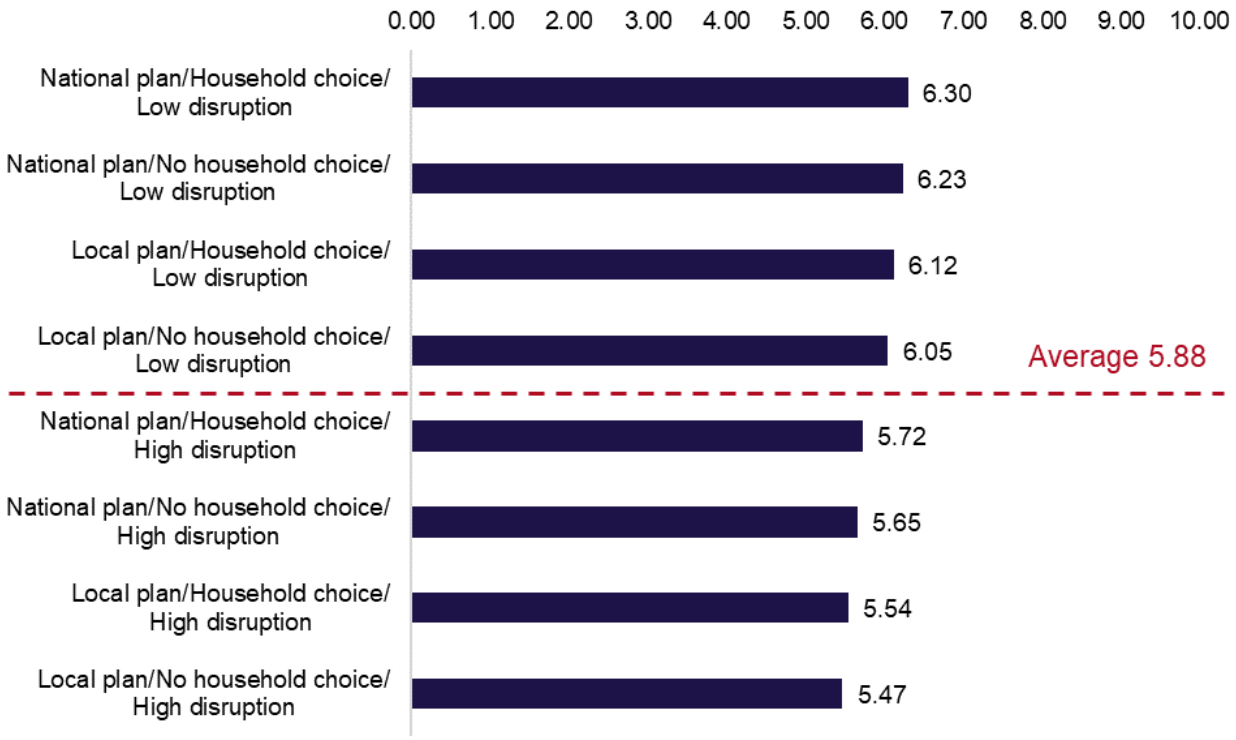
The different components of this average acceptability were explored by fitting a model to the three randomly-varied scenario elements, six key socio-demographic variables of interest[23] and the level of concern towards climate change.

The differences in the predicted mean score of the eight different scenarios (**Figure 6**) suggest a preference for specific variants of the scenarios. Where the work in the household involved a low level of disruption the transition was more acceptable than where there was high disruption, with the former being rated above the overall average of 5.88 and the latter below. Similarly, looking at scenarios with the same level of disruption, a hypothetical scenario with a nationally-managed transition was considered on average more acceptable than a locally-managed one.

The range of mean scores across the eight scenarios was relatively narrow, ranging from 5.47 to 6.30. This indicates that the different options did not have a substantial impact on acceptability on average.

[23] These were age group, country, equivalised household income, tenure (homeowner, private renter and other or social renter), whether the respondent had a degree or not, and heating system in the household (off-grid low carbon and other, off-grid high carbon, off-grid electric or on-grid gas).

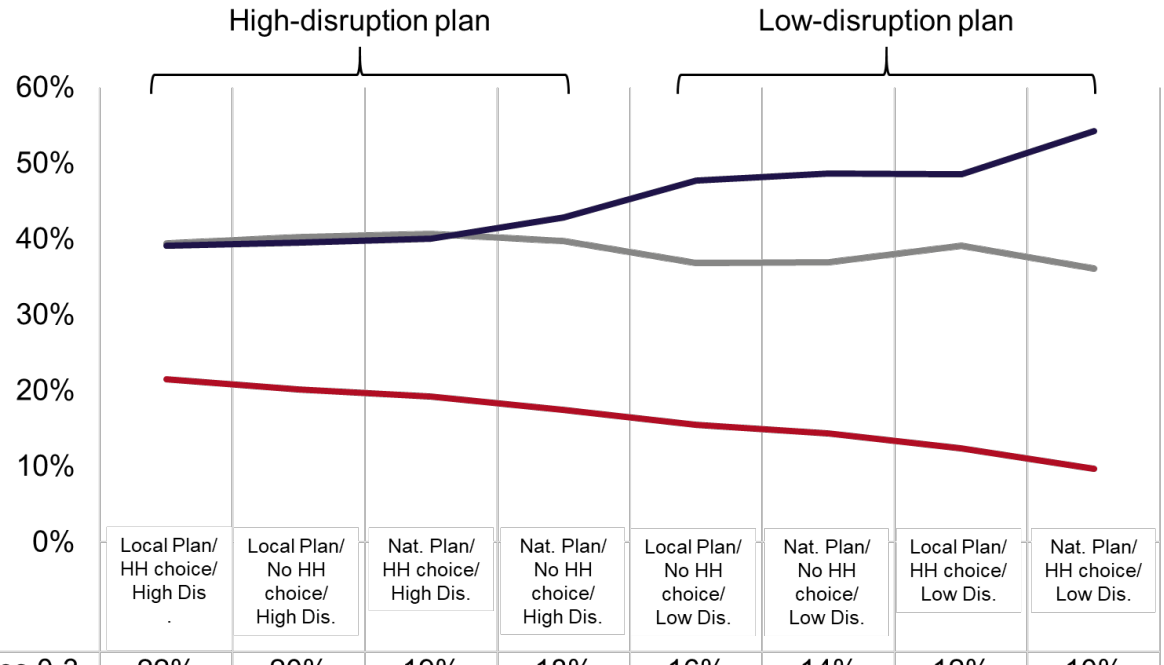
Figure 6: Predicted acceptability for the eight hypothetical transition scenarios



Base: British population aged 18+
[10,662 observations | 2,745 respondents].

The same trends around the levels of disruption can be seen observing the distribution of the scores for each scenario (**Figure 7**). Low-disruption scenarios had a relatively higher number of scores between 7 and 10 and a lower number of scores between 0 and 3, compared to high-disruption scenarios. The volume of scores between 4 and 6 did not particularly vary between scenarios, but sizeable movement is seen between the scenarios in the volume of scores of 0-3 give, from 22% to 10%.

Figure 7: Acceptability scores distribution in the eight hypothetical transition scenarios[24]



	Local Plan/ HH choice/ High Dis.	Local Plan/ No HH choice/ High Dis.	Nat. Plan/ HH choice/ High Dis.	Nat. Plan/ No HH choice/ High Dis.	Local Plan/ No HH choice/ Low Dis.	Nat. Plan/ No HH choice/ Low Dis.	Local Plan/ HH choice/ Low Dis.	Nat. Plan/ HH choice/ Low Dis.
Scores 0-3	22%	20%	19%	18%	16%	14%	12%	10%
Scores 4-6	39%	40%	41%	40%	37%	37%	39%	36%
Scores 7-10	39%	40%	40%	43%	48%	49%	49%	54%

Base: British population aged 18+
[Local plan/household choice/high disruption (1,344); Local plan/no household choice/high disruption (1,321); National plan/household choice/high disruption (1,304); National plan/no household choice/high disruption (1,347); Local plan/no household choice/low disruption (1,346); National plan/no household choice/low disruption (1,312); Local plan/household choice/low disruption (1,331); National plan/household choice/low disruption (1,357)].

These differences in the acceptability levels can be better understood looking at the regression coefficients of the three elements (**Figure 8**); these suggests that, controlling for socio-demographic characteristics and attitudes towards climate change:

- A low-disruption approach is more acceptable than a high-disruption one (on average, a low-disruption plan was 0.57 points more acceptable than a high-disruption plan);
- a national approach is more acceptable than a local one (a national approach was on average 0.18 points more acceptable than a local approach);
- an approach where a household has control over the timing of the transition is more acceptable than one that does not (overall, the former was considered 0.07 points more acceptable than the latter).

Of the three elements, the level of disruption contributes more to the overall acceptability of the transition than whether or not there is choice over the timing, or whether or not it is a national or

[24] The figures presented in this graph do not take into account the presence of four repeated observations for each respondent. Although this analysis was carried out on the same observations used in the model, the results are not the output of a statistical model.

locally-developed plan. However, the size of the effects in each case and in combination are very small, as discussed further below.

Figure 8: Effect of the scenario elements on the public acceptability of heating transition

Base: British population aged 18+
[10,662 observations | 2,745 respondents].
(sig.) = statistically significant effects in the model.

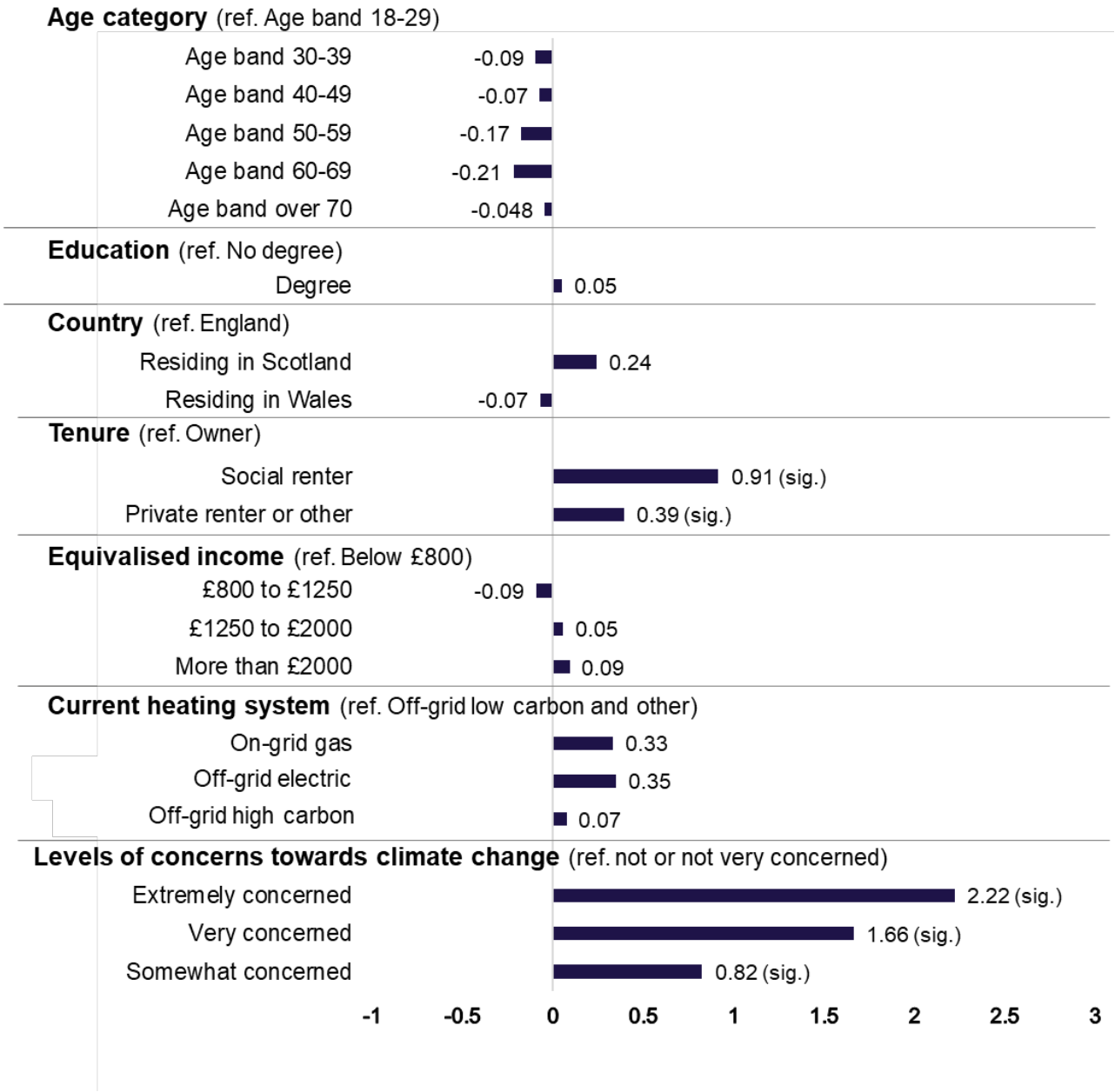
The lowest level of acceptability was associated with a locally-managed high-disruption plan with a coordinated switchover on specific dates. In contrast, the highest level of acceptability was associated with a national low-disruption plan with choice for the household regarding timing of the works. On average, the difference of the mean scores between the most and the least acceptable scenario was just 0.82 points[25] (0.57 + 0.07 + 0.18) on a scale of 0-10. This low level of variation suggests the need to look at socio-demographic elements and attitudes to understand how the acceptability for the transition changes in the general population.

Impact of socio-demographic characteristics and concerns about climate change

Figure 9 shows the coefficients for the socio-demographic characteristics (including the current heating system in the household) and the level of concern towards climate change included in the model.

[25] It is important to clarify that when a scenario included both the possibility to express a choice and low disruption plans, the combination of these two elements had a stronger effect on the overall acceptability of the transition process (statistically significant interaction term). However, the magnitude of this effect is particularly small and would only change the difference between the most acceptable and the least acceptable scenario by 0.05 on the 11-point scale.

Figure 9: Effect of the socio-demographic elements on the public acceptability of heating transition



Base: British population aged 18+
[10,662 observations | 2,745 respondents].
(sig.) = statistically significant effects in the model.

Type of tenure was the only socio-demographic characteristic that had a statistically significant effect on acceptability, controlling for the other characteristics. Both social and private renters found the transition more acceptable than homeowners, who may be more likely to be calculating the direct cost that they may incur during the transition.

There was no statistically significant variation in acceptability by age, equivalised income, country of residence, or current heating system.

Although having a degree did not seem to have any effect in this model, education's role was absorbed by attitudes towards climate change: in a previous model tested without climate

change concerns, those with a degree were estimated to have a higher level of acceptance of the transition than those without. In other words, greater concern about climate change was associated with higher educational attainment.

This analysis demonstrates that attitudes toward climate change contributed more to the overall acceptability of the transition than socio-demographic characteristics or the scenario elements. The acceptability of the transition increased with reported concern about climate change[26].

The scale of this relative importance is demonstrated by its effect on the explanatory capacity of the model. Statistical modelling is a methodology that aims to explain the complexity of the real world through the creation of simplified models. The model's capacity to explain real world differences (how the model fits the data) is generally expressed with a percentage: the higher the percentage, the more real-world variation can be explained by the model[27].

The transition scenario elements on their own, and in a model with the socio-demographic characteristics, had limited explanatory power (respectively 1.3% and 2.8%) and, therefore, a limited capacity to explain how the levels of acceptability vary between respondents. However, the addition of respondents' levels of concern about climate change substantially increased the variance explained by the model to 9.4%[28], indicating that attitudes to climate change are a relatively strong predictor of heating transition acceptability.

Impact of the transition scenario elements for different sub-groups

The second stage of the multi-variate analysis explored whether the effect of the elements of the transition scenario on acceptability varied by different sub-groups (key socio-demographic groups and different levels of concern about climate change). The analysis involved fitting a separate version of the model for the sub-groups of interest.

Overall, we found statistically significant variation[29] in the effect of the transition scenario elements by income, tenure, current heating system and climate change concern, but not by age or between countries. However, the effect sizes were small: they rarely affected the direction or relative importance of the elements, and still had a relatively small effect on the overall acceptability score.

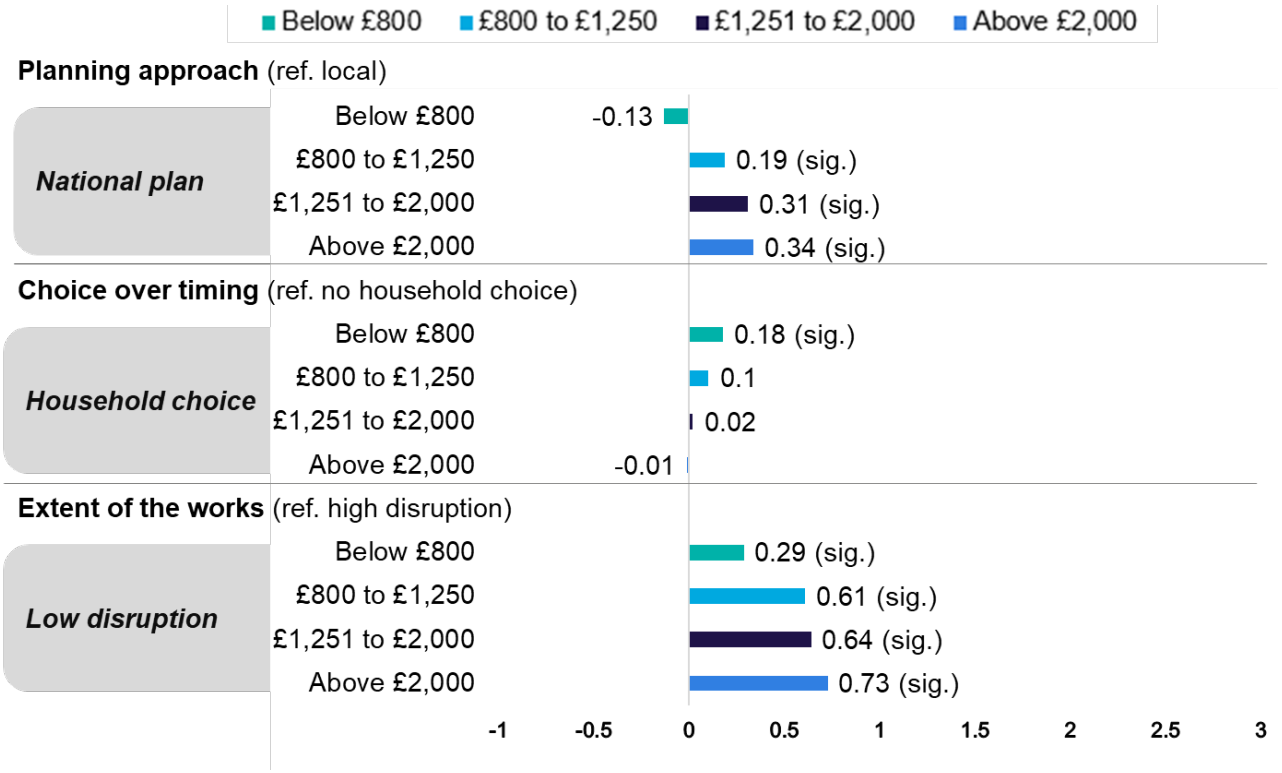
Interestingly, in all the cases where we detected statistically significant differences, the level of disruption of the in-home works was always among the elements that varied between the subgroups.

[26] This trend already identified in the first chapter
[27] It is important to note that models used in social research very rarely achieve levels of explanation above 30%
[28] The increase in the variance explained, captured in the R^2 MVP, was assessed fitting three different models (namely, the initial model with elements only was gradually expanded with the addition of socio-demographic elements and climate change attitudes).
[29] The statistical significance of the differences *between* the element effects of the split models were assessed adding interaction terms to the model. While these statistical significance levels are discussed in the text, the figures of this chapter report on the statistical significance *within* each split model.

Variation between socio-demographic groups

Analysis by income groups revealed statistically significant differences in the levels of predicted acceptability linked to planning approaches and levels of disruption (**Figure 10**). In both cases, the levels of acceptability for a national plan over a local plan and for a low disruption plan over a high disruption plan were higher for higher levels of income.

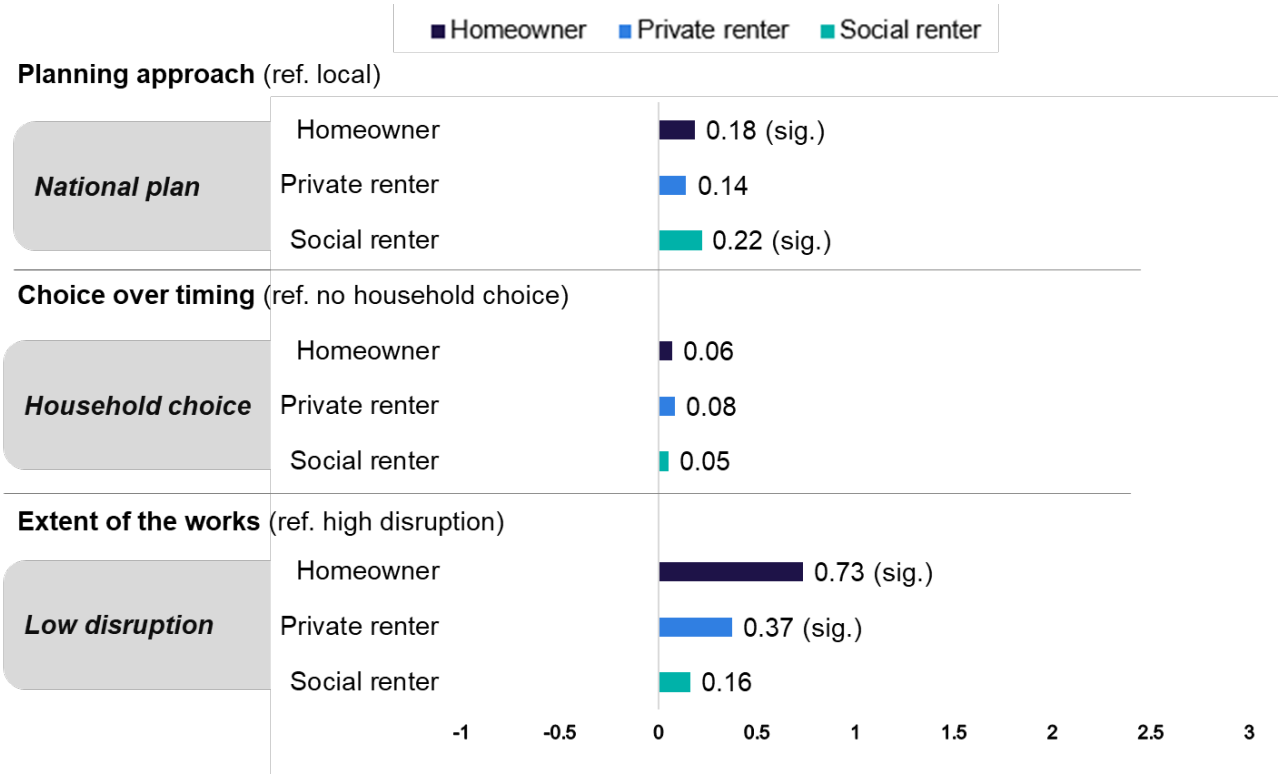
Figure 10: Effect of the vignette elements by income



Base: British population aged 18+
[Below £800 (1,933 observations | 505 respondents), £800 to £1,250 (2,163 observations | 565 respondents), £1,251 to £2,000 (2,628 observations | 673 respondents), above £2,000 (3,938 observations | 1,002 respondents)]
(sig.) = statistically significant effects within each model split (not between models).

In relation to tenure, the extent of the works was the only scenario element where there was a statistically significant difference between subgroups. The level of disruption (whether low or high) did not impact the acceptability of the transition for social renters, but the preference for a low disruption plan over a high disruption one played more of a role for private renters and had the largest effect on acceptability for homeowners (**Figure 11**).

Figure 11: Effect of the vignette elements by tenure



Base: British population aged 18+
[Homeowner (7,931 observations | 2,030 respondents), private renter and other (1,458 observations | 377 respondents), social renter (1,273 observations | 338 respondents)]
(sig.) = statistically significant effects within each model split (not between models).

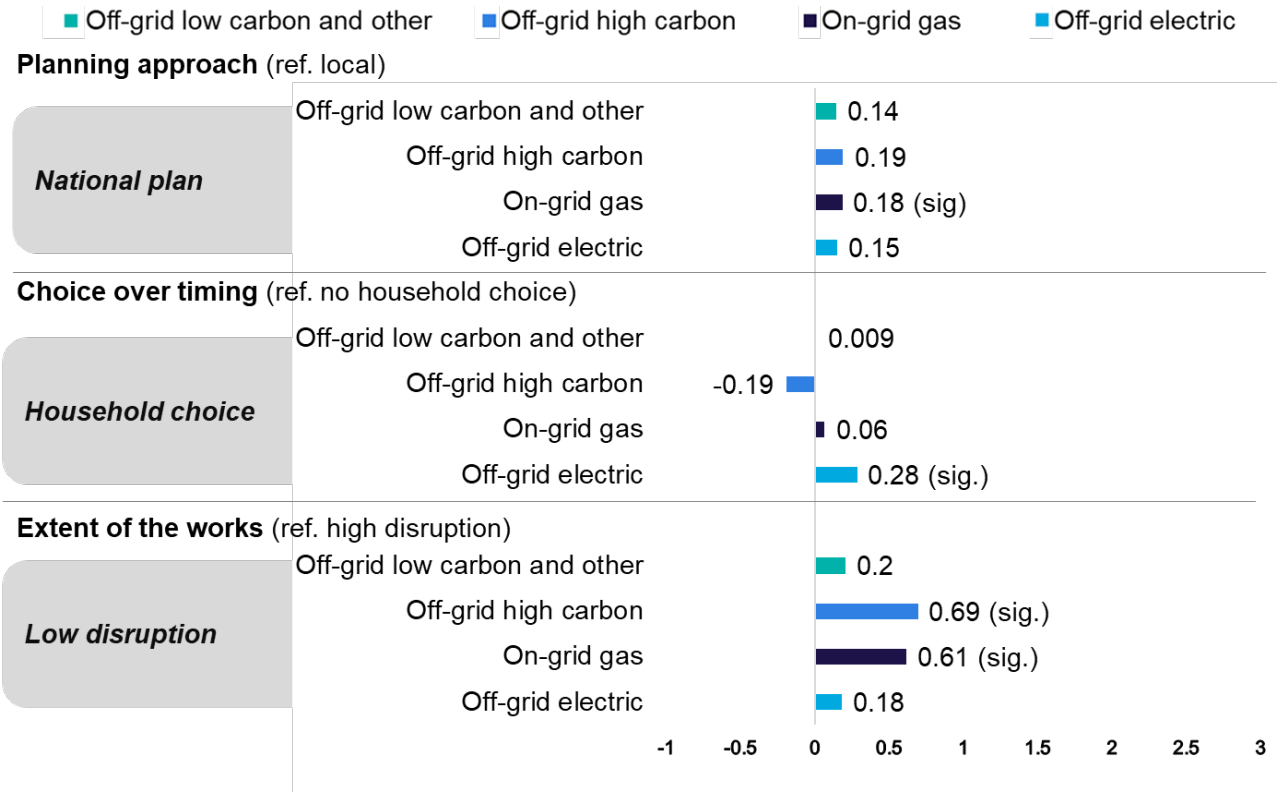
The effect of the vignette elements on the levels of public acceptability towards the transition did not statistically significantly differ between countries or across age.

Variation by current heating system

Analysis by different types of heating systems revealed some statistically significant differences for the extent of the works in the household, but not for the other two scenario elements. However, given the small sample sizes for some groups and an unclear pattern, the results should be treated with caution.

A low level of disruption (over high disruption) was preferred by all the respondents regardless the type of heating systems. It is worth noting that the impact on the acceptability was higher for those on the gas grid, or off the gas grid using high carbon heating systems, compared to those off the gas grid using electric or low carbon and other heating systems.

Figure 12: Effect of the vignette elements by heating system



Base: British population aged 18+
[Off-grid low carbon and other (549 observations | 142 respondents), off-grid high carbon (847 observations | 216 respondents), on-grid gas (8,549 observations | 2,204 respondents), off-grid electric (717 observations | 183 respondents)]
(sig.) = statistically significant effects within each model split (not between models).

Variation by concern about climate change

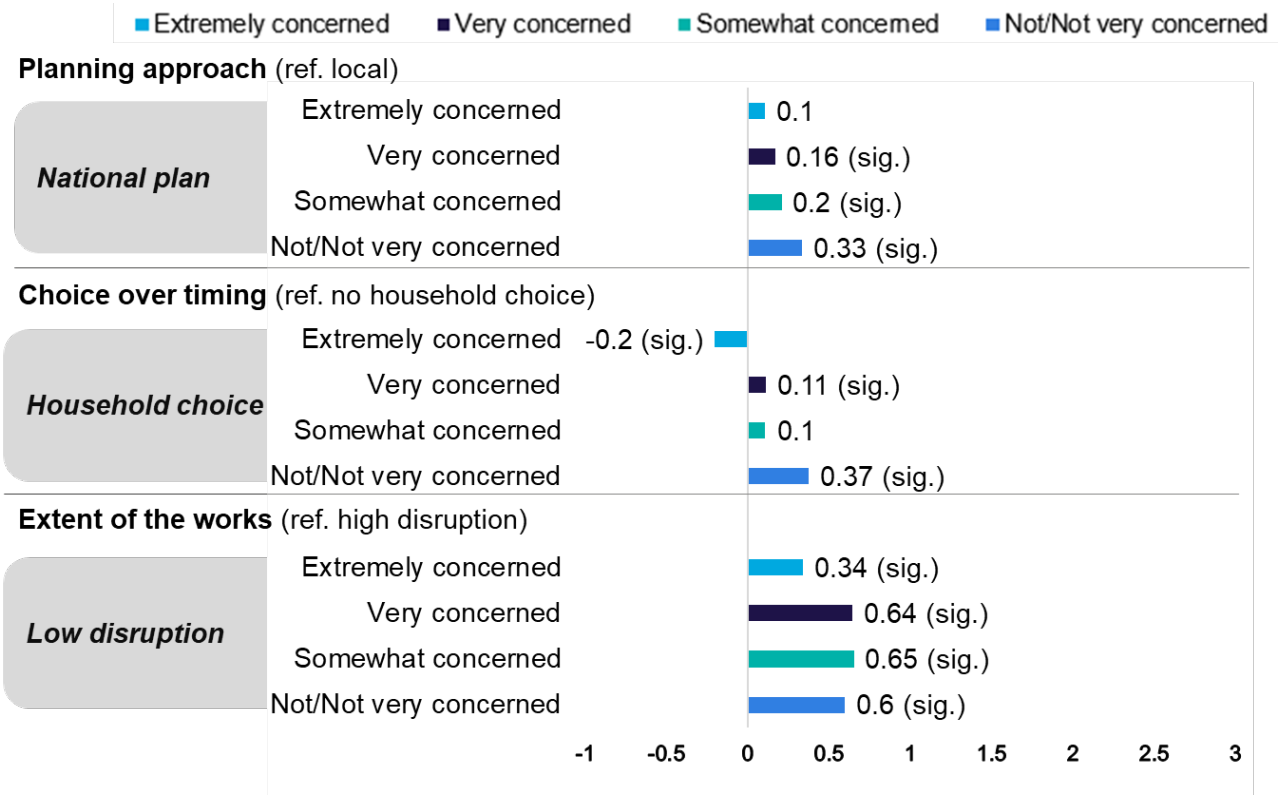
The effect of the scenario elements varied between those with levels of climate change concern (**Figure 13**). Statistically significant differences were detected for two scenario elements: households' level of control over timing and the level of disruption of the in-home works.

In particular, being able to choose the timing of the transition had a larger positive effect on the acceptability of the transition for those 'not' or 'not very' concerned about climate change, while those extremely concerned about climate change showed higher acceptability for a coordinated switchover (no household choice). Acceptability among those extremely concerned about climate change was also less influenced by the level of disruption than the other subgroups.

This analysis suggests that, for people who were highly concerned about climate change, the acceptability of the transition was less dependent on the elements of a potential transition. This is particularly evident when the mean difference between the predictions for the most and the least acceptable hypothetical scenarios for the two subgroups is compared: for a person 'not' or

'not very' concerned about climate change it was twice the difference predicted for those 'extremely' concerned (1.3 vs. 0.64 respectively[30]).

Figure 13: Effect of the vignette elements by levels of climate change concern and within-model statistical significance



Base: British population aged 18+
[Extremely concerned (2,529 observations | 646 respondents), very concerned (3,750 observations | 966 respondents), somewhat concerned (3,399 observations | 875 respondents), not or not very concerned (984 observations | 258 respondents)]
(sig.) = statistically significant effects within each model split (not between models).

Whether general policy support translated into specific scenario acceptability

Towards the beginning of the survey, the respondents had been asked whether they considered a full transition of the UK from heating systems which use fossil fuels towards greener and more

[30] **Extremely concerned**:
Average effect on acceptability of the most acceptable hypothetical scenario = (0.34+0+0.1) = 0.44
Average effect on acceptability of the least acceptable hypothetical scenario = (0-0.2+0) = -0.2
Difference = (0.44+0.2) = 0.64

Not/not very concerned:
Average effect on acceptability of the most acceptable hypothetical scenario = (0.6+0.37+0.33) = 1.3
Average effect on acceptability of the least acceptable hypothetical scenario = (0+0+0) = 0
Difference = (1.3-0) = 1.3

environmentally-friendly technologies to be important[31]. This question was asked before respondents were shown the specific hypothetical transition scenarios which may have given more understanding of what such a transition might potentially involve.

This section tries to understand whether the initial support for the policy in abstract was associated with higher levels of acceptability when hypothetical scenarios, introducing certain concrete practicalities, were presented. In other words, the objective is to understand whether those who supported the policy in abstract were also more accepting of the transition more concretely.

Following the same structure of the previous three sections, this aspect was explored in three stages:

- firstly, we looked at the general prediction of average scores of acceptability for different levels of initial policy support;
- secondly, we added initial policy support to the model to understand whether the general mean acceptability by level of policy support varied when controlling for the effects of other variables, such as concerns for climate change;
- finally, we fitted separate models to different initial policy support subgroups, to understand whether a specific element of the scenarios played a role in increasing or decreasing the acceptability expressed in each subgroup.

Overall, higher levels of initial support were associated with higher levels of general acceptability of the transition process. The pattern of effects of the scenario elements were similar between groups[32]. While supporting the policy led to higher general acceptability, the acceptability expressed for specific scenarios rather than others was not particularly influenced by the levels of initial policy support.

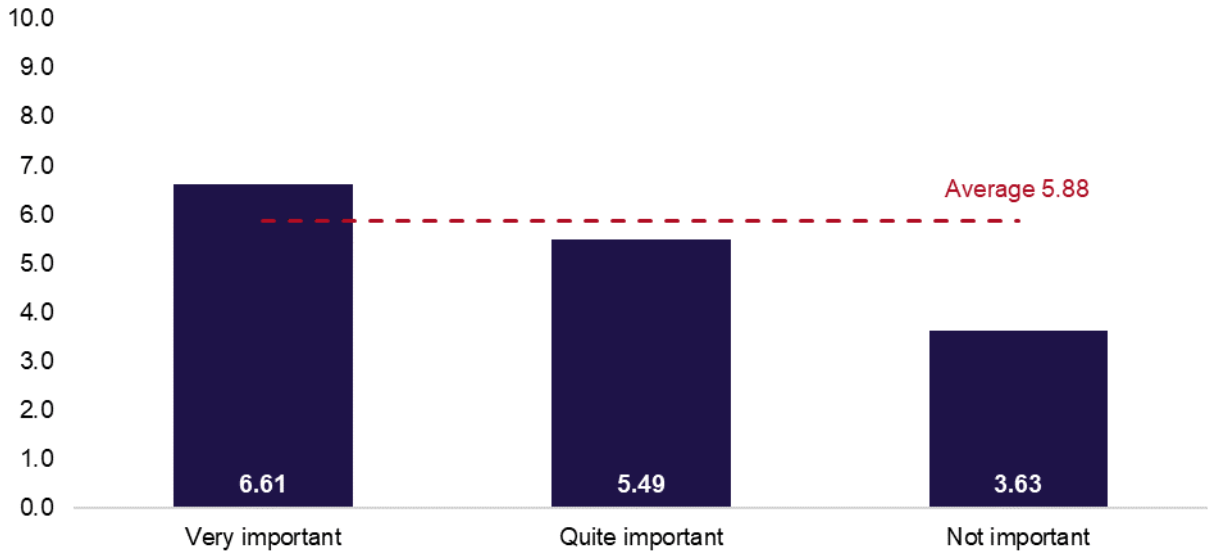
Overall acceptability of the transition by initial policy support

The mean acceptability predicted for different levels of initial policy support (**Figure 14**) suggests that those who supported the policy in abstract were also more accepting of the transition after having seen the concrete practicalities and disruptions of a hypothetical transition.

Indeed, those who reported that the policy was “very important” had an average score of 6.61, which is nearly 1 point above the overall average of the general acceptability, discussed earlier in this chapter (5.88). Similarly, those who opposed the policy and said that it was “Not important” were predicted a mean score of 3.63.

[31] The attitudes towards the policy support are discussed in the first chapter of this report.
[32] The only element of difference was represented by the possibility to express a choice over timing, as discussed in the last section of the chapter.

Figure 14: Predicted acceptability for the hypothetical transition by levels of initial policy support



Base: British population aged 18+
[10,662 observations | 2,745 respondents].

The prediction of the mean acceptability reveals a clear association: acceptability increases for higher levels of initial policy support, suggesting that – on average – those who showed high levels of support for the policy in abstract were also more supportive of the concrete hypothetical scenarios.

The effect of initial policy support in the model

The addition of the initial policy support to the model used in the previous paragraphs (including the scenario elements, socio-demographic characteristics and levels of concerns towards climate change), impacted the model in three different ways.

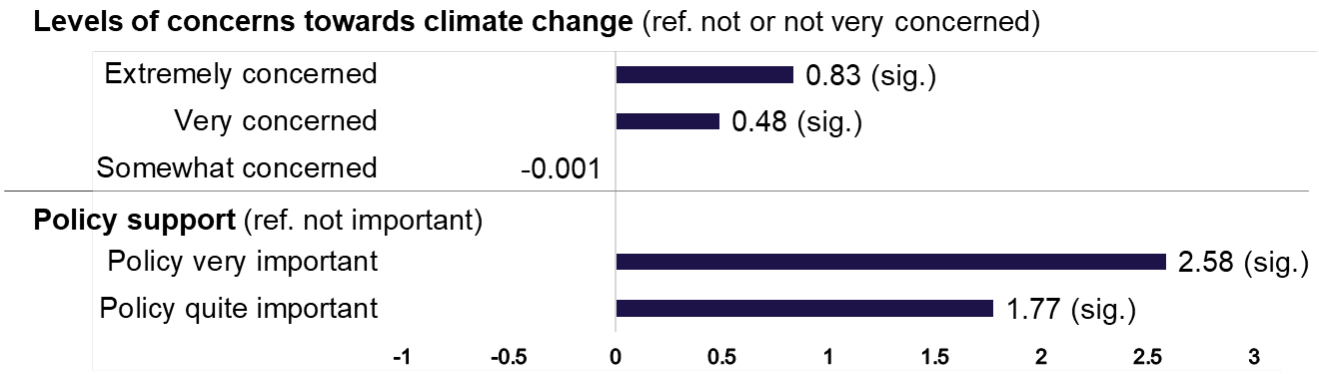
Firstly, the initial policy support became an important predictor for the understanding of the levels of acceptability of a transition. Indeed, its effect was the largest across all the other elements considered in the model (**Figure 15** includes the coefficients on policy support and climate change only. The full output in included in the Appendix D).

The second important finding of this model was the change of the effect of climate change concerns after accounting for the initial policy support. Although this element is still key for the understanding of the general acceptability, its effect was partly absorbed by the initial policy support, suggesting that these elements are associated (higher levels of concerns towards climate change reflect higher levels of support for the heating transition policy).

Finally, policy support increased the capacity of the model of explaining the variance between acceptability scores expressed by the respondents. While the model used in the previous sections could not explain more than 9.4% of the variance, the capacity of the new model increased to 15.3%. The importance of this variable in explaining the acceptability is comparable to the importance of climate change concerns, suggesting that attitudes are responsible for

larger changes in acceptability between people when compared to the role played by scenario elements or by socio-demographic characteristics.

Figure 15: Effect of climate change concern and policy support on the levels of acceptability when added to the same model



Base: British population aged 18+
[10,662 observations | 2,745 respondents].

Role of elements of the transition scenario for initial policy support sub-groups

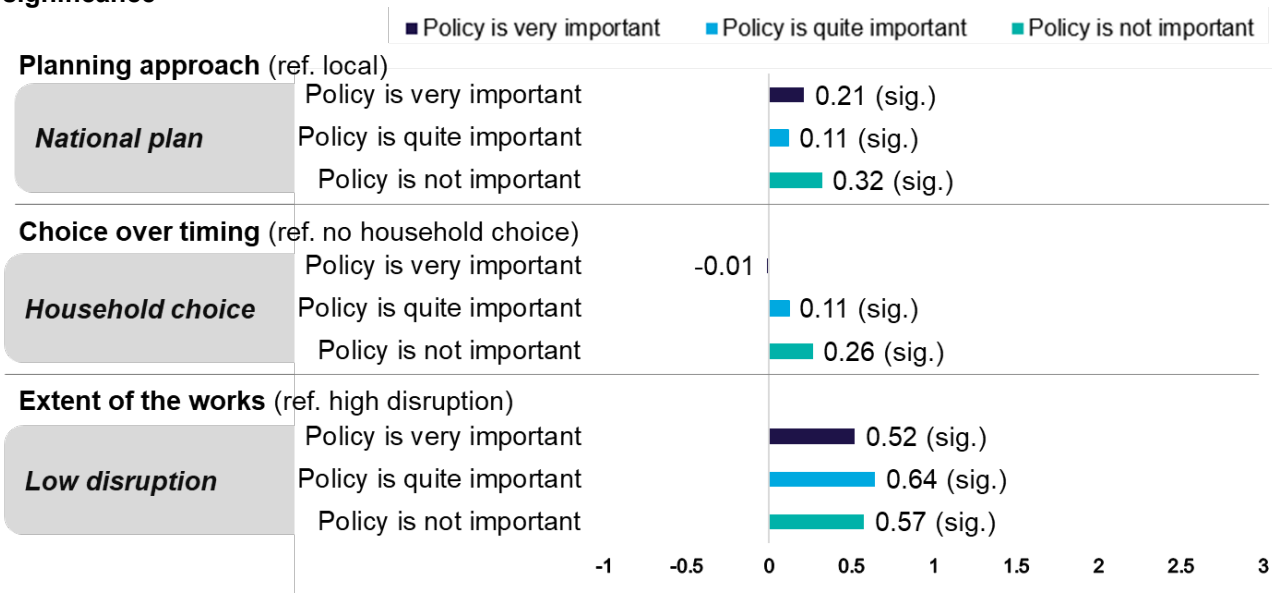
The division of the model in the subgroups of initial policy support revealed only one statistically significant difference between the three levels of policy support: this was the households' level of control over timing. Specifically, the possibility to express a choice or not had no effect on those who believed that the transition was "Very important" while lower levels of initial policy support expressed higher acceptability for scenarios where it was possible to express a choice (**Figure 16**).

Statistically significant differences between subgroups for this element (choice over timing) were detected also in levels of concern towards climate change. To sum up, the possibility to express a choice seemed to have a reduced effect on acceptability for those who are extremely concerned about climate change and for those who expressed the highest levels of support to the policy.

Looking at each subgroup separately, the mean effect of the scenario elements seemed to be generally larger for lower levels of initial policy support. However, this difference is not as large nor as statistically significant as the one that was identified for different subgroups of climate change concern.

As already discussed, this analysis confirms that the effect of the scenario elements on the transition acceptability did not change for different subgroups of initial policy support. Indeed, supporting the policy in abstract was largely associated with higher acceptability of the general transition process, regardless of the hypothetical scenario operationalised.

Figure 16: Effect of the vignette elements by levels of initial policy support and within model statistical significance



Base: British population aged 18+
[10,662 observations | 2,745 respondents].

Perspective of those living off the gas grid with a high-carbon heating system

This chapter addresses Research Question 3: *What attitudes exist towards low-carbon heating among people currently living in homes off the national gas grid using high-carbon heating?*

To better understand the nature of support for a heating transition among those who live off the mains gas grid and use a high-carbon heating system[33] this chapter explores their knowledge of and attitudes towards aspects of a transition towards low-carbon heat in buildings.

Understanding the profile of people living off the gas grid with high-carbon heating systems

People living off the gas grid with high-carbon heating systems made up 4% of the total population based on our survey estimates[34]. They were more likely to be older (50+) (71% compared to 49% in the general population), have higher equivalised household incomes (43% had more than £2,000 compared to 30% in the general population) and more likely to have a degree than the rest of the population (49% compared to 37% in the general population). As might be expected, a large majority reported owning their own home (85% compared to 64% in the general population).

As reported while discussing RQ1, people living off the gas grid with high-carbon heating systems did not vary significantly from the rest of the population in terms of their knowledge and attitudes for most areas related to a transition to low-carbon heat in buildings. They had similar attitudes, actions and beliefs in terms of concern about climate change, engagement in green behaviours, and awareness of the contribution of building heating to UK's carbon emissions. However, their awareness and knowledge of low-carbon heating technologies was substantially higher than the rest of the population[35]: people living off the gas grid with high-carbon heating systems were more likely to know a little or lot about either air or ground heat pumps (50% compared to 23% among the rest of the population), and bio-boilers (58% compared to 32%), although they were no more informed about hydrogen boilers than the rest of the population[36] (3% compared to 5%).

When considering satisfaction with their current heating system, people living off the gas grid with high-carbon heating systems were more likely to disagree with the statement '*My heating*

[33] High-carbon heating systems are defined here as those fuelled by oil, coal, bottled or tanked gas (LPG).
[34] Even with the off-grid population boosted in the survey sample, the unweighted sample size of people living off the gas grid with high-carbon heating systems was still relatively small (n=228) and, consequently confidence intervals around the estimates relatively large. As a result analysis of sub-groups within this was limited, this should be considered when interpreting figures presented in this chapter.
[35] The rest of the population here means those on the gas grid or off the gas grid with an electric, or low-carbon, or district or communal, or other heating system (i.e. all those not with oil, LPG, or coal-fuelled heating).
[36] As might be expected given that hydrogen boilers are still not available on the market.

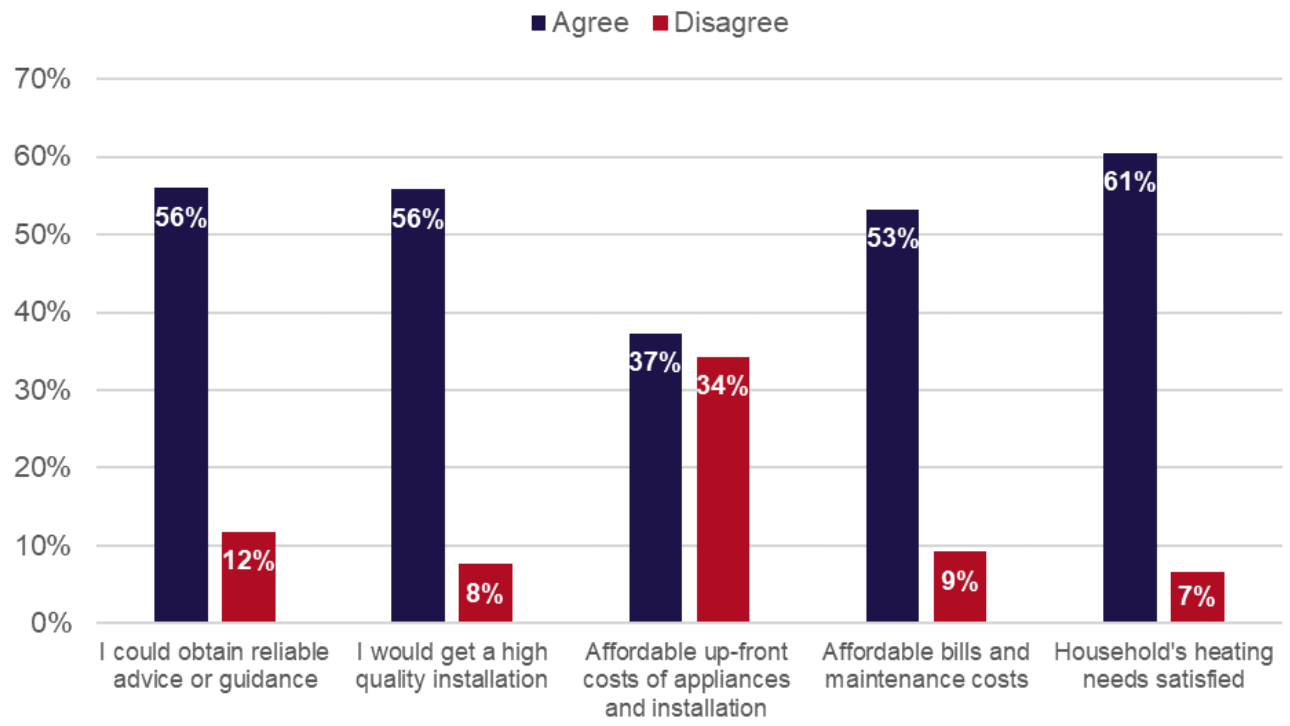
system is environmentally-friendly' (42% compared to 25% among the rest of the population). However, they were not significantly more or less aware of the UK's carbon emissions targets or the government's ambition to eliminate nearly all emissions from heat in buildings. Nor were they more or less likely to think it important that the UK achieves a substantial reduction in carbon emissions or makes a transition towards greener heating systems.

Perceptions of transitioning to low-carbon heating among this sub-group

People living off the gas grid with high-carbon heating systems were asked whether – if they were considering replacing their system with a more environmentally friendly one - they agreed or disagreed that (a) they could obtain reliable advice and guidance, (b) they would get high quality installation; (c) the up-front costs of appliances and the installation would be affordable; (d) the bills and maintenance of the heating system would be affordable; and (e) the environmentally-friendly system would meet the household's heating needs.

The proportion of people living off the gas grid with high-carbon heating systems who agreed (indicating a positive expectation of what the experience of switching to low-carbon heat might entail) varied across the statements (**Figure 17**). People living off the gas grid with high-carbon heating systems were more likely to agree than disagree that an environmentally-friendly heating system would meet their heating needs, be affordable to run and maintain, that they could obtain reliable guidance about their options, and would get a high-quality installation. However, as many people disagreed as agreed that the up-front costs would be affordable, suggesting that this could be a key perceived barrier to people's current desire to make the switch.

Figure 17: Attitudes of the off gas grid population using a high-carbon heating system towards specific heat transition elements



Base: Off-grid respondents using a high-carbon heating system
[Obtain reliable advice or guidance (228); Get a high-quality installation (227); Affordable up-front costs of appliances and installation (228); Affordable bills and maintenance costs (228); Household's heating needs satisfied (227)]

There was neither coherent nor significant variation in perceptions of transitioning to low-carbon heating among people living off the gas grid with high-carbon heating systems by age or income. However, the level of education seemed to be associated with more positive perceptions of a low-carbon transition: those with a degree were more likely than those without to agree that they would obtain reliable advice or guidance (63% vs. 50%), the system would meet their heating needs (66% vs. 55%), and that the running costs would be affordable (61% vs. 46%).

Positive perceptions of a transition were also associated with concerns about climate change: those more concerned about climate change were more likely to agree with all the five statements. Focusing on the running costs of the system, those who were currently not satisfied with the bills/maintenance costs of their high-carbon system (i.e. the 31% of the off-grid population with a high-carbon system who disagreed with the statement: '*The running costs of the heating system are acceptable*') were more likely to be confident of the bills and maintenance of a low-carbon heating system being affordable than those who considered their current running costs were acceptable (66% vs. 52% respectively).

Trusted sources of information

This chapter addresses Research Question 4: *Which sources do the public currently most trust to provide information, advice or recommendations about low-carbon heating technologies?*

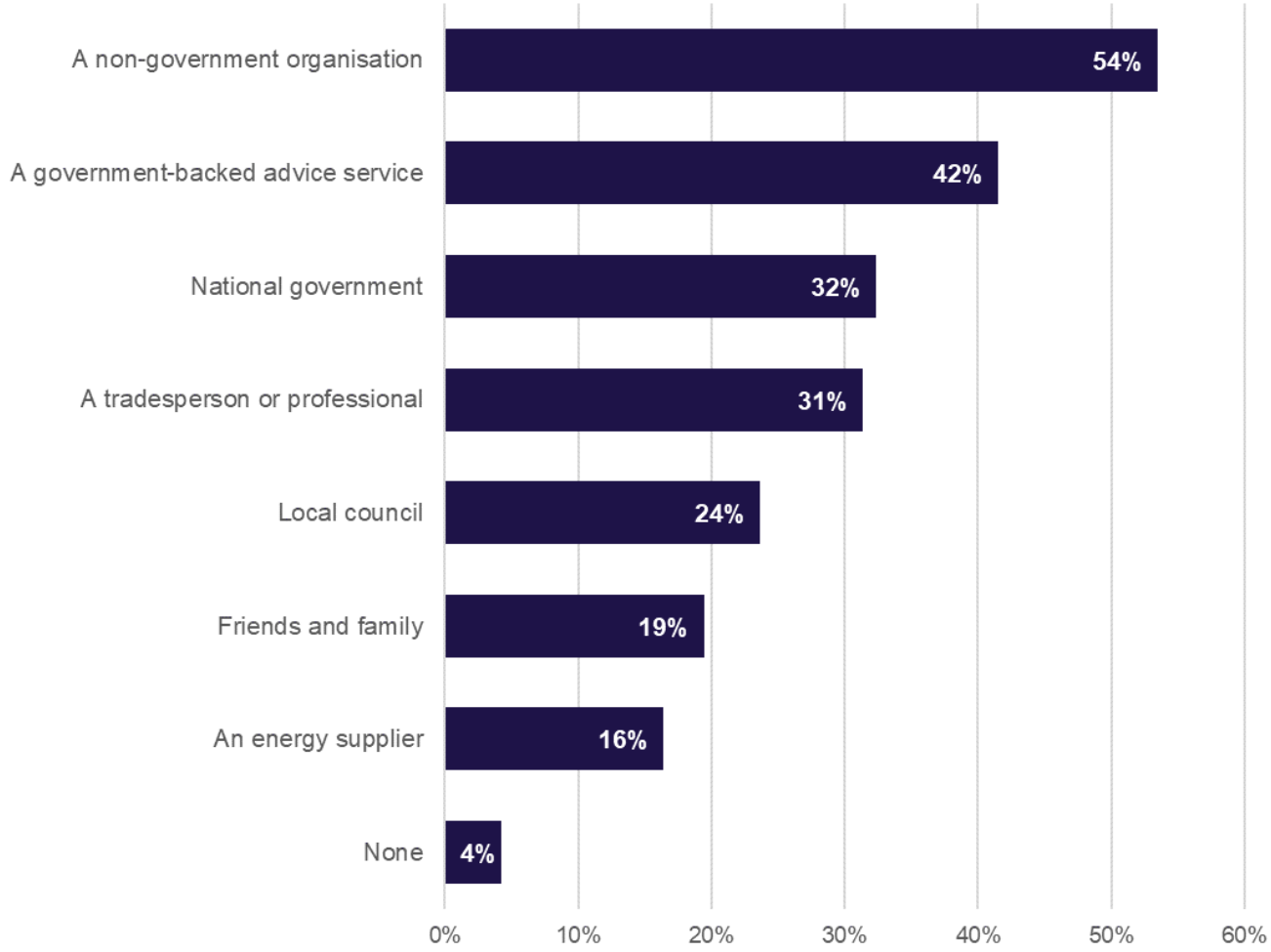
Respondents[37] were asked to select up to three sources from a list of organisations and people which they would trust most to provide information, advice or recommendations about installing a greener and more energy-efficient heating system.

Overall, the most selected trusted source of advice and guidance was a non-government organisation (selected by 54% of respondents) followed by a government-backed advice service (42%), and the national government or a tradesperson or professional (32% and 31% respectively). These were in turn followed by the local council, friends and family, and an energy supplier (24%, 19% and 16% respectively). Only a small proportion of the general population stated they did not trust any of the listed sources (4%) (**Figure 18**).

While the same overall distribution was found across countries, people living in Scotland were substantially more likely to trust information from a non-government organisation than the rest of the population (69% compared to 52% in England and 45% in Wales). However, there was no significant variation by country across the three 'government' options (the national government, a government-backed advice service and the local council).

[37] The findings presented in this chapter can be generalised to the population as a whole. The question about the most trusted sources of information was asked of *all* respondents, rather than of a sub-group of the population as in the previous chapter.

Figure 18: Most trusted source to provide information, advice or recommendations about technologies for low-carbon heating technologies



Base: British population aged 18+

There were no relevant or statistically significant variations in which sources were trusted by age, education or equivalised household income groups, or by levels of concern about climate change, frequency of avoiding non-recyclable materials or public perceptions of the importance of transitioning away from high carbon heating systems.

As might be expected, those who were sceptical about climate change or believed it is caused by natural processes were more likely than the rest of the population to say they did not trust any of the sources (12% compared to 5% of those who stated it is roughly equally caused by natural processes and human activity, and to 3% of those who believed it is caused by human activity only). This was also a sub-group of the population with one of lowest levels of coding[38]

[38] Respondents were asked what source(s) would ***most*** trust for advice or information about low-carbon heating systems. They could select ***up to three*** answer options. The sub-groups of the population with the lowest level of coding - meaning that fewer than three of the organisations and subjects presented in the list inspired trust in them –were: people not at all concerned about climate change, those for whom the government's target were not important and those who were sceptical about climate change or believed it is caused by natural processes. All these sub-groups are highly correlated.

for the different types of sources: only 33% of them selected up to three options, compared to 48% of those who stated it is roughly equally caused by natural processes and human activity, and to 53% of those who believed it is caused by human activity only. They were also less likely to trust a non-government organisation, the national government, a government-backed advice service or the local authority (**Table 4**).

Table 4: Preferred source of information about low-carbon heating technologies by climate change scepticism

	Natural processes or not changing	Roughly equally natural processes and human activity	Human activity
Frequency (%)			
A non-government organisation	28	51	57
A government-backed advice service	28	38	44
National government	20	30	35
A tradesperson or professional	33	29	32
Local council	22	27	23
Friends and family	25	21	18
An energy supplier	17	15	16
None	12	5	3
Base (count)			
Unweighted	225	625	2042
Weighted	256	625	1997

Conclusion

This report explores knowledge and attitudes in Great Britain towards a transition to low-carbon heat. Overall, there was a slight disconnect between the two: the general public was consistently supportive of policies aimed at reducing carbon emissions, and viewed the UK achieving a substantial reduction in carbon emissions as important. However, self-reported knowledge/awareness, when focused specifically on heating technologies especially, was relatively low. Moreover, the data suggested that the public as a whole is not aware of heat in buildings being one of the very largest contributors to carbon emissions in the UK, and only a minority reported having heard of specific low-carbon heating technologies.

However, it is not clear that a lack of knowledge of heat's role in carbon emissions, or of low-carbon heating technologies, is associated with lower levels of support for environmentally-friendly policies. Those who correctly identified heat in buildings as one of the three highest contributors to UK carbon emissions were not significantly more likely to think that a transition towards more environmentally-friendly technologies was important, and nor were those who knew about the government's ambition to eliminate nearly all emissions from heat in buildings. There was in fact some indication that those who were more knowledgeable about specific low-carbon heating technologies were less likely to think a transition was important, although support was still high.

Instead, support for a transition seems to be more strongly associated with more general attitudes and behaviour related to climate change: people who were more concerned about climate change, who engaged in green behaviours, and supported other policies targeted at reducing carbon emissions were also more likely to report thinking the transition was important. This was borne out in analysis of an experiment that presented respondents with specific heating transition pathways: concern about climate change had a far larger effect on the acceptability of the transition scenarios than a person's demographic characteristics or variation in elements of the transition scenario described.

Indeed, the analysis suggests that while the acceptability of a transition scenario did vary with differences in the delivery elements (level of disruption, whether or not a household could choose the timing, and whether it would be a nationally or locally co-ordinated process), the size of this effect was small. Additional analysis confirmed that the effect sizes for all elements were small across subgroups and showed that, although some patterns emerged, there was little variation. However, this may reflect the point that due to the lack of certainty about the eventual shape of any transition policy the scenarios presented did not include details about costs to the household or the specific nature of the works. The hypothetical scenarios used in this research represent a first step in gaining an understanding of the public's view of a heating transition and more concrete proposals in these areas may result in stronger effects on acceptability.

More generally, socio-demographic characteristics were associated with knowledge and attitudes towards a transition to low-carbon heating and related areas. Younger people, those

with degrees, and people with higher equivalised household incomes were more likely to be in favour of carbon reduction policies or think they were important, while *older* people, those with degrees, and people with higher equivalised household income tended to have higher knowledge/awareness of low-carbon heating technologies and carbon reduction policies. However, none of these categories were associated with acceptability of a concrete transition scenario once concern about climate change was included in the analysis.

Looking specifically at those off the gas grid, there was not significant variation in awareness of the government's ambition to eliminate nearly all emissions from heat in buildings, perceived importance of transitioning away from heating systems that use fossil fuels, or the acceptability of a transition scenario by current heating system. When asked about certain aspects of a switch to low-carbon heating systems, people living off the gas grid with high-carbon heating systems were generally positive, expecting an environmentally-friendly heating system would meet their heating needs and be affordable to run and maintain, that they could obtain reliable guidance about their options, and that they would get a high-quality installation. However, there was no such consensus on the up-front costs with as many people disagreeing that these would be affordable as agreeing, suggesting that this could be a key perceived current barrier to transition for this group.

When asked about who they would most trust for advice or information about low-carbon heating systems for their homes considering how to affect attitudes to a heating transition, non-governmental organisations were the most commonly selected trusted source, followed by a government-backed advice service, which in turn was followed by the national government, or a tradesperson or professional. This distribution was found across socio-demographic groups and levels of concern about climate change, perhaps suggesting a limited need for targeting of modes of communication. However, those who were sceptical about climate change or believed it is caused by natural processes were less likely to trust any of the sources, and the national government or a government-backed advice service in particular.

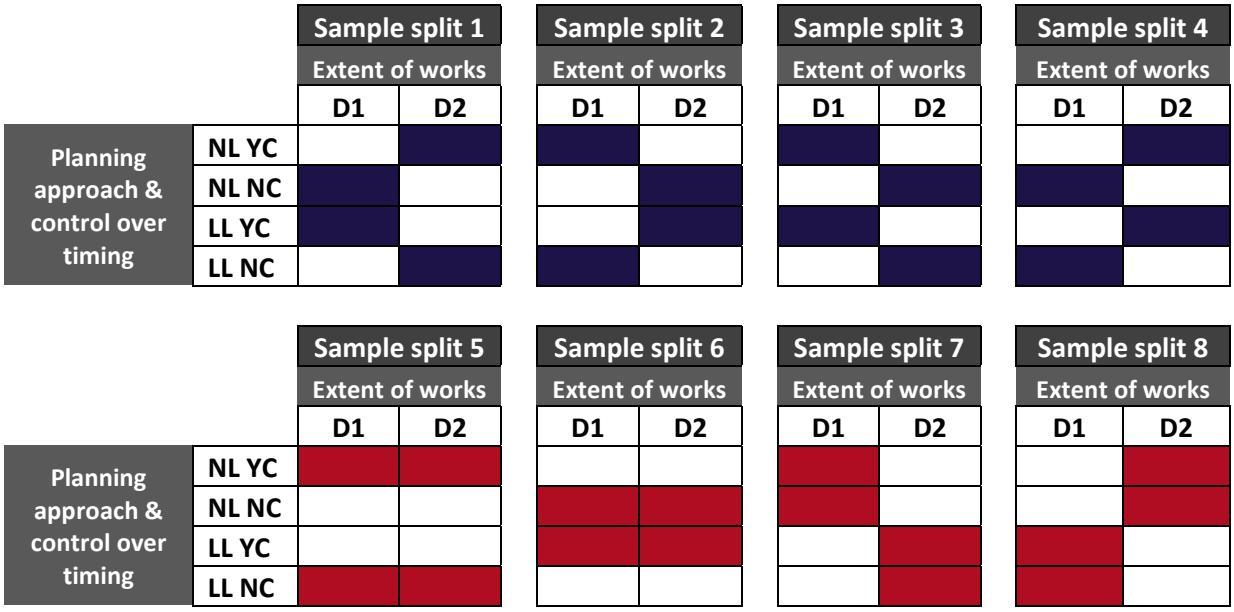
Appendix A – Detailed Methodology

Vignette design and randomisation logic

The vignette experiment was designed to balance maximising information available for addressing the research questions, and minimising measurement error caused by over-burdening respondents. The final implemented approach, outlined in the following paragraph, ensured:

- that the results enable inferences of 'acceptability' for the different combinations of the three elements within the potential transition approach. This means that subgroup analysis can also be conducted;
- and, the minimisation of cognitive burden for respondents to limit measurement error and, therefore, increase data quality.

There are 70 possible ways of combining four vignettes which contain eight potential scenarios. Of these, eight 'balanced' sets were selected (i.e. combinations of vignettes where each element variant is included twice across the four vignettes) to improve statistical power and ensure equal coverage of each variant. Furthermore, opting for balanced combinations allowed us to simplify the administration of the experiment. The diagram below shows the eight experimental groups into which the sample could have been split and the four vignettes that each respondent would be asked to score for 'acceptability'.



The eight balanced combinations of vignettes were then divided into two different groups:

- No repeating combinations of the element variants for the co-ordinating authority and control over timing elements (blue set of sample splits);

- Some repeating combinations of the element variants for the co-ordinating authority and control over timing elements (red set of sample splits)[39].

To avoid repeating combinations of the element variants for the co-ordinating authority and control over timing within sample split, only the 'blue' sample splits were used. The order of the vignettes was then randomised inside each sample split. Since the design of the experiment was 'balanced', combinations of vignettes randomly allocated and ordered, auto-correlation[40] and learning effects were controlled and prevented by design. Respondents were able to go back and edit the score given to any scenarios.

Cognitive testing

Given the complexity of the vignette experiment and of the topic treated, the questionnaire development involved both formal and informal cognitive testing.

Formal cognitive testing

Cognitive interviewing methods provide insight into the mental processes respondents use when answering survey questions, helping researchers to identify problems with question wording and questionnaire design. These methods investigate four cognitive stages: how respondents understand and interpret survey questions, how they recall information that applies to the question, the judgements they make as to what information to use when formulating their answers, and the response mapping process.

A cognitive testing protocol was developed in consultation with the BEIS research team. The protocol incorporated think-aloud, observation and probing techniques. The questions were tested with interviewer administered techniques where the interviewer read out the survey questions and responses were either read out, displayed on a showcard or open.

The formal testing explored:

- Comprehension of key terms within the questions;
- Whether respondents were able to select a suitable response option;
- Time frames used to answer the questions;
- Preferences for different question formats and response options;
- Sensitivity of questions and levels of comfort answering them.

Particular attention was given to the understanding of the vignettes. It was important for the scenarios to contain concrete examples of situations to allow participants to understand and engage fully with the question being asked. However, it was also crucial to ensure that the findings would not relate solely to the concrete situations that were presented in the scenarios and could feed into broader recommendations on the area (i.e. vignette's elements) as a whole.

[39] For example, in Sample Split 5 the 'National level' is always associated with the 'possibility of choice', while the 'Local level' with 'no possibility of choice'.
[40] Auto-correlation implies that successive vignette scores within individuals are correlated. It would be an issue only if certain types of participant were more likely to receive certain combinations of scenarios.

As much was dependent on the successful implementation of these vignettes within both the online and CATI questionnaires, the cognitive testing played an important role in determining:

- the maximum number of vignettes to show to participants;
- the amount of information to present within each vignette;
- how easy respondents found it to provide a considered measure of acceptability;
- whether the randomisation of the vignettes within each sample split (highly desirable to implement a pure random experiment design) could be implemented without threatening the overall understanding of the scenarios and the task; or, whether it would have been preferable to control for the order of the presentation of the scenarios to ensure that only one level (maximum two) would have varied from one screen to the following one for each respondent.

Interviews were carried out by researchers at NatCen who are experienced at carrying out cognitive interviews. Interviews were audio recorded with participants' consent. They were given £30 cash as a thank you for their time and help.

Participants were recruited through a recruitment agency. A total of 12 interviews were conducted: five in Crawley (suburban area), six in London (urban area) and one over the telephone. **Table 5** shows the composition of the cognitive interviewing sample.

Table 5 Cognitive test recruitment quotas		
Screening characteristics		**Number participants with characteristic**
Gender	Male	6
	Female	6
Age	18-29	3
	30-49	3
	50-64	3
	65+	3
Highest qualification	A-levels or above	7
	GCSE's or below	5
National Gas Grid	Yes	11
	No	1
Location	London	6
	Crawley	5
	Telephone	1

The interviews were summarised by researchers who reviewed the audio recording of each interview. All interview summaries were coded using a framework approach. Responses to each test question were recorded, along with observations made by interviewers, any think aloud and the responses to each of the scripted probes. Once the matrix was completed, the data in the

matrix were reviewed thematically. The analysis, discussed with BEIS during a de-briefing session, was written into a report from which recommendations for the final questionnaire were made.

Focusing on the vignettes experiment, the main result of the cognitive testing was that participants were able to answer the acceptability questions of the vignettes, although this task was considered burdensome. Considering both questionnaire length overall and the burden of the vignette task itself, we recommended a limit of four vignettes for each participant. The cognitive testing also suggested that the first vignette was more harshly judged than the subsequent ones. To address this apparent ordering effect, we recommended randomising the order of the vignettes within each sample split.

Informal cognitive testing

Since the understanding of the scenarios was key to the success of the project and given the CATI component of the NatCen Panel, informal testing was also undertaken. This was to assess the feasibility of the vignettes in telephone mode (no incentive was given). This test confirmed that the vignettes worked as expected overall but were perceived to be too long and a lot of information to process without any visual prompts. Therefore, prior to the main fieldwork, the wording was further simplified, and the length of each scenario trimmed.

Boost sample

The sample of people who live off the gas grid was boosted via postcode look-up file available on the website of the Centre for Sustainable Energy[41]. Identifying addresses that are not on the gas grid from a check of the postcode area does not produce completely accurate results (see **Table 6**). The postcode file is based on data from 2013, and changes may have occurred since then, including entirely new postcodes being created. A comparison of respondent addresses identified as an off-grid area by postcode look-up (*sample variable*) with respondents who self-reported that their address was not on the gas grid (*survey variable*) identified 47 cases where respondents claimed to be on-grid in a postcode identified as off-grid. Possible explanations include that, from 2013, the gas grid has been extended to cover a new area (for example, on a new-build housing estate), or that the respondent misreported their gas supply (for example, if they used bottled or stored gas but misunderstood the nature of their own supply). Conversely, 170 respondents reported being off-grid in postcodes that were identified at the sampling stage as on-grid neighbourhoods. This could be explained by the type of property they live in (for example, a high-rise flat or a flat in a converted building may have an all-electric fuel supply but be in an otherwise on-grid area); or by the fact that there are people whose address is on the gas grid, but not connected to it; and finally, again, misreporting by the respondent (for example, they may be unaware their heating runs off gas, particularly in buildings with less familiar heating systems such as district heating).

[41] The file was downloaded on 18/08/2019 at the following website address: https://www.cse.org.uk/projects/view/1259#GB_postcodes_off_the_mains_gas_grid

Table 6 Postcode area identifying whether respondents were on or off the mains gas grid by self-reported location of the address				
		Whether on or off the gas grid *(survey variable)*		
		On-grid	Off-grid	Total
Postcode look-up *(sample variable)*	Not applicable	8	1	9
	On-grid	2271	170	2441
	Off-grid	47	410	457
	Total	2326	581	2907

Overall, a total of 4,818 cases were issued, and 2,907 interviews were achieved, giving a survey response rate of 60% among those panellists invited to participate. More information about the survey and overall response rates is provided in the following paragraph.

Classification of the current heating system

The classification of the current heating system was based on a set of questions that focused on getting a comprehensive understanding of the type of heating system used by the respondents in their households. Specifically, each typology of installation (whether the system was centralised, fixed or portable) was associated to a question that focused on the specific type of fuel used by the heating technology (**Table 7**).

As mentioned in the previous section (“Boost sample”), we found some discrepancies between the responses of some panellists (whether they were on the gas grid or not) and data from the Centre for Sustainable Energy (whether the area where each panellist lived was on the gas grid or not).

Table 7: Report categories and survey responses		
Questionnaire structure		Report category
Gas central heating, using gas from the national grid	Gas central heating	On the grid gas
Central heating (that uses something other than gas from the national grid)	Bottled or tanked gas (LPG)	Off gas grid using high carbon heating systems
	Oil	Off gas grid using high carbon heating systems
	An electric boiler	Off gas grid using electric heating systems
	Solid fuel – coal	Off gas grid using high carbon heating systems
	Solid fuel – biomass (e.g. wood)	Off gas grid using low carbon or other heating systems

Table 7: Report categories and survey responses		
Questionnaire structure		**Report category**
	Air/Ground Source Heat Pump	Off gas grid using low carbon or other heating systems
	Something else	Off gas grid using low carbon or other heating systems
Fixed room heaters	Gas – using mains gas from the national grid	On the gas grid
	Gas – using bottled or tanked gas e.g. LPG or Calor gas	Off gas grid using high carbon heating systems
	Electric – storage	Off gas grid using electric heating systems
	Electric – not storage	Off gas grid using electric heating systems
	Solid fuel (open fire/enclosed stove) – coal	Off gas grid using high carbon heating systems
	Solid fuel (open fire/enclosed stove) – biomass (e.g. wood)	Off gas grid using low carbon or other heating systems
	Something else	Off gas grid using low carbon or other heating systems
Portable heaters	Electric	Off gas grid using electric heating systems
	Something else	Off gas grid using low carbon or other heating systems
Another way	Communal or district heating	Off gas grid using low carbon or other heating systems
	Something else (please describe)	Recoded into the other categories

Fieldwork and response rates

Fieldwork was conducted using the random-probability NatCen Panel[42]. The NatCen Panel is a panel of people recruited from the British Social Attitudes (BSA) survey, a high-quality, random probability face-to-face survey. For this survey, we invited to participate:

- all panel members recruited from BSA 2017 and 2018 who had not subsequently left the panel (**main sample**);
- all panel members who live off the gas grid recruited from BSA 2015 and 2016 who had not subsequently left the panel (**boost sample**);

No quotas were used, and the random probability design was therefore maintained.

Fieldwork was conducted using a sequential mixed-mode web/telephone design over a three-week fieldwork period to allow those without internet access, or those who might not be 'readily available' to take part. Respondents were initially invited to take part online, and web fieldwork ran from 23rd May to 16th June 2019, with those not taking part online issued to telephone

[42] More information on the design of the NatCen Panel can be found at http://the-sra.org.uk/wp-content/uploads/social-research-practice-journal-issue-06-summer-2018.pdf

fieldwork which ran from 28th May to 16th June 2019. A total of 2,907 people took part in the survey, of whom 2,475 (85%) completed online and 432 (15%) completed on the phone.

Response rates are a simple indicator of quality for surveys based on probability samples and are summarised in **Table 8**. If we consider the BSA 2017 and 2018 sample (main sample), this survey achieved a 60% response rate among those panellists invited to participate. When taking account of non-response at the BSA interview and then also at the point of recruitment to the panel, our overall response rate was 15%. The survey response rate for the boosted sample was 72%. Given the data available, it is not strictly possible to compute *an* overall response rate for the boosted sample, but if we assume the BSA response rates and Panel recruitment rates for this group are the same as for the rest of the population we can estimate it to be c.20%.

Table 8: Survey response rates

	BSA 2017 & 2018 Main sample	BSA 2015 & 2016 Boost
Response to the survey		
Issued	4,537	281
Deadwood	3	0
Achieved	2,706	201
Survey response rate	**60%**	**72%**
Overall response		
BSA issued	19,942	-
BSA deadwood	1,914	-
BSA productive	7,867	-
Recruited to panel	4,992	-
BSA response rate	44%	-
Panel recruitment rate	63%	-
Panel deadwood	7	-
Overall survey response rate	**15%**	**-**

Weighting

To ensure the estimates produced through the survey were as representative as possible of the general population, a survey weight was computed accounting for oversampling of off-grid cases (**design weight**) and differences in levels of non-response (**non-response weights**).

Design weight

As we have boosted our general population sample from BSA 2017/2018 with off-grid cases from BSA 2015/2016, the standard approach of weighting (i.e. accounting for non-response) would lead to biased results. We first needed to account for disproportionately more off-grid cases in our total sample by down-weighting the boosted off-grid cases from 2015/2016. Such an adjustment makes 2015-2018 off-grid panellists account for the same proportion of the total sample as those off the gas grid in the 2017/2018 sample.

Non-response weights

Non-response for NatCen's probability panel surveys can occur at three stages: non-response at the survey used for recruitment (the British Social Attitudes survey), refusal to join the panel at the end of that interview and non-response in the survey of panel members itself. We compute a weight to account for non-response at each of these three stages. The final weight is the product of these three weights. We use this three-stage system because the variables underlying non-response could be different at each stage. With this system we can also maximise the use of all the information available from the BSA. These are the weights we have computed:

BSA survey weight: the panel members were recruited from the BSA 2015 to BSA 2018. Having down-weighted the 2015/2016 cases as described above, the BSA survey weight was computed as per standard procedure. Firstly, the BSA weights account for unequal chances of selection in the BSA sampling. Secondly, a non-response model is used to produce a non-response weight. This weight adjusts for non-response at the BSA survey using: region, type of dwelling, whether there were entry barriers to the selected address, the relative condition of the immediate local area, the relative condition of the address, the percentage of owner occupied properties in quintiles and population density. Thirdly, the BSA weights make the sample of BSA respondents representative of the general British population in terms of gender, age and Government Office Region (GOR)[43]. Finally, a **model weight** was computed to be used in the panel non-response model, to make it representative of the population. The latter was computed by multiplying the BSA survey weight by the design weight.

Panel weight: this weight accounts for non-response at the panel recruitment stage where some people interviewed as part of the BSA survey chose not to join the panel. A logistic regression model (weighted by the model weight) was used to derive the probability of response of each panel member; the panel weight is computed as the inverse of the probabilities of response. This weight adjusts the panel for non-response using the following variables: age and sex groups, GOR, BSA year, household type, household income, education level, internet access, ethnicity, tenure, social class group, economic activity, political party identification, and interest in politics[44]. The resulting panel weight has been multiplied by the model weight, so the panel is representative of the population.

Survey weight: this weight is to adjust the bias caused by non-response to this particular panel survey. A logistic regression model has been used to compute the probabilities of response of each participant. The panel survey weight is equal to the inverse of the probabilities of response.

[43] More details on the BSA weight can be found at http://bsa.natcen.ac.uk/

[44] The characteristics that are likely to change with time for an individual and whose distribution differed between 2017 and 2018 BSA sample have been entered into the model in interaction with BSA year.

The initial set of predictors used to build the model was the same as for the panel weight; and at this wave the final set of variables used was also the same. The final survey weight is the result of multiplying the survey weight by the compounded panel weight.

Sample profile

NatCen Panel surveys are based on a random probability design, with panel members originally selected at random and considerable effort put in to maximise participation in order to minimise bias. **Table 9** below shows to what extent the profile of the achieved sample differs from the BSA population estimate by key demographic variables[45] and how the weights applied account for the already relatively small biases in the Panel sample.

Table 9: Sample profile by socio-demographics for the whole and the boosted sample

	BSA population estimate '17/'18 (weighted)[46]	Panel survey estimate '15/'16/'17/'18 (weighted)	Panel survey sample '15/'16/'17/'18 (unweighted)	Panel survey sample '17/'18 (unweighted)
Sex				
Male	49%	49%	41%	41%
Female	51%	51%	59%	59%
Age				
18-24	11%	11%	4%	4%
25-34	17%	17%	13%	14%
35-44	16%	17%	17%	17%
45-54	18%	18%	19%	18%
55-64	15%	15%	19%	19%
65+	23%	22%	27%	27%
Region				
North East	4%	4%	4%	4%
North West	11%	11%	11%	11%
Yorkshire and The Humber	8%	8%	10%	10%
East Midlands	7%	8%	9%	9%
West Midlands	9%	9%	7%	7%
East of England	10%	10%	11%	11%
London	14%	14%	9%	9%
South East	14%	14%	16%	16%
South West	9%	9%	11%	10%
Wales	5%	5%	5%	5%
Scotland	9%	9%	8%	8%
Highest level of education				
Degree	28%	28%	35%	35%

[45] This table shows only the classic key demographic variables. A more comprehensive table can be found in the technical report published alongside this report.
[46] Estimates are based on combined BSA 2017 & 2018 datasets, each weighted to reflect the population at the time.

Table 9: Sample profile by socio-demographics for the whole and the boosted sample				
	BSA population estimate '17/'18 (weighted)[46]	Panel survey estimate '15/'16/'17/'18 (weighted)	Panel survey sample '15/'16/'17/'18 (unweighted)	Panel survey sample '17/'18 (unweighted)
Higher education below degree	11%	11%	14%	14%
A level or equivalent	17%	17%	17%	17%
O level/CSE or equivalent	26%	26%	23%	24%
Foreign or other	2%	2%	1%	1%
No qualifications	17%	16%	9%	9%
Unweighted base	*7,867*	*2,970*	*4,915*	*4,160*

Analysis - Multi-level regression model

The level of public acceptability of a national transition towards more environmentally friendly heating systems was measured in a vignette experiment. Respondents were presented with four vignettes, each one outlining a different scenario, and asked the extent to which they found each scenario acceptable on a scale of 0 ('not at all acceptable') to 10 ('completely acceptable'). Each scenario randomly varied in whether the transition is planned centrally or locally, households' degree of control over the timing of the transition, and the amount of in-home disruption the transition would cause (as more fully described in the paragraph '*Vignette design and randomisation logic*').

Reshaping the dataset

Since each respondent was asked to rate four different scenarios, the survey results included four acceptability scores (observations) for each respondent. For analysis, the dataset was re-structured so that each row represented one observation. This re-shaped dataset included a total of 10,662 observations evaluated by 2,745 respondents[47].

Three different binary variables were computed to reflect the three elements that make up each vignette:

(a) the coordinating authority (national plan = 1; local plan = 0).
(b) the possibility to choose the timing of the works (household choice = 1; no household choice = 0).
(c) and the potential level of disruption (low-disruption = 1; high-disruption = 0).

For instance, the vignette 'NLYCD2' (for the specific wording, see questionnaire specification in Appendix B) was recoded as:

[47] The number of cases included in the statistical model was slightly smaller than the total achieved survey sample (2,970), due to the exclusion from the analysis of the cases with at least a missing value across all the variables fitted to the model as required by statistical modelling.

(a) IsNatPlan = 1
(b) YesChoice = 1
(c) IsLowDisr = 0

The choice of the model

Linear regression was judged to be the most suitable method for modelling the relationships between acceptability scores and the vignette attributes. Using linear regression means the acceptability scores are treated as continuous variables, thereby fully utilising the 0-10 scale, while the model output is relatively accessible to a non-technical audience (compared to other approaches such ordinal logistic regression).

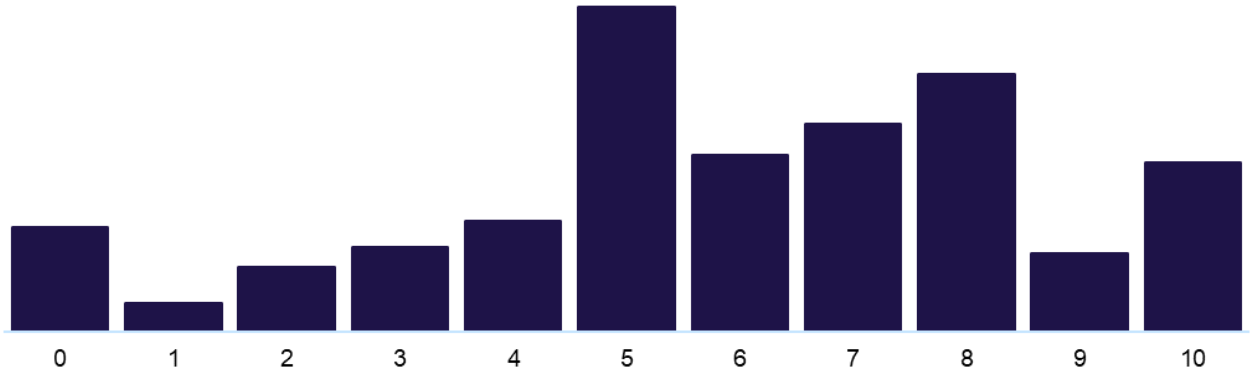
However, a 'simple' ordinary least squares (OLS) model is not able to correctly account for the presence of multiple responses (or "repeated measures") from each individual respondent. The presence of correlation between measures within individuals - people who rate highly on one might tend to rate highly on all and vice versa - violates the assumption of independence between observations, therefore a multi-level regression model was fitted to the survey data. This retained the analytical advantages of an OLS model, while accounting for responses being nested within individuals. Furthermore, the inclusion of a random intercept allowed for some variation in respondents' "baseline" scores[48].

Dependent variable and model assumptions

The distribution of the acceptability scores showed a strong central tendency, with a mean of 5.88, a median of 6 and a mode of 5[49].

[48] Our analysis showed that 59% of the variance in the dependent variable was attributed to different respondent baselines and that adding the grouping effect to the linear model significantly increased the model fit compared to an OLS model.
[49] As with many surveys in the UK, 'Don't Know' and 'Refusal' answer options were not shown to respondents up-front to reduce both satisficing and the amount of missing data. These codes are only available in the online questionnaire if a respondent tries to skip a question without giving an answer, or if it is given spontaneously in a telephone interview. It is possible that the high levels of coding here reflect that respondents used the midpoint option (a score of 5) as a proxy for 'Don't know'.

Figure 19: Distribution of the vignette scores in the regression dataset



Base: British population aged 18+
[10,662 observations | 2,745 respondents].

Analysis was carried out to check the model assumptions, including an assessment of the model residuals and checks on the correlation between the independent variables. Nothing was found to suggest that any model assumptions were violated.

The model attributes

Each vignette included three elements, namely (a) the planning approach - whether a nationwide switchover plan for the whole of the UK, or a series of locally developed plans towards an overall national target; (b) the extent of household control over timing - whether households are able to choose when to switch individually, or whether neighbourhoods undergo a coordinated switchover on specific dates; and (c) the extent of the in-home works - whether low (described as 2 to 3 days over a few months to replace heating appliances), or high (described as up to 8 consecutive weeks involving major works, such as installing new radiators and energy efficiency improvements).

The reference categories used for the model were:

(a) a series of locally developed plans towards an overall national target;
(b) no control over timing, i.e. neighbourhoods undergo a coordinated switchover on specific dates;
(c) high extent of the in-home works.

The elements were fitted to a model that included levels of climate change concerns and six key demographic variables[50], thought to influence the levels of acceptability or considered strategic for the understanding of the acceptability scenarios and of its elements.

[50] These were: age (6 groups); country (England, Wales or Scotland); equivalised monthly household income (4 levels); tenure (homeowner, private renter and other, or social renter); university education (whether the respondent had a degree or not); and type of heating system in the household (off-grid low carbon and other, off-grid high carbon, off-grid electric, or on-grid).

Models used in the report

Although this report was structured around the presentation of the results of one model only ("main model"), the complexity of this analysis required to fit a larger number of models to survey data. **Table 10** presents a summary of the four general models that formed the backbone of the analysis.

This summary includes an overview of the model building approach followed in the analysis and the changes in the variance caused by adding new sets of variables. The output of these four models are included in the Appendix D.

Table 10: Summary of the variance explained in each model and predictors used

Model	Independent variables in each model				Variance explained	Model output (Appendix D)
	Vignette elements	Demographics and heating system	Climate change concern	Policy support		
Scenario elements	✓				1.3%	**Table 27**
Socio-demographics	✓	✓			2.8%	**Table 28**
Main model	✓	✓	✓		9.4%	**Table 26**
Main model + policy support	✓	✓	✓	✓	15.3%	**Table 29**

Reporting conventions

The analysis and this report applied the following conventions:

Rounding

To improve readability, and because differences smaller than one percentage point will not be meaningful, percentages are presented to zero decimal points. As a result, figures may not sum to 100%.

Bases

All reported base sizes (i.e. the number of cases on which the analysis is based) are unweighted and exclude those who refused to answer or selected the option 'Don't Know'. Small sample sizes reduce the reliability of estimates, and it is indicated where results should be treated with caution. Figures based on a sample size of 25-50 cases are marked with an asterisk. Figures based on a sample size of less than 25 are not presented.

Significance testing

All findings have been tested for statistical significance, and all differences reported are statistically significant unless stated otherwise. Statistical testing was conducted at the 95% confidence level[51].

Percentages

Some tables and figures in the report relate to questions with mutually exclusive responses. In these tables, percentages will generally sum to 100; however, some percentages will not sum exactly to 100% because of rounding. In addition, percentages will not sum to 100% for questions where respondents could choose multiple responses.

[51] This means that 19 out of 20 times the observed results (for example differences between groups) are 'real' and not caused by random variation in the sample.

Appendix B – Questionnaire Specification

1.1.1 Environmental behaviours

{ASK ALL}
GrBeIn [GRID: RANDOMISE ROWS; FLIP SCALE 1…4]
How often, if at all, do you personally do any of the following?

WEB: “Please select one answer on every row”
TEL: “INTERVIEWER: READ OUT EACH STATEMENT AND THE ANSWER

GRID ROWS

1. Switch off lights in rooms you aren't using
2. Keep rooms you are not using at a cooler temperature than those you are using
3. Separate all your rubbish into items that can be recycled through your normal rubbish collection
4. Avoid non–recyclable or single-use materials when shopping or consuming food or beverages (packaging, shopping bags, straws, cups, etc.)

GRID COLUMNS

1. Always
2. Usually
3. Sometimes
4. Never
5. Not applicable [DISPLAY FOR ITEM 3 ONLY]

1.1.2 Attitudes towards climate change

{ASK ALL}
ClimChSc [FLIP SCALE 1…5 – PLACE CODE 6 VISUALLY SEPARATED FROM OTHER ANSWER OPTIONS]
Thinking about changes in the world’s climate over the past 100 years that are currently being reported, which, if any, of the following best describes your opinion?

Over the past 100 years, climate change has been caused by…

TEL: “INTERVIEWER: READ OUT”

1. natural processes entirely
2. natural processes mainly
3. roughly equally natural processes and human activity
4. human activity mainly
5. human activity entirely

6. I don't think the climate is currently changing

{ASK ALL}
ClimChCo [FLIP SCALE 1…5]
How concerned, if at all, are you about climate change?

TEL: "INTERVIEWER: READ OUT"

1. Extremely concerned
2. Very concerned
3. Somewhat concern
4. Not very concerned
5. Not at all concerned

1.1.3 Policy rationale awareness

{ASK ALL}
HeatGHGCa [GRID: RANDOMISE ROWS]
To what extent, in your opinion, do each of the following sectors contribute to UK carbon emissions?
Please rate your answer on a scale of 0 to 10 where 0 means 'Not at all' and 10 means 'A great extent'.

TEL: "INTERVIEWER: READ OUT"

1. Transport, such as journeys by cars, vans, trains, planes and ships in the UK

BOX FOR SCORE RANGE 0-10 […]

2. Heating and cooling in domestic, commercial and public sector buildings

BOX FOR SCORE RANGE 0-10 […]

3. Non-heating energy use in domestic, commercial and public sector buildings (for example, powering lights and electrical appliances)

BOX FOR SCORE RANGE 0-10 […]

4. Industry, including the manufacture of goods and chemicals

BOX FOR SCORE RANGE 0-10 […]

5. Agriculture, including raising livestock, growing crops and using farm machinery

BOX FOR SCORE RANGE 0-10 […]

{ASK ALL}
ClimChPoB [GRID: RANDOMISE ROWS; FLIP SCALE 1…5]

And to what extent are you in favour or against, if at all, measures aimed at reducing carbon emissions?

WEB: "Please select one answer on every row"
TEL: "INTERVIEWER: READ OUT EACH STATEMENT AND THE ANSWER

GRID ROWS

1. Using money from taxes on fossil fuels (such as oil, gas and coal) to subsidise renewable energy (such as wind and solar power)
2. Phasing out the sale of petrol and diesel cars in favour of electric or hybrid ones
3. Phasing out the sale of gas boilers in favour of more environmentally-friendly heating systems
4. Phasing out the sale of gas cookers in favour of electric ones

GRID COLUMNS

1. Strongly in favour
2. Somewhat in favour
3. Neither in favour nor against
4. Somewhat against
5. Strongly against

1.1.4 Household type & heating system

{ASK ALL}
Tenure
Thinking about your main residence, does your household own or rent this accommodation?

INTERVIEWER: PROBE IF NECESSARY:
IF OWNS: Outright or on a mortgage?
IF RENTS: From whom?

1. Owns - Outright
2. Owns - Buying on mortgage
3. Shared ownership (e.g. part rent, part buy)
4. Rents - Local authority / council
5. Rents - Housing Association/charitable trust/new town development corporation
6. Rents - Property company
7. Rents - Employer of a household member
8. Rents - Other organisation
9. Rents - Relative/friend (before living here) of a household member
10. Rents - Other individual/private landlord
11. Rent free, squatting
12. Other (please describe)

{ASK ALL}
HHProp

Which of the following types of property best describes your accommodation?

INTERVIEWER: PROBE IF NECESSARY:
IF HOUSE OR BUNGALOW: Terraced, detached or semi-detached?

TEL: “INTERVIEWER: READ OUT”

1. Flat or maisonette
2. Terraced house
3. Semi-detached house
4. Detached house
5. Terraced bungalow
6. Detached bungalow
7. Semi-detached bungalow
8. Other (please describe)

{ASK ALL}
HeatSyGCh

START DISPLAY: Help menu

- **TITLE -** What is the national grid?
- **TEXT** – The national grid is the network of pipelines that distributes gas around the country. Being on mains gas means that gas comes through this national network to your home, and not from a standalone tank on your property. A connection to this 'mains gas' network is the case for more than 80% of homes in the country.

Thinking about the main way you heat your home, is this…?

TEL: "INTERVIEWER: READ OUT"

1. Gas central heating, using gas from the national grid

2. Something else

END DISPLAY

{ASK IF HeatSyGCh = 2}
HeatSyPo
What is the main way you heat your home?

TEL: "INTERVIEWER: READ OUT"

1. Central heating (that uses something other than gas from the national grid)
2. Fixed room heaters
3. Portable heaters
4. Another way

{ASK IF HeatSyPo = 1}
HeatSyCHT
What type of central heating do you have?

TEL: "INTERVIEWER: READ OUT"

1. Bottled or tanked gas e.g. LPG or Calor gas
2. Oil

3. An electric boiler
4. Solid fuel – coal
5. Solid fuel – biomass (e.g. wood)
6. Air/Ground Source Heat Pump
7. Something else

{ASK IF HeatSyPo = 2}
HeatSyFT

START DISPLAY: Help menu

- **TITLE** - What are electric 'storage' and 'not storage' heaters?
- **TEXT** – Storage heaters store energy by heating up internal ceramic bricks at certain off-peak times (e.g. during the night) and then release that heat at other times (e.g. during the day). Not storage heaters, sometimes also known as 'direct electric heating', provide heat on demand (without storing heat at certain times).

What type of fixed room heaters do you have?

TEL: "INTERVIEWER: READ OUT"

1. Gas – using mains gas from the national grid
2. Gas – using bottled or tanked gas e.g. LPG or Calor gas
3. Electric – storage
4. Electric – not storage
5. Solid fuel (open fire/enclosed stove) – coal
6. Solid fuel (open fire/enclosed stove) – biomass (e.g. wood)
7. Something else

{ASK IF HeatSyPo = 3}
HeatSyPT

What type of portable heaters do you have?

TEL: "INTERVIEWER: READ OUT"

1. Electric
2. Something else

{ASK IF HeatSyPo = 4}
HeatSyOT

Is that…

TEL: "INTERVIEWER: READ OUT"

1. Communal or district heating
2. Something else (please describe)

COMPUTE DV VARIABLE 'GasGrid' {whether on- or off- the gas grid}
IF HeatSyGCh=1 or HeatSyFT=1 GasGrid=1 {On-gas grid}
ELSE GasGrid=2 {Off-gas grid}

{ASK ALL}
HeatResDec [FLIP SCALE 1…4]

And which of the following best describes your involvement in managing the energy bills and in taking decisions about your home heating system (e.g. when or how to replace the boiler)?

TEL: "INTERVIEWER: READ OUT"

1. I am responsible for, or contribute to paying, the energy bills and for taking decisions about the home heating system
2. I am responsible for, or contribute to paying, the energy bills, but not for taking decisions about the home heating system
3. I am responsible for taking decisions about the home heating system, but not responsible for paying or contributing to the energy bills
4. I am neither responsible for paying the energy bills nor for taking decisions about the home heating system

{ASK ALL}
CurHeatSat [GRID: RANDOMISE ROWS; FLIP SCALE 1…5]

Thinking about the heating system in your home, how much do you agree or disagree with the following statements?

WEB: "Please select one answer on every row"
TEL: "INTERVIEWER: READ OUT EACH STATEMENT AND THE ANSWER

GRID ROWS

1. The heating system meets my household's heating needs
2. The running costs of the heating system are acceptable
3. My heating system is environmentally-friendly

GRID COLUMNS

1. Strongly agree
2. Agree
3. Neither agree nor disagree
4. Disagree
5. Strongly disagree

1.1.5 Knowledge of heating systems

{ASK ALL}
HeatTechAw [RANDOMISE 1…6]
Which of the following heating technologies have you heard of?

TEL: “INTERVIEWER: READ OUT”

1. Biomass boilers (e.g. burning wood pellets)
2. Hydrogen boilers
3. Air source heat pumps
4. Ground source heat pumps
5. Gas boilers
6. Oil boilers
7. WEB: "None of these"
   TEL “INTERVIEWER: DO NOT READ OUT None of these”

{ASK IF HeatTechAw=1,2,3,4}
HeatTechSc [RANDOMISE ROWS 1…4 max; FLIP SCALE 1…3]

And how much, if anything, do you know about…

WEB: “Please select one answer on every row”
TEL: “INTERVIEWER: READ OUT EACH STATEMENT AND THE ANSWER

GRID ROWS – *Show items selected at ‘HeatTechAw’*

GRID COLUMNS

1. Know a lot
2. Know a little
3. Have heard of it of it, but do not really know what it is

{ASK ALL}
HeTrAw [FLIP SCALE 1…4]
How much, if anything, do you know about the following?

WEB: “Please select one answer on every row”
TEL: “INTERVIEWER: READ OUT EACH STATEMENT AND THE ANSWER

1. The UK has legally binding targets to substantially reduce carbon emissions by 2050
2. The Government’s ambition to eliminate nearly all emissions from heating buildings as part of meeting overall carbon emissions targets by 2050

GRID COLUMNS

1. Know a lot
2. Know a little
3. Have heard of it, but do not know details about it
4. Never heard of it

{ASK ALL}
HeatTrIm [FLIP SCALE 1…4]
How important, if at all, is it that the UK ….

TEL: "INTERVIEWER: READ OUT"

1. achieves a substantial reduction in carbon emissions by 2050
2. makes a full transition away from heating systems which use fossil fuels towards greener and more environmentally-friendly technologies by 2050

GRID COLUMNS

1. Very important
2. Quite important
3. Not very important
4. Not at all important

1.1.6 Acceptability of the heating system transition - randomised vignettes

{ASK ALL}
IntroVig
The UK has legally binding targets to reduce its carbon emissions. To meet these targets, it is expected that all households will need to switch to greener and more environmentally-friendly heating systems.

{TEL: 'I will read out'; WEB: 'We will now show you'} four ways that it has been suggested this switchover could happen and ask you how acceptable you find each one. The following things vary between the options:

- **the planning approach** (national versus local),
- **the extent of the works** (2 to 3 days over a few months to replace heating appliances versus up to 8 consecutive weeks involving major works),
- **the timings of the works** (switchover of the entire neighbourhood on a specific date versus several years to arrange the switch at a time that suits you before a deadline).

Please consider that the **costs** to homeowners of the new system and running costs for households will be the same for all the options.

START DISPLAY: CAROUSEL (randomised)
START DISPLAY: HELP MENU

{ASK ALL}
Vig1 to Vig4
Help menu:

- **TITLE** - Who will pay?
- **TEXT** - There will be costs. Please consider that the costs to homeowners of the new system and running costs for households will be the same for all the options.

The UK has legally binding targets to reduce its carbon emissions. To meet these targets, it is expected that all households will need to switch to greener and more environmentally-friendly heating systems.

Please rate how acceptable you would find the following scenario on a scale of 0 to 10 where 0 means 'Not at all acceptable' and 10 means 'Completely acceptable'.

DISPLAY Vig1 to Vig4 (randomised) for each sample split as detailed in the table below:

IF SampSplit=1 then Vig1= NLNCD1
IF SampSplit=1 then Vig2= LLYCD1
IF SampSplit=1 then Vig3= NLYCD2
IF SampSplit=1 then Vig4= LLNCD2

IF SampSplit=2 then Vig1= NLYCD1
IF SampSplit=2 then Vig2= LLNCD1
IF SampSplit=2 then Vig3= NLNCD2
IF SampSplit=2 then Vig4= LLYCD2

IF SampSplit=3 then Vig1= NLYCD1
IF SampSplit=3 then Vig2= LLYCD1
IF SampSplit=3 then Vig3= NLNCD2
IF SampSplit=3 then Vig4= LLNCD2

IF SampSplit=4 then Vig1= NLNCD1
IF SampSplit=4 then Vig2= LLNCD1
IF SampSplit=4 then Vig3= NLYCD2
IF SampSplit=4 then Vig4= LLYCD2

BOX FOR SCORE […]

END DISPLAY: HELP MENU
END DISPLAY: CAROUSEL

Vignette text specification

VigSet	VigTxt	Levels
NLYCD1	A nationwide plan would be developed for the whole of the UK, establishing a deadline by when all households would need to have switched system. Households would have several years to arrange the necessary works at a time that suits them before this deadline. Workers would need 2-3 days spread over a few months to carry out the works, which would only involve replacing the heating appliances.	National level / Household choice/ Minimum level of disruption
NLYCD2	A nationwide plan would be developed for the whole of the UK, establishing a deadline by when all households would need to have switched system. Households would have several years to arrange the necessary works at a time that suits them before this deadline.	National level / Household choice/ Maximum level of disruption

Vignette text specification		
VigSet	**VigTxt**	**Levels**
	Workers would need up to 8 consecutive weeks to carry out the works, which would involve major works in the home, such as new larger radiators and energy efficiency improvements (e.g. double-glazed windows and solid wall insulation) where not already in place.	
NLNCD1	A nationwide plan would be developed for the whole of the UK, establishing a deadline by when all households would need to have switched system. All the properties in your neighbourhood would make a coordinated switchover together on specific dates according to this national plan. Workers would need 2-3 days spread over a few months to carry out the works, which would only involve replacing the heating appliances.	National level / No household choice/ Minimum level of disruption
NLNCD2	A nationwide plan would be developed for the whole of the UK, establishing a deadline by when all households would need to have switched system. All the properties in your neighbourhood would make a coordinated switchover together on specific dates according to this national plan. Workers would need up to 8 consecutive weeks to carry out the works, which would involve major works in the home, such as new larger radiators and energy efficiency improvements (e.g. double-glazed windows and solid wall insulation) where not already in place.	National level / No household choice/ Maximum level of disruption
LLYCD1	Every local council area would develop its own heating plan, towards an overall national target. They would also set a deadline by when all households would need to have switched system. Households would have several years to arrange the necessary works at a time that suits them before this deadline. Workers would need 2-3 days spread over a few months to carry out the works, which would only involve replacing the heating appliances.	Local level / Household choice/ Minimum level of disruption
LLYCD2	Every local council area would develop its own heating plan, towards an overall national target. They would also set a deadline by when all households would need to have switched system. Households would have several years to arrange the necessary works at a time that suits them before this deadline. Workers would need up to 8 consecutive weeks to carry out the works,	Local level / Household choice/ Maximum level of disruption

Vignette text specification		
VigSet	**VigTxt**	**Levels**
	which would involve major works in the home, such as new larger radiators and energy efficiency improvements (e.g. double-glazed windows and solid wall insulation) where not already in place.	
LLNCD1	Every local council area would develop its own heating plan, towards an overall national target. They would also set a deadline by when all households would need to have switched system. All the properties in your neighbourhood would make a coordinated switchover together on specific set dates according to this local plan. Workers would need 2-3 days spread over a few months to carry out the works, which would only involve replacing the heating appliances.	Local level / No household choice/ Minimum level of disruption
LLNCD2	Every local council area would develop its own heating plan, towards an overall national target. They would also set a deadline by when all households would need to have switched system. All the properties in your neighbourhood would make a coordinated switchover together on specific set dates according to this local plan. Workers would need up to 8 consecutive weeks to carry out the works, which would involve major works in the home, such as new larger radiators and energy efficiency improvements (e.g. double-glazed windows and solid wall insulation) where not already in place.	Local level / No household choice/ Maximum level of disruption

{ASK ALL}
VigDis
Thank you for evaluating the scenarios. Please note that while the scenarios described some ways that it has been suggested this switchover could happen in theory, none of these represents national or local government policy or plans.

1.1.7 Acceptability for those off the gas grid

{ASK IF (HeatSyCHT = 1,2,4 OR HeatSyFT = 2,5)}
OffGas [RANDOMISE ROWS 1…4; FIP SCALE: 1…5]
You previously said your heating system is {IF HeatSyCHT=1 or HeatSyFT=2 “bottled or tanked gas (e.g. LPG or Calor)” IF HeatSyCHT=2 “oil”; IF HeatSyCHT=4 or HeatSyFT=5 “coal”; fuelled .

If you were considering replacing your current heating system with a greener and more environmentally-friendly one, to what extent, if at all, would you agree or disagree with the following statements?

TEL: “INTERVIEWER: READ OUT”

GRID ROWS
1. I can obtain reliable advice or guidance about greener and more energy-efficient heating options
2. I will get a high quality installation
3. the up-front costs of appliances and the installation will be affordable
4. the bills and maintenance of the heating system will be affordable
5. it would meet my heating needs

GRID COLUMNS
1. Strongly agree
2. Somewhat agree
3. Neither agree nor disagree
4. Somewhat disagree
5. Strongly disagree

1.1.8 Preferred source of information

{ASK ALL}
SouTru [RANDOMISE 1…7]

Which of the following would you most trust to provide information, advice or recommendations about installing a greener and more energy-efficient heating system in your home?

WEB: “Please select up to three”
TEL: “INTERVIEWER: ‘Please select up to three”

1. National government (e.g. BEIS, Ofgem)
2. A government-backed advice service (e.g. The Simple Energy Advice Service)
3. Local council
4. A non-government organisation (e.g. The Energy Savings Trust or Citizens Advice)
5. An energy supplier
6. A tradesperson or professional (e.g. builder, plumber, gas fitter or architect)
7. Friends and family
8. WEB: "None of these"
   TEL “INTERVIEWER: DO NOT READ OUT None of these”

Appendix C – General Population Tables

Table 11: Green behaviours				
How often, if at all, do you personally do any of the following?				
	Switch off lights in rooms not in use	**Keep rooms not in use at a cooler temperature**	**Separate rubbish into items that can be recycled**	**Avoid non–recyclable or single-use materials**
Frequency (%)				
Always	64	34	74	11
Usually	28	25	17	31
Sometimes	7	22	6	45
Never	1	19	3	13
Base (count)				
Unweighted	2905	2900	2877	2901
Weighted	2905	2900	2873	2902

Table 12: Climate change scepticism	
Over the past 100 years, climate change has been caused by…	
Frequency (%)	
Natural processes entirely	2
Natural processes mainly	5
Roughly equally natural processes and human activity	22
Human activity mainly	48
Human activity entirely	22
I don't think the climate is currently changing	3
Base	
Unweighted	2896
Weighted	2883

Table 13: Climate chance levels of concern	
How concerned, if at all, are you about climate change?	
Frequency (%)	
Extremely concerned	22
Very concerned	34
Somewhat concern	33
Not very concerned	8
Not at all concerned	3
Base	
Unweighted	2906
Weighted	2906

Table 14: Policy rationale awareness **To what extent, in your opinion, do each of the following sectors contribute to UK carbon emissions?**					
	Transport	**Heating and cooling**	**Non-heating energy use**	**Industry**	**Agriculture**
Frequency (%)					
Not at all - 0	0	1	2	1	2
1	0	0	1	0	2
2	1	3	4	1	5
3	1	4	6	1	8
4	2	6	9	2	9
5	8	21	25	8	22
6	7	15	16	7	12
7	12	19	14	14	12
8	26	18	14	27	15
9	18	5	3	14	4
A great extent - 10	25	8	6	25	9
Descriptive					
Mean (weighted)	7.98	6.38	5.77	7.87	5.86
Base (count)					
Unweighted	2880	2871	2855	2875	2870
Weighted	2875	2865	2841	2867	2858

Table 15: Attitude towards measures aimed at reducing carbon emissions **To what extent are you in favour or against, if at all, measures aimed at reducing carbon emissions?**				
	Using money from taxes on fossil fuels to subsidise renewable energy	**Phasing out the sale of petrol and diesel cars in favour of electric or hybrid ones**	**Phasing out the sale of gas boilers in favour of more environmentally-friendly heating systems**	**Phasing out the sale of gas cookers in favour of electric ones**
Frequency (%)				
Strongly in favour	41	29	30	19
Somewhat in favour	35	32	36	27
Neither in favour nor against	17	21	24	33
Somewhat against	5	13	6	14
Strongly against	3	6	3	7
Base (count)				
Unweighted	2900	2901	2897	2895
Weighted	2895	2898	2895	2889

Table 16: Tenure	
Respondents' type of tenure	
Frequency (%)	
Owner occupied	64
Private rented and other	18
Social rented	17
Base	
Unweighted	2906
Weighted	2905

Table 17: Type of household	
Respondents' type of household	
Frequency (%)	
Flat	18
House	72
Bungalow and other	10
Base	
Unweighted	2907
Weighted	2907

Table 18: Type of heating system	
Respondents' type of heating system	
Frequency (%)	
On-grid gas	87
Off-grid high carbon	4
Off-grid electric	6
Off-grid low carbon, communal/district or other	4
Base	
Unweighted	2898
Weighted	2894

Table 19: Respondents' involvement in paying the bills and taking decisions on the heating system	
Which of the following best describes your involvement in managing the energy bills and in taking decisions about your home heating system (e.g. when or how to replace the boiler)?	
Frequency (%)	
I am responsible for **paying** the energy bills **and** taking **decisions** about the heating system	66
I am responsible for **paying** the energy bills but **not** for taking **decisions** about the heating system	21
I am responsible for taking **decisions** about the heating system but **not** for **paying** the energy bills	3
I am **neither** responsible for paying the energy bills nor for taking decisions about the heating system	10
Base	
Unweighted	2903
Weighted	2900

Table 20: Current heating system evaluation			
Thinking about the heating system in your home, how much do you agree or disagree with the following statements?			
	The heating system meets my household's heating needs	**The running costs of the heating system are acceptable**	**My heating system is environmentally-friendly**
Frequency (%)			
Strongly agree	22	8	6
Agree	60	39	23
Neither agree nor disagree	10	24	46
Disagree	6	22	22
Strongly disagree	2	7	4
Base (count)			
Unweighted	2905	2904	2866
Weighted	2902	2897	2845

Table 21: Knowledge level of heating technologies				
	Biomass boilers	**Hydrogen boilers**	**Air source heat pumps**	**Ground source heat pumps**
Which of the following heating technologies have you heard of?				
Frequency (%)				
No	49	88	75	61
Yes	51	12	25	39
Base (count)				
Unweighted	2906	2906	2906	2906
Weighted	2906	2906	2906	2906
And how much, if anything, do you know about… ?				
Frequency (%)				
Know a lot	11	4	13	10
Know a little	54	33	43	48
Have heard of it, but do not really know what it is	35	63	44	42
Base (count)*				
Unweighted	1705	310	919	1336
Weighted	1479	363	724	1128
*Question asked only to those respondents who said that they have heard of these technologies.				

Table 22: Awareness of targets and ambitions		
How much, if anything, do you know about the following?		
	Awareness of the UK having legally binding targets to substantially reduce carbon emissions by 2050	**Awareness of the Government's ambition to eliminate nearly all emissions from heating buildings as part of meeting overall carbon emissions targets by 2050**
Frequency (%)		
Know a lot	4	3
Know a little	33	21
Have heard of it, but do not know details about it	44	39
Never heard of it	18	37
Base (count)		
Unweighted	2906	2904
Weighted	2906	2906

Table 23: Importance of targets **How important, if at all, is it that the UK… ?**		
	Achieves a substantial reduction in carbon emissions by 2050	**Makes a full transition away from heating systems which use fossil fuels towards greener and more environmentally-friendly technologies by 2050**
Frequency (%)		
Very important	55	48
Quite important	37	42
Not very important	6	8
Not at all important	1	2
Base (count)		
Unweighted	2901	2896
Weighted	2900	2886

Table 24: Acceptability for those with high-carbon heating systems **If you were considering replacing your current heating system with a greener and more environmentally-friendly one, to what extent, if at all, would you agree or disagree with the following?**					
	I can obtain reliable advice or guidance about greener and more energy-efficient heating options	**I will get a high quality installation**	**The up-front costs of appliances and the installation will be affordable**	**The bills and maintenance of the heating system will be affordable**	**It would meet my heating needs**
Frequency (%)					
Strongly agree	19	19	17	20	26
Agree	37	37	20	33	35
Neither agree nor disagree	32	37	28	37	33
Disagree	10	5	21	7	5
Strongly disagree	2	2	13	2	2
Base (count)					
Unweighted	228	227	228	228	227
Weighted	102	102	102	102	102

Table 25: Trusted source of information

Which of the following would you most trust to provide information, advice or recommendations about installing a greener and more energy-efficient heating system in your home?

Frequency (%) of yes*	
National government	32
A government-backed advice service	42
Local council	24
A non-government organisation	54
An energy supplier	16
A tradesperson or professional	31
Friends and family	19
None	4
Base	
Unweighted	2906
Weighted	2905

*When answering this question, the respondents could select more than one option and the total of the frequency is above 100%. Each figure in each line reports on the number of respondents who selected that option.

Appendix D – Multi-level regression model outputs

Table 26: Output of the multi-level regression model "Main model"			
Variable	**Predictor**	**B**	**Std. error**
	(Constant)	3.679***	0.292
Vignette attributes	National plan	0.185***	0.032
	Local plan (1)	-	-
	Household choice	0.070**	0.032
	No household choice (1)	-	-
	Low-disruption plan	0.579***	0.032
	High-disruption plan (1)	-	-
Age band	Age Band over 70	-0.048	0.176
	Age Band 60-69	-0.217	0.174
	Age Band 50-59	-0.175	0.174
	Age Band 40-49	-0.073	0.176
	Age Band 30-39	-0.097	0.174
	Age Band 18-29 (1)	-	-
University education	Degree	0.051	0.091
	No degree (1)	-	-
Country	Residing in Scotland	0.244	0.155
	Residing in Wales	-0.07	0.192
	Residing in England (1)	-	-
Heating system	On-grid gas	0.333*	0.196
	Off-grid electric	0.351	0.253
	Off-grid high carbon	0.075	0.249
	Off-grid low carbon and other (1)	-	-
Tenure	Social renter	0.913***	0.137
	Private renter or other	0.393***	0.127
	Homeowner (1)	-	-
Income	£800 to £1250	-0.093	0.133
	£1250 to £2000	0.057	0.132
	More than £2000	0.093	0.13
	Below £800 (1)	-	-
Concern about climate change	Extremely concerned	2.222***	0.16
	Very concerned	1.664***	0.15
	Somewhat concerned	0.825***	0.151
	Not very or at all concerned (1)	-	-
		Variance	**St. dev.**
Random effects	Intercept by PanelID	3.494	1.869
	Residual	2.703	1.644
Observations	10,662		
Groups (PanelID)	2,745		
Dependent variable	Level of acceptability of the vignettes		
Notes	(1) Reference category *p<0.1 **p<0.05 ***p<0.01		

Table 27: Output of the multi-level regression model "Scenario elements"			
Variable	**Predictor**	**B**	**Std. error**
	(Constant)	5.468***	0.051
Vignette attributes	National plan	0.184***	0.032
	Local plan (1)	-	-
	Household choice	0.071**	0.032
	No household choice(1)	-	-
	Low-disruption plan	0.577***	0.032
	High-disruption plan (1)	-	-
		Variance	**St. dev.**
Random effects	Intercept by PanelID	4.031	2.008
	Residual	2.707	1.645
Observations	10,662		
Groups (PanelID)	2,745		
Dependent variable	Level of acceptability of the vignettes		
Notes	(1) Reference category *p<0.1 **p<0.05 ***p<0.01		

Table 28: Output of the multi-level regression model "Socio-demographics"			
Variable	**Predictor**	**B**	**Std. error**
	(Constant)	5.094***	0.274
Vignette attributes	National plan	0.184***	0.032
	Local plan (1)	-	-
	Household choice	0.071**	0.032
	No household choice(1)	-	-
	Low-disruption plan	0.578***	0.032
	High-disruption plan (1)	-	-
Age band	Age Band over 70	-0.159	0.185
	Age Band 60-69	-0.268	0.182
	Age Band 50-59	-0.232	0.182
	Age Band 40-49	-0.16	0.184
	Age Band 30-39	-0.151	0.183
	Age Band 18-29 (1)	-	-
University education	Degree	0.291***	0.094
	No degree (1)	-	-
Country	Residing in Scotland	0.121	0.162
	Residing in Wales	-0.111	0.201
	Residing in England (1)	-	-
Heating system	On-grid gas	0.238	0.204
	Off-grid electric	0.192	0.264
	Off-grid high carbon	-0.02	0.26
	Off-grid low carbon and other (1)	-	-
Tenure	Social renter	0.810***	0.143
	Private renter or other	0.386***	0.133
	Homeowner (1)	-	-
Income	£800 to £1250	-0.057	0.139
	£1250 to £2000	0.11	0.138
	More than £2000	0.117	0.136
	Below £800 (1)	-	-
		Variance	**St. dev.**
Random effects	Intercept by PanelID	3.926	1.981
	Residual	2.707	1.645
Observations	10,662		
Groups (PanelID)	2,745		
Dependent variable	Level of acceptability of the vignettes		
Notes	(1) Reference category *p<0.1 **p<0.05 ***p<0.01		

Table 29: Output of the multi-level regression model "Main model and policy support"			
Variable	**Predictor**	**B**	**Std. error**
	(Constant)	2.886***	0.288
Vignette attributes	National plan	0.184***	0.032
	Local plan (1)	-	-
	Household choice	0.070**	0.032
	No household choice(1)	-	-
	Low-disruption plan	0.578***	0.032
	High-disruption plan (1)	-	-
Age band	Age Band over 70	-0.118	0.168
	Age Band 60-69	-0.263	0.166
	Age Band 50-59	-0.267	0.166
	Age Band 40-49	-0.205	0.168
	Age Band 30-39	-0.161	0.166
	Age Band 18-29 (1)	-	-
University education	Degree	-0.018	0.088
	No degree (1)	-	-
Country	Residing in Scotland	0.259*	0.148
	Residing in Wales	-0.07	0.184
	Residing in England (1)	-	-
Heating system	On-grid gas	0.229	0.188
	Off-grid electric	0.182	0.243
	Off-grid high carbon	0.06	0.24
	Off-grid low carbon and other (1)	-	-
Tenure	Social renter	0.814***	0.131
	Private renter or other	0.314***	0.121
	Homeowner (1)	-	-
Income	£800 to £1250	-0.124	0.127
	£1250 to £2000	0.062	0.126
	More than £2000	0.086	0.124
	Below £800 (1)	-	-
Concern about climate change	Extremely concerned	0.836***	0.175
	Very concerned	0.487***	0.161
	Somewhat concerned	-0.001	0.156
	Not very or at all concerned (1)	-	-
Importance of the transition away from high-carbon heating	Very important	2.588***	0.163
	Quite important	1.774***	0.155
	Not important (1)	-	-
		Variance	**St. dev.**
Random effects	Intercept by PanelID	3.113	1.764
	Residual	2.699	1.643
Observations	10,662		
Groups (PanelID)	2,745		
Dependent variable	Level of acceptability of the vignettes		
Notes	(1) Reference category *p<0.1 **p<0.05 ***p<0.01		

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