

Communicating effectively on the heat transition

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Executive summary

This research aimed to identify appropriate trusted messengers, communication channels, engagement formats and points of intervention, for engaging with different groups across the Scottish public on delivering heat decarbonisation.

Findings from this research will be used to inform the development of the Scottish Governments' Heat in Buildings Public Engagement Strategy and associated communications activity.

Methods included a literature review, a survey and focus groups conducted between February and March 2023.

Main findings

Awareness, motivations and barriers

There is a general lack of awareness about the heat transition, low-carbon technology and zero direct emissions heating systems (ZDEHS). ZDEHS such as heat pumps are not front of mind when people decide to change their gas boiler.

Participants had some cynicism with regard to climate change action at a personal level, driven by the perception that the impact of actions at industry and government level will be far greater. In addition, some ZDEHS, especially air source heat pumps, were not expected by participants to be effective in cold temperatures.

Concerns about energy bills are a motivator for people to switch to a more energy efficient and cost-saving heating system. It is important to note here that the current energy crisis and accompanying high price of electricity means that having a ZDEHS will not necessarily reduce heating bills. Respondents perceived that an efficient heating system is one that has low running costs, rather than a system that uses energy efficiently. High energy prices in late 2022/early 2023 created the belief that ZDEHS are less efficient and more costly.

For most people, in deciding to install a heating system, the benefits of improving energy efficiency are more important than reducing harmful emissions. Upfront cost is the key barrier to adopting new energy efficiency and low-carbon heating measures at home. Subsidies and grants are motivating incentives. Seeing ZDEHS systems in use by others can also be a motivator to follow suit.

There are some trigger points, or key moments of change, that lower the barriers or hassle factor for adopting ZDEHS. These include moving home, renovating, or having to replace a boiler/heating system. Respondents reacted negatively to the idea of making zero direct emissions heating systems a legal requirement. A third of respondents would only consider installing ZDEHS if required by legislation.

Communicating the heat transition

Online channels are the most commonly used to search for information about ZDEHS. Word of mouth and social media channels are important message carriers.

Messaging needs to highlight the positive impact of the heat transition on society, especially in the context of perceived limited choice. Messaging should break target behaviours into smaller steps such as “find out more about the technology and funding available”, “make sure your home is as insulated as much as possible” and/or “make an appointment to have your home assessed for feasibility of installing ZDEHS”.

Respondents indicated that financial information would be most useful, alongside information about which ZDEHS would suit their home.

Messengers

All messengers and sources need to be credible and trusted. This includes being independent from commercial or government interests and thus fully impartial; and/or highly knowledgeable about ZDEHS, the technology and support available.

Relevant tradespeople, specialist energy advice providers and energy suppliers are seen to have a key role to play.

Online and offline social networks also play an important role in sharing information and influencing low-carbon home improvements, both positively and negatively. In contrast, negative experiences from others who have installed heat pumps can deter from transitioning.

The Scottish Government is expected to play a key role in direct communications, particularly around any new legislation, but at some stages of the heat transition journey other sources of information are likely to be more important, meaning the Government must function as a coordinator and facilitator to ensure consistent messaging. For those signalling stronger intent to install a ZDEHS in the next few years, the Scottish Government is a particularly trusted voice.

Conclusions

Developing communications and public engagement to facilitate the heat transition and move to ZDEHS is a complex and challenging task. It includes raising public awareness across:

- understanding and buy-in of the changes required
- improvement options and potential benefits
- the support and advisory services available to households to facilitate uptake.

The role of communications is limited as it can only be used to best present the available ZDEHS offer to homeowners. Our research shows that the current ZDEHS offer, particularly in relation to cost, is weak in comparison to a modern gas-fuelled heating system, which homeowners are familiar with and see as reliable, easy to use and efficient.

Recommendations

- 1. Make the case for change visible and attractive.** To convince consumers to install ZDEHS, understanding and familiarity with the technology must increase. This includes understanding the available options and suitability to consumers' homes, the financial support on offer, the impact on running costs, the installation process, maintenance and guarantees, and the environmental impact.
- 2. Highlight the positive impact the heat transition will have.** Focus on presenting the co-benefits of ZDEHS; look to reduce the deferral of action by breaking down the target behaviour into smaller steps and leverage key moments, when consumers need to replace their old system, renovate, or move house.
- 3. Empower and equip the various trusted messengers and sources to deliver the required messaging and information** in a consistent, relevant and accessible way to the different consumer groups and their needs.
- 4. Deliver effective and well-timed preparatory communications from the Government well in advance of any legislation being announced.**

Contents

Executive summary	1
Main findings	1
Awareness, motivations and barriers	1
Communicating the heat transition	2
Messengers	2
Conclusions	2
Recommendations	3
1 Introduction and approach	5
1.1 Introduction	5
1.2 Approach	5
2 Desk review	6
2.1 Attitudes and awareness	6
2.2 Barriers	8
2.3 Motivators	9
2.4 Messengers, channels and formats	11
2.5 Communication channels	13
2.6 Formats	13
2.7 Messaging requirements and narratives	15
3 The climate change and heat in buildings context	19
3.1 Levels of awareness and concern about the environment and government climate change targets	19
3.2 Awareness and understanding of heat transition and ZDEHS	22
3.3 Awareness and attitudes towards specific ZDEHS technology	24
4 Propensity to install ZDEHS	28
4.1 Likelihood of installing a ZDEHS in the next 5 years	28
4.2 Barriers against installing a ZDEHS	28
4.3 Motivating factors for installing a ZDEHS	31
4.4 Opportune trigger points/moments of change	32
4.5 Trusted messengers, sources of information and advice, and messages ...	33
5 Conclusions and recommendations	40
5.1 Conclusions	40
5.2 Recommendations	44
6 References	50
7 Appendices	53
7.1 Appendix A – Methodology	53
7.2 Appendix B – Quantitative online survey	58

1 Introduction and approach

1.1 Introduction

The Scottish Government's Heat in Buildings Strategy aims to transform Scotland's buildings and systems that supply their heat, ensuring a transition to net zero emissions and addressing fuel poverty commitments. Scotland has a target to achieve net zero greenhouse gases by 2045. This aim directly affects the heating in homes and buildings with a specific interim commitment to decarbonise the heating of at least 1 million homes by 2030.

To facilitate this the Scottish Government plans to invest at least £1.8 billion of funding in heat and energy efficiency to help secure the accelerated rollout of both energy efficiency and zero emissions heat measures. A significant proportion of this will be targeted at supporting those least able to pay for the transition, including those in fuel poverty.

Public engagement has a key role to play in the successful transition to zero emissions heat by raising public awareness, understanding and buy-in of the changes required. This includes raising awareness of the available improvement options and potential benefits, and the support and advisory services available to households to facilitate uptake. To this end, work is underway to develop the Heat in Buildings Public Engagement Strategy due to be published in Summer 2023.

ClimateXChange, on behalf of the Scottish Government, commissioned research to identify appropriate 'trusted messengers', along with associated communication channels, engagement formats, and points of intervention, for engaging with different groups across the Scottish public on the issue and delivery of heat decarbonisation.

Findings from this research will be used to inform and contribute to the development of the Scottish Governments' Heat in Buildings Public Engagement Strategy and associated communications activity.

1.2 Approach

ClimateXChange commissioned JRS to undertake this research. The work was split into three sequential phases:

1. A rapid review of existing literature/evidence to identify potential trusted messengers, effective communications channels, formats, and points of intervention for engaging with people about heat decarbonisation/transition.
2. A quantitative online survey with a large representative sample of the Scottish public (adults age 16+), including priority groups, to explore relevant messengers, channels, formats, points of intervention plus identify levels of awareness and understanding of the changes required, options and support available. There were 1,621 base respondents. Weighting was applied on age, gender, and socio-economic group.
3. Qualitative research with a cross-section of the Scottish public and priority audiences to get more in-depth insight. This involved 8 online focus groups with 36 participants.

For full details of the methodology please see Appendix A.

This report sets out the findings from this research which was conducted between February and March 2023. The desk research findings are presented first followed by the quantitative and qualitative findings combined around the core objectives associated themes.

In reading this report it is important to note the following terminology:

Low carbon simply means less carbon dioxide (CO₂) than traditional heating systems. Carbon dioxide is a key greenhouse gas that drives global climate change. It is released through lots of different types of activities including the burning fossil fuels in heating systems.

A zero direct emission heating system (ZDEHS) is one which produces zero direct greenhouse gas emissions (at the point of use) under normal operating conditions. Examples of technologies included in this scope are direct electric systems, air source heat pumps, ground source heat pumps, water source heat pumps, and district heat networks. Currently, district heat networks that provide heat from gas and other fossil fuels are understood to meet the zero direct emission heating classification, as they do not emit greenhouse gases at point of use, and the emissions from the heat source for a

2 Desk review

This section sets out the findings from the desk-based review of existing and emerging evidence relating to the heat transition to identify:

- Attitudes towards, and awareness of, heat decarbonisation and zero emissions heating systems, including barriers and motivators to installing low carbon¹ heating systems
- Who trusted messengers are for homeowners (and different groups) around heat transition related topics
- Effective communication channels and formats of engagement
- Appropriate timings/points of intervention for raising awareness of the need for heat transition
- Effective messaging requirements and narratives, along with insight from previous campaigns around heat transition.

The resources were drawn from current and recent (mostly from 2019 onwards) Scottish and UK Government documents and publications, communications from third sector organisations, and communications from industry experts and academia.

2.1 Attitudes and awareness

This section outlines levels of public awareness about heat decarbonisation and the associated technology.

¹ Note that the desk review included material relating to both low carbon and zero direct emission heating systems to get a broader view of attitudes towards and awareness of alternatives to fossil-fuelled heating systems. The primary research focussed specifically on collecting insight around zero direct emission heating systems.

2.1.1. Lack of awareness about heat transition and low-carbon technology

Overall, concern about climate change amongst the general population in the UK is high but awareness about the changes homeowners need to make to combat climate change is low (Lancaster University/Climate Citizens, 2022). Though 84% of people in the UK agree that everyone will need to adopt energy-efficient and green heating measures sooner or later (Chapman, O., Kapetaniou, C. and Gabriel, M., 2021), there is a general lack of awareness about what ‘heat transition’ actually means.

2.1.2. Low level of awareness about why change is needed

This lack of awareness could be because people do not recognise the link between home heating and carbon emissions (LGA & The Behaviouralist, 2022). Research conducted by the UK Government found that people in the UK tend to consistently underestimate the contribution that heat in buildings makes to UK carbon emissions (LGA & The Behaviouralist, 2022; Help For Households, 2023). Awareness of the need to change heating systems in homes is higher in those living in owner-occupied homes and those aged 55+ (Department for BEIS, 2022).

2.1.3. Awareness of heat pumps is higher than awareness of other low-carbon heating systems

In a survey conducted by the UK Government (Department for BEIS, 2022), 87% of respondents had heard of low-carbon heating systems, and there was a notably higher awareness of air source and ground source heat pumps, and biomass boilers in comparison to hydrogen or hydrogen-ready boilers, heat networks and hybrid heat pumps. Furthermore, a ClimateXChange report found that in Scotland, there is a higher awareness of biomass boilers and ground source heat pumps compared to the rest of the UK (Caiger-Smith, D. and Amal, A., 2020). This, however, does not translate into more people having or installing these systems in their homes (Caiger-Smith, D. and Amal, A., 2020). In Scotland, awareness of heat pumps is higher among men, higher socioeconomic groups, and older people (Energy Saving Trust & Home Energy Scotland, 2021). Additionally, those aged 18-24 years are more likely than average to consider installing a heat pump, and those aged 55-64 years are less likely to consider installing a heat pump (Energy Saving Trust & Home Energy Scotland, 2021).

2.1.4. Awareness of low-carbon heating correlates with knowledge of net zero

In general, it was found that awareness and knowledge of low carbon heating systems was higher for those who had a better knowledge of the concept of Net Zero. An example provided stated that 75% of those who were aware of Net Zero were also aware of air-source heat pumps, compared with only 34% of those who had never heard of Net Zero (Department for BEIS, 2022). Additionally, findings from the UK Government’s Department for Business, Energy and Industrial Strategy demonstrate that though some people within the UK are aware that the Net Zero strategy exists, they are not aware of what actions the public are asked to take to meet the Net Zero target (Fimatix, 2022). Plus, for some, there is a sense that it is the Government’s responsibility more than the consumer’s to reach the Net Zero target (ARUP & Imperial College London, 2022).

2.1.5. Perceived lack of information about low-carbon heating

Due to a general lack of awareness of heat transition and zero emissions heating systems, technologies like heat pumps are not front of mind when people decide to change their gas boiler (Sustainable Energy Authority of Ireland, 2020). In turn, consumers feel there is a lack of high-quality information when it comes to low-carbon heating installation (UK power networks innovation, 2022) and so people feel they do not have enough knowledge about these technologies to make a decision about installing them (Department for BEIS, 2022). Additionally, along with a general lack of awareness, many lack knowledge about grants and schemes available to help with the cost of installing low-carbon systems.

2.2 Barriers

From the review of the literature, it is evident that many believe the end result of adopting more energy efficiency and low and zero carbon heating measures is a desirable one. However, the hurdles to getting there - from the initial costs to the process of researching and installation - often stand in the way of people actually adopting these measures.

2.2.1. Cost

Generally, it was found that many are worried about the upfront costs of making changes to their homes, while others believe that the running costs of an electric heating system will be too great (Department for BEIS, 2022; Chapman, O., Kapetaniou, C. and Gabriel, M., 2021). In a survey conducted by Nesta (2021), 52% are worried about the upfront costs and just under half of respondents (45%) said that upfront costs are more important than the running costs when considering making changes to their home (Chapman, O., Kapetaniou, C. and Gabriel, M., 2021). It is worth noting that this view may have changed since the recent energy crisis which has driven an increase in electricity prices.

2.2.2. The hassle/disruption of building work

If people are thinking about upgrading their property, they expect it to be time-consuming and disruptive, as such the 'hassle-factor' and inconvenience play a significant role in the low uptake of low-carbon heating technologies (LGA & The Behaviouralist, 2022; Colley, K. and Craig, T. P., 2014).

2.2.3. The decision-making effort

The effort required to research energy efficiency and green heating measures can put people off seriously thinking about upgrading their heating system (Chapman, O., Kapetaniou, C. and Gabriel, M., 2021). Additionally, a large proportion of people don't know where to start looking into energy efficiency measures and 34% of people surveyed strongly agreed that it would take a lot of effort to research and manage the installation of new energy efficiency measures (Chapman, O., Kapetaniou, C. and Gabriel, M., 2021). As such, this can be an obstacle to making decisions about installing new heating systems (Chapman, O., Kapetaniou, C. and Gabriel, M., 2021).

2.2.4. Lack of knowledge about suitability of systems

For some, there is a perception that it may not be possible to install low-carbon heating systems (e.g. heat pumps) in their home. Research by the Department of BEIS (2022) found this is a particular obstacle for those living in flats, 59% of whom indicated this compared to

31% overall². People in Scotland are significantly more likely to live in flats compared to the rest of the UK (Caiger-Smith, D. and Amal, A., 2020). In addition, a common reason cited for not installing a low-carbon heating system is a lack of space for a heat pump/water tank (Caiger-Smith, D. and Amal, A., 2020).

2.2.5. Unfamiliarity of new technologies

The perceived benefits of gas heating, such as reliability, convenience, and ease of use are a deterrent for switching to low-carbon heating (Chapman, O., Kapetaniou, C. and Gabriel, M., 2021). Those without low-carbon heating systems are generally concerned about the cost and performance of these unfamiliar technologies and would prefer to opt for the familiarity and convenience of a gas boiler (Caiger-Smith, D. and Amal, A., 2020).

2.2.6. Noise and looks of heat pumps

A common concern with heat pumps is the noise interference within the home, and whether the wider community could be affected by noise pollution (Beaglehole, J. and Patel, R., 2016). It is a widespread perception that heat pumps are noisy and due to their size, also not very attractive to look at (The Behavioural Insights Team, 2023; Caiger-Smith, D. and Amal, A., 2020).

2.2.7. Scepticism about how developed the technology is and its longevity

The importance of longevity and whether new heating systems will be 'fit for the future' and able to keep up and adapt to new technologies is a concern for some (Beaglehole, J. and Patel, R., 2016). As such, there is a preference to wait and see how the tech develops in time (Beaglehole, J. and Patel, R., 2016). Additionally, there is scepticism about the supply chain being sufficiently advanced to enable installation, maintenance, and general support to consumers (ARUP & Imperial College London, 2022).

2.2.8. Lack of trust in reliability and independence of advice and providers

A consumer survey in Scotland conducted by the Energy Saving Trust suggests that the majority of Scots (65%) do not fully trust the UK Government, Scottish Government or local councils to give impartial advice, often believing that these institutions have hidden or mixed motives (Colley, K. & Craig, T. P., 2014). Over 65% of respondents either did not trust local councils and the Scottish Government or found them to only be partly trustworthy due to mixed or hidden motives and approximately 80% only partly trusted or did not trust the UK Government due to mixed or hidden motives (The Energy Saving Trust, 2010).

Furthermore, the same research found that energy suppliers are amongst the least trusted by the Scottish public, with less than 10% of Scottish households saying they trust energy suppliers.

2.3 Motivators

2.3.1. A desire to be energy efficient and protect the environment

² This was backed up in the primary research discussions where there was the

Research has shown that many of those who have installed low-carbon heating already have been motivated by environmental benefits in an attempt to make their home more environmentally friendly, but also by the desire to improve their homes (e.g. by increasing its value) (Energy Saving Trust, 2022; ARUP & Imperial College London, 2022). Nesta (2021), found that ‘I want to make my home as energy efficient as possible’ was the largest driver of likelihood to adopt energy efficiency measures (Chapman, O., Kapetaniou, C. and Gabriel, M., 2021). As such, the top motivators to install energy efficiency and green heating measures are related to a desire to be more energy efficient and the environment (Chapman, O., Kapetaniou, C. and Gabriel, M., 2021).

2.3.2. Saving money³

Concerns about energy bills rising are a motivator for people to switch to a more energy efficient and cost-saving heating system (LGA & The Behaviouralist, 2022). Marketing efforts should focus on emphasising the economic savings, comfort benefits and environmental benefits of heat pumps, in that order (Sustainable Energy Authority of Ireland, 2020).

2.3.3. Financial incentives

It was very apparent within much of the literature that money and cost are the main barriers for consumers to install low-carbon heating systems (Chapman, O., Kapetaniou, C. and Gabriel, M., 2021; Beaglehole, J. and Patel, R., 2016; Colley, K. & Craig, T. P., 2014). Furthermore, upfront costs appear to be considered more important than running costs for the many homeowners (Sustainable Energy Authority of Ireland, 2020). A consumer survey conducted by Nesta (2021) found that 45% of consumers surveyed believe upfront costs to be more important than running costs when they are considering making changes to their home (Chapman, O., Kapetaniou, C. and Gabriel, M., 2021) As such, the most motivating incentives for people to switch to green energy is receiving subsidies and grants (Chapman, O., Kapetaniou, C. and Gabriel, M., 2021; Behavioural Insights Team, 2012).

2.3.4. Warmth and comfort

Studies have shown that, when choosing a heating system, many prioritise comfort, familiarity, and reliability (Sustainable Energy Authority of Ireland, 2020). Nesta’s (2021) consumer survey on attitudes towards energy efficiency and green heating measures found that having a warm home was ranked fifth as the most motivating incentive for the adoption of energy efficiency measures, ranked closely behind receiving grants and paybacks from energy companies (Chapman, O., Kapetaniou, C. and Gabriel, M., 2021). Most consumers focus on the outcomes of a system rather than the system itself, i.e., a warm and comfortable home heated by a system that is easy to run and use (ARUP & Imperial College London, 2022).

2.3.5. Ease of use

³ Given the current energy crisis and accompanying high prices this concern is a significant issue. This is discussed in more detail in 3.3.2. Barriers against installing a ZDEHS and 4.1 Conclusions.

Ease of use is important, and consumers say they want the ability to control the temperature (Beaglehole, J. and Patel, R., 2016; Energy Saving Trust, 2022; Furtado, J., 2019).

2.3.6. Increase in the value of homes

Research conducted by Savills (2022) (the property firm) found that 59% said they would be willing to pay more for a home if at least 75% of its energy is powered by renewable sources. Further, analysis of average values of homes transacted between 2019 and 2021, shows that newer, cleaner types of energy systems have a higher price tag. The same research found that properties utilising community heating schemes demand the highest average prices, followed by homes supplied by heat pumps.

2.3.7. Seeing others adopting the technology

Evidence has shown that peer influence in local communities can encourage more homeowners to retrofit their homes (SEAI Behavioural Economics Unit, 2020). This peer effect has been shown in relation to the installation of solar panels – with greater and quicker adoption found in cases where solar panels are street facing and clearly visible to other homes on a street (Rode and Müller, 2019). This suggests that the visibility of heat pumps/zero direct emissions heating systems is therefore important in encouraging others to adopt similar measures. Furthermore, the uptake of unfamiliar technologies is usually relatively slow as they are perceived as complex. Carmichael (2019) suggests that peer effects and observing others using this technology or being able to test the technology before investing in it could improve public uncertainty and increase adoption (Carmichael, R., 2019). This allows for better visibility of the costs, benefits, and relative advantages for the consumers' own home.

2.4 Messengers, channels and formats

2.4.1. Messenger types

Focussing solely on the behaviours and actions of owner-occupiers, landlords, and tenants does not take into consideration the influence of other actors and their actions in the energy system. There are many potential messengers across the home energy/heating supply chain. These can be divided into broad groups⁴ (The Decarbonisation of homes in Wales Advisory Group and the UCL Centre for Behaviour Change, 2020):

1. Government: BEIS, Ministry of Housing, Communities & Local Government(MHCLG), local planning authorities, devolved administrations, Building Control, regulators
2. Infrastructure: energy supply companies, infrastructure companies (e.g. National Grid)
3. Non-Governmental Institutions: Insurance companies, valuation companies, certification bodies, professional bodies, warranty providers, finance companies, energy advisory services
4. Markets and User Practices: Owner-occupiers, house builders, social landlords, private landlords, residents

⁴ Note this list highlights the broad range of potential messengers that have a role to play – no preferences were stated

5. The 'Technical Regime': Equipment manufacturers, materials manufacturers
6. The 'Knowledge Regime': Universities, other research bodies, consultants, manufacturers, training Providers
7. The 'Production Regime': Contractors, installers, manufacturers, resellers

2.4.2. Social networks

Generally, it was found that word of mouth and social factors have a greater influence over heating system choices in Scotland compared to the rest of the UK (Caiger-Smith, D. and Amal, A., 2020). The Energy System Catapult consumer segmentation found that 44% of those surveyed in Scotland said they would prefer to get a heating system they knew others had, compared to 30% in the rest of the UK (Caiger-Smith, D. and Amal, A., 2020). The BEIS Public Attitudes Tracker found that about a quarter of those surveyed in Scotland say they would ask friends and family for advice on which kind of heating system to install (Department of BEIS, 2022). Within the UK more generally, it was found that about a third of those who had installed a new heating system had gotten related information from their family and friends (Caiger-Smith, D. and Amal, A., 2020). Additionally, further research conducted by the LGA Behavioural Insights Programme (2022) found that people are more likely to take energy-saving advice from their friends/family than from websites or government-led initiatives. In contrast, negative experiences from others who have installed heat pumps can deter others from transitioning (Sustainable Energy Authority of Ireland, 2020).

2.4.3. Trusted heating trade and installers

It was found that people generally tend to trust tradespeople, low-carbon heating specialists and heating manufacturers (Department for BEIS, 2022; Sustainable Energy Authority of Ireland, 2020). About a third of Scottish consumers say they would ask members of the heating trade (e.g., gas fitters or plumbers) for advice about heating systems (Caiger-Smith, D. and Amal, A., 2020). As such, installers play a large part in the householders' decision over what type of heating system to install. Householders are more likely to install a heating technology they are already familiar with or that is recommended to them by the installer (Sustainable Energy Authority of Ireland, 2020). A report published by ClimateXChange stated that about a fifth of those surveyed in Scotland say that they would 'probably just choose the heating system their plumber recommends' (Caiger-Smith, D. and Amal, A., 2020).

2.4.4. Professional/trade advice available

There are relatively few heat pump installers compared to boiler installers and so there may not be much awareness in the industry to advise customers on the technology (Sustainable Energy Authority of Ireland, 2020). This could also play a role in the lack of uptake of these technologies. Additionally, a number of studies suggest that heat pump installers often fail to provide sufficient training to householders on how to operate their heat pump system, this can make their experiences more negative if left to figure this out themselves (Sustainable Energy Authority of Ireland, 2020).

2.4.5. Non-government sources

Research by Addario et al. (2020) found that the most trusted sources of advice and guidance for the UK population were non-government organisations, followed by a government-backed advice service, and then the national government. People living in Scotland were substantially more likely to trust information from a non-government organisation than the rest of the UK population (69% compared to 52% in England and 45% in Wales) (Addario, G. et al., 2020). Similarly, other research has found that the majority of Scots do not fully trust the UK Government, the Scottish Government or local councils to give impartial advice, often believing that these institutions have hidden or mixed motives (Colley, K. & Craig, T. P., 2014). Independent/impartial sources of information such as Citizen's Advice, the Energy Saving Trust, charities, and local community-based groups were found to be trusted sources and positively received by consumers (Colley, K. & Craig, T. P., 2014; Ambrose, A. et al., 2019).

2.5 Communication channels

2.5.1. Word of mouth

As mentioned above, social networks are an important source of information when it comes to communicating about heating systems. Word of mouth from friends/family and/or heating experts has been found to be the most popular and trusted channel for communicating information about low-carbon heating and energy efficiency more generally (Caiger-Smith, D. and Amal, A., 2020; Colley, K. & Craig, T. P., 2014). Although the high level of consumer trust makes word of mouth a potentially valuable channel in motivating domestic heat transition, research findings also indicated that negative experiences with ZDEHS shared via word of mouth were likely to contribute to negative perceptions of these technologies.

2.5.2. Online channels

In general, the internet is a popular source of information for consumers on retrofitting the home (Sustainable Energy Authority of Ireland, 2020; Electrify Heat, 2022). As such, advice channels are largely online, with a noticeable decline in use of the telephone to provide advice and of face-to-face assistance. However, this can exclude consumers in vulnerable circumstances (Ambrose, A. et al., 2019). Research highlights that those looking for Net Zero-related information are using resources other than Gov.uk (Fimatix, 2022).

2.5.3. Multiple media sources

TV, social media, radio, and digital campaigns have all been used to advertise low-carbon heating. This can sometimes be from energy companies themselves who benefit from advertising their low-carbon heating products (Vaillant Group, 2020). Research suggests that promotion of low-carbon heating from the energy industry can bring valuable sector experience in advertising and promotion. However, due to perceptions that the energy industry bears significant responsibility for climate change, promotion of low carbon heating through commercial energy firms may be interpreted as placing too much responsibility on individual consumers to take action. (Motherway, B. et al., 2022).

2.6 Formats

2.6.1. In-person events

Home energy events have been trialled to leverage peer effects to increase the installation of energy efficiency measures in the home (Caiger-Smith, D. and Amal, A., 2020). Home energy events involve people from the local community inviting their neighbours, friends, and family to their homes to learn more about the importance of energy upgrades (SEAI Behavioural Economics Unit, 2020). An independent energy assessor provides energy efficiency information at the event and subsequently undertakes a free Building Energy Rating (BER) of all attendees' homes and advises them on how their homes could be made more energy efficient including what grant funding is available. The results from a pilot event in Ireland found that the programme was successful at generating awareness and engagement, but that these intentions did not translate into action after a three-month follow up period (SEAI Behavioural Economics Unit, 2020). Reflections from these events concluded that while effective at raising awareness, customer support and access to better financial support will need to be offered in conjunction with promotional events to increase the number of energy efficiency upgrades undertaken by homeowners. Another key recommendation was for the independent advisor to offer more detailed step-by-step guidance of the entire process (including choosing products, applying for grants, and installation).

2.6.2. Engaging with consumers as a community

When it comes to engaging with members of the public on energy efficiency and climate change, research suggests that it may be more beneficial to engage with individuals as members of a community as opposed to just consumers of energy (Behavioural Insights Team, 2012). Intervention results highlight that community aspects and the focus on helping others appeals to a large audience (LGA & The Behaviouralist, 2022). People are attracted to the idea that 'we are all in this together' to meet a common outcome or goal, and they want to be reassured that their actions are contributing to a larger picture (Fimatix, 2022). As such, there may be opportunities to motivate consumers using prosocial behaviour and the incentive of being part of a wider movement of change (Citizens Advice, 2020).

2.6.3. Highlighting behaviours of others

As mentioned above in relation to peer effects, modelling behaviours such as installing low-carbon heating systems can encourage others to do the same through social norms (The Decarbonisation of homes in Wales Advisory Group and the UCL Centre for Behaviour Change, 2020). As such, family and friends have been found to be significant influencers of heating home improvements and important messengers to consider.

2.6.4. Trigger points/key moments for change

Trigger points related to changing energy systems are "the times in the life where energy-saving measures can be fitted as part of an existing or planned home improvement project" (Colley, K. & Craig, T. P., 2014). Measures can be proposed based on each of the three stages in a homeowner's life cycle – buying and selling; renovating; living in a home (Lancaster University/Climate Citizens, 2022).

2.6.5. Boiler breakdowns

When it comes to replacing heating systems, there are a number of trigger points which could be harnessed to encourage consumers to replace their gas boilers with a low-carbon

heating system such as heat pump. Several research reports found that most people say they would only replace their heating system when their current one breaks down or is becoming difficult to maintain (Caiger-Smith, D. and Amal, A., 2020; Department for BEIS, 2022). A report from ClimateXChange (Caiger-Smith, D. and Amal, A., 2020) found that 65% of Scots would not replace their heating system unless it had broken down beyond repair.

2.6.6. Distress purchases

People who may be open to alternative heating systems are in the prime position for considering low-carbon heating. However, in the circumstance that a boiler has broken down, the need for a quick and trusted replacement – i.e. a ‘distress purchase’ - could mean people simply turn to familiar technologies, typically gas boilers (Department for BEIS, 2022 & Sustainable Energy Authority of Ireland, 2020). Returning to the ‘default’ position of having a gas boiler may be further reinforced if heating engineers/installers recommend like-for-like replacement, as mentioned above.

2.6.7. Moments of disruption

Much of the research conducted on timings of engagement for encouraging low carbon heating cite the ‘hassle-factor’ as being a major barrier for consumers when considering installing low-carbon heating systems in their home (Nesta, 2021; Behavioural Insights Team, 2012; Colley, K. & Craig, T. P., 2014). It has been found that when other disruptions and refurbishments are taking place, the hassle-factor of installing low carbon heating tends to be less salient (Behavioural Insights Team, 2012). As such, trigger points such as moving house or renovating have been highlighted within the literature as ideal opportunities to encourage heat transition (The Behavioural Insights Team, 2023).

2.7 Messaging requirements and narratives

Messaging needs to highlight the positive impact on society that heat transition will have, especially in the context of perceived limited choice. Research suggests that the general public will be more open to the idea of heat transition if they feel they have a degree of choice rather than being forced into changing (ARUP & Imperial College London, 2022). However, in order to make an informed choice, consumers need a lot of information, evidence and advice when it comes to zero direct emissions heating systems.

2.7.1. Co-benefits of low-carbon heating

Research shows that it is important that messages are framed in a way that tells a positive story about how low carbon lifestyles can have many and varied co-benefits (Policy Connect, 2019). For example, low-carbon heating systems and energy efficiency upgrades could improve health by providing a home with the right temperature and humidity to promote better health: this could be an important angle, given the large number of deaths directly linked to too-cold or too-hot homes in the UK and that two thirds of homes in the UK report issues with draughts, damp or mould (Policy Connect, 2019). Similarly, low carbon heating systems could promote healthier air in larger urban centres – a large proportion of reports highlighted the benefits of messaging that focused on cleaner air and the health benefits that accompanied this (Corner, A., Shaw, C. and Clarke, J., 2018; Shaw, C., Corner, A. and Clarke, J., 2019).

2.7.2. Target behaviours steps

Studies have found procrastination to be a barrier to sustainability-related behaviours. Even when people are willing to move to low-carbon behaviours and lifestyles and able to act, actions are commonly put off until another day (Carmichael, R., 2019). It is suggested that messaging should therefore reduce the deferral of action by breaking down the target behaviour into smaller steps, along with leveraging key trigger-points (more on this below).

The literature reviewed demonstrates key areas campaigns should focus on in order to communicate with the general public about low-carbon heating. These include:

- **The changes needed and why** – linked to evidence, policy and legislation (Lancaster University/Climate Citizens, 2022)
- **The technology and options available and associated benefits** – energy efficiency, security, reliability (ARUP & Imperial College London, 2022)
- **Which measures are right for them** – their home and budget (Chapman, O., Kapetaniou, C. and Gabriel, M., 2021)
- **The help/support available** – not least, financial support/incentives (Lancaster University/Climate Citizens, 2022)
- **How to find the right tradesperson** (Chapman, O., Kapetaniou, C. and Gabriel, M., 2021)

Other areas of concern requiring further information and reassurance include (Beaglehole, J. & Patel, R., 2016):

- **Hidden costs:** the cost of maintenance and repair, as well as incidental costs including the cost of underfloor heating, or installing new radiators.
- **Reliability:** the importance of easy access to maintenance services, back-up systems, and concerns about the interdependence of heating systems across a network.
- **Flexibility and ease of use:** whether the technologies meet the particular needs of certain households, provide sufficient levels of control and be easy to use.
- **Long-term financial and sustainability implications:** whether the technologies would still be cost-effective and/or energy efficient in the future
- **Household disruption:** linked to installing the new technologies and about the timescale for installation.
- **Noise pollution:** noise interference within the home and whether the wider community could be affected through noise pollution.
- **Impact on the neighbourhood:** if planning permission is necessary, or whether the roads may need to be dug up for installation.
- **Suitability of the home:** is the technology suited to the home, including whether it could be made available in specific locations and whether retrofit was realistic or feasible.

To persuade the general public on zero direct emissions heating systems, common misconceptions and concerns, relating to the points above, should be addressed. Key messaging territories for persuasion are:

- Comfort, safety, and reliability that low-carbon heating systems can offer (Sustainable Energy Authority of Ireland, 2020)
- Energy efficiency and the positive impact on the environment (Energy Saving Trust, 2022)
- Energy security and reliability that comes with not being dependent on rising gas prices and imports from other countries (Nesta & The Behavioural Insights Team, 2022)
- Benefits to health of non-polluting low-carbon technology (Furtado, J., 2019)
- Improvement to property values and home marketability due to zero direct emissions heating system (Savills, 2022)
- Benefits to society as a whole, such as supporting economic growth and creating green jobs, combating climate change, boosting Scotland's green innovation status (Electrify Heat, 2022)

2.7.3. Existing campaign messaging

Saving money is the most important message to the greatest number of people – this can be framed positively or negatively, i.e., saving or losing money. Campaigns typically focus the narrative around three approaches (Motherway, B. et al., 2022):

1. Saving money
2. The environmental approach
3. The social approach – messages relating to being a good citizen, appealing to social norms or the general good

Some examples of messaging in current heat transition and sustainable heating solution campaigns are:

- 'Keep the bills low and the climate cool' (CAN Europe, 2022)
- 'Warm homes 4 all' (CAN Europe, 2022)
- 'Heat homes not the planet' (CAN Europe, 2022)
- 'There has never been a better – nor more urgent – time for property owners to change to energy efficient heating systems. Energy efficient systems benefit the homes, the climate, and family' (Vaillant Group, 2020)
- 'Why Wait' (Vaillant Group, 2020)

Nesta and the Behavioural Insights Team (2022) also created and tested five different messaging territories with the British population in an online experiment in order to establish the most effective messaging territories for increasing the demand for heat pumps.

- Heating upgrade (e.g. 'Have you thought about upgrading your heating? Upgrade your heating, get a heat pump!')
- Lower emissions (e.g. 'Have you thought about greener heating? Green your heating, get a heat pump!')
- Preparing for the gas boiler phase out (e.g. 'Are you ready for the gas boiler phase out? Get ready, get a heat pump!')
- Energy security (e.g. 'Help UK energy to be independent (not dependent on gas exports), get a heat pump!')

- Property value (e.g. 'Have you heard that new heating boosts your home's value?' Upgrade your home, get a heat pump!')

People thought that the 'Heating upgrade' message territory was the most appealing:

"We have an old house which was pretty cold, so I wasn't sure a heat pump would work for me but the new heat pump system has actually made our home **so much more comfortable**. The heating is on at a low level continuously, so (even though it's super-efficient) it's warm all the time now".

The other two most effective messages were 'Energy security':

"It's important we create our energy in the UK, so **we're not dependent on imports and gas prices set by volatile parts of the world**. For households, that means we must move away from gas boilers, so I chose an electric heat pump instead."

And 'Property value':

"We upgraded our property's heating system by getting a heat pump and **it has already increased the value of our home**. The market really rewards energy efficiency – for instance, I heard that sellers who upgrade their EPC to C, can get as much as an extra 16%. Don't miss out on extra cash from your house sale!"

The results of the experiment showed that the message related to 'Heating that works', 'Energy security', and 'Property value' increased intention to buy a heat pump in the next five years.

These messages respond to current concerns within society related to energy efficiency, rising costs, and energy security:

- 'Heating that works' – addresses the misconception that heat pumps aren't as effective as gas boilers and emphasises the theme of warm and comfort which is a key factor when consumers consider their heating system.
- 'Energy security' – may appeal more to people who no longer want to rely on other countries for energy. This message encourages people to move away from relying on foreign trade to a UK-based system.
- 'Property value' – taps into the concerns over rising prices and more specifically, rising house prices. Financial gains are a major incentive and this message emphasises the long-term monetary benefits of installing a heat pump at a time when people are generally more concerned about their finances.

3 The climate change and heat in buildings context

This and the following sections combine and present the findings and feedback of both the quantitative survey with the qualitative focus group discussions into key themes.

3.1 Levels of awareness and concern about the environment and government climate change targets

3.1.1. Widespread levels of awareness and concern

The survey results showed that three-quarters of respondents are concerned about climate change, with a quarter saying they are very concerned. Knowledge of the Scottish Government's net zero by 2045 target is reasonably widespread with almost two-thirds aware.

Awareness of the net zero target was more prevalent among those with higher levels of concern about climate change, among respondents aged 55+, and among those who reported higher levels of knowledge around heat transition and ZDEHS. Respondents who reported the highest level of concern also tended to report higher levels of knowledge around heat transition and ZDEHS.

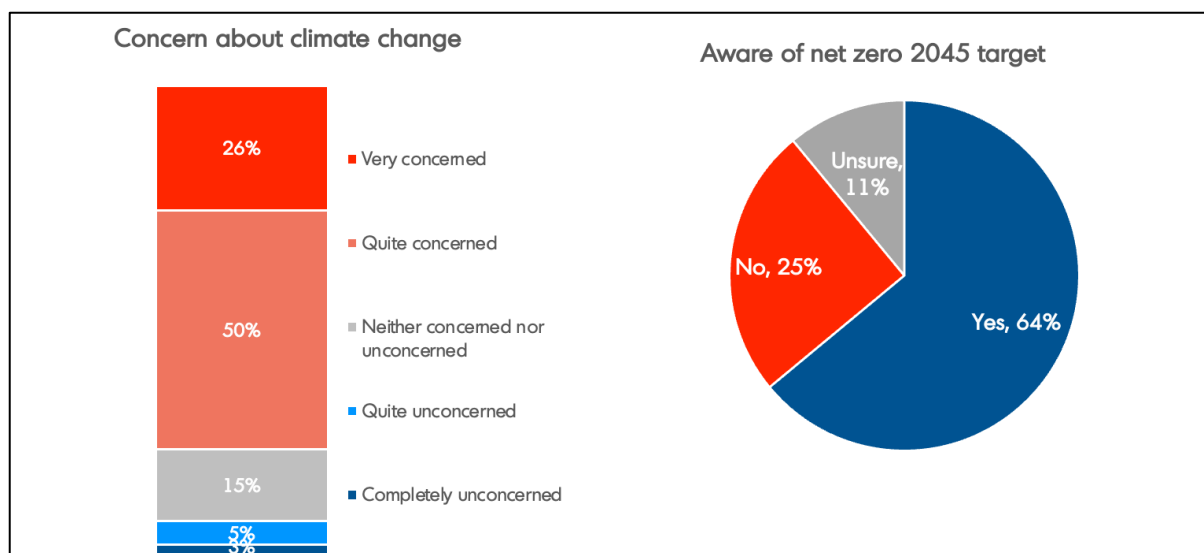


Figure 1: Survey responses to the following questions:

Q7 Overall, how concerned are you about climate change? Base: All 1621

Q10 Are you aware that the Scottish Government has set a target of achieving net zero emissions by 2045? Base: All 1621

For most respondents in the focus group discussions, although climate change itself was a worry, it is not currently their primary concern. They were aware of the climate change in general terms and considered it to be a genuine issue, but the current cost of living situation meant that personal financial security was prioritised over climate change goals (e.g. net zero).

3.1.2. Positive attitude

Focus group respondents were generally aware that net zero was the target which had been set, and although fewer were clear on the exact timescale, there was awareness that the

target year was in the near future. This target was perceived by most respondents to be ambitious, but very much necessary. Some were particularly positive about how this ambition cast Scotland as a leader on the global stage. Less positive views tended to centre on the idea that the reality of reaching such a target would involve a significant investment of time and money at both national and individual levels.

One participant said: “I just think that's quite ambitious of the Government. That's a very ambitious thing to say. I know they've been talking about these alternatives like use of hydrogen and heat pumps, but to actually roll some of these things would be very, very expensive.” (M, 46-55, pre 1919 house, Rural Aberdeenshire)

3.1.3. Behaviour change

Most respondents within the qualitative research spontaneously reported behaviours such as recycling or turning off lights/appliances, with only a smaller number talking about changes to existing habits, such as reducing private car use or cutting down on meat consumption.

Crucially, even among those who reported more significant changes to their behaviour, domestic heating systems were not front of mind in an environmental context. Where spontaneously mentioned, reducing energy consumption was perceived as a cost saving measure first and foremost, rather than being done to reduce climate impacts.

This level of action was reflected in the survey findings below.

3.1.4. Home fuel types and energy efficiency measures

Most survey respondents (77%) use mains gas to heat their homes, with 4 in 10 using electricity. Very few are currently using ZDEHS. In terms of energy efficiency measures, two thirds have double glazing, and over half have loft insulation and smart meters. Cavity wall and under floor insulation are less common.

Use of ZDEHS was more prevalent among respondents who were ‘managing very well’ financially and respondents living in homes built post-1982. Some specific energy efficiency measures were more prevalent among sub-groups:

- Respondents aged 55+, those living in detached houses and respondents who owned their homes outright were more likely to have double/triple/secondary glazing, loft, and/or cavity wall insulation.
- Respondents aged 25-34 and respondents in the AB socio-economic groups⁵ were more likely to have a smart heating control system installed in their home.
- Those ‘managing very well’ financially, those in the AB socio-economic groups and those living in new detached housing were more likely to have under floor insulation.

⁵ Socioeconomic factors generally include occupation, income/wealth, education, and location. This National Readership Survey (NRS) social grade socioeconomic classification is based on occupation marked in letters: A = upper class, B = upper middle class, C = middle class, D = lower middle class, E = lower class.

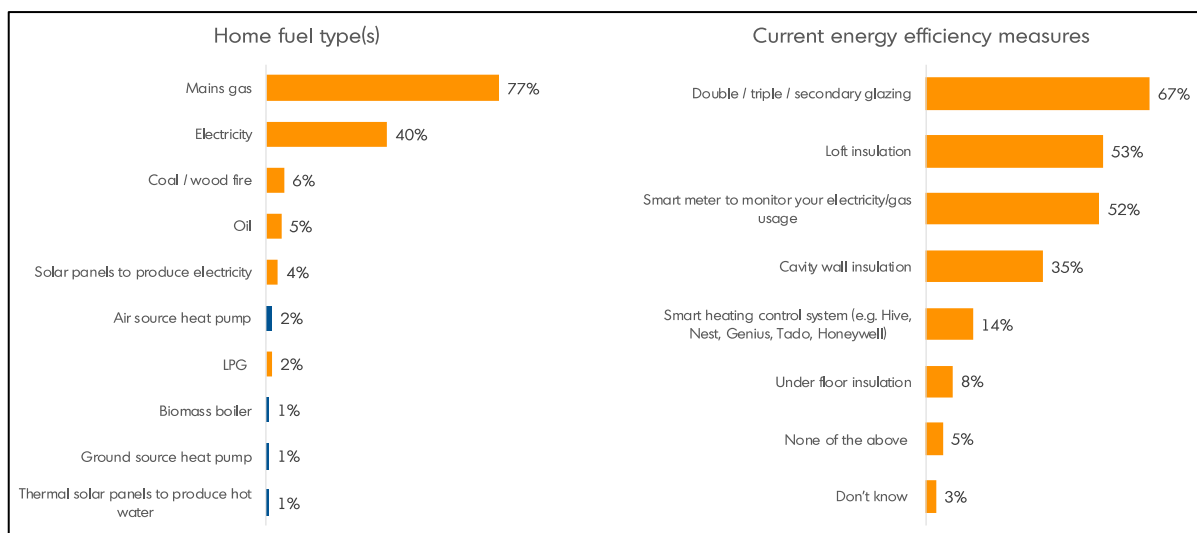


Figure 2: Survey answers to the following questions:

Q8 How do you currently heat your home? Base: All 1621

Q9 Does your home have any of the following? Base: All 1621

3.1.5. Cynicism about individual action

The focus group respondents often made spontaneous reference to their workplace's creation of waste or use of energy as a justification for their own energy use. At a larger scale, some participants also suggested that the emissions produced in large countries such as the USA or China would outweigh anything they could do as individual consumers. Some participants also made it clear that they perceived Net Zero and other related climate goals as a government responsibility rather than an individual one – often mentioning previous government communications around targets and measures.

These feelings, plus the very real need to keep their home warm while avoiding excessive cost, meant that the cost effectiveness of any new system was the key attribute to consider – not its environmental impact. Participants said:

“Just being very real here, there are other things to think about. Bills, children, fees, it's not high on my list of worries right now.” (F, 36-45, ABC1, Owner resident)

“For myself I don't give it a regular thought, the environmental impact of things. But I know it's quite a high priority topic for the Scottish Government and the UK Government, because it's talked about a lot, and I know we're working towards net zero.” (F, 36-45, ABC1, Owner resident)

“I don't know if it's a naive point of view but I also think to quite an extent, ‘What difference do I make?’. I work in healthcare labs and the sheer amount of plastic waste, it's buckets and buckets per hour. You just look at that and think, ‘If I have my boiler on for an extra day, it's not the problem.’” (M, 26-35, Owner resident)

3.1.2. Understanding of 'efficiency' in a home energy context

Respondents viewed an 'efficient' heating system as one which effectively created a warm home without high running costs.

In line with the cost-of-living crisis being the major front of mind concern among the focus group respondents, low running costs were the highest priority for heating systems, a

viewpoint driven by the recent increase in energy prices. This created the perception that an 'efficient' system would also make the most of the consumer's energy spend by generating enough heat to warm the entire home (wood burning stoves were particularly prized for this). The idea of lower emissions or reduced impact on the environment was not mentioned spontaneously as an attribute of an 'efficient system'. Most (61%) survey participants who said they were very or quite likely to install ZDEHS within 5 years cited energy efficiency as a key motivator.

3.1.6. Factors influencing the efficiency of heating systems

Often, older systems were perceived to be inefficient by default – either because of advances in technology, or because their efficiency would be expected to decrease over time. Those who had experience of purchasing a heating system tended to base perceptions of its efficiency on how recent the purchase was, and how expensive the system was. The consensus was that a high cost and a newer system would be of better quality, more efficient, and therefore more cost-effective.

Some respondents factored in the type and age of their building (e.g. older tenements with high ceilings being harder to keep warm, new builds potentially having better insulation). Some also included the effectiveness of insulation in this definition of efficiency, again in the context of cost-effectiveness (e.g. how much this reduced bills) rather than considering environmental impacts.

3.1.7. Environmental impact

When considering the efficiency or effectiveness of heating systems environmental impacts (such as carbon dioxide emissions) was not as easily verifiable in comparison to financial cost or effective heating. Both of which were more measurable to the end user, either through a noticeably warmer home or a quantifiable reduction in their energy bills.

Although respondents weren't often strongly aware of alternatives, the impact of fossil fuels was widely understood. This led to the assumption that gas-fuelled systems were inherently less environmentally friendly – however, this view only became apparent when prompted.

3.2 Awareness and understanding of heat transition and ZDEHS

3.2.1. Awareness and attitudes towards the need for heat transition

Most people have some awareness of ZDEHS and the need for heat transition, but awareness of potential legislation around the issue is low.

Most survey participants (67%) know at least a little about the need to change our heating systems to meet net zero targets, although very few know a lot about this. Knowledge about ZDEH systems is at a similar level. However, most (7 in 10) do not know about the potential legislation compelling owners to install ZDEH.

There were some differences in levels of reported awareness of the need for heat transition, ZDEHS and potential legislation on heat transition between sub-groups:

- Awareness of the need for heat transition was highest among the AB socio-economic groups, among respondents aged 16-34, those most concerned about climate change, male respondents, and landlords.

- Awareness of the need for heat transition was lowest among the DE socio-economic groups, those renting from local authorities/housing associations, and those who were least concerned about climate change.
- Awareness of ZDEHS was highest among the AB socio-economic groups, respondents aged 16-24, those who knew most about heat transition, those with high levels of concern about climate change, landlords, and those living in newer detached or terraced housing.
- Awareness of ZDEHS was lowest among those least concerned about climate change, the DE socio-economic groups, those renting from local authorities/housing associations.
- Awareness of potential legislation around heat transition was highest among the AB socio-economic groups, those aged 16-24, those with high concern about climate change, and those who knew most about ZDEHS and the need for heat transition.

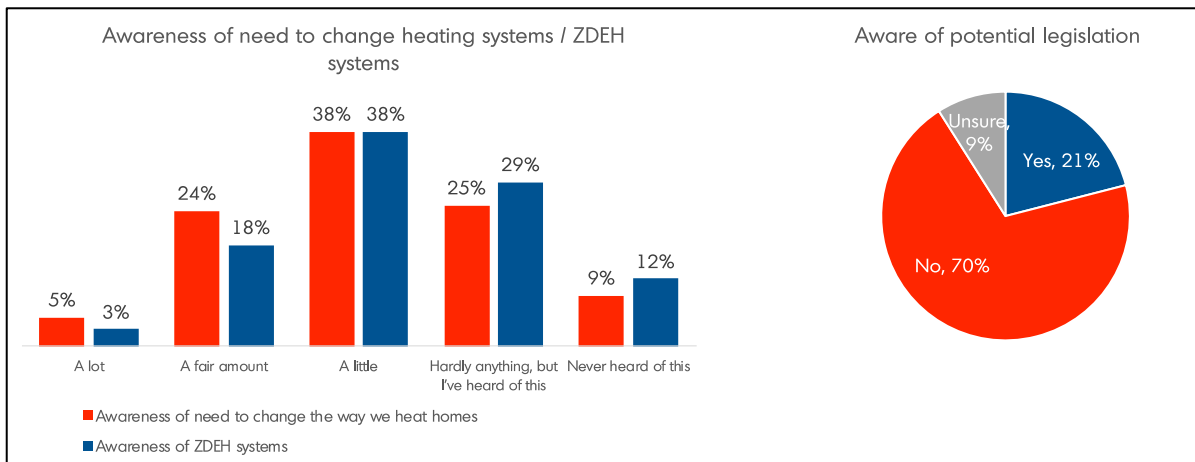


Figure 3: Surveys answers to the following questions:

Q11 In order to meet the net zero target, we will need to change the way we heat our homes and buildings by phasing out oil and gas heating systems like boilers. Before today, how much did you know about this? Base: All 1621

Q12 Zero direct emissions heating systems produce zero greenhouse gas emissions at the point of use (in your home). Examples include: solar thermal, heat pumps and heat networks. Before today, how much did you know about zero direct emissions heating systems? Base: All 1621

Q13 The Scottish Government is considering introducing regulations to make it a legal requirement for all property owners to install zero direct emissions heating systems. Were you aware of this? Base: All 1621

3.2.2. Need for domestic heat transition and potential impacts on individuals

Awareness of domestic heat transition overall was not high among focus group respondents, with some considering this possibility for the first time. On reflection, participants did tend to feel that a society-level transition away from fossil fuel systems was something they might have expected in the future. The potential pace of change being faster than anticipated was a key driver of concerns.

Respondents tended to perceive other actions, such as transportation, plastic or food waste, as being higher priority than home heating as an area of potential action, making ZDEHS feel like an unexpected additional concern. Linked to this, another source of concern or hesitation around transitioning to ZDEHS was the fact that many participants were not currently planning to change their existing heating system – meaning this would represent a significant investment which they had not planned for.

There was also some cynicism linked to the idea of individuals' impacts on the climate being less important than industry and larger organisations or nations. Participants who raised this issue often cited other initiatives which they saw as the government placing more responsibility on individuals (including low emission zones and taxes on disposable plastic).

3.2.3. Mandatory direct emissions heating systems

The generally low level of awareness and consideration among focus group participants around installing a ZDEHS meant this was a surprise. Some viewed this as further evidence that the government was focusing too much on the actions of individuals rather than larger organisations. There was some discussion among participants about whether this legislation would prove to be enforceable, with some citing the recent legal requirement to install heat, carbon monoxide and smoke detectors in homes as an example. Respondents who were already more committed to making larger changes to reduce their personal impacts on the climate tended to be more accepting of the proposed law change.

Above all else, the high installation cost of a new heating system meant that this felt like a major financial imposition on individual homeowners, which would be very difficult for most to comply with without some form of monetary support. Participants who had considered a ZDEHS often challenged the idea of a legal requirement due to their view that the systems they had researched seemed unworkable for their properties (for example, living in a listed building). The current high cost of living in the UK (largely driven by energy prices) provided an additional contextual factor which made a legal requirement to invest in a new heating system seem out of step with the reality of many participants. They said:

“The problem is that now is not the right time (for Government plans)...fuel poverty is real....I paid £800 for my last bill.” (F, C1, 45-55yo, Home Owner)

“If the government is so keen on pushing this on individuals, I'd like to see them starting with things like new school buildings, and making huge companies that make billions of pounds start to make changes.” (M, 36-45, ABC1, Owner resident)

“I know it's in the bid to save the environment, but if you look at it, there is a cost element involved, and that is going to fall on the homeowners. Even if the government is going to pay half of it, or whatever incentive they're going to do, the cost and requirement will still fall on the homeowners.” (F, 36-45, ABC1, Owner resident)

3.3 Awareness and attitudes towards specific ZDEHS technology

3.3.1. Specific ZDEHS and Scottish Government financial support

Almost 1 in 6 have not heard of any of the common ZDEHS. Amongst those who are aware, solar thermal panels and heat pumps (air and ground source) are the most widely

recognised. A fifth are aware of funding support provided by the Scottish Government for ZDEHS installation.

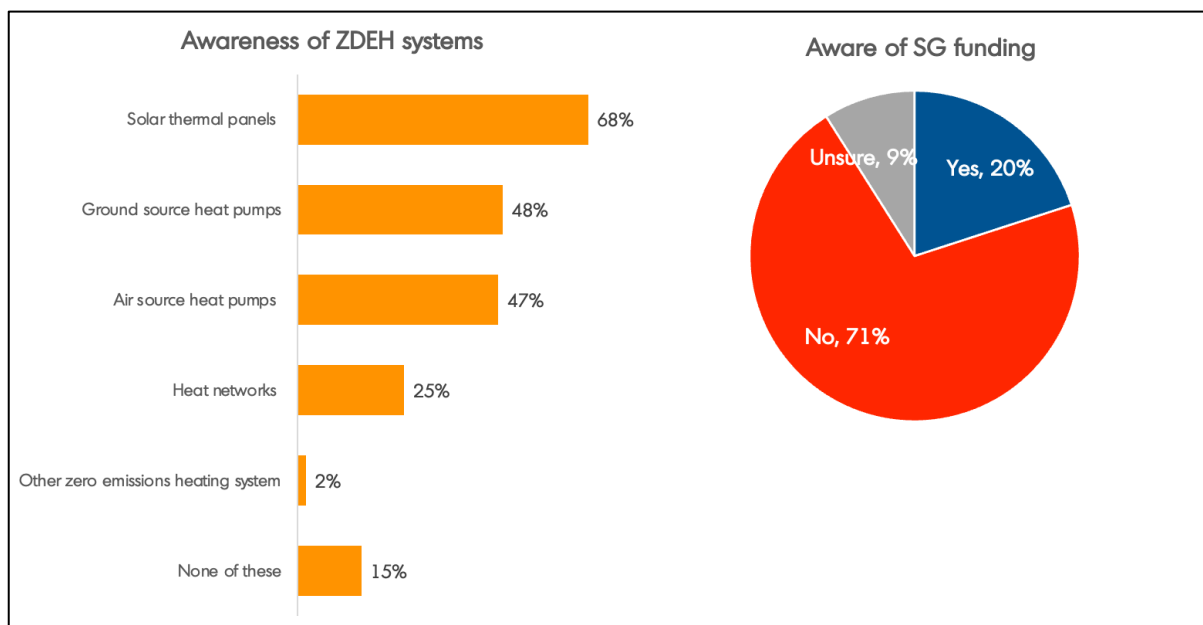


Figure 4: Survey answers to the following questions:

Q14 Before today, which if any of the following types of zero direct emissions heating systems had you heard of? Base: All 1621

Q15 Were you aware that the Scottish Government provides funding to support the installation of zero direct emissions heating systems in properties – owner occupiers may be eligible for a grant worth up to £7,500 (or up to £9,500 if living in a rural area), available through Home Energy Scotland? Base: All 1621

Some sub-groups of respondents had higher awareness of heat pumps and/or the available funding to support domestic heat transition:

- Awareness of both kinds of heat pump was highest among male respondents, those aged 45+, those in the AB socio-economic groups, those who owned their homes outright, those living in detached houses, those living in rural areas, and those with higher levels of concern about climate change.
- Awareness of Scottish Government funding was highest among those in the AB socio-economic groups, those aged 16-34, those living in rural areas, landlords, those living in detached homes, and respondents who knew more about ZDEHS and heat transition.

3.3.2. No real or meaningful awareness of ZDEHS

Overall awareness of ZDEHS across the sample was low. Some participants had a very general awareness of air and ground source heat pumps, but typically knew few details of how these systems functioned or what would be required to install and run them. Awareness of heat networks was non-existent among focus group participants.

Awareness of solar thermal technology was also low, and respondents typically were not aware of the difference between these and solar photovoltaic (PV) panels which generate

electricity. This finding contrasts with the quantitative survey, in which 68% of participants claimed awareness of solar thermal panels. The frequent confusion of PV vs thermal solar panels in the group discussions raises the possibility that quantitative survey respondents may also have been unaware of the difference.

Some focus group participants had questions about the basic function of ZDEHS, with the idea of an air source pump working in low winter temperatures seeming particularly counter-intuitive:

“So they work by drawing heat from the outside air. This is Scotland, there’s not that much heat in the outside air right now! How does that work?” (F, 56-64, C2DE, Long term renter)

3.3.3. Moderate level of understanding around ZDEHS

These respondents tended to have learned about zero direct emissions systems passively, either as frequent consumers of news media, by hearing from family and friends who had installed one of these systems, or by working in a field where zero direct emissions systems may be discussed (e.g. local authority procurement, housing).

3.3.4. In-depth understanding of ZDEHS

These were often respondents who were at or near a potential trigger point for considering a new heating system (e.g. moving house, planning to buy, older system in need of replacement). Demographically, these respondents tended to be higher socio-economic groups, with rural respondents also more highly represented due to the higher prevalence of ‘alternative’ heating systems (e.g. non-natural gas) and priority placed on energy security. Typically, these respondents explored zero direct emissions systems as one of several options alongside conventional fossil fuelled systems, rather than being committed to heat transition.

Often, those who had researched the possibility of installing a zero direct emissions system had developed a negative perception⁶:

- They were perceived as being more costly than fossil fuelled equivalents to buy, install, and potentially to run day-to-day
- They were seen as being less effective at heating homes in comparison to fossil fuelled equivalents
- Rural participants felt that a system dependent on mains electricity to operate could be vulnerable to power outages
- Zero direct emissions systems were also seen by some as less attractive due to the size of the external unit required for heat pump systems and a belief that they made more noise than fossil fuelled equivalents

Participants said:

“I looked at all of them [ZDEHS options as listed on the Showcard]....and for the heat network you need to be in the right area, for solar panels you need to have twin cylinders, for the ground pump you need to excavate your garden, and for the air pump you need to

⁶ This was not relating to any specific sources of information

be OK with the noise and it can't go into an old property like mine....so none of them were really options for me." (M, B SEG, 55-65yrs, Owner and Landlord)

"I think it's an amazing idea and I'd love to have that. But they're going to have to heavily subsidise people who own their own properties. I've looked up local authority support and I could get £5000 towards the cost, but that still leaves £3000 to pay. Like, who's got that money? I don't have enough to do that." (F, 36-45, ABC1, Owner resident)

"It's quite a big machine that sits at the back of your house and can be quite noisy. What I do know is they're very expensive to install, but they're maybe cheaper to run and definitely better for the environment." (F, 36-45, ABC1, Owner resident)

'Heat source pumps are expensive and quite noisy as well. I walk past one, it's on the outside wall, it's a pretty beast of a thing and noisy.' (M, 46-55, pre 1919 house, Rural Aberdeenshire)

4 Propensity to install ZDEHS

4.1 Likelihood of installing a ZDEHS in the next 5 years

The survey results indicate that 29% of people are likely; 37% not likely. When those who say it’s not their decision are removed, the number likely to install a ZDEHS rises to just over a third.

The degree of reported likelihood to install a ZDEHS within the next 5 years varied between certain sub-groups within the sample:

- 16–34-year-olds, those with high levels of concern about climate change, landlords, and those with higher levels of knowledge about ZDEHS tended to see themselves as more likely to install ZDEHS within 5 years.
- Those aged 55+, respondents who owned their homes outright, respondents living in older bungalows and respondents with the least concern about climate change saw themselves as less likely to install ZDEHS within 5 years.

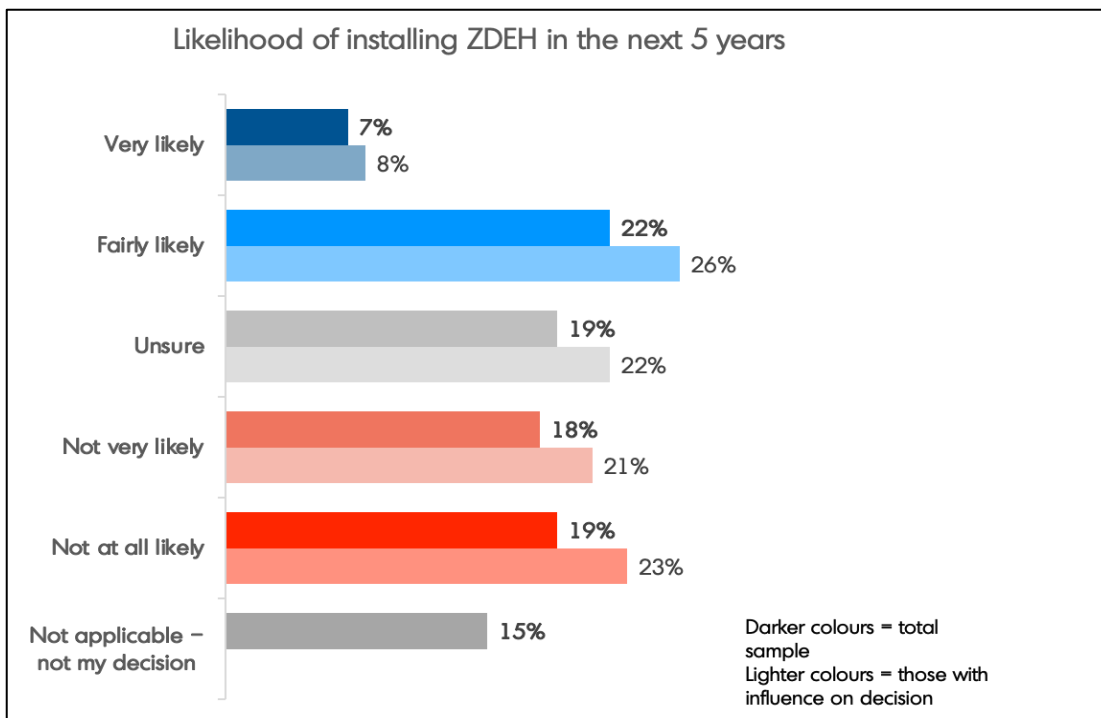


Figure 5: Survey answer to the question: Q21 Taking everything into consideration, how likely is it that you would install a zero direct emissions heating system in your home in the next 5 years? Base: All 1621

4.2 Barriers against installing a ZDEHS

4.2.1. Those unlikely to install ZDEHS in the next 5 years

The most frequently identified barrier among quantitative respondents was concerns about the potential cost of installation, highlighted by just over 6 in 10 respondents. The other frequently selected answers included being satisfied with their current heating system, concerns about running costs, and a preference to wait and see how home heating technology developed before committing to a new system. Some respondents also indicated that low awareness of financial support, disruption associated with installation of

ZDEHS, and uncertainty over whether ZDEHS was suitable for their home would also present potential barriers to uptake.

Key sub-group differences among those who were unlikely to install ZDEHS in the next 5 years were:

- Respondents living in both older and newer flats were more likely to cite uncertainty over whether ZDEHS would be possible to install in their homes.
- Those aged 55+ and those in the AB socio-economic groups were more likely to want to wait and see whether technology developed over time.

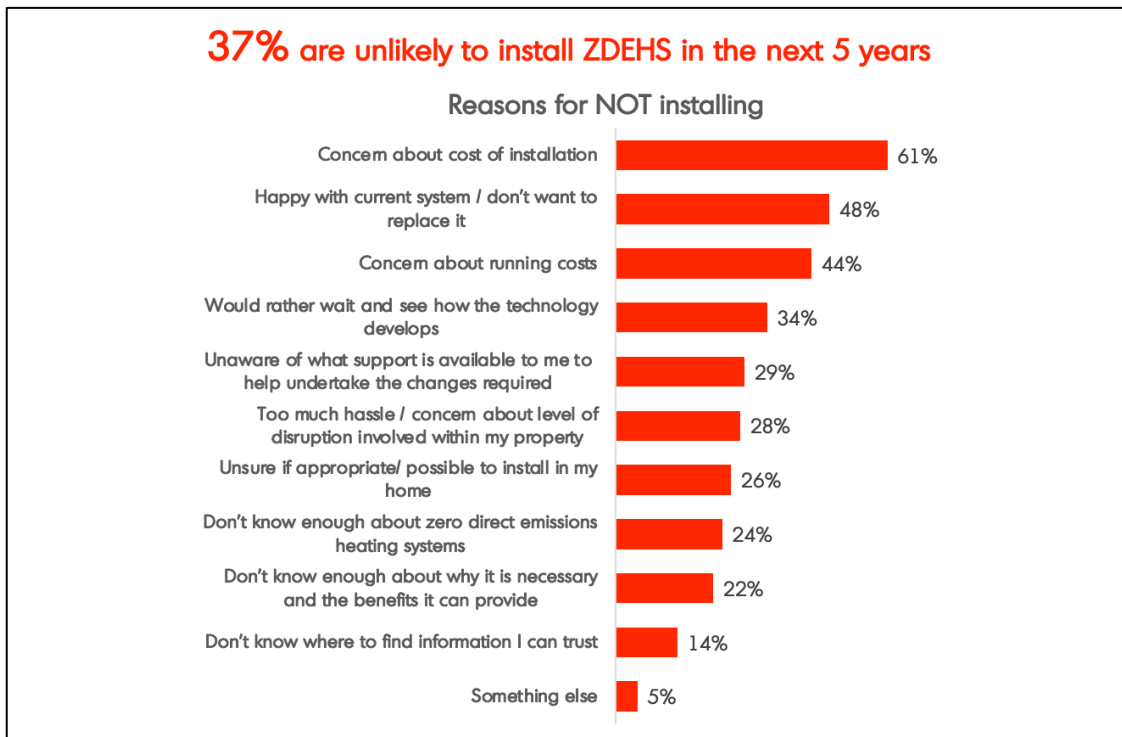


Figure 6: Survey answer to the question: Q23 Why are you currently unlikely to install a zero direct emissions heating system? Base: 600

Although the idea of installing a ZDEHS was acceptable to the focus group respondents in theory, significant barriers exist in practice.

4.2.2. Cost

As highlighted in the survey findings, financial concerns were the primary front-of-mind issues driving scepticism around ZDEHS installation. The ongoing cost of living situation combined with lingering impacts of Covid-19 led some respondents to question whether it would be affordable for the Scottish Government to support mass domestic heat transition at population level. Although government grants towards insulating measures and ZDEHS are available, awareness of these among respondents tended to be low. In addition, cynicism around grants was often present, with focus group participants often sceptical around both their eligibility criteria and whether the amount offered would be enough to make installation achievable. For some participants, cynicism around grants was exacerbated by the prevalence of scams or ‘pushy’ advertising for home improvements, which often mention the availability of grants for insulation or double glazing as part of a sales pitch.

Beyond the cost of installing a ZDEHS itself, respondents were unclear on whether government support would extend to the additional costs associated with preparing their property for installation (such as improving the EPC rating or surveying costs to assess suitability). Potential running costs of ZDEHS were another consideration which could present a barrier in the event that they proved to be less cost-efficient than fossil fuelled equivalents.

Some sub-groups within the sample highlighted specific barriers relevant to their circumstances. A cost barrier unique to rural respondents was the potential need to install a backup system to ensure their home could be heated in the event of a power outage. Some homeowners who rented out property indicated that they would prefer to sell their rental property rather than take on the cost of installing ZDEHS, especially those who had recently updated their existing gas boiler. Participants said:

“I just put in a new boiler and it cost me £10,000...that was because it had to be beside an external wall....if I had to change again I would have to sell” (M, Owner of property for Rent, Edinburgh)

“We regularly get power cuts – we need a reliable back up and our [wood burning] stove is it” (F, 46-45, old 1920-1981 house, Rural Aberdeenshire)

4.2.3. Effectiveness expectations

Some focus group respondents who had researched air source heat pumps more extensively believed that they would be less efficient at heating homes in Scottish winter temperatures. This barrier was particularly relevant to participants in rural areas, or who lived in the north of the country.

A participant said: “Air source pumps won’t work in the middle of Aberdeenshire – it’s far too cold in the winter.” M, 46-55, pre 1919 house, Rural Aberdeenshire

4.2.4. Long-term renters

As renters typically pay utility bills, including energy, they felt that there was less of an incentive for landlords to install a more cost-efficient heating system in general, including a ZDEHS. Further to this, participants who rented their home often reported finding it challenging to convince their landlords to make smaller changes to the property, with a larger investment like a new heating system seeming out of reach. Renters also often expressed concerns that the cost of installing ZDEHS would be passed on to them via rent increases.

A participant said: “I’ve been trying to get a smart meter for over a year now – I doubt I’d have much luck asking for something that big.” (M, 36-45, C2DE, Long term renter)

4.2.5. Waiting for technology improvements

Focus group participants who were interested in being ‘early adopters’ of new technology often expressed the view that new technology often develops rapidly after becoming widely available to consumers, as minor issues and inefficiencies are discovered and solved. For these participants, it made more sense to delay installing a ZDEHS until they felt that any initial ‘teething problems’ with the new technology had been addressed. Further to this, some participants questioned whether entirely different systems, which might prove

cheaper to install/run, or would suit their property better, could become available in the near future.

A participant said: “I saw something about wallpaper that can heat your home, what’s that about?” (F, 25-29, semi-rural house, West Lothian)

4.3 Motivating factors for installing a ZDEHS

4.3.1. Those likely to install a ZDEHS

Twenty-nine percent of survey respondents indicated they were likely to install a ZDEHS within 5 years. Energy efficiency was the most common motivator, with 6 in 10 (61%) of those likely to install ZDEHS citing this as a reason. Slightly fewer mentioned reducing their heating bills, and just over half indicated that protecting the environment was a factor. Other motivators cited frequently were the idea of ZDEHS helping to keep their home warm, making use of the available funding support, and the proposed legislation to enforce heat transition.

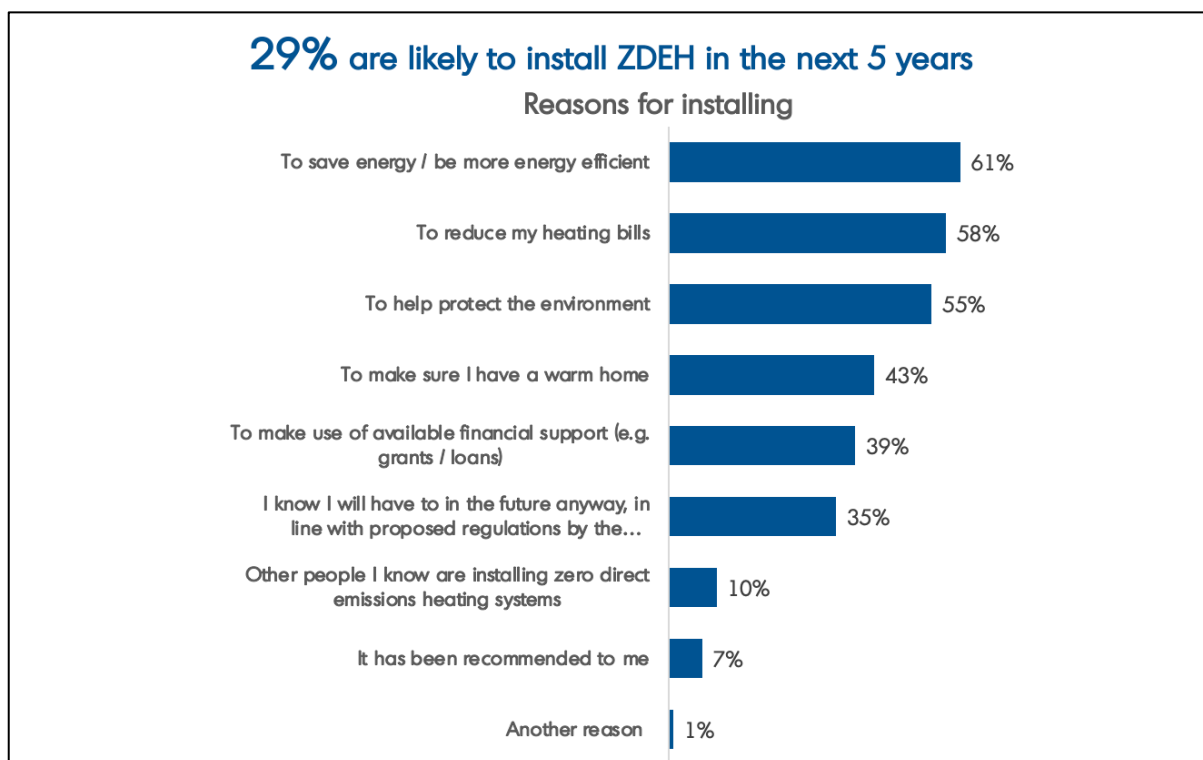


Figure 7: Survey answer to the question: Q22 Why do you say you are likely to install a zero direct emissions heating system? Base: 471

Key sub-group differences among those who were likely to install ZDEHS in the next 5 years were:

- Older respondents were more likely to select energy efficiency and making use of financial support.
- Those who owned their home outright were also more likely to select making use of financial support.

- Respondents with higher levels of concern about climate change were more likely to select energy efficiency and protecting the environment.
- Landlords were more likely to be motivated by other people installing ZDEHS.

As with the barriers to ZDEHS installation, discussion of potential motivators in the focus groups centred around finances.

4.3.2. Financial support

All focus group respondents regardless of socio-economic group felt they would be unable to meet the cost of installing ZDEHS on their own. Awareness of the available grants is a key motivating factor, without which they were unlikely to consider updating their existing system. To overcome scepticism, participants would need to be aware that the eligibility criteria for these grants would include them before considering ZDEHS.

4.3.3. Efficiency of ZDEHS versus fossil-fuelled equivalents

If ZDEHS could be shown to meet respondents' understanding of 'efficiency' in a home heating context (e.g. effectively heats the home with low running costs relative to equivalent systems) this would provide a long-term financial incentive to install a ZDEHS, along with the short-term benefit of a warmer home.

4.3.4. Home value

For these respondents, presenting ZDEHS as a way of 'futureproofing' their property to comply with planned regulations could be motivational, as this would be expected to increase the value of their properties for any future sale.

4.3.5. Low environmental motivations

While respondents were universally positive about the idea of tackling climate change, in practice they felt that the environmental benefits of ZDEHS alone would not be enough to motivate them to update their existing heating system in the current financial context. The idea that ZDEHS helped to reduce harmful emissions would be an additional positive of installing one, but only where other barriers had already been overcome. This finding provides useful extra context to the quantitative survey findings. Although 55% of survey respondents who said they were very or fairly likely to install ZDEHS within 5 years mentioned protecting the environment as a motivating factor, group discussions revealed that this would not be an effective core message in comparison to highlighting financial or practical benefits.

4.4 Opportune trigger points/moments of change

The most common trigger point among survey respondents for considering installing ZDEHS was when their existing heating system reached a point where it required replacement (46%). Over a quarter (29%) of all respondents would **only** consider installing ZDEHS if required to by new legislation. Around 1 in 5 would consider installing ZDEHS if moving to a new home (23%) or renovating their existing home (20%). Around 1 in 10 could be influenced to consider installing ZDEHS by seeing neighbours (9%) or friends and family (9%) installing them.

- Respondents who were likely to install ZDEHS within 5 years were more likely to be influenced when moving home, renovating an existing home, or when friends/family/neighbours were installing them.
- Almost 4 in 10 respondents in the DE socio-economic group (37%), and half of respondents aged 75+ (50%) would only consider installing ZDEHS if legally required to do so.

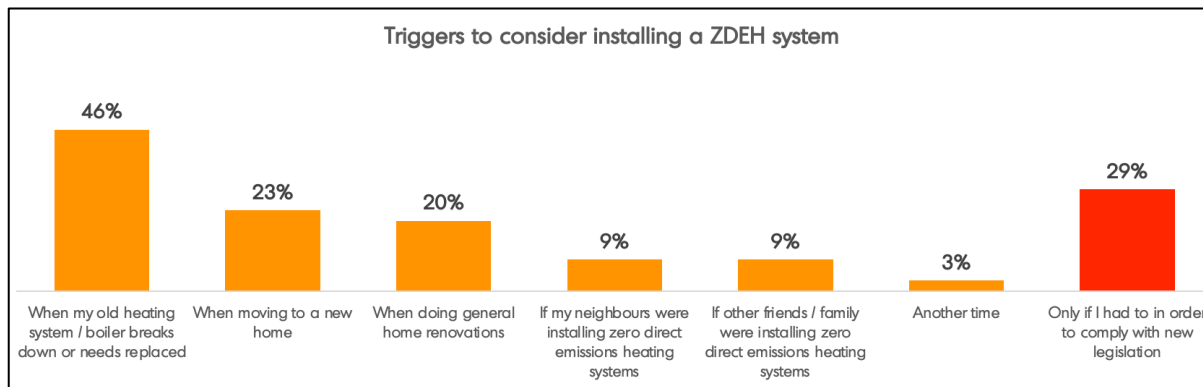


Figure 8: Survey answer to the question: Q20 When would you be most likely to consider installing a zero direct emissions heating system? Base: All 1621

The focus group respondents indicated that they would be more receptive to messaging around ZDEHS in relation to these trigger points. These tend to be points at which the consumer is already planning to invest a significant sum, either into improvements to their existing home (e.g. renovations, current heating system breaking down, installing new insulation) or into a new home. Those at one of these ‘trigger points’ are likely to be actively seeking information around home improvements, but may not have a strong awareness of ZDEHS.

4.5 Trusted messengers, sources of information and advice, and messages

4.5.1. Potential trusted sources of advice

A number of trusted sources of advice about ZDEHS were identified within the quantitative research, with relevant tradespeople and specialist energy advice organisations the first and most popular to turn to. Energy suppliers are also potentially important in the mix, along with SG and local authorities.

Just under 6 in 10 quantitative respondents selected heating engineers/gas fitters/plumbers as a trusted source, with around a quarter indicating that this would be their first choice. Over 4 in 10 said they trusted specialist energy advice organisations, with just over a quarter indicating that they would choose this source first. Energy suppliers were also trusted by over 4 in 10 but were less likely to be a first choice source. The Scottish Government was a trusted source for 3 in 10 but a first choice source for just over 1 in 20. Local authorities, peers who had already installed ZDEHS and heating system manufacturers were also selected by around a quarter of respondents.

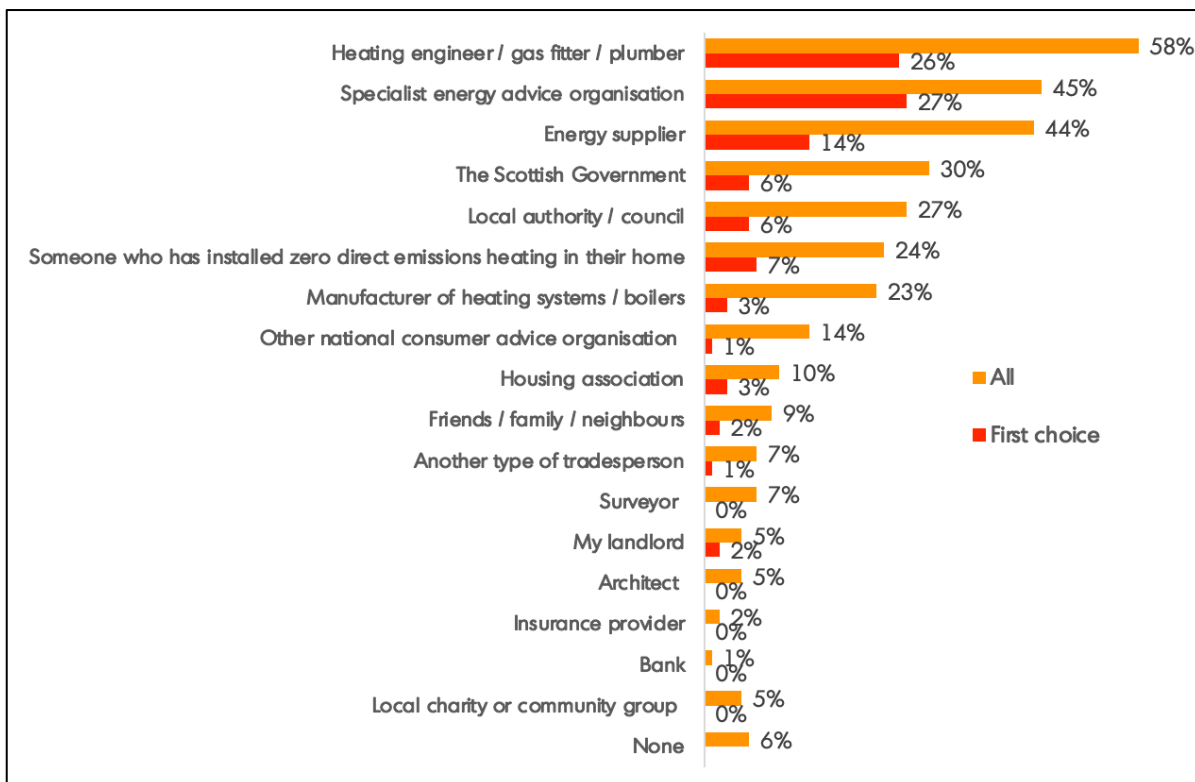


Figure 9: Survey answer to the following questions:

Q16 Who would you trust to provide advice about installing a zero direct emissions heating system in your home? Base: All 1621

Q17 And which of these would you turn to first for advice about installing a zero direct emissions heating system in your home? Base: Those who would trust someone 1516

Key sub-group differences on trusted sources were:

- Those who were very likely to install ZDEHS within 5 years tended to trust the Scottish Government more as an information source and were more likely to consider them first choice.
- Around half of the AB socio-economic group would trust specialist energy advice organisations.
- Respondents with smart meters fitted were more likely to look to their energy supplier for advice.
- Landlords were more likely to trust another type of tradesperson (i.e. not a heating engineer, gas fitter or plumber), and more likely to trust their bank.
- Private and social renters were more likely to look to their landlord for advice.

4.5.2. Preferred channels

Survey respondents selected an average of 2.5 channels that they would use. A combination of online searches and websites, as well as talking to trusted advisors or those with experience of installing ZDEHS in their home are the preferred methods of finding information. Younger respondents were more likely to select digital channels, while older respondents were more likely to choose in-person contact or printed materials. Just 1 in 20 (5%) would prefer to find out by phone.

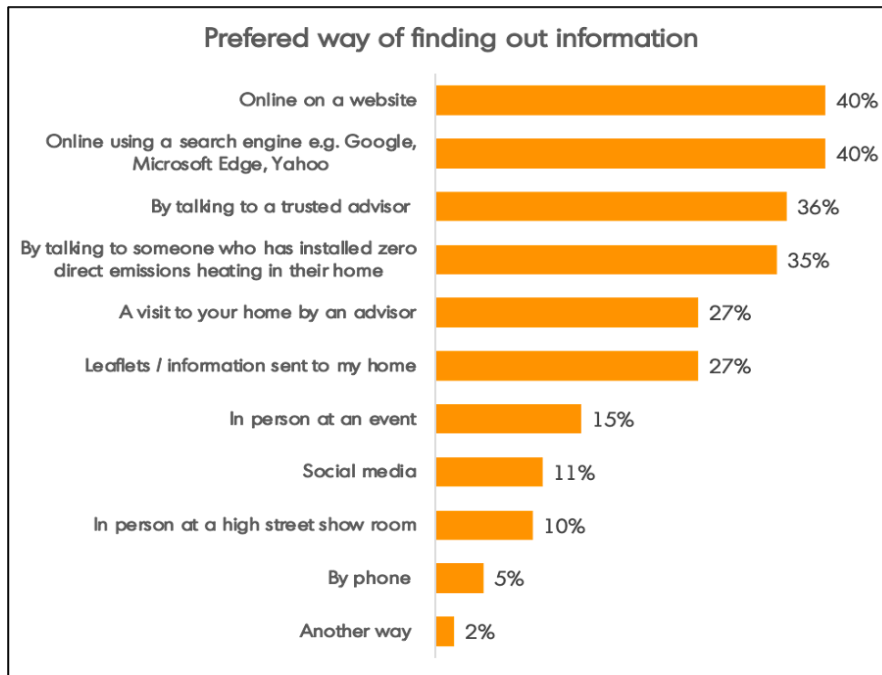


Figure 10: Survey answer to the question: Q18 How would you prefer to find out information about installing a zero direct emissions heating system in your home? Base: All 1621

4.5.3. Most useful information

Installation and running costs, available financial support and the most suitable type of ZDEHS are the key topics expected for information provision. However, it is clear more information in general about ZDEHS is needed with respondents selecting an average of 4.8 types of information.

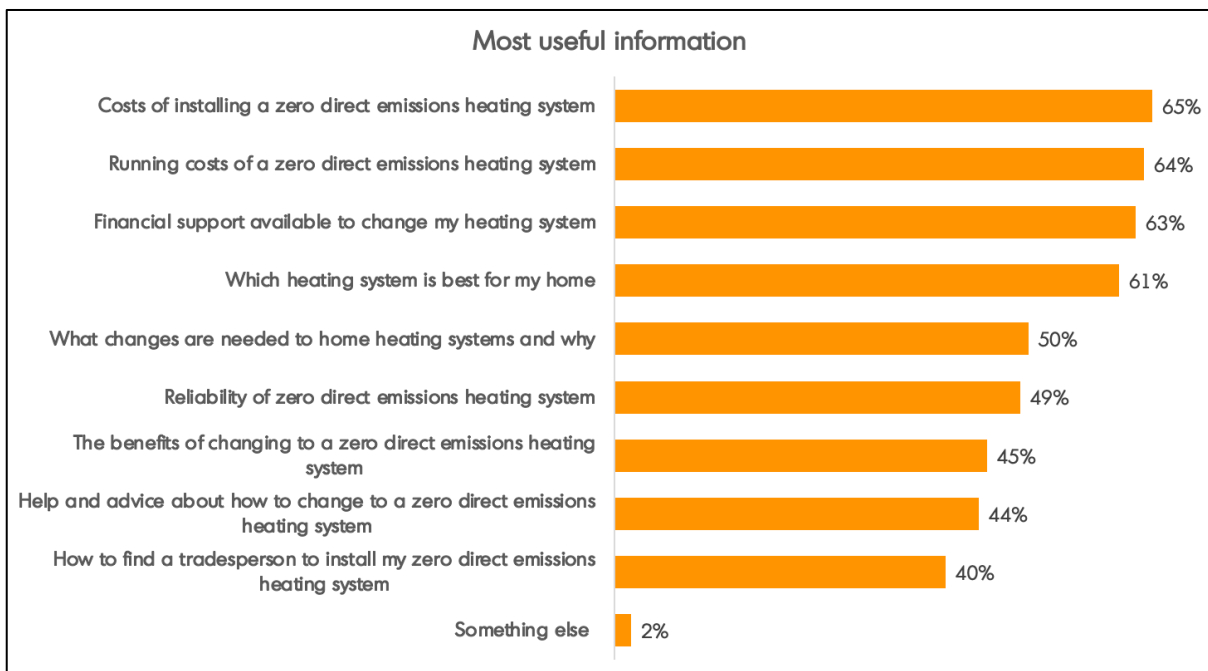


Figure 11: Survey answer to the question: Q19 What types of information would be most useful for you when considering whether to install a zero direct emissions heating system? Base: All 1621

In the focus groups respondents were invited to talk freely about: who they would turn to, what channels they would use or expect the source to use to reach them, when in the decision making process they would use a source, and what information they would seek from different sources – in effect set out what role and how specific messengers, channels and messages play along the ZDEHS customer decision making journey.

4.5.4. Sources of information and stages in the customer journey

Contextualising the wide variety of information sources, channels and messengers highlighted by quantitative survey respondents, the focus group discussions indicated that the decision-making process around ZDEHS can be described as a progression through multiple stages, with different information, messages and preferred messengers required at each stage. First, greater consumer awareness and understanding of ZDEHS and the need for domestic heat transition must be established. Following on from this, the process follows the pre-contemplation, contemplation, preparation for action and action phases of a classic customer journey⁷.

The stages of the process and their associated requirements in terms of messengers, channels and types of information are detailed below as part of the reflections section, and summarised in the table 2 on page 49.

⁷ This point draws on the Stages of Change Model (Prochaska, J. O., Johnson, S., & Lee, P. (2009). The Transtheoretical Model of behaviour change.) that focuses on the decision-making of the individual and is a model of intentional change. It posits that individuals move through six stages of change: precontemplation, contemplation, preparation, action, maintenance, and termination.

4.5.5. Stage specific communication

Preliminary information requirements

Before actively seeking information, focus group participants outlined a need for general awareness around domestic heat transition to be increased, establishing this as a topic which the public should look to inform themselves about. Communications at this stage should focus on preparing the public for the coming change to avoid a sense of being ‘ambushed’ by any legal requirements or legislation around home heating.

The Scottish Government was viewed as the key messenger at this stage, playing a role in establishing ZDEHS as part of the wider national effort to reduce emissions in line with the Net Zero target. The overall tone of communications should strike a balance between positivity and acknowledgement of the challenges of large scale changeover to ZDEHS.

At this stage, the key messages expected by participants were:

- That ZDEHS will be the future of home heating - and that this is necessary for the environment
- That in order to install ZDEHS many homes will require additional preparatory work (such as improvements to insulation)
- That requirements to change heating systems to ZDEHS placed on individuals by the Scottish Government will be part of a wider package of measures which includes similar requirements for private and public sector organisations (especially construction and high-profile public buildings)
- That financial support would be available to those who need to make a change
- That subgroups who may be affected differently by the transition to ZDEHS (owners of homes to rent, rural areas, lower SEG) have been considered and additional support is available where required

Once the wider context for transition to ZDEHS is established, and the audience possesses a basic understanding of the options and potential requirements of them to install ZDEHS, the public are likely to begin actively seeking information around ZDEHS. Participants anticipated that their information needs, and the sources they would trust to deliver this information, would differ as they moved closer to the point of action.

Information requirements at pre-contemplation

At the pre-contemplation phase, gaining an understanding of the types of ZDEHS available, any obligations to the public as individuals, and basic information on the potential costs of the changeover were prioritised. Trusted sources included personal networks (e.g. family and friends) where these people had any knowledge or experience around ZDEHS, and any specialist energy advice organisation which was viewed as being impartial (e.g. Energy Saving Trust, Home Energy Scotland). Scepticism was reserved for sources perceived as lacking specialist knowledge of ZDEHS, or as having an ulterior motive to promote these systems (including commercial interest, or in the case of government an interest in meeting climate change targets). Messaging at this stage should focus on building understanding of the benefits of ZDEHS, raising awareness of the specific requirements on individuals and the support offered to meet these, and building knowledge of the different types of ZDEHS and their suitability for different property types.

Information requirements at contemplation

Once the audience is satisfied that they understand the basic contextual factors around the potential switch to ZDEHS, they are likely to begin gathering more detailed information on their options to support a final decision. The information needs participants identified at this stage centred around the pros and cons of different systems, comparing their efficiency and running costs to current fossil-fuelled systems, and the available financial support options. With more practical and detailed information now required, information sources which were considered credible now included more commercial entities (such as energy suppliers, heating system manufacturers, or tradespeople) who could provide both expertise around the general topic of home heating and give an informed view on different systems.

Neutral consumer advice and review organisations would also become relevant at this stage, as would online reviews written by the general public. While more commercial information sources would be more welcome at this stage, participants indicated that they would strongly reject a ‘cold calling’ approach (often citing past experience around double glazing and similar home improvements). Messaging at this stage should be more specific, highlighting benefits relevant to individuals’ unique circumstances (e.g. rural/urban locations, types of housing), and signposting to the practical information required to make final decisions at the next phase.

Information requirements as the consumer prepares for action

At this stage, a preferred ZDEHS option has been selected based on its suitability for the type of home, and expected efficiency and running costs versus the alternatives. Participants associated this stage in the process with highly specific information needs, as they anticipated considering the manufacturer and model of their preferred system, who they should contact to install the system, and how to apply for available financial support. Accordingly, practical knowledge and experience around ZDEHS and the financial support system will now become the key attributes of trusted information sources. Participants would be most likely to seek out trusted local tradespeople, organisations who provide funding support for ZDEHS, and manufacturers of ZDEHS. Messaging for the audience at this stage would be expected to have a strong practical focus, highlighting any potential challenges and signposting to sources of credible opinion to support smaller decisions (e.g. choice of installation firm, brand/model of system).

4.5.6. Consumers planning to move house

In group discussions around information needs, an important sub-group with additional requirements was identified. Participants who were planning to move house in the near future recognised that they were at a key ‘trigger point’ for installing ZDEHS, if they could be convinced to consider these systems as part of ‘futureproofing’ their new home. However, with current low awareness levels around these systems and the need for domestic heat transition, there is a need to ‘fast-track’ this sub-group through specifically targeted messaging, with the aim of rapidly building their understanding of ZDEHS and positioning contemplation of ZDEHS as part of the process of moving house. Trusted sources for this sub-group would include those outlined for the more general audience, but sources with a tangible link to the process of buying/selling homes would have a particularly important

role. Sources such as surveyors, estate agents and mortgage providers have extensive contact with those in the process of moving house, and are already established as sources of key advice in a highly involved decision. This makes them ideal messengers for information to support consumers in understanding and installing ZDEHS.

4.5.7. Scottish Government communications

The Scottish Government was viewed by participants as being a key source of information, especially at the pre-contemplation phase. The Government would be expected to set the tone around how ZDEHS fits into the wider climate strategy and its associated targets, and to clarify any legislation planned which will affect homeowners.

As a source, there is likely to be some consumer distrust around communications from the Scottish Government, as participants recognised that there are strong incentives for governments to promote individual consumer actions on climate change. With many individuals likely to resent the idea of being required to change their heating systems at personal expense, effective preparatory communications from government will be needed to reduce the impact of this on uptake of ZDEHS. The potential for pushback from consumers also necessitates a coordination role for the Scottish Government: where other messengers are considered to be more credible or relevant, the government should look to support and equip these other sources to deliver consistent messaging around the benefits of ZDEHS and the support available to reduce the burden on individuals.

4.5.8. Timing of communications

Most focus group participants saw themselves as being at the pre-contemplation stage, as many had little to no awareness of ZDEHS prior to taking part in one of the group discussions. Communications targeting those at this stage will need to be timed well in advance of any legislation being announced, to allow sufficient time for consumers to build an understanding of ZDEHS and the need for domestic heat transition away from fossil fuelled systems.

As already highlighted, there are also several 'trigger points' at which participants indicated that they would be more receptive to messaging around ZDEHS. To maximise uptake of ZDEHS in the short term, communications targeting these key moments must look to rapidly move consumers with low awareness of ZDEHS through the pre-contemplation and contemplation phases of the customer journey.

5 Conclusions and recommendations

5.1 Conclusions

5.1.1. Climate change concern is widespread but the need for heat transition is not front of mind

The research highlighted that concern about climate change is widespread and two-thirds of people are aware of the Scottish Government's net zero by 2045 target. However, for most people this has not translated into many significant lifestyle changes.

Most focus group participants referred to minor behaviours such as recycling or turning off lights and appliances, and only a smaller number talked about bigger changes to existing habits, such as reducing private car use or cutting down on meat consumption.

The survey highlighted that there is significant room for improving energy efficiency in homes across Scotland with many not having loft, cavity wall, and/or under floor insulation.

Few currently have ZDEHS installed at home. Crucially, even among those who reported more significant changes to their behaviour, heat transition and the need to change to zero direct emission heating systems were not front of mind.

5.1.2. Knowledge about heat transition and low-carbon technology needs improving

Most research participants knew something, but not a lot, about the need for homeowners to move to ZDEHS. Almost all had heard of zero direct emission heating as a general concept, but few knew much about specific systems - solar (thermal) panels and heat pumps were the most widely recognised types. There was also some claimed awareness of potential legislation around ZDEHS. Although participants tended to be aware of, and positive towards the overall goal of reaching net zero by 2045, they had some concerns around the potential impacts on individuals for domestic heat transition. Also, reactions to the idea of the Scottish Government making zero direct emissions heating systems a legal requirement were generally negative.

Building strong awareness of why change is needed will enable consumers to make an informed choice about their heating system. To convince consumers to install ZDEHS, understanding and familiarity with the technology must increase. This includes being aware of and understanding the available options and suitability to consumers' homes, the financial support on offer, the impact on running costs, the installation process, maintenance and guarantees, and the environmental impact.

5.1.3. The barriers to installing ZDEHS are significant

The cost of installing, particularly retrofitting, a ZDEHS is a significant barrier and the main deterrent, even with incentives and subsidies from the Government. Generally, many participants are worried about the upfront costs of making changes to their homes, while others believe that the running costs of an electric heating system will be too great - this belief is exacerbated by the current cost of living crisis and the financial pressure many people are facing.

In addition, the familiarity of gas heating deters some from switching to more unfamiliar technologies. People can feel there’s no need to change as they are happy with their current system – they see gas heating as reliable, convenient and easy to use, whereas they don’t have sufficient knowledge or experience of ZDEHS to be able to compare or make the same observations.

A summary of all barriers and motivators for installing ZDEHS are highlighted in Table 1.

Table 1: Common barriers and motivators for homeowners installing a ZDEHS

Barriers	Motivators
<ul style="list-style-type: none"> • Cost • Installation and running costs, and satisfaction with current heating systems • The hassle/disruption of building work • Required decision-making effort • Lack of knowledge about suitability of low-carbon heating systems in certain homes • Unfamiliarity with new technologies • Noise and looks of heat pumps • Scepticism about how developed the technology is and its longevity • Lack of trust in reliability and independence of advice and providers • Perceived unsuitability of some ZDEHS, especially air source heat pumps, in colder temperatures in Scotland 	<ul style="list-style-type: none"> • Saving money (in any way) • Financial incentives • Warmth and comfort • A desire to be energy efficient and protect the environment • Increase in the value of homes • Seeing others adopting the technology • Demonstration that ZDEHS to be more efficient than fossil fuelled equivalents

5.1.4. Improving energy efficiency of higher importance than reducing harmful emissions

When specifically prompted, around one-third of survey respondents who can make a decision about ZDEHS signal some intent to install one within the next five years. Key reasons for installing a ZDEHS would be to become more energy efficient, reduce heating bills, protect the environment and make sure they have a warm home.

However, while participants were universally positive about the idea of tackling climate change, in practice they felt that the environmental benefits of ZDEHS alone would not be enough to motivate them to update their existing heating system in the current financial context.

It is important to note here that the current energy crisis and accompanying high price of electricity means that having a ZDEHS will not necessarily reduce heating bills whilst costs remain high.

We found a perception among many respondents that an efficient heating system is one which has low running costs, rather than a system which uses energy efficiently. As a result, sustained high energy prices in later 2022/early 2023 created the belief that ZDEHS are less efficient and more costly.

This means it will be difficult to persuade/convince these consumers of the potential energy efficiency benefits and accompanying savings in running costs that ZDEHS can offer until electricity prices fall to a constant level where having a ZDEHS will be a more cost effective heating system.

5.1.5. Key moments make change more likely

Common moments of change or trigger points for considering installing ZDEHS included replacing existing (old or broken) heating systems, moving home or renovating, and if legislation makes it mandatory. At these moments when other disruptions and refurbishments are taking place, the hassle-factor of researching and installing a ZDEHS will be less salient and therefore these are ideal opportunities to encourage heat transition.

The most common trigger point among all respondents for considering installing ZDEHS was when their existing heating system reached a point where it required replacement.

Respondents who were likely to install ZDEHS within five years were also more likely to be influenced when moving home, renovating an existing home, or when friends/family/neighbours were installing them. Over one-quarter of all respondents would only consider installing ZDEHS if required to by new legislation.

5.1.6. Potentially trusted messengers and sources of information change throughout the decision-making process

Messengers have an important role to play across the homeowner decision-making process. They need to educate homeowners about the technology, choice of systems, features, installation process and other aspects. They also need to make the case for, or persuade people to, switch from their current and familiar heating system, which will be a significant and potentially costly change for many.

There are several types of messenger across the home energy/heating supply chain that would be trusted to give advice about ZDEHS depending on where the consumer is on their heat transition journey. That is starting from being unaware of the requirement for heat transition and moving to a zero direct emission heating system in their home, through to

taking action to retrofit/install the system (a heat pump and all the other necessary infrastructure).

All messengers/sources need to be credible and trusted. This includes some needing to be independent from commercial or government interests and thus fully impartial; and/or highly knowledgeable about different aspects of ZDEHS, the technology and support available.

- Relevant tradespeople, specialist energy advice providers and energy suppliers are seen to have a key role to play.
- Social networks also play an important role in sharing information and influencing low-carbon home improvements, both positively and negatively. In contrast, as highlighted in the qualitative work, negative experiences from others who have installed heat pumps can deter from transitioning.
- The Scottish Government is expected to play a key role in direct communications, particularly around any new legislation, but at some stages of the heat transition journey other sources of information are likely to be more important, meaning the Government must also function as a coordinator and facilitator to ensure consistent messaging. For those signalling stronger intent to install a ZDEHS in the next few years, the Scottish Government is a particularly trusted voice.

5.1.7. Relevant and appropriate information needs to be easily available

In order for consumers/homeowners to make an informed decision and choice to undertake the installation of a ZDEHS they have a lot to consider. For most people, those with little awareness and knowledge of the technology and systems available, there will be many questions to answer including:

- What is a ZDEHS?
- How do they work?
- How efficient are they?
- What system is appropriate for their home?
- How much do they cost to install and run?
- How does this compare to what they have already?
- How long do they take to install?
- How long will they last before needing to be replaced?
- How reliable are they?

The answer to these and other questions will also vary depending on the homeowners' type of property and the ZDEHS choices available. The information and advice required will therefore need to be wide ranging, accessible and relevant for the different audiences.

Overall, the communications and public engagement to facilitate the heat transition and move to ZDEHS is a complex and challenging task.

1. **It has a lot to cover.** This includes raising public awareness, understanding and buy-in of the changes required, the available improvement options and potential benefits, and the support and advisory services available to households to facilitate uptake.
2. **The role of communications is limited** – it can only be used to best present the available ZDEHS offer to homeowners. The current ZDEHS offer, particularly in relation to cost, is weak in comparison to a modern gas-fuelled heating system, which homeowners are familiar with and see as reliable, easy to use and efficient.

To convince homeowners to install a ZDEHS, it is important to be able to present a stronger offer against the perceived benefits of using gas as an energy source. For example, given significant financial barriers, any improvement in the financial incentives/support available (for instance, increasing the availability/value of installation grants and/or creating an incentive linked to reducing running costs such as a specific electricity tariff for ZDEHS energy users) would help strengthen the offer in comparison to gas.

To persuade customers towards this, the numerous co-benefits such as reliability, energy efficiency and security, also need to be front and centre of communications.

The lack of familiarity with ZDEHS also means that there is a lot of homework for homeowners to do – being able to navigate to and find relevant information and advice needs to be easy.

3. **To be convincing, credible and trustworthy the messengers need to be fully bought into the heat transition and the move to ZDEHS.** They also need to be suitably knowledgeable to communicate/provide the information and advice required. As well as making visible a strong case for change at a national and collective level, homeowners must be able to easily access advice and information relevant to them from sources/messengers that have the appropriate knowledge, capacity and resources to help.

5.2 Recommendations

Considering the findings and conclusions from this study, to develop the Heat in Buildings Public Engagement Strategy key considerations/recommendations are as follows:

1. Make the case for change visible and attractive

- Raise awareness of the relevance and need for decarbonisation of home heating, and visibility of the incentives and support available for consumers/homeowners to install ZDEHS. This should focus on encouraging the public to find out more about how this applies to them and start them on their heat transition journey.

- The overall tone of communications should strike a balance between positivity and acknowledgement of the challenges of large-scale changeover to ZDEHS.
- The Scottish Government has the lead messenger or campaigning role here with support from other credible national messengers or sources such as Home Energy Scotland and the Energy Saving Trust.

2. The messaging needs to highlight the positive impact on society that heat transition will have, especially in the context of limited choice of zero direct emission heating alternatives to gas.

- Focus on presenting the co-benefits of ZDEHS
- Look to reduce the deferral of action by breaking down the target behaviour into smaller steps

Leverage key trigger-points or moments of change eg when consumers need to replace their old system, renovating, or moving house. At this stage, the key messages are:

- ZDEHS will be the future of home heating and this is necessary for the environment
- In order to install ZDEHS many homes will require additional preparatory work (such as improvements to insulation)
- Financial support will be/is available to those who need to make a change - this needs to be transparent and easy to find information
- If and when energy (electricity) costs stabilise at a level that makes ZDEHS cost-competitive in comparison to fossil-fuelled systems, messaging on running costs can be made more explicit
- Requirements to change heating systems to ZDEHS placed on individuals by the Scottish Government will be part of a wider package of measures, which includes similar requirements for private and public sector organisations (especially construction and high-profile public buildings)
- Subgroups who may be affected differently by the transition to ZDEHS (i.e. owners of homes to rent, rural areas, lower SEG) have been considered and additional support is available where required

Other important, persuasive message territories to convey include:

- ZDEHS, such as heat pumps, work – they can offer reliable and safe heating that will keep homes warm and comfortable
- As an alternative to gas, ZDEHS can offer energy security and reliability that comes with not being dependent on rising gas prices and imports from other countries
- Having a ZDEHS (that is installed and working properly) will enhance the value and saleability of your property

3. Empower and equip the various trusted messengers/sources to deliver the required messaging/information – in a consistent, relevant and accessible way to the different consumer groups and their needs.

Providing comprehensive, consistent, clear and accessible information and advice is particularly important. Given the complexity and scale of information required, without a reasonable awareness and understanding of ZDEHS people are likely to get confused, misunderstand and/or make incorrect assumptions and judgements about ZDEHS and the associated features, benefits and issues.

This means working to ensure that these trusted messengers/sources have bought into the public engagement strategy and core messages, and have the necessary information, knowledge and expertise to provide the information required by consumers throughout their heat transition journey in a transparent, accessible and equitable way.

In addition to the above messaging, key engagement areas should focus on:

- the changes needed and why – linked to evidence, policy and legislation
- the technology and options available and associated benefits
- which solutions are appropriate for different homes and households
- the help/support available – not least financial support and incentives
- how and where to find the right supplier, installer and/or tradesperson

Specific areas of concern requiring further information and reassurance also include:

- **hidden costs** - the cost of maintenance and repair, as well as incidental costs including the cost of underfloor heating, or installing new radiators
- **reliability** - the importance of easy access to maintenance services, back-up systems and concerns about the interdependence of heating systems across a network
- **flexibility and ease of use** - whether the technologies meet the particular needs of certain households, provide sufficient levels of control and are easy to use
- **long-term financial and sustainability implications** - whether the technologies would still be cost-effective and/or energy efficient in the future
- **household disruption** - linked to installing the new technologies and about the timescale for installation
- **noise pollution** - noise interference within the home and whether the wider community could be affected through noise pollution
- **suitability of the home** – whether the technology is suited to the home, including whether it could be made available in specific locations and whether retrofit was realistic or feasible

Table 2 below presents a summary of the trusted messengers and sources of information, their role and appropriate channels across the consumer heat transition journey.

4. Targeted communications needed for legislation

With many individuals likely to resent the idea of being required to change their heating systems at personal expense, effective preparatory communications from government will be needed to reduce the impact of this on uptake of ZDEHS.

Communications targeting those at this stage will need to be timed well in advance of any legislation being announced, to allow sufficient time for consumers to build an understanding of ZDEHS and the need for domestic heat transition away from fossil fuelled systems.

Table 2. Trusted messengers, sources of information and channels across the consumer heat transition journey

Customer journey stage	Key attributes of trusted sources	Trusted information sources	Key channels	Type of information required	Rejected sources
<p>Pre-contemplation:</p> <p>Audiences understand the need to inform themselves about ZDEHS and domestic heat transition, but lack detailed knowledge.</p> <p>Audiences require sufficient basic understanding to inform more specific information gathering.</p>	<ul style="list-style-type: none"> • Impartiality • Independence from commercial or government interests • Trustworthy/credible • Viewed as experts or highly knowledgeable 	<ul style="list-style-type: none"> • Family and friends with prior experience of installing or owning ZDEHS • Specialist energy advice organisations (e.g. Home Energy Scotland, Energy Saving Trust) • Third sector organisations specialising in energy support and advice 	<p>For family/friends:</p> <ul style="list-style-type: none"> • Word of mouth • Social media <p>For organisations:</p> <ul style="list-style-type: none"> • Search engines • Multimedia campaign fronted by energy advisers (e.g. Home Energy Scotland) • Social media 	<p>General information:</p> <ul style="list-style-type: none"> • Requirements for individuals • Available heating system options • Approximate cost of installing and running ZDEHS • How to prepare a home for ZDEHS • Available funding support 	<ul style="list-style-type: none"> • Any organisations with a financial interest in ZDEHS or home energy (e.g. heating engineers, manufacturers of ZDEHS, energy suppliers) • More generic advice sources were not seen as having the required expertise (e.g. non-specific local charities, financial services organisations, Citizens Advice)
<p>Contemplation:</p> <p>Audience is now considering action, which requires a more detailed understanding of the different types of ZDEHS, potential</p>	<ul style="list-style-type: none"> • Impartiality • Independence from commercial or government interests • Trustworthy/credible • Viewed as experts or highly knowledgeable 	<ul style="list-style-type: none"> • Family and friends with prior experience of installing or owning ZDEHS • Specialist energy advice organisations • Third sector organisations 	<ul style="list-style-type: none"> • Word of mouth (for family/friends and tradespeople) • Search engines • Telephone calls or in-person 	<ul style="list-style-type: none"> • The most suitable for an individual's home • Efficiency of ZDEHS heat at a person's home in comparison to their current system • Eligibility for financial support to 	<ul style="list-style-type: none"> • Organisations with financial interest would be rejected if perceived as 'cold calling' or engaging in aggressive sales tactics

<p>challenges around installation and support available</p>	<ul style="list-style-type: none"> • Has credible knowledge of their individual situation (e.g. current heating system, type of building) 	<p>specialising in energy support/ advice</p> <ul style="list-style-type: none"> • Consumer advice organisations (e.g. Which) • Local authorities • Tradespeople with experience of installing ZDEHS • Energy suppliers • Heating system manufacturers 	<p>conversations (if made/ arranged by the consumer)</p> <ul style="list-style-type: none"> • Multimedia campaign by trusted sources • Social media • Online reviews 	<p>help cover the cost of installation</p>	<ul style="list-style-type: none"> • More generic advice sources were not seen as having the required expertise
<p>Preparation to action:</p> <p>Once all options have been evaluated and a preferred option selected, information needs are more focused on the practical and financial details of installation.</p> <p>Information requirements differ between those buying a home and those installing a new system in their current property.</p>	<ul style="list-style-type: none"> • Credible trade knowledge/ experience of installing ZDEHS • Extensive knowledge of sources of funding support and eligibility for these <p>For those buying a home:</p> <ul style="list-style-type: none"> • Sources offering wider advice and support around the process of buying and/or selling a home 	<ul style="list-style-type: none"> • Trusted local tradespeople (especially heating engineers, but including plumbers or electricians) • Sources of grants and loans (e.g. Home Energy Scotland, Scottish Government, UK Government) <p>For those buying a home:</p> <ul style="list-style-type: none"> • Other sources of funding (e.g. banks) • Surveyors • Solicitors and estate agents • Architects (where relevant) 	<ul style="list-style-type: none"> • Telephone calls or in person conversations (if made/ arranged by the consumer) • Websites of sources (e.g. tradespeople, funding sources) 	<ul style="list-style-type: none"> • Any relevant details of the installation process • Details of financial support (e.g. how to apply, eligibility criteria) <p>For those buying a home:</p> <ul style="list-style-type: none"> • Communications should aim to fast-track any consumers in this sub-group through the initial stages if their awareness of the need to install ZDEHS is low 	<ul style="list-style-type: none"> • Any sources without a clear connection to the practical process of installing ZDEHS or accessing financial support towards installation <p>For those buying a home:</p> <ul style="list-style-type: none"> • Sources without a connection to the process of moving home

6 References

- Addario, G. Jessop, C. Mezzanzanica, M. Wood, M. (2020) Transforming heat: public attitudes research. Available at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/913541/transforming-heat-public-attitudes-research-report.pdf [Accessed: December 20, 2022].
- Ambrose, A. et al. (2019) Reaching the 'Hardest to Reach' with energy advice: final report, Sheffield Hallam University. Available at: <https://www.shu.ac.uk/centre-regional-economic-social-research/publications/reaching-the-hardest-to-reach-with-energy-advice-final-report> [Accessed: December 20, 2022].
- ARUP & Imperial College London (2022) The role of consumer choice in decarbonising heat. Available at <https://www.arup.com/perspectives/publications/research/section/the-role-of-consumer-choice-in-decarbonising-heat> [Accessed: December 20, 2022].
- Beaglehole, J. and Patel, R. (2016) Public views on low-carbon heat technologies: Report of the Sciencewise Sounding Board pilot. Sciencewise. Available at: <https://sciencewise.org.uk/wp-content/uploads/2018/08/CCC-Sounding-Board-full-report-final.pdf> [Accessed: December 27, 2022].
- Behavioural Insights Team (2012) Behaviour Change and Energy Use. Available at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/48123/2135-behaviour-change-and-energy-use.pdf [Accessed: December 20, 2022].
- Caiger-Smith, D. and Amal, A. (2020) Public awareness of and attitudes to low-carbon heating technologies: an evidence review. ClimateXChange. Available at: www.climateexchange.org.uk/media/4298/attitudes-and-awareness-low-carbon-heating-oct-2020.pdf [Accessed: December 20, 2022].
- CAN Europe (2022) Warm Homes 4 All Renewables heating campaign. Available at https://caneurope.org/active_campaigns/the-renewables-heating-campaign/ [Accessed: December 27, 2022].
- Chapman, O., Kapetaniou, C. and Gabriel, M. (2021) Decarbonising homes: Consumer attitudes towards energy efficiency and green heating in the UK. Nesta. Available at: <https://www.nesta.org.uk/report/decarbonising-homes-consumer-attitudes/> [Accessed: December 20, 2022].
- Citizens Advice (2020) Taking the temperature - Consumer choice and low carbon heating, Citizens Advice. Citizens Advice. Available at: www.citizensadvice.org.uk/Global/CitizensAdvice/Energy/Taking%20the%20temperature%20-%20Consumer%20choice%20and%20low%20carbon%20heating.pdf (Accessed: December 19, 2022).
- Colley, K. & Craig, T. P. (2014) Home energy efficiency - review of evidence on attitudes and behaviours. ClimateXChange report for Scottish Government. Available at https://www.researchgate.net/publication/275656270_Home_energy_efficiency_-

_review_of_evidence_on_attitudes_and_behaviours_ClimateXChange_report_for_Scottish_Government. [Accessed: December 20, 2022].

Corner, A., Shaw, C. and Clarke, J. (2018). Principles for effective communication and public engagement on climate change: A Handbook for IPCC authors. Oxford: Climate Outreach. Available at <https://www.ipcc.ch/site/assets/uploads/2017/08/Climate-Outreach-IPCC-communications-handbook.pdf> [Accessed: December 27, 2022].

The Decarbonisation of homes in Wales Advisory Group and the UCL Centre for Behaviour Change (2020) Written Evidence submitted by the Decarbonisation of Homes in Wales Independent Advisory Group and the UCL Centre for Behaviour Change. Available at <https://committees.parliament.uk/writtenevidence/18247/pdf/> [Accessed: December 20, 2022].

Department for BEIS (2022) Public Attitudes Tracker: Heat and Energy in the Home Spring 2022. Available at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1082718/BEIS_PAT_Spring_2022_Heat_and_Energy_in_the_Home.pdf [Accessed: December 20, 2022].

Electrify Heat (2022) The campaign for clean, safe and affordable heating for British homes today. Available at <https://electrifyheat.uk/> [Accessed: December 20, 2022].

Energy Saving Trust (2010) At home with energy: A selection of insights into domestic energy use in Scotland. Available at <https://www.energysavingtrust.org.uk/sites/default/files/reports/At%20home%20with%20energy.%20A%20selection%20of%20insights%20into%20domestic%20energy%20use%20in%20Scotland,%202010.pdf> [Accessed: 5 January 2023]

Energy Saving Trust (2022) Case Study: Colin and his family's air source heat pump. Available at <https://energysavingtrust.org.uk/case-study/colin-and-his-familys-air-source-heat-pump/> [Accessed: December 20, 2022].

Fimatix (2022) Digital Discovery: Improving public- facing climate change content. Department for Business, Energy and Industrial Strategy [Accessed: December 21, 2022]

Furtado, J. (2019) Uncomfortable Home Truths: Future Gas Series Part 3, Policy Connect Available at <https://www.policyconnect.org.uk/research/uncomfortable-home-truths-future-gas-series-part-3> [Accessed: 5 January 2023]

Help For Households (2023), Gov. UK Available at: https://helpforhouseholds.campaign.gov.uk/energy-saving-advice/?gclid=Cj0KCQiA_P6dBhD1ARIsAAGI7HB3v4veGdG8jff5N4tFSOsLRXLxWViHFpyE9gOK4d3MmgYcP2r49bUaAgV9EALw_wcB&gclsrc=aw.ds#spend-to-save-home-improvements [Accessed: 27 December, 2022].

Lancaster University/Climate Citizens (2022) Addressing emissions from owner-occupied homes: Findings of a citizens' panel on home energy decarbonisation. Lancaster University. Available at <https://climatecitizens.org.uk/wp-content/uploads/2022/09/Lancaster-University.-2022.-Addressing-emission-from-owner-occupied-homes.pdf> [Accessed: 4 January 2023]

LGA & The Behaviouralist (2022) Scoping Report: LGA Behavioural Insights Programme: Reducing energy usage among homeowners consortium. Available at <https://www.local.gov.uk/our-support/financial-resilience-and-economic-recovery/behavioural-insights/projects#climate-environment-waste> [Accessed: December 20, 2022]

Motherway, B. et al. (2022) Empowering people to act: How awareness and behaviour campaigns can enable citizens to save energy during and beyond today's energy crisis. IEA. Available at: <https://www.iea.org/commentaries/empowering-people-to-act-how-awareness-and-behaviour-campaigns-can-enable-citizens-to-save-energy-during-and-beyond-today-s-energy-crisis> [Accessed: December 15 2022].

Nesta & The Behavioural Insights Team (2022) How to increase the demand for heat pumps. Available at https://www.nesta.org.uk/report/how-to-increase-the-demand-for-heat-pumps/?gclid=CjwKCAiAqt-dBhBcEiwATw-ggFHKJeWqfduy8j3JELWvof58PkMxCm0iCegBRBdQp2CbnaFRleeNHBoCZSUQAvD_BwE [Accessed: December 20, 2022].

Rode, J. and Müller, S. (2019) 'I Spot, I Adopt! A Discrete Choice Analysis on Peer Effects in Solar Photovoltaic System Adoption of Households' . Available at doi: 10.2139/ssrn.3469548 [Accessed: May 18, 2023]

Shaw, C., Corner, A. and Clarke, J. (2019) Are the public ready for net zero? Recommendations for building a positive public discourse. Oxford: Climate Outreach. Available at <https://climateoutreach.org/reports/report-are-the-public-ready-for-net-zero/> [Accessed: 5 January, 2023]

SEAI Behavioural Economics Unit (2020) Home Energy Events: Leveraging peer effects to increase the installation of energy efficiency measures in Ireland Available at <https://www.seai.ie/data-and-insights/behavioural-insights/publications/home-energy-events-levera/> [Accessed: 5 January, 2023]

Sustainable Energy Authority of Ireland (2020) Encouraging Heat Pump Installation in Ireland: Strategies to maximise heat pump installation and the saving produced. Behavioural Insights Paper Series. Available at <https://www.seai.ie/publications/Heat-Pump-Adoption.-Maximising-Savings.pdf> [Accessed: December 15, 2022].

UK power networks innovation (2022). Decarbonisation of Heat strategy - Our updated view. Available at: https://innovation.ukpowernetworks.co.uk/wp-content/uploads/2022/05/UKPN_029_HeatStrategy_v05.pdf [Accessed: December 19, 2022].

Vaillant Group (2020) #Whywait - Campaign for climate protection and environmentally friendly heating technology). Available at: <https://www.vaillant-group.com/news-stories/whywait-vaillant-campaign-for-climate-protection-and-environmentally-friendly-heating-technology.html> [Accessed: December 20, 2022].

7 Appendices

7.1 Appendix A – Methodology

ClimateXChange commissioned JRS to undertake this research. The work was split into three sequential phases:

1. A rapid review of existing literature/evidence to identify potential trusted messengers, effective communications channels, formats, and points of intervention for engaging with people about heat decarbonisation/transition.
2. A quantitative online survey with a large representative sample of the Scottish public, including priority groups, to explore relevant messengers, channels, formats, points of intervention plus identify levels of awareness and understanding of the changes required, options and support available.
3. Qualitative research with a cross-section of the Scottish public and priority audiences to get more in-depth insight.

1. Desk Research – reviewing existing evidence on heat transition communication

The aim of the literature review was to identify existing and emerging evidence on heat transition related to general public awareness, attitudes and understanding, as well as best practice in engaging the public and message delivery:

8. How the topic of ‘heat transition’ is being presented and discussed
9. Evidence on public understanding of and attitudes towards heat transition and Zero Emissions Heating Systems
10. Learnings and best practice in engaging the public and message delivery – messengers, channels, formats, and timings

The resources were identified through discussion with the client team and independent online searches – search keywords/phrases included: ‘heat decarbonisation’, ‘low-carbon heating’, ‘net zero homes’, ‘heat pumps’, ‘home retrofit’, ‘energy saving measures’. They were drawn from current and recent (mostly from 2018 onwards) National and Local Government publications and communications, research from academia, communications from third sector organisations, and messages from organisations within the energy industry.

A detailed analysis framework was drawn up to identify key insights with implications for message delivery around heat transition. A systematic process was used to analyse each resource and populate the framework, ultimately identifying trusted messengers, channels, formats, and narratives for testing in the primary data gathering stages. Sources that did not offer the required insight were discarded. Observations and insight were drawn from over 40 resources

2. Quantitative Survey – measuring awareness, understanding and key communications tenets for heat transition

Drawing on evidence from the desk review, the quantitative phase aimed to:

11. Test awareness and understanding of heat transition and what this means at a general and individual level
12. Measure recognition of and openness to engage with the actions required

13. Explore propensity to engage with key messengers, communication channels and message formats

Sample

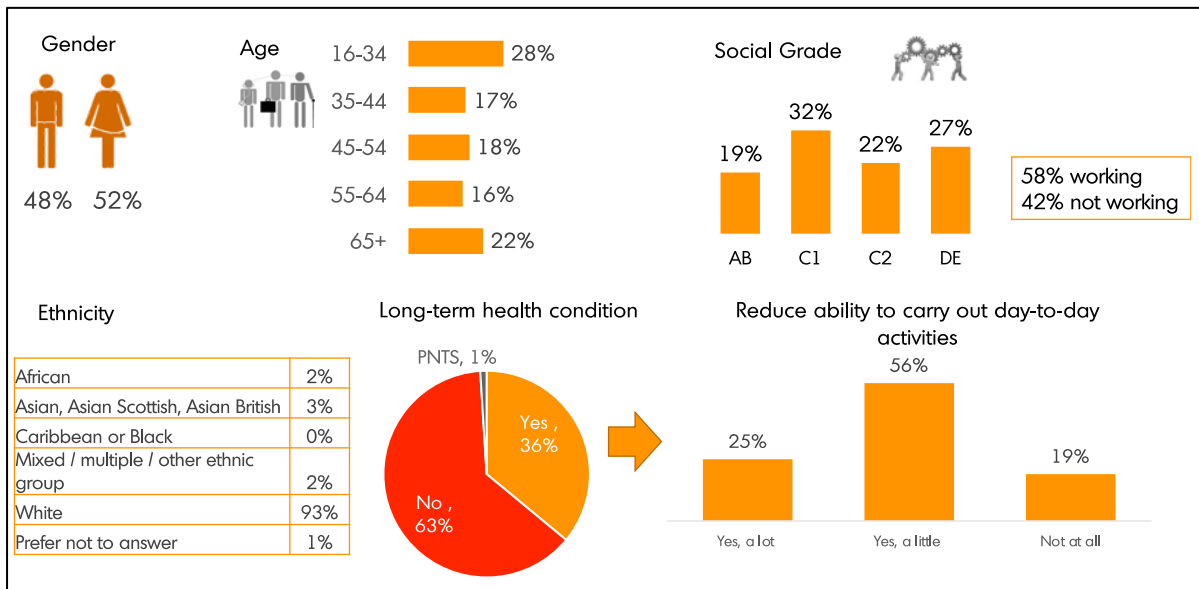
An online survey was conducted between 13th-21st February 2023, with a representative sample of Scottish adults.

A short (10 minute) questionnaire (Appendix B) was designed and developed by the JRS team including questions to test general concern about climate change, and knowledge of the Scottish Government’s net zero by 2045 target, awareness of ‘heat transition’, openness to change heating systems, motivations and barriers of installing a Zero Direct Heating System along with identification of key trusted messengers, communication channels and message formats.

The survey was distributed by JRS’s online panel partner and there were 1,621 base respondents. Weighting was applied on age, gender, and Socio-Economic Group (SEG).

Sample breakdown:

This resulted in a sample with a slight majority of female respondents (52%) and a mix of age groups, slightly skewed towards 16-34 (28%) and 65+ (22%). Just under 6 in 10 (58%) identified themselves as currently in work. Ethnicity of respondents was predominantly White (93%) with Asian/Asian Scottish/Asian British (3%), African (2%), and Mixed/multiple or other ethnicities (2%) also represented. Over one third (36%) of the sample had a long-term health condition, with 81% of these respondents indicating that their condition reduced their ability to carry out day-to-day activities to some extent.

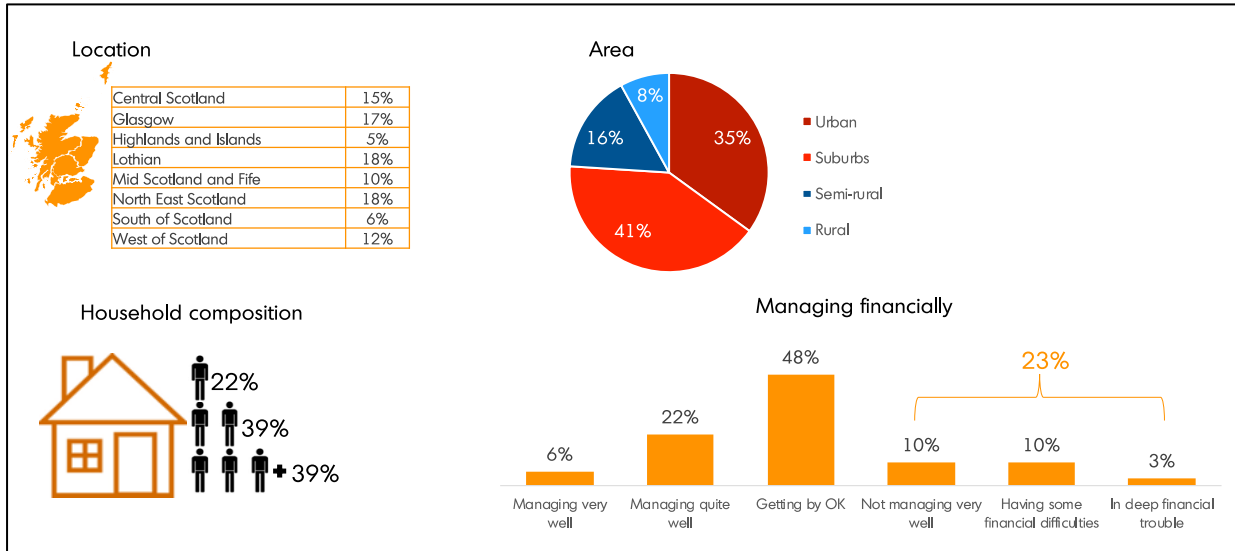


Q5 Do you have a physical or mental health condition or illness lasting or expected to last 12 months or more? Base: All 1621

Q6 Does your condition or illness reduce your ability to carry-out day-to-day activities? Base: Those with a condition 579

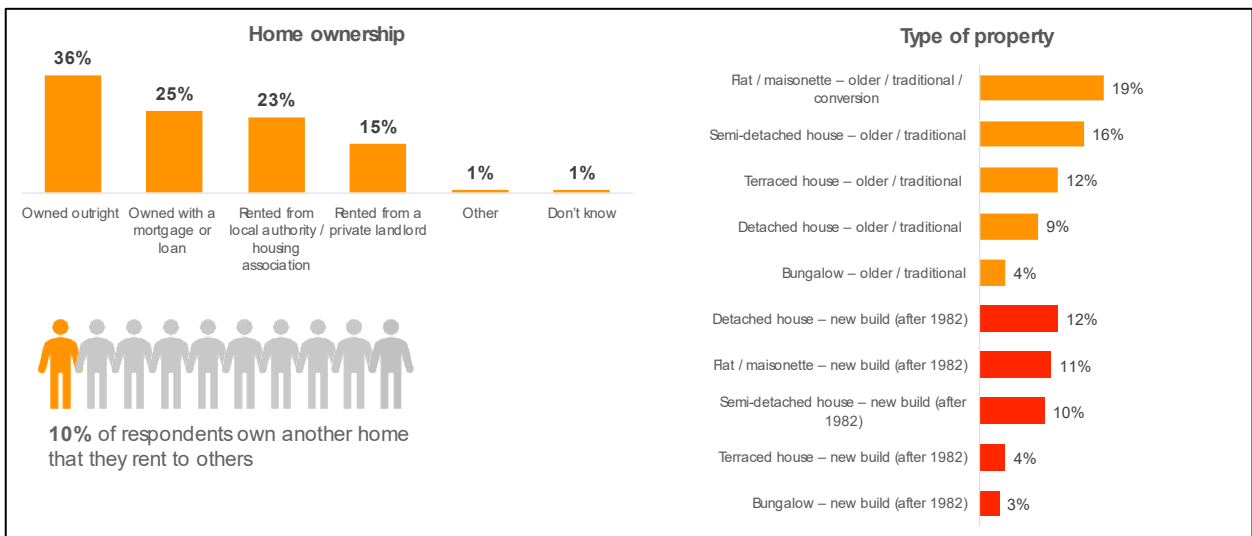
Geographically, the sample included Scotland-wide representation. Just over three quarters of the sample lived in either suburban or urban areas, with the remainder living in semi-rural or rural areas. Around 4 in 10 lived in a household of 3 or more people, with a further 4 in 10 (living in 2-person households and the remaining 2 in 10 (living alone.

Respondents were asked to describe their household’s current financial situation using a 6-point scale which ranged from ‘managing very well’ to ‘in deep financial trouble’. The largest proportion of the sample indicated that they were ‘getting by ok’ (48%), with 28% describing themselves as ‘managing quite well’ (22%) or ‘managing very well’ (6%). At the other end of the scale, 23% indicated that they were experiencing some form of financial pressure, with 10% ‘not managing very well’, a further 10% ‘having some financial difficulties’ and 3% ‘in deep financial trouble’.



Q31 Thinking about your household finances at the moment...Which ONE of the following best describes how you and your household are managing financially these days? Base: All 1621

Home ownership among respondents varied, with just over 6 in 10 either owning their home outright (36%) or with a mortgage (25%). Just under 4 in 10 respondents rented from either socially (23%) or from a private landlord (15%). 1 in 10 respondents owned at least one other home which they rented out to others. The types and ages of property represented ranged widely, with older flats (19%), older semi-detached houses (16%), new build detached houses (12%) and older terraced houses (12%) the most frequent. For the purposes of this research, an ‘older home’ was defined as one built pre-1982.



Q28 Which of the following best describes the ownership of your home? Base: All 1621

Q24 Do you own any properties that you do not live in yourself, but rent out to others?

Q27 Which of these best describes the type of property you live in? Base: All 1621

14. A set of profiling questions were also included in order to enable detailed analysis of the data – by demographics, including protected characteristics, attitudes, and other relevant information such as key life moments
15. The survey was programmed using Snap Survey software, and fully tested prior to launch
16. Once all responses were received, a detailed analysis process was followed, starting with data cleaning and validation, before generating a series of data tabulations for analysis. Weighting was applied on age, gender, SEG.
17. The quantitative data was then examined at two key levels – overall (total) data; and by key sub-groups using cross-tabulations analysis (e.g. age, socioeconomic group, gender, concern about climate change etc.). This allows for comparison of attitudes and awareness related to heat transition between different groups.

3. Qualitative research to identify and assess appropriate trusted messengers

Drawing on the findings of the desk review and quantitative work, the qualitative phase of research aimed to:

18. Explore current levels of awareness and understanding amongst the Scottish public of the ‘heat transition’ as set out in the Scottish Governments Heat in Buildings Strategy, including why it is important, what benefits it can generate, the changes homeowners will need to make, and where and what support they can access.
19. Identify the preferred formats, channels, and messengers for information to support domestic transition to ZDEHS.
20. Explore the extent to which different factors affect how receptive people are to messages around heat transition, including timing, location, format, and channels.

A total of 8 online group discussions took place, attended by 36 participants. The sample focused on owner/residents, but also included some long-term renters, and some owners of property to rent. None of the participants had a ZDEHS installed. The sample included some participants who had considered installing ZDEHS, and some participants who were approaching relevant life events, such as moving house or replacing an existing heating system. A wide range of housing types in both rural and urban areas ensured that specific practical barriers could be explored.

Urban respondents tended to have gas boilers, while rural homes were more likely to use oil or wood burning systems

Gas boilers were used by almost all urban respondents in the group discussions. A few lower SEG respondents reported owning a gas boiler but preferring to use smaller, more targeted heating devices, typically powered by mains electricity (e.g. bar or fan heater) for cost reasons and to increase targeted warmth in their homes.

Those in rural homes not connected to the gas grid typically used oil or wood-fuelled systems. This group often placed a higher priority on energy security – with backup generators or stores of firewood providing a safety net in case of supply outages.

Sample/group breakdown:

Group	Age/gender	SEG	Owner/Renter
1	Younger- under 45yo M/F mix	ABC1	Owner residents

2	Younger- under 45yo M/F mix	ABC1	Owner residents
3	Younger- under 45yo M/F mix	C2D	Owner residents
4	Older- 45yo and over M/F mix	ABC1	Owner residents
5	Older- 45yo and over M/F mix	C2D	Owner Residents
6	Younger- under 45yo M/F mix	BC1C2D	Long Term (+2yrs) Private Renters
7	Older- 45yo and over M/F mix	BC1C2D	Long Term (+2yrs) Private Renters
8	Target mix M/F Target spread of ages from 35 to 60yo	ABC1C2	Landlord and Landladies of private residencies (3 or fewer properties)

A range of other recruitment criteria was used to ensure the sample represented all key segments:

21. Urban and Rural across Scotland- 4 respondents off gas-grid
22. Minority Ethnic x7; 6x had registered disabled person in their home
23. Range of types of home and age of home
24. 32 of the 36 either planned to buy, planned to move, needed to update their heating system, or wanted to update their heating system

The sample excluded anyone:

25. Working in sector connected to heating systems; or in the Scottish Government
26. Already having a ZDEHS
27. Who does not have any influence on the decision-making process regarding heating system maintenance and installation

Client discussion and the findings from the desk review and survey were used to develop a discussion/topic guide and stimulus material.

At the end of fieldwork, the team followed a staged approach to analysis, with each moderator reviewing and analysing their own groups before coming together to discuss and synthesise findings.

Research limitations

28. In the desk review, observations and insight were drawn from over 40 resources. This was a short exercise to find and review Heat in Buildings insight, as described above, that relates to a Scottish/UK population. It was not a full literature review on the topic in question.
29. In the quantitative research we were limited in the explanations we could give about key elements, and in our ability to ask open questions to really measure what people understood by the key terms/ideas. Also, we looked at 'trusted messengers' and channels overall, which didn't allow for the detail around which are best at which stage in the comms process.

All the research adhered to UK GDPR legislation and the Market Research Society Code of Conduct.

7.2 Appendix B – Quantitative online survey

Thank you for agreeing to take part in this survey. It should take no more than 12 minutes to complete.

JRS are independent researchers who abide by the Market Research Society Code of Conduct and GDPR regulations. Our full privacy policy can be read at [Privacy Policy – Jump Research](#)

. Our promises to you:

- We will not disclose any of your details
- We will anonymise all of our reports
- We will only use the information you provide for the purpose of this research
- We will not collect any personal identifying data.

Do you voluntarily agree to take part in the research and provide answers to the survey questions, as well as questions about yourself including gender, age and ethnicity to help with our analysis?

- Yes, I agree to participate
- No, I do not agree to participate

Screening & Quota Questions (to ensure we achieve a representative sample)

Q1. Do you identify as...? SINGLE CODE

- Female
- Male
- Prefer to self-describe (_____)
- Prefer not to answer – CLOSE

Q2. Which of the following age groups do you fall into?

- Under 16 - CLOSE
- 16-17
- 18-24
- 25-34
- 35-44
- 45-54
- 55-64
- 65-74
- 75+
- Prefer not to answer – CLOSE

Q3. Which of the following groups does the Chief Income Earner in your household belong to?

- The person in the household with the largest income is the Chief Income Earner, no matter how this income is obtained.
- If the Chief Income Earner is retired with an occupational pension, please select according to their previous occupation
- If the Chief Income Earner is not in paid employment but has been out of work for less than 6 months, please select based on their previous occupation
- **Semi or unskilled manual worker** (e.g. Manual jobs that require no special training or qualifications; Manual workers, Apprentices to be skilled trades, Caretaker, Cleaner, Nursery School Assistant, Park keeper, non-HGV driver, shop assistant etc.)

- **Skilled manual worker** (e.g. Skilled Bricklayer, Carpenter, Plumber, Painter, Bus/Ambulance Driver, HGV driver, Unqualified assistant teacher, pub/bar worker, etc.)
- **Supervisory or clerical / Junior managerial / Professional / administrator** (e.g. Office worker, Student Doctor, Foreman with 25+ employees, sales person, Student Teachers etc.)
- **Intermediate managerial / Professional / Administrative** (e.g. Newly qualified (under 3 years) doctor, Solicitor, Board director small organisation, middle manager in large organisation, principal officer in civil Service/ local government etc.)
- **Higher managerial/ Professional/ Administrative** (e.g. Established doctor, Solicitor, Board Director in large Organisation (200+ employees), top level civil servant/ public service employee, Headmaster/mistress, etc.)
- **Student** (living away from home)
- Retired and living on state pension only
- **Unemployed (for over 6 months)** or not working due to long term sickness
- Prefer not to answer – **CLOSE**

Q4. Which council area do you permanently live in?

- | | |
|-------------------------|--------------------------------------|
| • Aberdeen City | • Inverclyde |
| • Aberdeenshire | • Midlothian |
| • Angus | • Moray |
| • Argyll and Bute | • Na h-Eileanan Siar (Western Isles) |
| • City of Edinburgh | • North Ayrshire |
| • Clackmannanshire | • North Lanarkshire |
| • Dumfries and Galloway | • Orkney Islands |
| • Dundee City | • Perth and Kinross |
| • East Ayrshire | • Renfrewshire |
| • East Dunbartonshire | • Scottish Borders |
| • East Lothian | • Shetland Islands |
| • East Renfrewshire | • South Ayrshire |
| • Falkirk | • South Lanarkshire |
| • Fife | • Stirling |
| • Glasgow | • West Dunbartonshire |
| • Highland | • West Lothian |
| | • None of these – CLOSE |

Q5. Do you have a physical or mental health condition or illness lasting or expected to last 12 months or more?

- Yes
- No
- Prefer not to answer

IF YES

Q6. Does your condition or illness reduce your ability to carry-out day-to-day activities?

- Yes, a lot
- Yes, a little
- Not at all
- Prefer not to answer

Main Survey

Q7. Overall, how concerned are you about climate change?

- Very concerned
- Quite concerned
- Neither concerned nor unconcerned
- Quite unconcerned
- Completely unconcerned
- Don't know

Q8. How do you currently heat your home? Please select all that apply.

- Mains gas
- Electricity
- LPG
- Oil
- Coal / wood fire
- Solar panels to produce electricity
- Thermal solar panels to produce hot water
- Ground source heat pump
- Air source heat pump
- Biomass boiler
- Other renewable sources
- Other (Specify)

Q9. Does your home have any of the following? Please select all that apply

- Smart meter to monitor your electricity/gas usage
- Smart heating control system (e.g. Hive, Nest, Genius, Tado, Honeywell)
- Cavity wall insulation
- Loft insulation
- Under floor insulation
- Double / triple / secondary glazing
- None of the above
- Don't know

Q10. Are you aware that the Scottish Government has set a target of achieving net zero emissions by 2045?

- Yes
- No
- Unsure

Q11. In order to meet the net zero target, we will need to change the way we heat our homes and buildings by phasing out oil and gas heating systems like boilers. Before today, how much did you know about this?

- A lot
- A fair amount
- A little
- Hardly anything, but I've heard of this
- Never heard of this

Q12. Zero direct emissions heating systems produce zero greenhouse gas emissions at the point of use (in your home). Examples include: solar thermal, heat pumps and heat

networks. Before today, how much did you know about zero direct emissions heating systems?

- A lot
- A fair amount
- A little
- Hardly anything, but I've heard of this
- Never heard of this

Q13. The Scottish Government is considering introducing regulations to make it a legal requirement for all property owners to install zero direct emissions heating systems. Were you aware of this?

- Yes
- No
- Unsure

Q14. Before today, which if any of the following types of zero direct emissions heating systems had you heard of? Please tick all that apply.

- **Air source heat pumps** - these extract heat from the outside air to heat your home and water.
- **Ground source heat pumps** - these extract heat from pipes buried in the ground to heat your home and water.
- **Heat networks (also known as communal or district heating)** – these take heat from a central source and distribute it to multiple customers in a building or across several buildings.
- **Solar thermal panels** - these capture heat from the sun to provide hot water, typically in a storage tank. This is not the same as solar panels which use energy from the sun to produce electricity.
- Other zero emissions heating system (specify _____)
- None of these

Q15. Were you aware that the Scottish Government provides funding to support the installation of zero direct emissions heating systems in properties – owner occupiers may be eligible for a grant worth up to £7,500 (or up to £9,500 if living in a rural area), available through Home Energy Scotland?

- Yes
- No
- Unsure

Q16. Who would you trust to provide advice about installing a zero direct emissions heating system in your home? Please select all that apply

- Heating engineer / gas fitter / plumber
- Another type of tradesperson (e.g. builder)
- The Scottish Government
- Local authority / council
- Manufacturer of heating systems / boilers
- Specialist energy advice organisation e.g. Home Energy Scotland, Energy Saving Trust
- Other national consumer advice organisation e.g. Citizens Advice Bureau
- Local charity or community group
- Friends / family / neighbours

- Someone who has installed zero direct emissions heating in their home
- Energy supplier (e.g. Scottish Power, British Gas, Ovo)
- Housing association
- My landlord
- Bank
- Insurance provider
- Surveyor
- Architect
- Someone else (specify _____)
- None of these

Q17. And which of these would you turn to first for advice about installing a zero direct emissions heating system in your home? Choose ONE answer only. MASK CODE LIST (ONLY SHOW CODES SELECTED AT Q16)

- Heating engineer / gas fitter / plumber
- Another type of tradesperson (e.g. builder)
- The Scottish Government
- Local authority / council
- Manufacturer of heating systems / boilers
- Specialist energy advice organisation e.g. Home Energy Scotland, Energy Saving Trust
- Other national consumer advice organisation e.g. Citizens Advice Bureau
- Local charity or community group
- Friends / family / neighbours
- Someone who has installed zero direct emissions heating in their home
- Energy supplier (e.g. Scottish Power, British Gas, Ovo)
- Housing association
- My landlord
- Bank
- Insurance provider
- Surveyor
- Architect
- Someone else (specify _____)
- None of these

Q18. How would you prefer to find out information about installing a zero direct emissions heating system in your home? Please select all that apply

- Online using a search engine e.g. Google, Microsoft Edge, Yahoo
- Online on a website
- Social media
- In person at an event
- In person at a high street show room
- By talking to a trusted advisor
- By talking to someone who has installed zero direct emissions heating in their home
- By phone
- Leaflets / information sent to my home
- A visit to your home by an advisor
- Another way (specify _____)

Q19. What types of information would be most useful for you when considering whether to install a zero direct emissions heating system? Please select all that apply

- What changes are needed to home heating systems and why
- The benefits of changing to a zero direct emissions heating system
- Costs of installing a zero direct emissions heating system
- Running costs of a zero direct emissions heating system
- Help and advice about how to change to a zero direct emissions heating system
- Which heating system is best for my home
- Reliability of zero direct emissions heating system
- Financial support available to change my heating system
- How to find a tradesperson to install my zero direct emissions heating system
- Something else (specify _____)

Q20. When would you be most likely to consider installing a zero direct emissions heating system? Please select all that apply

- When moving to a new home
- When doing general home renovations
- When my old heating system / boiler breaks down or needs replaced
- If my neighbours were installing zero direct emissions heating systems
- If other friends / family were installing zero direct emissions heating systems
- Another time (when? _____)
- Only if I had to in order to comply with new legislation

Q21. Taking everything into consideration, how likely is it that you would install a zero direct emissions heating system in your home in the next 5 years?

- Very likely
- Fairly likely
- Not very likely
- Not at all likely
- Unsure
- Not applicable – not my decision

IF VERY / FAIRLY LIKELY

Q22. Why do you say you are likely to install a zero direct emissions heating system? Please select all that apply

- To make use of available financial support (e.g. grants / loans)
- To save energy / be more energy efficient
- To reduce my heating bills
- To make sure I have a warm home
- Other people I know are installing zero direct emissions heating systems
- To help protect the environment
- I know I will have to in the future anyway, in line with proposed regulations by the Scottish Government
- It has been recommended to me (SPECIFY WHO)
- Another reason (specify _____)

IF NOT VERY / NOT AT ALL LIKELY

Q23. Why are you currently unlikely to install a zero direct emissions heating system?

Please select all that apply

- Concern about cost of installation
- Would rather wait and see how the technology develops
- Unsure if appropriate/ possible to install in my home
- Don't know enough about zero direct emissions heating systems
- Don't know enough about why it is necessary and the benefits it can provide
- Concern about running costs
- Unaware of what support is available to me to help undertake the changes required
- Happy with current system / don't want to replace it
- Too much hassle / concern about level of disruption involved within my property
- Don't know where to find information I can trust
- Something else (_____)
- Unsure

Q24. Do you own any properties that you do not live in yourself, but rent out to others?

- Yes
- No

And finally, a few questions about you. Remember all answers you give are completely confidential.

Q25. What is your ethnic group? **SINGLE CODE**

African

- African, African Scottish or African British
- Any other African

Asian, Asian Scottish or Asian British

- Pakistani, Pakistani Scottish or Pakistani British
- Indian, Indian Scottish or Indian British
- Bangladeshi, Bangladeshi Scottish or Bangladeshi British
- Chinese, Chinese Scottish or Chinese British
- Any other Asian

Caribbean or Black

- Caribbean, Caribbean Scottish or Caribbean British
- Black, Black Scottish or Black British
- Any other Caribbean or Black

Mixed or Multiple ethnic groups

- Any Mixed or Multiple ethnic groups

White

- Scottish
- Other British
- Irish
- Gypsy/Traveller
- Polish
- Any other White ethnic group

Other ethnic group

- Arab, Arab Scottish or Arab British
- Any other ethnic group
- Prefer not to answer

Q26. Which of these best describes your working status? (Please tick one box only)

- In paid full-time employment (30+ hours per week)
- In paid part-time employment (less than 30 hours per week)
- Self-employed full time (30+ hours per week)
- Self-employed part-time (less than 30 hours per week)
- Unemployed
- Retired from paid work altogether
- On maternity/paternity leave
- Looking after family or home
- Full-time student/ at school
- Long term sick or disabled
- Unable to work because of short-term illness or injury
- On a government training scheme
- Something else (please write in) _____
- Prefer not to answer

Q27. Which of these best describes the type of property you live in? Note – building standards changed in 1982, so homes built after this time are classed as ‘new build’ here.

- Detached house – new build (after 1982)
- Detached house – older / traditional
- Semi-detached house – new build (after 1982)
- Semi-detached house – older / traditional
- Terraced house – new build (after 1982)
- Terraced house – older / traditional
- Bungalow – new build (after 1982)
- Bungalow – older / traditional
- Flat / maisonette – new build (after 1982)
- Flat / maisonette – older / traditional / conversion
- Other (specify)

Q28. Which of the following best describes the ownership of your home?

- Owned outright
- Owned with a mortgage or loan
- Rented from local authority / housing association
- Rented from a private landlord
- Other (specify _____)
- Don’t know

Q29. How many people live in your household, including yourself?

- 1 – live alone
- 2
- 3
- 4
- or more
- Prefer not to say

Q30. Which of the following best describes the area you live?

- Urban (in city or town)
- Suburbs (just on outskirts of city or town)
- Semi-rural (in a village not attached to city)
- Rural (a small group of houses or house on own)

Q31. Thinking about your household finances at the moment...Which ONE of the following best describes how you and your household are managing financially these days?

- Managing very well
- Managing quite well
- Getting by OK
- Not managing very well
- Having some financial difficulties
- In deep financial trouble
- Prefer not to say

CLOSE

Thank you very much for taking part in this important research.

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