

European project on consumer response
to energy labels in buildings



Deliverable 5.2

A study of homeowners' energy efficiency improvements and the impact of the Energy Performance Certificate

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Project: Improving Dwellings by Enhancing Actions on Labelling for the EPBD
Acronym: IDEAL EPBD
Home page: <http://www.ideal-epbd.eu>
Agreement: IEE/07/600/SI2 499426
Co-ordinator: Energieonderzoek Centrum Nederland

Supported by Intelligent Energy Europe.

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Acknowledgements

The project relied on contributions from members of the IDEAL EPBD project team. The authors would like to thank them for the time and resources that they committed to the development of the questionnaire, the administration of the survey and reviewing the report.

We would particularly like to thank Toke Haunstrup Christensen and Kirsten Gram-Hanssen (SBI), Francoise Bartiaux (UCL), Bettina Brohmann and Martin Cames (OEKO), Krzysztof Klobut and Anne Tolman (VTT), Casper Tigchelaar, Marjolein de Best-Waldhober and Julia Backhaus (ECN) and Sara Coward (BRE).

Executive Summary

A survey of homeowners was carried out in five member states: Denmark, Germany, the Netherlands, England and Finland. Homeowners were asked a range of questions about the home improvement that they had completed and planned; the Energy Performance Certificate (EPC); and factors that may influence their decision-making around energy efficiency. The questionnaire was in the field during the spring and summer of 2010, in the form of an online survey that was distributed to homeowners by mail, email or via a link from the project website.

The survey collected responses from 3,207 homeowners. Despite the fact that the study sampled households with an EPC, or those that should have one because they had recently been involved in purchasing a dwelling, some respondents were unaware of having an EPC for their home. About 60% (1,912) of homeowners reported that they had an EPC.

Key findings

- Over 50% of households had either installed energy efficiency lighting, or planned to; and 48% of households had installed, or planned to install, some form of insulation.
- Households living in a dwelling in a 'very poor' condition were about 18 times more likely to carry out improvements than someone living in a dwelling rated in a 'very good' condition.
- Homeowners living in dwellings built between 1919 and 1970 were around four times more likely to have completed an energy efficiency measure compared to homeowners living in a dwelling built after 2000.
- Around 60% of homeowners who were aware of the recommendations available with their EPC had carried out one or more energy efficiency measures, compared with just over 40% of households who could not recollect or were unaware of the recommendations.

Conclusion

The EPC on its own was not the strongest driver influencing whether homeowners purchased a particular dwelling or carried out improvements. However, homeowners with an EPC with recommendations were up to twice as likely to have carried out one or more energy efficiency measures, when compared to homeowners without, or unaware of, the EPC for their home. Therefore increasing the availability of this tool, and creating wider use and understanding of it, may enhance the likelihood that more energy efficiency measures will take place.

What drives homeowners to implement energy efficiency measures?

- The perceived condition of the dwelling
- The age of the dwelling
- The Energy Performance Certificate

What barriers do homeowners face when implementing energy efficiency measures?

- Lack of awareness of the Energy Performance Certificate
 - Lack of awareness of the recommendations received with the Energy Performance Certificate
 - Lack of visibility of the Energy Performance Certificate at the home-buying stage
 - Reluctance to use the Energy Performance Certificate to inform a home purchase decision
 - Level of trust in the Energy Performance Certificate
 - Energy efficiency is not a consideration for homebuyers
 - The competition between general and energy efficiency improvements
-

A summary of homeowners' energy efficiency improvements and the impact of the Energy Performance Certificate

Article 11 of the Energy Performance of Buildings Directive¹ (EPBD) targets dwellings that are sold, newly built or rented. The 'IDEAL EPBD' survey focused on homeowners, as they are a key group affected by this aspect of the Directive. Seventy-three percent of households in the EU-27 member states are owner-occupiers. The energy efficiency behaviour of this group, therefore, has a bearing on the energy saving potential in each country. Previous work carried out by the IDEAL EPBD project team suggests that there is the potential to save 20% of present heating energy consumption of dwellings by 2030². However, homeowners' behaviour will determine whether all this energy saving will be realised. Determining how this group reacts to the EPBD may help to assess the likelihood of countries' reaching their energy saving targets.

Methodology

A survey of homeowners was carried out in five member states: Denmark, Germany, the Netherlands, England and Finland. Homeowners were asked a range of questions about their home improvement behaviour, the Energy Performance Certificate (EPC) and factors that may influence their decision-making around energy efficiency. The questionnaire was informed by a literature review, stakeholder interviews and in-depth homeowner interviews in ten member states. The questionnaire was in the field during the spring and summer of 2010, in the form of an online survey that was distributed to homeowners by mail, email or via a link from the project website. The samples in Denmark and the Netherlands were drawn from households with an EPC. In Germany, England and Finland, the samples were drawn from homeowners who had bought a dwelling during the previous two years while EPCs were required under the EPBD in their country.

Objective

The IDEAL EPBD project aims to assess the impact of EPCs as laid out in the EPBD. In particular, it aims to investigate whether EPCs affect buyers' behaviour, or whether they motivate homeowners to carry out energy efficiency home improvements. The key objective of this report is to assess the behaviour and attitude of homeowners towards the EPC.

The sample

The survey collected responses from 3,207 homeowners as shown in the table below.

Percentage of homeowners by length of time since moving into property

	All five countries	Denmark	Germany	Netherlands	England	Finland
Less than 6 months	6%	8%	5%	7%	4%	11%
6-23 months	57%	42%	66%	51%	70%	57%
24 months or more	27%	20%	23%	40%	25%	26%
Not declared	10%	30%	6%	1%	1%	6%
N	3,207	743	1,165	565	625	109
% of total sample	100	23	36	18	19	3

¹ Directive 2010/31/EU

²Tuominen and Klobut (2009)

The majority of the sample consisted of recent homebuyers that had bought a dwelling within two years of the survey. The survey also collected data from homeowners who had bought dwellings earlier, generally because it was assumed that they had an EPC for reasons other than a recent purchase.

The age of the dwellings in the sample varied. A fifth of the sample occupied dwellings built after 2000. Either couples or families comprised the majority (76%) of households in the survey. There were broad similarities in the demographic and housing stock profile of the sample from each country.

Key findings for all homeowners

Homeowners' attitudes to home-buying

Homeowners rated the availability of the garden/outdoor space, the price and the location of the property as the most important factors when they were considering purchasing a property. The potential cost of energy and other utilities was ranked ninth in a list of twelve potential home-buying priorities.

An assessment of the dwelling

The condition of the dwelling played an important role in homeowners' decisions to carry out energy efficiency improvements. Over half of homeowners reported that they purchased a property that was in a good condition, and just over a fifth purchased a property that they described as being in a poor condition. More than half of homeowners lived in dwellings where the living room temperature during the winter months was regarded as comfortable; this temperature was on average 21°C. Fewer than one in ten homeowners lived in dwellings that were uncomfortably hot or cold.

Over a third (36%) of homeowners had problems with draughts, high energy bills, their heating system or the temperature in their home. Less than a third had identified other non-energy related problems with their dwelling after they had moved in; these ranged from general repairs to problems with damp and condensation and pest control.

Thirty-six percent of homeowners who had completed energy efficiency measures rated their current dwelling to be in a poor condition at the time of purchase; this was only the case for 6% of homeowners who had not completed improvements.

General home improvements

Three quarters of the homeowners surveyed had completed some form of home improvement at the time of the survey. The median number of home improvements was 4; this increased to 5 among homeowners who had carried out at least one improvement. Costlier improvements such as installing or improving a kitchen or bathroom were carried out by 52% (for kitchens) and 46% (for bathrooms) of homeowners who had completed improvements.

Energy efficiency improvements

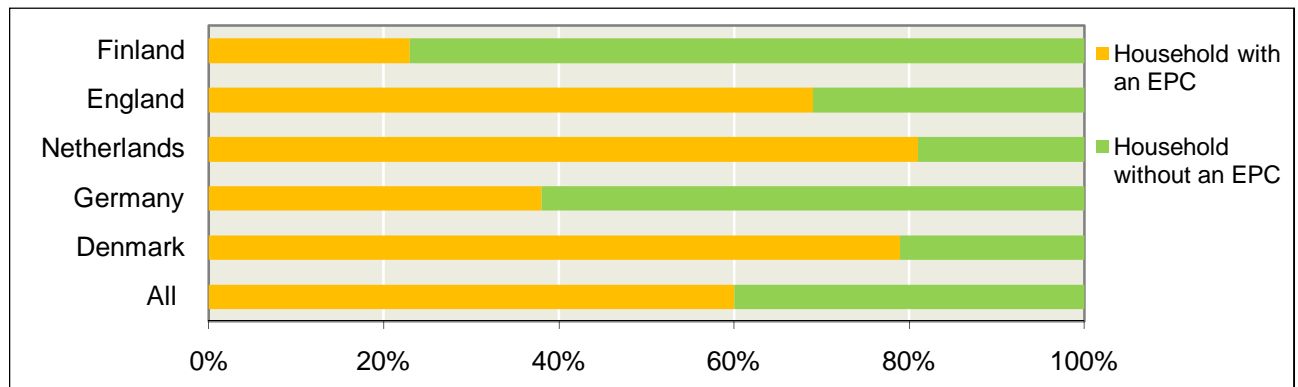
Over 50% of households had either installed energy efficiency lighting, or planned to; and 48% of households had installed, or planned to install, some form of insulation. Renewable technologies had been installed by just over 5% of all households. The most common renewable technology installed was a solar water heating system (110 households) followed by a wood-fuelled heating system (50) and solar electricity systems (49 homeowners).

The EPC as a source of information

The study found that some respondents were unaware of having an EPC for their home. Various questions were used to determine whether a household remembered seeing an EPC. This included images of the energy label available in their country, and questions that linked the label to the home-buying and selling

process. About 60% (1,912) of homeowners reported that they had an EPC. Over 70% of homeowners with an EPC had one because they had purchased a property, and 17% voluntarily acquired one.

EPC status of homeowners



There were notable differences in the EPC status of homeowners in the countries involved in the study. More than 70% of homeowners in Finland, and more than 60% in Germany did not have an EPC for their dwelling.

Of homeowners who had an EPC because they had purchased a property, less than half were shown the EPC before they made an offer on that property. Less than a third (30%) saw it after an offer was accepted but before the transaction was completed, and a further 14% saw the EPC after the transaction was completed. Only a third of homeowners who saw the EPC before making an offer reported that it was an important factor in their decision to make an offer on their current dwelling.

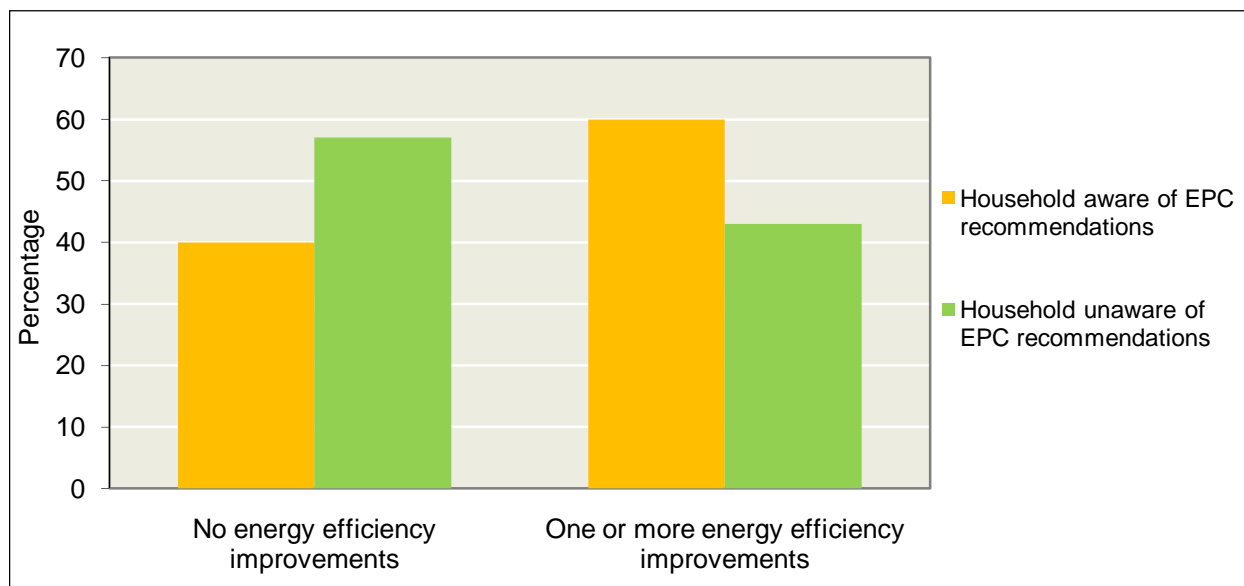
While two-thirds of the homeowners in the sample were aware that they had an EPC, a smaller group of these was aware of some of the details contained in the document, such as the energy efficiency rating and the energy efficiency recommendations. Almost 70% of homeowners who had an EPC for their home could recall its energy efficiency rating, and about 50% could recall the energy efficiency recommendations included with it.

The impact of the EPC on homeowners' energy efficiency investments

Overall, the EPC was found to influence homeowners' decision-making, although the percentage of homeowners with an EPC, and who had carried out one or more energy efficiency improvements, was only slightly higher than those who had carried out improvements without being aware of an EPC.

The graph below shows notable differences between the percentage of homeowners carrying out energy efficiency improvements, depending on whether they had knowledge/awareness of a full EPC (including recommendations) or an EPC without knowledge/awareness of the recommendations report.

EPC recommendations and energy efficiency behaviour



Fifty-seven percent of households, in Denmark, Germany, the Netherlands and England, that had an EPC with recommendations had carried out one or more of the recommendations likely to feature on an EPC recommendations report³. The percentage of households in the other EPC categories carrying out these type of measures was much lower, 40% (EPC without recommendations) and 44% (households without an EPC).

There were also differences between countries. Almost 70% of homeowners in the Netherlands with an EPC with recommendations had carried out these types of energy efficiency measures. In Denmark, the figure was 52%, but only 29% of Danish households that had an EPC but were not aware of recommendations had carried out one or more of these energy efficiency measures.

The impact of the EPC and other factors on homeowners' energy efficiency investments

The EPC continued to be a factor that informed homeowners' decision-making, even when it was considered among many other factors. The graph below shows a series of factors that influence homeowners' energy efficiency investments. All the factors are on the right of the dotted line (i.e. 1 and above), which indicates that they increased the likelihood that an energy efficiency measure would be completed.

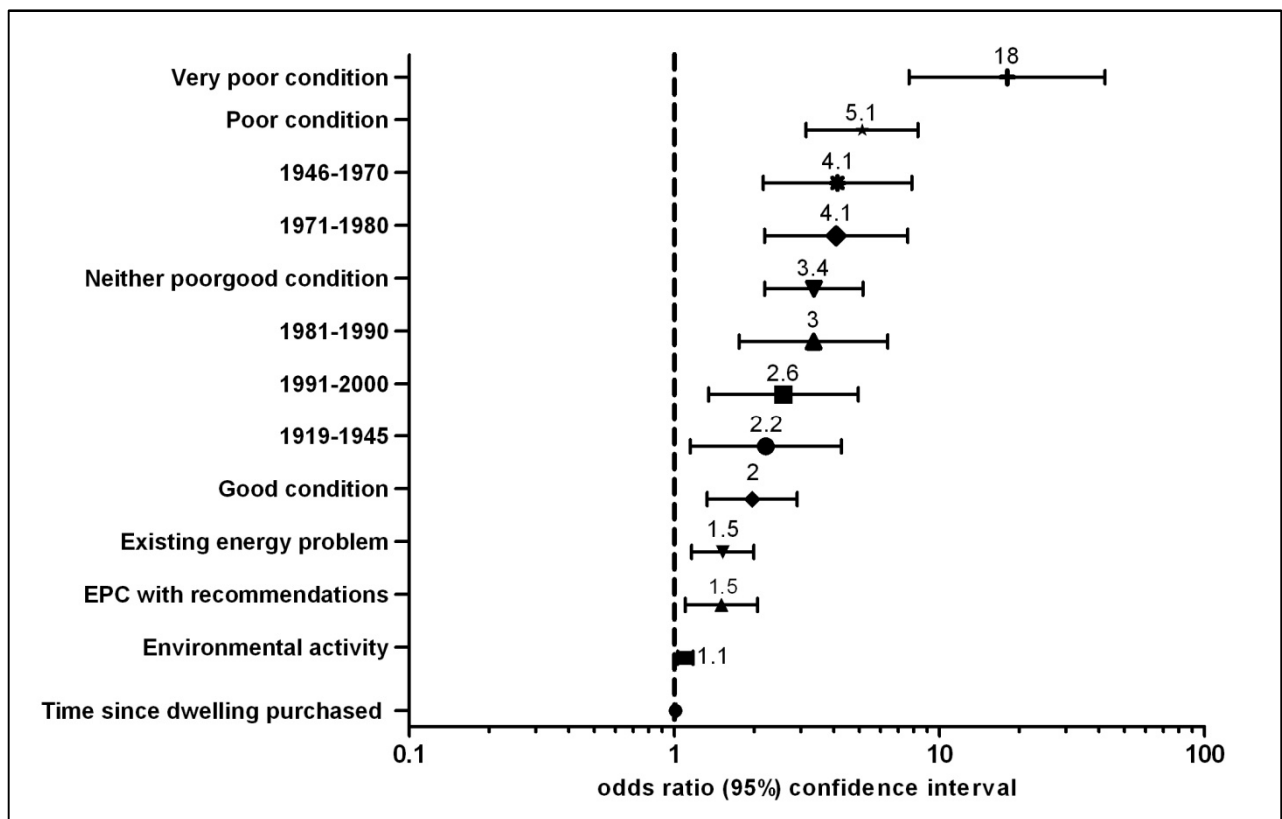
Homeowners with an EPC with recommendations were up to twice as likely to have carried out one or more energy efficiency measures when compared to homeowners without, or unaware of, the EPC for their home. However, other factors had a more striking influence on homeowners' decision-making. These were the perceived condition of the dwelling and the age of the dwelling.

The age and condition of the dwelling affected the likelihood that an energy efficiency measure would be completed. The poorer the condition of the homeowners' current dwelling, the more likely they were to have carried out one or more energy efficiency measures. A homeowner who rated their dwelling to be in a

³ There were six energy efficiency measures that featured as potential recommendations in all five member states. These were: insulate roof and or loft, insulate walls, improve glazing, upgrade and or install boiler, improve central heating system, and use or install solar energy system.

'good' condition were more likely to carry out energy efficiency improvements than someone living in a dwelling rated in a 'very good' condition. Compared with a dwelling rated in a 'very good' condition, those in a 'poor' condition were five times more likely to be improved, and dwellings in a 'very poor' condition were about 18 times more likely to be improved, and homeowners in older dwellings were also more likely to have carried out an energy efficiency measure. This is notably the case for dwellings built between 1919 and 1970, which are about four times as likely to be improved as dwellings built after 2000.

Factors influencing the energy efficiency behaviour of all homeowners



Potential support mechanisms

More than half of all homeowners thought that 'talking to an energy professional' would help them to decide on the action necessary to improve the energy efficiency of their home. Two-fifths thought that 'better information from my energy supplier' would be beneficial. The media and the internet were the least popular choices.

The majority of homeowners rated monetary issues to be important. The overall cost of making improvements was important for 85% of homeowners, while 51% considered it 'very important'.

More than half of all homeowners were 'very interested' in a grant to carry out energy efficiency home improvements and repairs, in paying a lower level of tax because they had made energy efficiency home improvement, or in a reduction in price of energy efficiency products. A fifth were 'not at all interested' in a low interest loan for energy efficiency home improvements and repairs, and 10% were 'not at all interested' in paying a lower level of tax based on their EPC score.

Conclusion

The EPC on its own was not the strongest driver influencing whether homeowners would purchase a dwelling or carry out improvements. However, homeowners with an EPC with recommendations were up to twice as likely to have carried out one or more energy efficiency measures, in comparison with homeowners without, or unaware of, the EPC for their home. Therefore increasing the availability of this tool, and creating wider use and understanding of it, may increase the likelihood that more energy efficiency measures will be taken.

The main drivers of energy efficiency investment were:

- The perceived condition of the dwelling
- The age of the dwelling
- The EPC

The main barriers to energy efficiency investment were:

- Lack of awareness of the EPC
 - Lack of awareness of the recommendations received with the EPC
 - Lack of visibility of the EPC at the home-buying stage
 - Reluctance to use the EPC to inform a home purchase decision
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1 Introduction

Energy efficiency forms a major part of the energy strategy of the European Commission. In 2007, the European Council agreed 'to reduce greenhouse gas emissions by 20%, to increase the share of renewable energy to 20% and to make a 20% improvement in energy efficiency'⁴. In 2010, the European Commission reported concerns about meeting these stated objectives. However the Commission is clear that energy efficiency remains a priority:

"Energy efficiency is the most cost effective way to reduce emissions, improve energy security and competitiveness, make energy consumption more affordable for consumers as well as create employment, including in export industries. Above all, it provides tangible benefits to citizens: average energy savings for a household can amount to €1,000 per year."

One of the main instruments for reaching the energy efficiency target in the residential sector is the Energy Performance of Buildings Directive (EPBD), originally introduced in 2002 and recently recast in 2010⁵. The EPBD introduced Energy Performance Certificates for dwellings that are sold, newly built or rented. The certificate provides details of the energy performance status of the dwelling, often divided into seven classes such as A to G. In most member states, the EPC includes advice on energy efficiency measures that would reduce energy use.

The Improving Dwellings by Enhancing Actions on Labelling for the Energy Performance of Buildings Directive (IDEAL EPBD) project is funded by the European Commission under the 'Intelligent Energy – Europe' programme. IDEAL EPBD focuses on understanding households' energy efficiency behaviour. The project started in October 2008 and will end in September 2011. Ten member states are involved. Further details are available online at <http://www.ideal-epbd.eu/>.

This report provides findings from a homeowners' survey, as part of work package 5 of the project. The purpose of the IDEAL EPBD survey was to examine the energy efficiency behaviour and attitude of homeowners with an EPC and to investigate the usefulness of the EPC in homeowners' decision-making about home improvements. Five countries were involved in the survey: Denmark, Germany, the Netherlands, United Kingdom (England) and Finland.

The 'IDEAL EPBD' survey focused on homeowners. Seventy-three percent of households in the EU-27 member states are owner-occupied and a good proportion of these households is likely to be involved in the home-buying process each year. The energy efficiency behaviour of this group, therefore, has a bearing on the energy-saving potential in each country. Previous work carried out by the IDEAL EPBD project team suggests that there is the potential to save 20% of the present heating energy consumption of dwellings by 2030⁶. Determining how this group reacts to the EPBD may help to assess the likelihood of countries reaching their energy saving targets.

⁴ European Commission (2010a)

⁵ European Commission (2010b)

⁶ Tuominen and Klobut (2009)

The objective of the survey was to report on the behaviour and attitude of homeowners towards the Energy Performance Certificate (EPC). The key questions were:

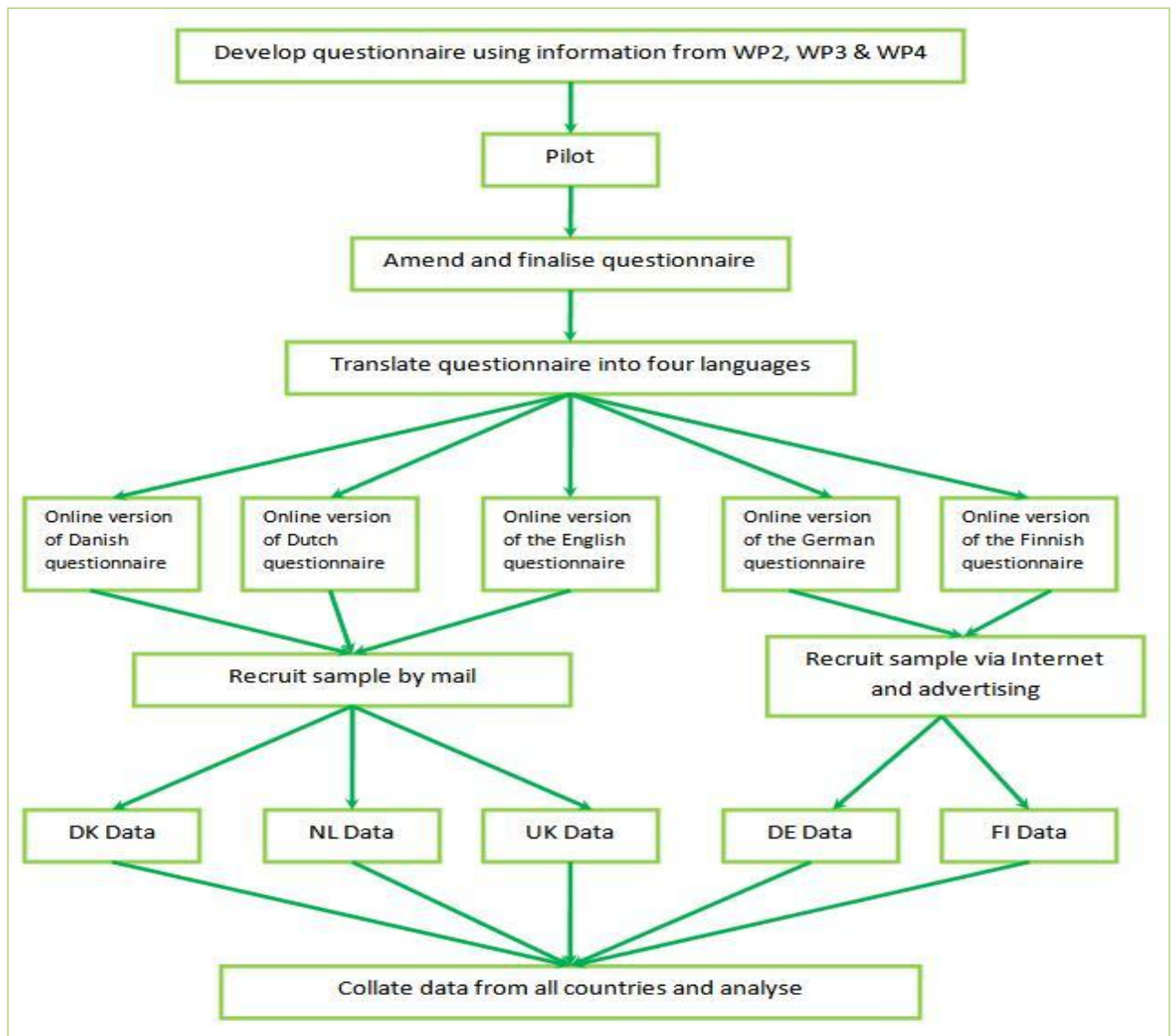
- To provide an overview of the energy efficiency behaviour of homeowners
 - Which energy efficiency measures do homeowners invest in?
 - What barriers do homeowners face when implementing energy efficiency measures?
 - What motivates homeowners to implement energy efficiency measures?
- To measure the use and effectiveness of the EPC by homeowners
 - What part, if any, does the EPC play on homeowners' decision to carry out energy efficiency home improvements?
 - What part, if any, do the recommendations stated in EPCs play on homeowners decision to carry out energy efficiency home improvements?
- To compare homeowners attitude and behaviour to energy efficiency by country

The survey collected responses from over 3,000 homeowners. The findings provide insight into the energy efficiency measures taken by homeowners, and the impact of the EPC on their decision-making. These findings and others will be used to formulate policy action plans at the European level and for each country as part of Work Package 6.

2 Methodology

An online survey of homeowners was carried out in five European Union member states. These were Denmark, Germany, the Netherlands, United Kingdom (England) and Finland. Some aspects of the methodology differed in some countries, and this chapter provides details of the methodology used to develop the questionnaire, to access a sample and collect the data. Figure 1 provides a summary of the main features of the research method.

Figure 1 The main features of the research method



2.1 Developing the questionnaire

The questionnaire was developed in consultation with partner organisations from the five member states involved in the online study (ECN, Oeko, SBI, VTT & BRE). The questionnaire was informed by information collated during various stages of the IDEAL EPBD project, including a literature review, stakeholder interviews, a national policy review and 50 in-depth pilot interviews.

2.1.1 Literature review

The literature review⁷ focused on individual and household energy behaviour and energy efficiency in residential buildings. The literature review included studies based on approaches and schools of thought in economics, psychology and sociology. In total, 74 studies were reviewed; more than half of them were published in the year 2007 or later. Most of the documents were related to behavioural aspects and to recommendations for improvements for policy measures. The literature review pointed to theoretical studies that provided insight into consumer behaviour; for example the concept of 'natural timing' posited by Gelissen (2008) and the 'phase-model of behavioural change' (Prochaska et al. 1997) both confirmed the importance of 'time' and 'situation' and led to the inclusion of questions about property purchase date, move-in date and the reason for having an EPC. The literature review documents barriers and factors that may influence consumers' behaviour. Some of these are listed below:

- The importance of an individual's attitude to 'green' issues (Hering 2007)
- The impact of socio-economic group (Hering 2007) and (Gelissen 2008)
- The impact of dwelling type (Gelissen 2008)
- The issue of payback time (Sunikka 2005), Gelissen 2008 and Caird 2007)
- The relationship between the energy bill and the household budget (Gelissen 2008)
- The dissemination of information (contact between homeowner and energy professional) (Cowi 2001 and Jensen 2004)
- The influence of negative press/media (Jensen 2004)
- The impact of economic incentives (EHHP 2008, Uitdenbogerd 2007a, Helsingin 2009, MoE Finland 2008, Wilkinson 2008 and Steg et al. 2006)
- The influence of energy suppliers (Oxera 2006)

2.1.2 Stakeholder interviews

Each member state that was involved in the IDEAL EPBD project interviewed national stakeholders and policy makers. The purpose of the interview was to gather their views on the barriers that prevented the successful implementation of energy labelling for housing⁸. The barriers identified by stakeholders and deemed most relevant for the survey fell under three main categories:

- Regulation
- Financial
- Information, promotion and education

As a result of the stakeholder interviews, it was clear that a number of factors should be explored in the questionnaire including incentives, subsidies and the visibility of the label.

2.1.3 In-depth interviews in 10 member states

Five in-depth interviews with homeowners were carried out in all ten member states involved in the project. The findings from these 50 in-depth interviews informed the development of the questionnaire. The key

⁷ Brohmann *et al* (2009)

⁸ Tuominen and Klobut (2009)

objective of the interview was to gather information on homeowners' experience of home renovations and the EPC. There was a notable number of barriers to action reported in the interviews, including:

- Financial constraints
- Cost-effectiveness of improvement measures
- Timing, missed opportunity
- Price
- Appearance of improvement
- Intention not to stay in the dwelling
- Other home improvement priorities
- Poor quality of materials and work
- Lack of control of work and prices, bureaucracy, frequent changes of laws and rules
- Lack of information and knowledge
- Negative depiction by media or estate agents
- Degree of concern about environmental issues
- Lack of interest regarding environmental issues
- Price of energy

2.1.4 Summary

The three main sources of information (literature review, stakeholder interviews and in-depth interviews) highlighted both similarities and differences in the homeowners' experience of EPCs. Some of the issues raised were country-specific; they identified the impact of specific policies in place in a country. If the country was included in the survey, these issues were taken forward and considered. If the country was part of the qualitative part of the study, these issues were explored during further in-depth interviews. The impact of finance was a common theme through all three sources, whereas the impact of the media was highlighted in the literature and during the in-depth interviews. The questionnaire was formed by listing all the issues and then deciding how they could be explored in a questionnaire. The policy reviews also provided details of the way in which the EPBD had been implemented in each country.

2.2 A pilot of the questionnaire

The questionnaire was developed in partnership with ECN, Oeko, SBi, VTT and BRE. Once the questionnaire had been finalised, it was transformed into an electronic version so that it could be tested by homeowners. A qualitative pilot of the questionnaire took place between December 2009 and February 2010 in England. Thirteen homeowners were interviewed. Homeowners were recruited by mail from a database of recent home buyers in the area within three miles of BRE's headquarters in Watford, UK. Homeowners received £30 for attending the interview. They were interviewed using cognitive interviewing techniques. Cognitive interviewing 'explicitly focuses on the cognitive processes that respondents use to answer survey questions; therefore, covert processes that are normally hidden, as well as overt, observable ones, are studied'; an example of a cognitive interviewing technique used during this study was 'verbal probing'; participants were asked to paraphrase questions (ask them in their own words), and they were also asked to explain how they arrived at certain answers.⁹ Half of the homeowners completed the questionnaire online and were timed. The rest completed some of the questions by hand, and all were interviewed for up to an hour and a half to gauge their understanding of a number of questions, and of terms that would be used in the questionnaire, such as 'energy efficiency' and 'home improvements'.

⁹ Caspar *et al* (1999)

Seven men and six women were interviewed; they lived in a range of dwellings, from those built before 1919 to newer dwellings built up to 1991. Six of the participants were under 30 years of age, four were in their thirties and the rest over 40. Ten of the participants had attained a university degree.

Seven of the 13 interviewees were asked to complete an online questionnaire. The participants were timed, to gather information on the length of time it might take potential participants to complete the task at home. Four of the participants completed the online questionnaire in 20 minutes or less; the longest time was 25 minutes and the shortest time was 10 minutes.

Much of the feedback surrounded key questions on the barriers and drivers of energy efficiency home improvements. The following is an example of a question that was asked during the interview and the open ended response from a participant:

E6. How important to you are the following, when you are thinking about home improvements and repairs?
E6c. The time it will take to get payback on the money invested

'Because we're quite careful about making sure we've always got a certain amount of savings for emergencies, if I feel it would take so long to payback to have something done we would think twice about it. (Prompted and reads question again) Sorry haven't read that very well, I read it as how long it would take to pay back what I had spent out, but other than get back. Get pay back means what it's trying to ask me now that I'm looking at it differently is if I'd had the loft insulation put in when it would start to make a difference to my bills, lower the bills for heating, the difference financially' (Interviewee 1)

As a consequence of the pilot, a number of suggestions were made to change the questionnaire. For example, it was noted that in general, respondents were confused by the term 'payback'. Therefore specific reference to 'payback' was removed from the questionnaire and two choices were amended:

D9. How important to you are the following, when you are thinking about energy efficiency home improvements and repairs?
D9b. The time it will take to get back the money invested through savings on energy bills
D9c. Whether the reduction in the energy bill is worth my time and money

The pilot identified the length of time it might take to complete the questionnaire and provided data that were considered when revising the questionnaire. The final questionnaire reflects as far as was possible an attempt to improve the questions so that they were clear and would measure the key factors that were of interest to the study.

2.3 Final questionnaire and translation

The final questionnaire was translated into Danish, Dutch, German and Finnish. The translation was an iterative process and involved the project partners from ECN, Oeko, SBi and VTT translating the questions into their respective language. The translation was often a collaborative process with multiple colleagues involved in ensuring that the translation was as accurate as possible. The translated questionnaires were then transformed into an online questionnaire using TELEform software and posted on the internet; all five questionnaires are shown in Appendix A. The questionnaires were all accessed via the IDEAL EPBD website.

2.4 The sample, recruitment and fieldwork in each country

Owner-occupiers with an EPC were the key target group for the research project. However, the pilot in-depth interviews that formed part of Work Package 4, and the questionnaire pilot, raised questions about the feasibility of accessing this group in all countries. The sampling frame in Denmark and the Netherlands comprised dwellings registered with a Government department as having an EPC. In England, Germany and Finland, a national register of dwellings with an EPC either did not exist, or could not be accessed for this study. Therefore, in England and Germany the sampling frame comprised homeowners who had purchased dwellings when the EPC had been implemented, and was therefore a requirement of the home-buying process. In Finland the sampling frame comprised homeowners, as there was little confidence that it would be possible to target homeowners with an EPC in the same way as in England and Germany. The general sample framework agreed on was:

- Homeowners (no rental properties) with an energy label (any form)
- Homeowners who recently bought properties between six months and up to two years before the survey, or homeowners who obtained an energy label between six months and up to two years before the survey

Over 3,000 homeowners completed the survey. The number of homeowners from each country varied (see Table 1). The sample, recruitment and the fieldwork for each country is explained below.

Table 1 Number of homeowners by country

	N	% of total sample
Denmark	743	23
Germany	1,165	36
Netherlands	565	18
England	625	19
Finland	109	3
Total	3,207	100

2.4.1 Denmark

The exact number of EPCs for sold dwellings in Denmark is not known. However, in 2007 and 2008 a total of 137,580¹⁰ single family houses were marketed for sale, and during this time 91,261¹¹ EPCs were issued for this type of dwelling. Therefore the survey population was around 91,000. The sample frame was made up of mailing addresses of dwellings registered as having an EPC by the Danish Energy Agency (Energistyrelsen). A random sample of 10,000 addresses was selected from this database. Responses were received from 757 individuals (8% response rate). Of these, 743 were homeowners and therefore were included in the statistical analysis.

The sample was approached by mail. The letter explained that the survey was about homeowners' comfort, and included a link to the questionnaire and an eight-digit unique identifier. The unique identifier was used to ensure that only homeowners from the database completed the online survey, and offered the potential for IDEAL EPBD data to be linked with Energistyrelsen data at a later date.

¹⁰ Statistics from Realkreditrådet (Association of Danish Mortgage Banks) retrieved 2009-11-04.
<http://www.realkreditraadet.dk/Statistikker.aspx>

¹¹ Energimærkningsdatabasen (the Danish energy label database)

The letter also indicated that an incentive was available for completing the questionnaire. The incentive was entry into a prize draw for a thermal imaging survey of the dwelling.

The questionnaires were mailed in the early part of June 2010. The first response was received on the 18 June and the last response on 11 August.

2.4.2 Germany

Recent homebuyers were sought to respond to the German survey, as a register of dwellings with an EPC was not available. A national database of addresses of recent homebuyers was also not available, and therefore a commercial organisation called 'Payback' hosted the survey on their website and invited their online panel to respond. There are around 110,000 individuals registered on Payback's online panel, a good proportion of whom were owner-occupiers; although it was uncertain how many were recent home buyers. Part of the questionnaire was completed by 10,482 individuals of whom 1,165 were homeowners who had purchased a dwelling within the defined time frame.

Two screening questions were used for the German survey; the first determined whether respondents were owner-occupiers, and the second established whether they had purchased a dwelling between January 2008 and October 2009. From July 2008 the German EPC was mandatory for buildings that were built before 1 January 1966. In January 2009, the legislation came into force for buildings built after 31 December 1965. Before these dates, the EPC was available to homeowners who chose to acquire it.

The German questionnaire was launched by Payback on 23 June, and by the 8 July over 1,000 responses from recent homeowners had been received (see Table 2).

Table 2 German responses

Date	All respondents		Recent homeowners	
	N	%	N	%
23/06/2010	30	0	3	0
24/06/2010	107	1	13	1
25/06/2010	118	1	21	2
26/06/2010	55	1	8	1
27/06/2010	32	0	6	1
28/06/2010	1,351	13	150	13
29/06/2010	2,790	27	261	22
30/06/2010	1,988	19	247	21
01/07/2010	1,553	15	199	17
02/07/2010	1,434	14	150	13
03/07/2010	450	4	42	4
08/07/2010	574	6	65	6
Total	10,482	100	1,165	100

Members of the online panel receive payment for accepting an invitation to respond to a questionnaire. The level of remuneration in the form of reward points depends on the amount of the questionnaire that is completed. Respondents who were screened out of the IDEAL EPBD survey received a small payment, while those completing the full questionnaire received a greater sum.

2.4.3 Netherlands

In the Netherlands there are over 1.5 million dwellings with an EPC; however, only around 20,000 of these were issued to privately-owned houses. As the target sample for the IDEAL EPBD survey was homeowners living in a single family house, the survey population in the Netherlands was 20,000. The sample frame consisted of the mailing addresses of dwellings registered as having an EPC by the organisation Agentschap NL¹². A random sample of 10,368 addresses was selected. Responses were received from 612 individuals (an 8% response rate). Of these, 565 were homeowners and therefore were included in the statistical analysis.

The sample was approached by mail in the same way as the Danish sample. The letter explained that the survey was about homeowners' comfort, and included a link to the questionnaire and an eight-digit unique identifier. The unique identifier was used to ensure that only homeowners from the database completed the online survey.

The letter also advised that an incentive was available for completing the questionnaire. The incentive was entry into a prize draw for a cash payment of €500.

The questionnaires were mailed in the early part of June 2010. The first response was received on 18 June, and the last response was received on 28 August.

2.4.4 UK (England)

The survey was carried out in England. The United Kingdom is made up of four countries, England, Northern Ireland, Scotland and Wales. The UK central government has devolved some powers to governments in these countries, and as a result some government policies and public services in Northern Ireland, Scotland and Wales are different from those in England. Both England and Wales introduced EPCs over a period of time starting in August 2007. Northern Ireland began a phased introduction of EPCs at the end of June 2008 and Scotland started to introduce them in December 2008.

At the time the survey sampling was discussed, England and Wales were the most advanced UK nations in term of implementing EPCs. As there are more dwellings in England, 22 million compared to 1.3 million in Wales, the sample was based on households in England.

In England, around 800,000 houses (detached, semi detached and terraced) were sold between January 2008 and September 2009. These dwellings were sold when EPCs were mandatory. This group of recent home buyers constituted the sample population. The sample frame comprised the mailing addresses of dwellings officially registered by the Land Registry and sold between January 2008 and September 2009. The addresses were provided commercially by Nethouseprices Ltd. A random sample of 19,900 addresses was selected. Responses were received from 647 individuals (a 3% response rate). Of these, 625 were homeowners and therefore were included in the statistical analysis.

The sample was approached by mail in the same way as in Denmark and the Netherlands. The letter explained that the survey was about homeowners' comfort and included a link to the questionnaire and an eight-digit unique identifier. The unique identifier was used to ensure that only homeowners from the database completed the online survey.

The letter also advised that an incentive was available for completing the questionnaire. The incentive was entry into a prize draw for a cash payment of £500.

¹² <http://www.senternovem.nl/english/index.asp>

The questionnaires were mailed in the early part of June 2010, and the first response was received on the 17 June. After two weeks in the field the questionnaire had received a poor response, and therefore a reminder letter was sent to households in July; this resulted in a notable increase in responses. The last response was received on 25 August.

2.4.5 Finland

In Finland, a register of dwellings with an EPC could not be accessed for this study, and it was not possible to acquire a database of owner-occupied addresses or recent home buyers. Therefore in Finland the target sample was homeowners. There are 1.6 million owner-occupiers in Finland¹³; however the exact number of owner-occupiers in Finland with an EPC is not known. An online survey of homeowners was carried out in Finland during the spring and summer of 2010, and 120 responses were received; of these 109 were from homeowners.

Homeowners were recruited using three methods. In May an advertisement (see Figure 2) was placed in the 'Omakoti'¹⁴ magazine. The magazine is circulated by the Finnish House Owners' Association and is aimed at single family house owners. The magazine has a circulation of over 70,000 homes and is delivered five times a year to the members of the association.

Figure 2 Advertisement in 'Omakoti' magazine

ARVOISA ASUKAS!

Kutsumme teidät mukaan asumisviihteisyyttä ja energia-asioita tarkastelemaan internet-kyselyyn, johon vastaamalla samalla tunnistatte itsellenne tärkeitä asioita. Kyselyn lopussa on tietolinkkejä mielenkiintoanne herättäneistä aihepiirin asioista.

Kutsumme suomalaisia asumismukavuudesta ja energia-asioista kiinnostuneita henkilöitä vastaamaan IDEAL EPBD -tutkimuksen kannalta merkittäviin kysymyksiin internetkyselyssä. Kysymykset ovat helppoja eivätkä vaadi valmistautumista. Vastaaminen vie noin 20 minuuttia, ja kyselyn läpi käyminen auttaa vastaajaa tunnistamaan oman kotinsa viihtyisyydelle ja energiatehokkuudelle merkityksellisiä seikkoja. Kyselyn lopussa on linkkejä, joista löydätte lisätietoa aihepiiriin mielenkiintoanne herättäneistä kysymyksistä.

Kyselyn tarkoituksena on tutkia, mikä suomalaisille kodin omistajille on asunnossaan tärkeää ja miten rakennusta on muokattu:

- Minkälaiset asiat vaikuttavat kodin parannustöihin?
- Minkälaisia parannuksia kotiin on tehty tai aiotaan tehdä?
- Mitä syitä asuntojen omistajalla on toteuttaa tai olla toteuttamatta energiakorjauksia ja muita energiansäästötoimia?
- Mikä edistäisi kotien korjaushankkeita?

Aloittakaa vastaaminen internetissä tästä Internet-osoitteesta:
www.ideal-epbd.eu/kyselylomake

¹³ Official Statistics of Finland (OSF): Dwellings and housing conditions [e-publication].

ISSN=1798-6761. Overview 2009, Appendix table 2. Household-dwelling units and persons by tenure status in 1970–2009, number . Helsinki: Statistics Finland [referred: 10.3.2011].

Access method: http://www.stat.fi/til/asas/2009/01/asas_2009_01_2010-11-12_tau_002_en.html.

¹⁴ <http://www.omakotiliitto.fi/en>

The national energy agency Motiva also advertised the questionnaire between 10 June and the end of September. A link to the questionnaire was placed in three places on their website:

- Motiva's front page http://www.motiva.fi/koti_ja_asuminen/
- Motiva's page that focused on energy certificate Energiatodistus (energy certificate): <http://energiatodistus.motiva.fi/> (front page and link in news)
- Energiatehokas koti - (energy-efficient home; front page news with link): http://www.energiatehokaskoti.fi/ajankohtaista/uutiset/mita_asunnonomistajat_ajattelevat_energian_saastamisesta_ja_energiatehokkuustodistuksesta_osallistu_kyselyyn!.html

Finally, an advertisement was also posted via the Intranet at VTT, the Finish partner's organisation between 14 and 22 June; this would have reached up to 3,000 people. The first response to this survey was received on the 9 June, and the last response was received on 30 August.

An incentive was not offered to homeowners in Finland.

2.5 Limitations of the survey

The key sample for the study was households with an EPC, who had recently purchased a dwelling. Ideally, all countries would have sampled from national lists of households registered as having an EPC; however, these databases either did not exist or were unavailable for this project. The fact that the implementation date of EPCs also varied between countries added additional complexity to accessing similar samples in every country. In Denmark, energy labels were introduced in the 1980s, although the EPC that conformed to the requirement of the EPBD was implemented on the 1 January 2006. The EPC for our target sample was implemented in the Netherlands and England at similar times; it was from the 14 December 2007 for properties marketed for sale in England and Wales, and from January 2008 in the Netherlands for all dwellings rented or sold. The EPC was implemented over a period of time in Germany; by January 2009 it was mandatory for all sold houses. In Finland it was also mandatory to have an EPC for existing buildings when rented or sold from 1 January 2009. The sample strategy broadly focused on recent homebuyers and those who had recently acquired an EPC; adopting this approach should have minimised any effect of the impact of different sampling methodology in the resulting analysis.

In most countries, response rates were lower than anticipated; one of the reasons for this may have been the length of the questionnaire. There were over 160 questions to answer. The online questionnaire survey does not monitor the level of attrition from respondents; however the pilot study indicated that the questionnaire would take 20 minutes.

There were some differences in the questions' categories that were available in each country, and therefore the questionnaire was not completely harmonised. Details of the questions asked in each country are available in the language of the member state in Appendix A.

3 The influence of Energy Performance Certificates

Article 11 of the Energy Performance of Buildings Directive (EPBD) (EU 2010) targets dwellings that are sold, newly built or rented. The 'IDEAL EPBD' survey focused on homeowners, as they form a key group affected by this aspect of the Directive. Seventy-three percent of households in the EU-27 member states are owner-occupiers. Over 3,000 homeowners responded to the survey, and around two-thirds of these homeowners were aware that they had an EPC for their dwelling. The energy efficiency behaviour of this group has a bearing on the energy-saving potential in each country. Previous work carried out by the IDEAL EPBD project team suggests that there is the potential to save 20% of the present heating energy consumption of dwellings by 2030¹⁵. However, homeowners' behaviour will determine whether this energy saving will materialise. Therefore, determining how this group reacts to the EPBD may help to assess the likelihood of countries reaching their energy-saving targets.

3.1 The Energy Performance Certificate status of the sample

The sample for the study focused on households that were either known to have an EPC (e.g. the Netherlands and Denmark) or were expected to have one because of the date that their property was purchased (e.g. England and Germany). However, the study found that some respondents were unaware of having an EPC for their home. Various questions were used to determine whether a household had an EPC. This included images of the energy label available in their country and questions that linked the label to the home-buying and selling process.

Figure 3 EPC status of homeowners

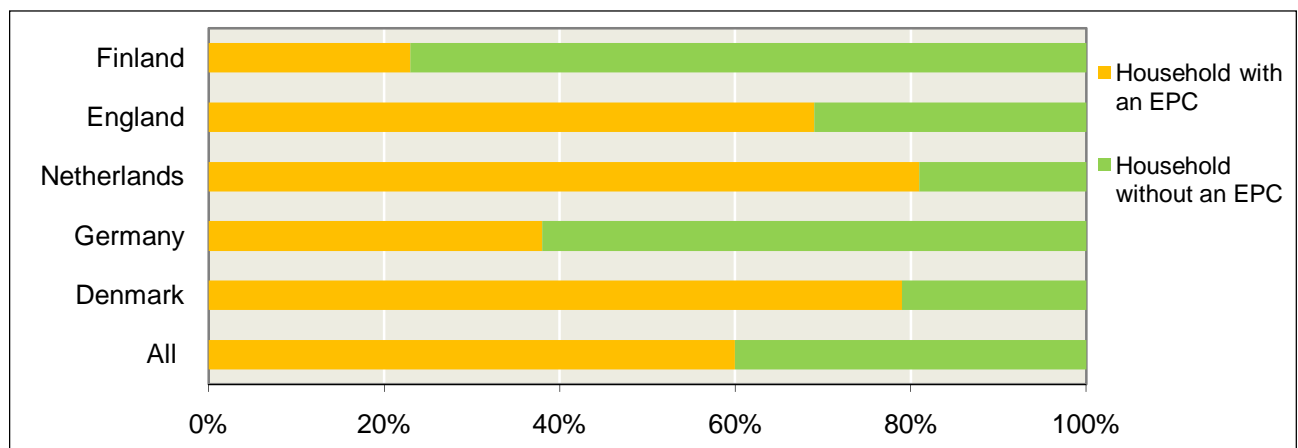


Figure 3 identifies notable differences in the EPC status of homeowners in the countries involved in the study. More than 70% of homeowners in the Finnish sample did not have an EPC for their dwelling; over 60% of homeowners in Germany were also in this position.

¹⁵Tuominen and Klobut (2009)

3.2 Completed Energy Efficiency measures and EPC status

The IDEAL EPBD project was developed to monitor the effectiveness of EPCs. The EPC is a tool that provides information on a number of factors related to energy efficiency in the home. Its dissemination of energy efficiency recommendations is expected to lead to homeowners making decisions that will benefit their comfort levels at home, and will help to reduce the amount of energy consumed, and hence reduce carbon emissions. The following section investigates the influence of EPCs on energy efficiency behaviour; namely, whether having an EPC increased the likelihood that a household would implement energy efficiency measures.

In each country, all homeowners were asked about the type of home improvements that they had carried out. These included general home improvements such as decoration or building an extension. They were also asked to specify whether they had carried out home improvements that could be regarded as energy-efficient. These included the following improvements:

- Insulated the water/heating pipes
- Insulated the hot water tank
- Fitted double glazing or energy-efficient glazing
- Installed cavity or solid wall insulation
- Installed floor insulation
- Installed loft insulation
- Installed a new boiler/heating supply
- Installed wood burning stove or fireplace
- Changed the heating controls
- Draught-proofed windows and/or doors
- Improved the air tightness of the building
- Installed a ventilation system with heat recovery
- Installed renewable energy technologies
- Other energy efficiency home improvements

Just less than 60% of homeowners had carried out at least one of the above energy efficiency improvements. This varied by country. In the Netherlands 76% of homeowners had implemented energy efficiency measures, but less than 50% had done this in Germany.

Using information on whether a household had carried out any of the above energy efficiency measures, and the households' EPC status, it was possible to test whether the EPC had an influence on energy efficiency behaviour. There was a small statistically significant difference¹⁶ between the proportion of households with an EPC and households without an EPC, in relation to whether an energy efficiency improvement had been completed (see Table 3).

Table 3 Energy efficiency behaviour by EPC status

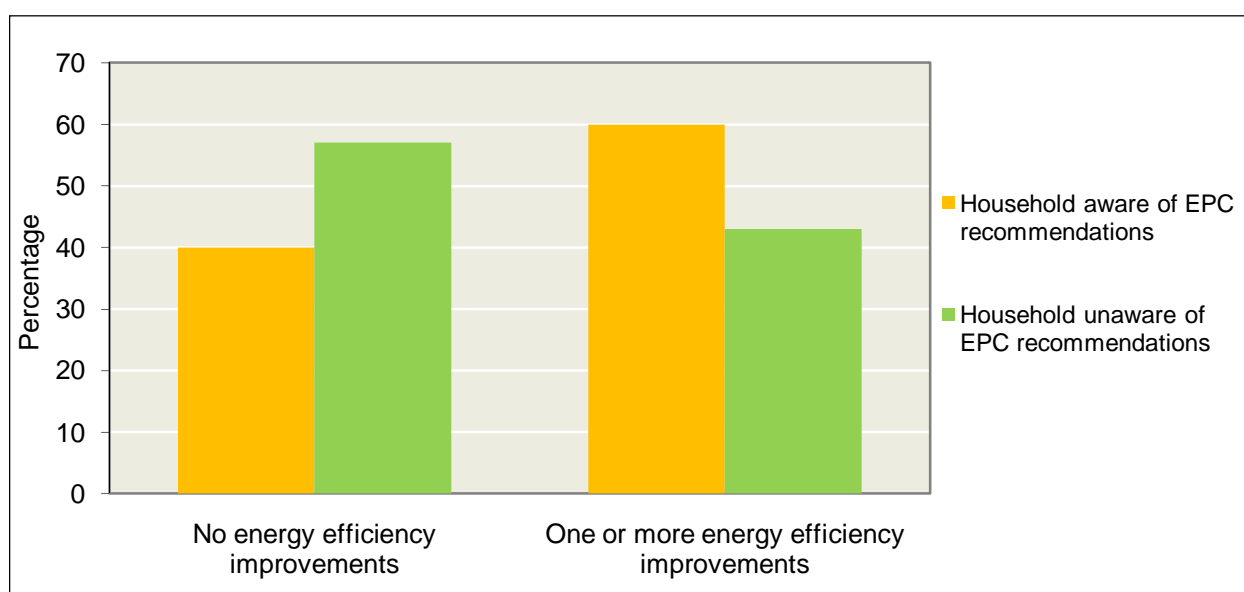
	Household with an EPC	Household with no EPC
No energy efficiency improvements	48%	53%
One or more energy efficiency improvements	52%	47%
N	1,912	1,186

¹⁶ Table H1 in Appendix H provides the results of the non-parametric test (Mann-Whitney)

There was also a significant difference depending on whether the household could recollect the recommendations available in their EPC. Around 50% of homeowners with an EPC could recollect the recommendations; the rest could not recollect, or were unaware, that recommendations were received.

Figure 4 shows that 60% of homeowners who were aware of the recommendations available with their EPC had carried out one or more energy efficiency measures, compared with just over 40% of households who could not recollect or were unaware of the recommendations.

Figure 4 EPC recommendations and energy efficiency behaviour



These results suggest that the energy efficiency behaviour of homeowners was influenced by the EPC, and this was even more apparent when the homeowner could recollect the recommendations on the EPC. However, the literature review¹⁷ suggests that there are many factors influencing homeowners' decision-making. These factors will be explored throughout the following report to investigate what part the EPC plays in the overall energy efficiency behaviour of homeowners.

¹⁷ Brohmann *et al* 2009

4 The characteristics of the sample

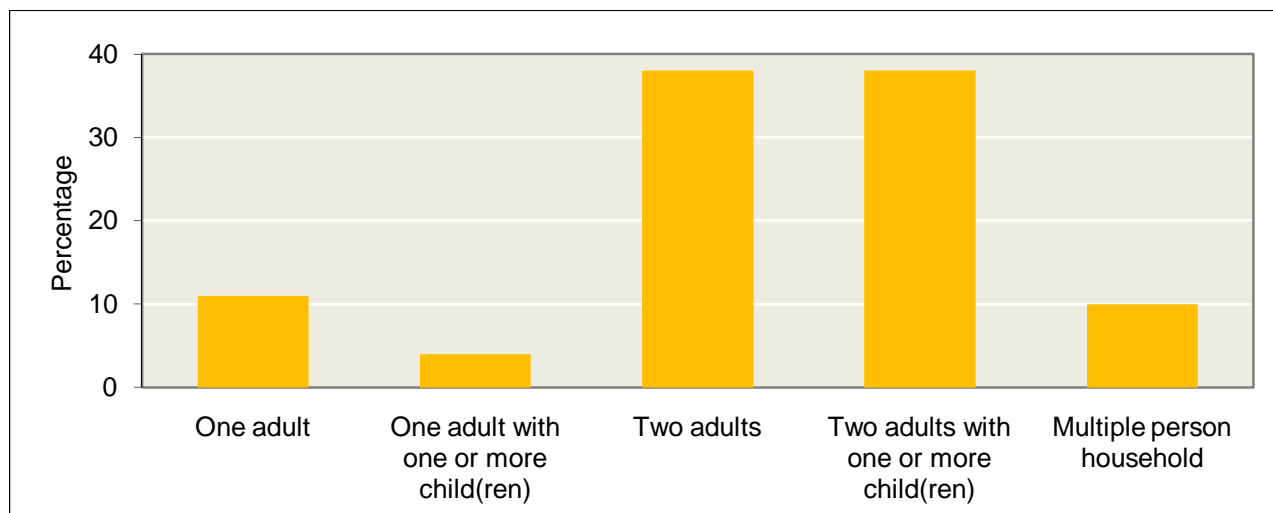
In this study, the term 'homeowner' encompasses a number of demographic and household factors about the respondents in the sample. This includes the sex and age of the respondents, the household size, and the type of dwellings that they occupied. All these elements inform the study and are discussed below.

4.1 General findings

Overall, the number of respondents that were male and female was evenly split; the sample was composed of 49% men and 51% women. The average age of respondents was 41 (mean 41.09 with a 95% confidence interval 40.63 – 41.54). The majority (70%) of respondents had lived in their property for less than two years at the time of the survey. This was due to the sampling methodology, which is explained above. The EPC is part of the home-buying and selling process. Therefore, the behaviour of recent homebuyers was of particular interest to the study. Around 60% of respondents had lived in their dwelling for between six months and two years.

The majority of respondents lived in two-adult households, or households with two adults and children. The survey did not explore the relationship of household members, but it was assumed that the two-adult households were couples and the two adults with children were families. The majority of respondents were therefore either couples or families, accounting for 76% of households in the survey (see Figure 5). Overall, the mean household size was 2.78 (95% confidence interval 2.74 – 2.82).

Figure 5 Household composition



Base: All homeowners (N=3,158)

The majority (88%) of homeowners responding to the survey lived in a detached, semi-detached or terraced house. The researchers were keen to explore the motivations and barriers that face homeowners when they have sole responsibility for determining the type of works that can take place. Therefore, the sample in some countries specifically targeted homeowners in houses, rather than in other types of

dwelling. Homeowners lived in dwellings built over a wide age span; nearly 80% lived in dwellings built before the year 2000 and more than 10% occupied dwellings built before 1919 (see Figure 6).

Figure 6 Date dwelling built

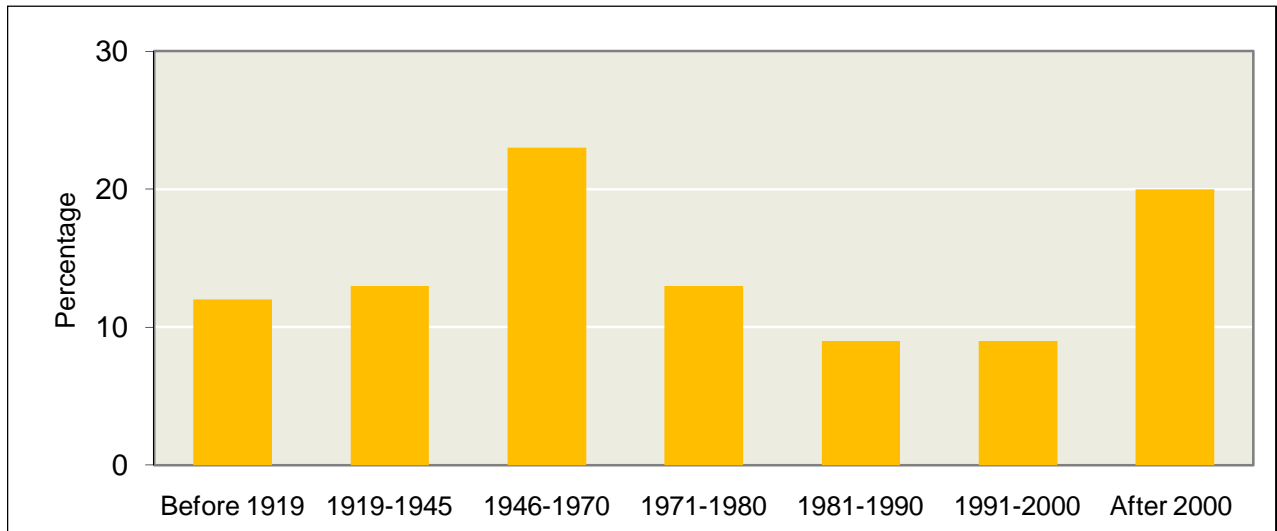


Table B7 in Appendix B

Homeowners in Denmark, Germany, the Netherlands and Finland were asked about the size of their property in square metres. Homeowners in England reported the numbers of bedrooms in their property. Figure 7 shows the reported size in square metres for all four countries. The mean is 149.32 m² (95% confidence interval 147.15m² – 151.49m²).

Figure 7 Floor area in square metres DK, NL, DE, FI

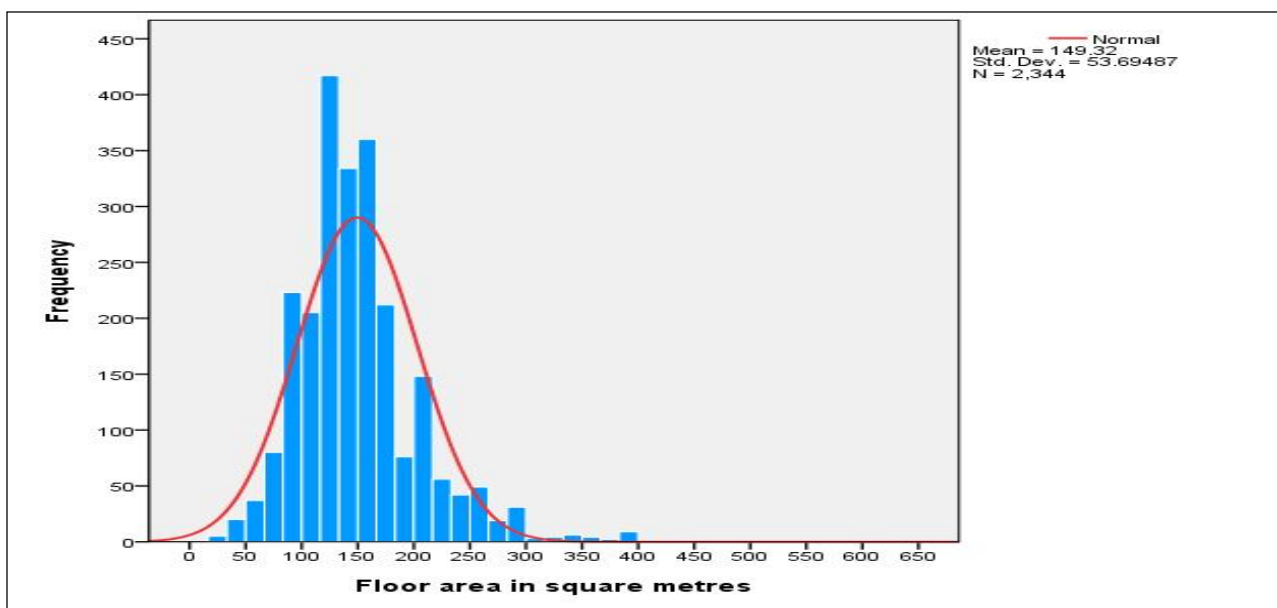


Table B8 in Appendix B

4.2 Country-specific factors

There were notable differences between the ratios of men and women responding to the survey in the Netherlands, Germany and Denmark. In the Netherlands and Denmark more men responded to the survey, while in Germany, a third more women than men responded (see Table 4). Therefore, where the sex of the respondent is an influential factor in the analysis of the data, the interaction between the country and the sex of the respondent may need further exploration.

Table 4 Percentage of male and female respondents by country

Sex of respondents	Denmark	Germany	Netherlands	England	Finland
Male	60%	34%	65%	49%	45%
Female	40%	66%	35%	51%	55%
N	727	1,130	552	616	105

The mean age of respondents differed by country. Homeowners in the German sample were much younger than homeowners in the other countries. The mean age of the German sample was 35 (mean 34.58 with a 95% confidence interval 34.16 – 35.01). The average age in all other countries was between 44 and 46 years of age (see Table 5). The difference in the mean age of German homeowners may be a result of the sampling methodology. The German sample was drawn from individuals registered on an online survey panel hosted by 'PAYBACK', a loyalty program.

Table 5 Mean age of respondents

		Denmark	Germany	Netherlands	England	Finland
Mean		44.31	34.58	45.71	44.51	44.44
95% Confidence Interval for Mean	Lower Bound	43.32	34.16	44.48	43.38	42.12
	Upper Bound	45.29	35.01	46.94	45.65	46.77
Std. Deviation		13.533	7.294	14.761	14.277	12.064

Although the majority of homeowners had purchased their property within two years of the survey, this was not the case for the majority (71%) of homeowners in Finland (see Table 6). Homeowners in Finland were recruited through various means (see methodology section). Although the Finnish sample of recent homeowners was small, Finnish homeowners were able to provide insight into their general experience of home improvements. Over 40% of homeowners in the Netherlands had occupied their dwelling for two years or more (see Table 6); this may also relate to the sampling methodology.

Table 6 Percentage of homeowners by time in property in months since move in date (grouped)

Time in property in months since move (grouped)	All five countries	Denmark	Germany	Netherlands	England	Finland
Less than 6 months	7%	12%	5%	7%	4%	6%
6-11 months	21%	24%	22%	11%	28%	7%
12-17 months	20%	19%	24%	14%	23%	13%
18-23 months	22%	17%	25%	27%	20%	4%
24 months or more	30%	28%	25%	41%	25%	71%
N	2,888	521	1,086	558	620	103

The percentage of single-person households in the sample was low for all countries (see Figure 8). It ranged from 5% in Germany to 18% in England. This contrasts with national figures for Germany that report that 40% of households are one-person households¹⁸. However, the survey focused on owner-occupiers that were also recent buyers, and this may be the reason for the divergence. National statistics in England also report that 42% of owner-occupier households were couples with no dependent children¹⁹; this is similar to the figures reflected in the IDEAL EPBD survey. In the Netherlands, about half of the respondents lived in two-person households; this was a similar figure to the German homeowners living in households with two adults and children.

Figure 8 Household composition

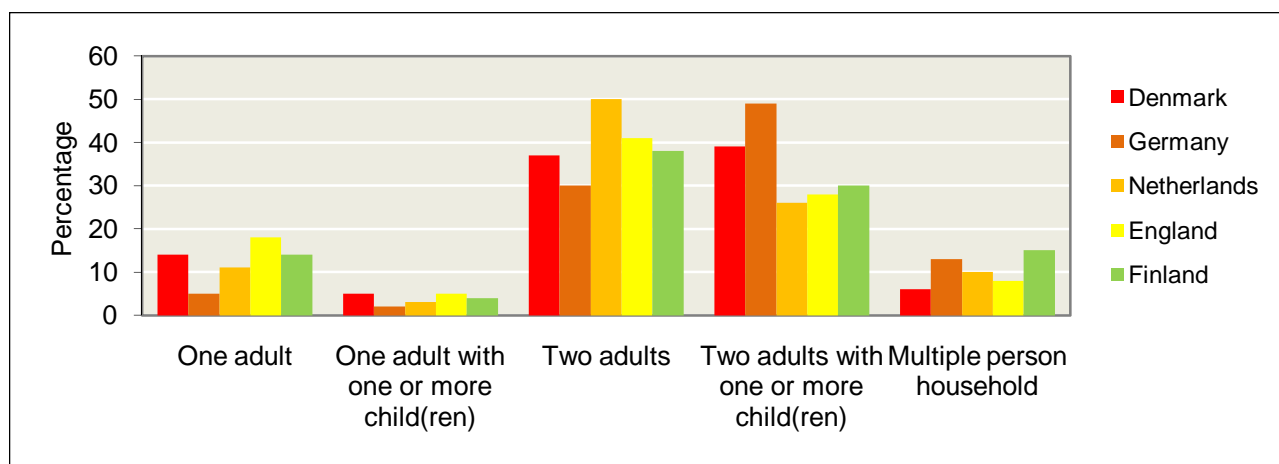


Table H2 in Appendix H

Table 7 shows the mean household size in each country. There were notable differences between the survey means by country and those reported in national statistics. However, the national statistics reflect

¹⁸ Destatis (2011)

¹⁹ Communities and Local Government (2010a)

the size of all dwellings in the housing stock and indicate that similar figures would be expected in the five specified countries. As the proportion of single-person households is much smaller in the sample, this is likely to account for differences between the national statistics and the data collected in the survey.

Table 7 Household size

Total number of adults and children in household		Denmark	Germany	Netherlands	England	Finland
Mean		2.72	3.07	2.59	2.45	2.95
95% Confidence Interval for Mean	Lower Bound	2.63	3.00	2.49	2.37	2.63
	Upper Bound	2.81	3.15	2.69	2.54	3.28
Std. Deviation		1.231	1.287	1.194	1.092	1.713
Average number of people per household (National statistics)²⁰		2.2	2.1	N/A	2.3²¹	2.1

Each country measured household income using country-specific categories (details of these are available in Appendix G). However, a grouped mean was calculated for each country (see Table 8). It would seem that households in Denmark were the wealthiest, and those in England the least wealthy.

Table 8 Grouped mean from IDEAL EPBD survey

	Denmark	Germany	Netherlands	England	Finland
Grouped mean	€80,936	€45,340	€55,602	€43,796	€67,871
N	671	767	440	505	101

Given that the study evaluates responses from all homeowners as well as homeowners in each country, it was important to assess whether there were sufficient similarities within the sample. The above shows that there were some differences in the demographic data of respondents and households in the five countries involved in the study. However, using the four variables reported in Table 9, a Two-Step Cluster Analysis²² found that the sample falls into two distinct clusters. Generally, cluster 1 includes households without children and cluster 2 includes households with children. The country of the respondents does not determine which cluster they fall into for these demographic issues. This provides some assurance that the types of households in the sample were similar in all countries.

²⁰ Federcasa (2006)

²¹ Communities and Local Government (2010a)

²² The purpose of cluster analysis is to subdivide a number of cases into homogeneous groups. A two-step cluster analysis was used as it can use both continuous and categorical variables.

Table 9 Results of Two-Step Cluster Analysis*

	Cluster 1	Cluster 2	Level of importance
Sample N (%)	1,111 (53.7%)	956 (46.3%)	
Children aged six and under (mean)	0.12	1.39	1.00
Household composition	62.6% two adult households	99.4% two adults with one or more child(ren)	1.00
Number of children in household (mean)	0.18	1.76	1.00
Household size (mean)	2.15	3.78	0.70
Evaluation field: Country	32.6% German	50.3% German	0.02

* measure of cohesion and separation is a value of 0.6

Over 90% of homeowners in the Danish sample lived in a house, and more than three-quarters lived in a detached house (see Table 10). This compares with the sample from England where around a quarter of respondents lived in a detached house. The type of dwelling reflects the housing stock of the country, but it also may reflect the type of homeowners purchasing property in the present financial climate.

Table 10 Percentage of homeowners living in types of dwelling by country

	All	Denmark	Germany	Netherlands	England	Finland
Detached house	52%	77%	60%	34%	26%	45%
Terraced or semi-detached house	36%	19%	29%	48%	62%	28%
Other dwelling	11%	4%	11%	19%	12%	27%
N	3,145	738	1,133	562	605	107

Of the 25% of homeowners living in properties built after the year 2000, many of them lived in Denmark (23% of the Danish dwellings in the sample) and Germany (33% of the German dwellings in the sample). National statistics report that 3% of Germany's housing stock was built after 2001²³, and therefore it would seem that there was an over-representation of dwellings built in this time period. Over 20% of homeowners in England lived in properties built before 1919; this is very similar to national statistics for England, which state that 21.3% of owner-occupiers live in dwellings built before 1919²⁴. Figure 9 shows that there was a wide range of dwelling ages in the sample, for the whole sample and each country. Communities and Local Government (2010b) states that "dwelling age is a strong indicator of energy efficiency, with pre-1919

²³ Destatis (2011)

²⁴ Communities and Local Government (2010b)

dwellings averaging 23 SAP²⁵ points fewer than post-1990 dwellings in 2008, while their mean CO₂ emissions per dwelling were twice those of post-1990 stock²⁶; this is for the housing stock in England.

Figure 9 Date homeowners' current dwelling built by country

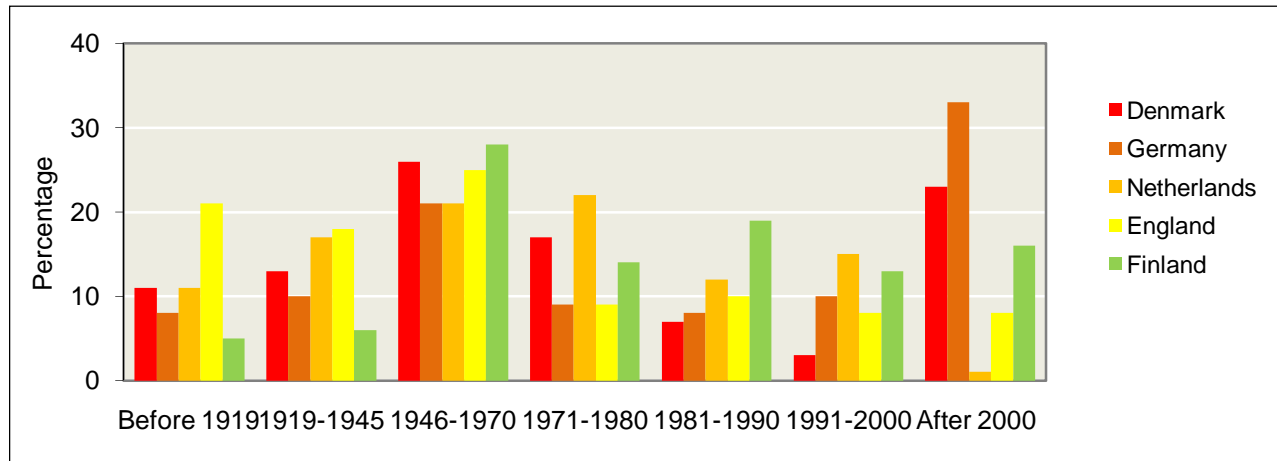


Table B7 in Appendix B

There were differences in the size of dwellings in Denmark, Germany, the Netherlands and Finland; national statistics also report differences in the size of dwellings in these countries²⁶. Figure 10 compares the size of dwellings reported by homeowners in the survey to the useful floor area reported in national statistics for all households. While the survey respondents lived in larger-than-average sized dwellings, Germany was the only country where the sample lived in houses notably larger than reported in the general housing stock. This is likely to be because national figures include apartments as well as houses. In England, 47% of households in the survey lived in three-bedroom dwellings, while the national figure is 50% of owner-occupiers²⁷.

Figure 10 Comparison of national statistic and survey data on dwelling size

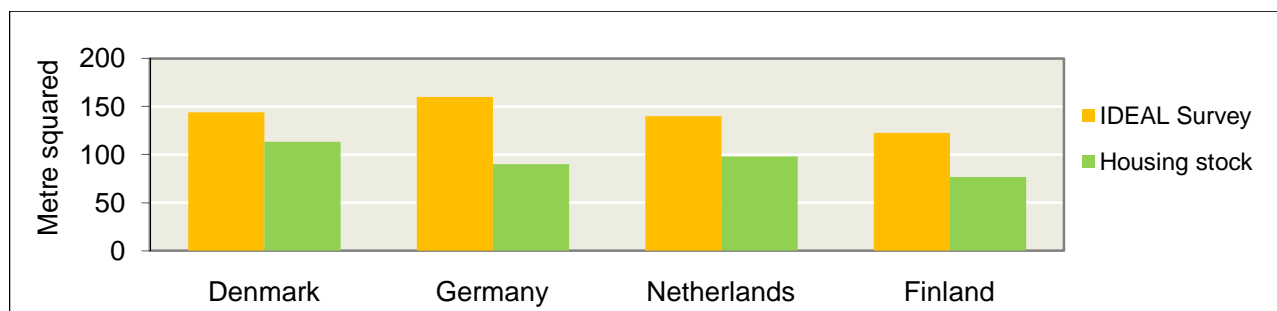


Table B8 in Appendix B

²⁵ SAP is the UK's Government's Standard Assessment Procedure for assessing the energy performance of dwellings. The SAP rating is based on the energy costs associated with space heating, water heating, ventilation and lighting, less cost savings from energy generation technologies. The SAP rating is expressed on a scale of 1 to 100, the higher the number the lower the running costs. (BRE 2010)

²⁶ Housing statistics in the European union 2005/2006

²⁷ Communities and Local Government (2010a)

4.3 Other factors

This study assessed whether the length of time since the homeowner had purchased a dwelling had an impact on their energy efficiency behaviour. This followed the Throne-Holst et al (2006) reference to the change of dwelling as a 'window of opportunity' that may influence consumers' behaviour²⁸. However, length of time in the property was not significant when examined against whether energy efficiency measures been taken. Yet, the length of time in the property at the time of the survey was significant in relation to the EPC status of the homeowner. More households with an EPC had lived in their properties for less than two years, compared to households without one. In some countries, this may relate to the date the policy was implemented. There was also a notable difference between households who recollected the EPC and its recommendations, and those without an EPC.

Seventy-one percent of households with an EPC with recommendations had lived in their dwelling for less than two years, compared to 62% of those without a label. A fifth (21%) of homeowners who had an EPC but were not aware of recommendations had lived in their dwelling for two years or more, compared to two-fifths of homeowners without a label. This may relate to the suggestion by Gram Hanssen *et al* (2007) that energy expert advice is discarded or forgotten by homeowners in their daily lives. Therefore, the longer a homeowner has the EPC the less likely they are to recall the details of it.

The literature on energy efficiency behaviour does not focus on any differences between the sexes; however the study found a notable difference, in the EPC status between the sexes²⁹. Almost two-fifths of men were aware of the recommendations, compared to just less than a fifth of women (see Table 11). Almost half of the women who responded reported that they did not have an EPC for their dwelling; this was markedly different from the male respondents.

Table 11 EPC status by gender

	Male	Female
Household aware of EPC and recommendations	39%	22%
Household aware of EPC but not recommendations	31%	31%
No EPC	31%	48%
N	1,526	1,604

Economic factors were discussed extensively in the literature³⁰. This study looked specifically at the impact of household income on energy efficiency behaviour, and found that there was no significant difference between household income and the completion of energy efficiency measures³¹.

There was, however, a notable difference between household income and the EPC status of the household. This was particularly noticeable for households that did not have an EPC (see Table 12).

²⁸ Cited in Brohmann *et al* (2009)

²⁹ Table H3 in Appendix H provides the results of the non-parametric test (Kruskal Wallis)

³⁰ Brohmann *et al* (2009)

³¹ Table H4 in Appendix H provides the results of the non-parametric test (Mann-Whitney)

Table 12 household income by EPC status

	Household with an EPC	Household with no EPC
Household income lower than grouped mean	49%	60%
Household income higher than grouped mean	51%	40%
N	1,581	903

4.4 Discussion

The purpose of the study was to seek information from homeowners, as they are one of the target groups of the EPC. The survey collected data from 3,207 homeowners. An evaluation of the homogeneity of the sample would suggest that while on the whole, the sample includes recent homeowners in their early forties with an equal number of male and female respondents living in houses of various ages, there were some variances and these should be noted. While 60% of homeowners in the sample had lived in their dwelling for between six months and two years, many other homeowners had lived in their dwelling for well over two years. Therefore, the implementation of the EPC for those who did not receive an EPC related to a house purchase, or for those that received an EPC months or years before the majority of the sample, should be considered.

Overall, respondents were in their early forties. However, there were some noticeable differences in the sample by country. For example, respondents from Germany were on average almost a decade younger than homeowners in the other four countries. There was also a high level of variance in the household income within the sample. Many of the differences can be explained by the distinct nature of the sample. The majority of the sample consists of recent homeowners who bought property in a particularly turbulent economic period. To enable them to do this, their circumstances may well be distinct from other homeowners.

Generally, most dwellings in the sample were houses, although the age of the dwellings varied. Some of the variance in the age of dwellings by country, for example the number of newer dwellings in the German sample, may have been a consequence of sampling recent buyers.

Where there were differences in the sample that may be due to the sampling methodology this will be highlighted. But overall, the sample provides a variety of homeowners in five member states who generally live in the type of housing that is relevant to the study. Comprehensive detail about the sample is available in Appendix G.

5 Homeowners' attitude to home-buying

The EPC is available at various stages of the home-buying process, depending on the national policy of the member state involved in the study. During interviews related to this project, various stakeholders raised the timing of the provision of EPCs to homeowners³². Therefore, a key question in this study was to consider the impact of the energy efficiency on decision-making at the home-buying stage.

5.1 General findings

The majority of homeowners (60%) had moved into their property less than 24 months before they completed the survey. The sampling strategy employed in individual countries (see methodology section) sampled recent buyers, as they were the most likely to have an EPC. Respondents were asked to rate the importance of the following considerations when seeking to purchase a dwelling:

- Access to public transport
- Availability of garden and outdoor space
- Availability of local amenities (e.g. shops, schools, leisure facilities)
- Condition of the property
- Expected cost of water, electricity and heating for the property
- Layout of rooms
- Parking facilities
- The location of the property
- The price of the property
- The size of the property
- Type of heating system
- Feelings about the neighbourhood

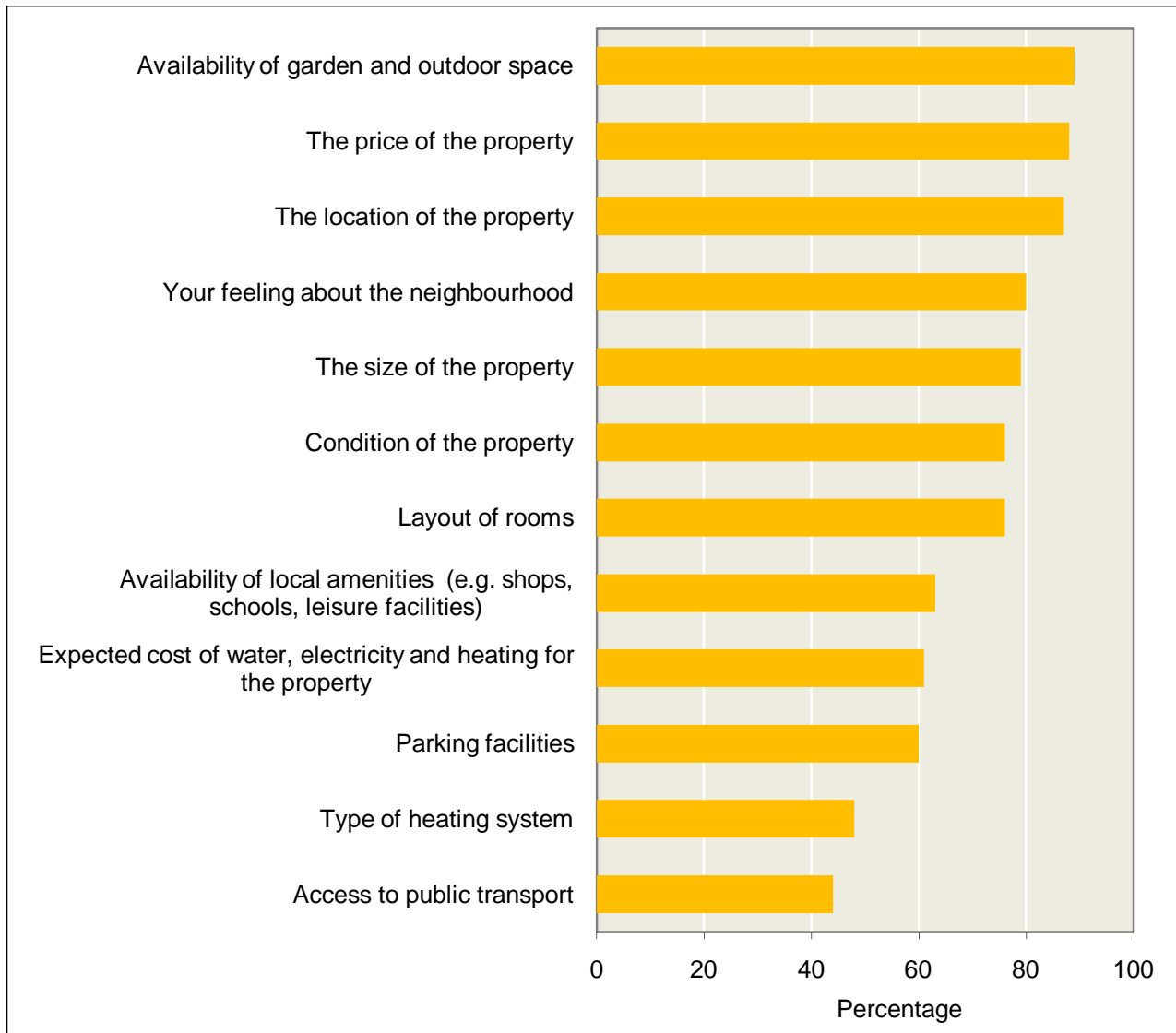
Almost 90% of homeowners rated the 'availability of garden and outdoor space' as 'very important' or 'important' (see Figure 11). Similar results were found in a study of detached housing in Denmark, where almost 90% indicated that the garden and the privacy of the detached housing were the main reason to choose this housing type³³.

From the list of twelve housing priorities, there were three factors related to energy efficiency considerations. These were the condition of the property, the expected cost of water, electricity and heating (utility costs) and the type of heating system. The condition of the property was important to over 70% of homeowners, utility costs were important to around 60%, and the type of heating system was a consideration for less than 50%. While the majority of homeowners considered all twelve factors important, it was notable that utility costs were rated very differently from the availability of garden and outdoor space, for example.

³² Tuominen and Klobut (2009)

³³ Gram-Hanssen and Bech-Danielsen (2000)

Figure 11 Home-buying priorities rated 'very important' or 'important' by homeowners



Tables B13 – B24 in Appendix B

5.2 Country-specific factors influencing homeowners' attitude to home-buying

There were country-specific differences in the response by homeowners to all twelve home-buying factors. The most notable differences between countries were for two factors, the condition of property and utility costs.

Although nearly half (48%) of homeowners considered the condition of the property 'very important' during the buying stage, there were clear points of difference between countries (Figure 12). For example, 63% of homeowners in Germany prioritised the condition by rating it 'very important' compared to 46% of homeowners in Denmark and 42% of homeowners in Finland. Homeowners in Denmark and Finland also differed from the Netherlands and England because in both countries only 34% of homeowners rated condition 'very important'. The Netherlands and England responded differently from Denmark, Germany and Finland, as less than 40% of these homeowners rated condition 'very important'. More than 10% of

homeowners in England did not regard this issue as important; this is very different from homeowners in the other countries.

Figure 12 Importance of property condition

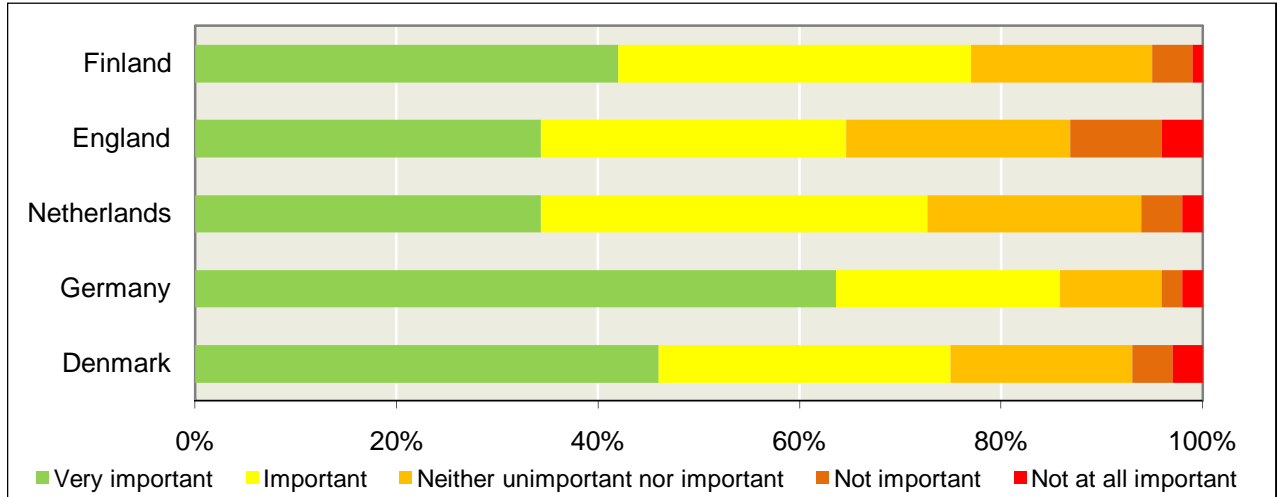


Table 16 in Appendix B

The other factor highlighting differences between countries was the importance of utility costs at the home-buying stage. In Figure 13 Germany is distinct from the other countries, as nearly 80% of homeowners considered expected utility costs important when they were purchasing a property. Overall, 61% of homeowners considered expected utility costs to be important, although this was less of a factor for homeowners in the Netherlands (44%) and England (48%). Homeowners in Netherlands and England responded differently from homeowners in Denmark, Germany and Finland. In both Denmark and Finland over 60% of homeowners considered expected utility costs to be important.

Figure 13 Importance of utility costs

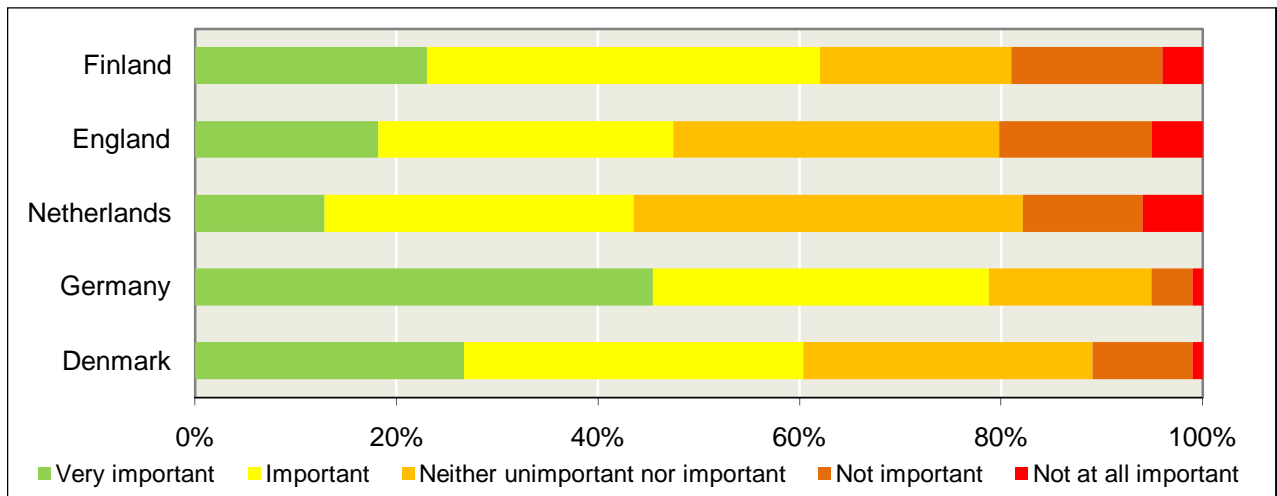


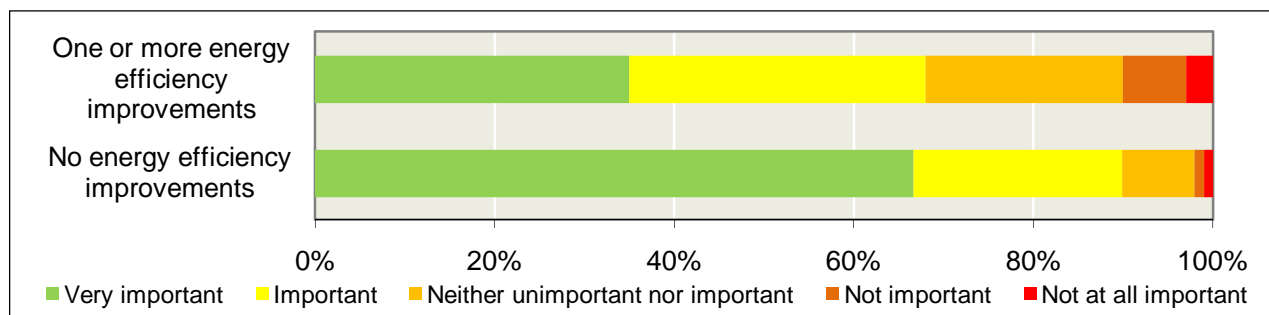
Table B17 in Appendix B

5.3 Other factors

The sex of the respondent, and their energy efficiency behaviour, were influential factors in homeowners' attitude to home-buying. The energy efficiency behaviour of homeowners had a bearing on their attitude to home-buying, in relation to nine of the twelve factors. It was not important in relation to the size, location or feelings about the neighbourhood. The most notable difference was for the importance of property condition; another important difference was in the attitude to the type of heating system.

While condition was important overall for those who had completed energy efficiency improvements, 35% regarded it to be 'very important' compared to 66% of homeowners who had not completed any improvements (Figure 14).

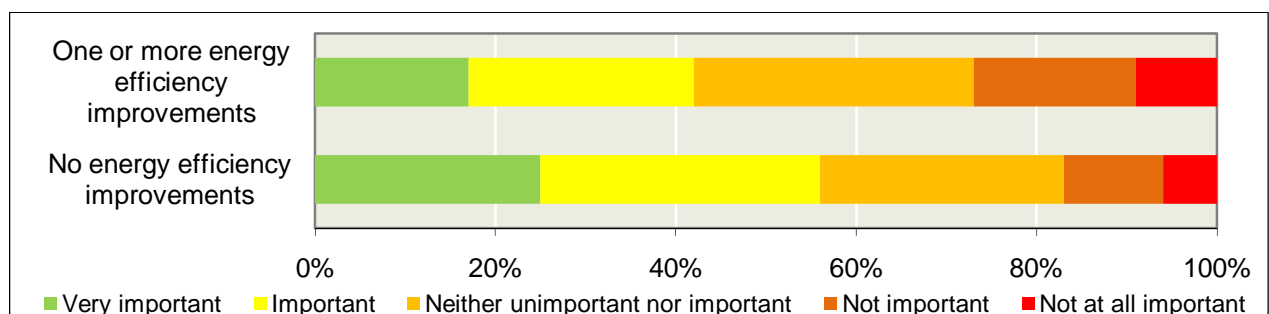
Figure 14 Importance of condition by whether household completed any energy efficiency improvements



Base: All homeowners (N=3,156)

The other interesting finding was that there was a significant difference between homeowners' attitude and energy-efficient behaviour when they considered the type of heating system in a potential dwelling for purchase. More homeowners who had not yet completed any home improvements reported that this issue was important than those who had (see Figure 15). Those homeowners who had completed energy efficiency improvements may have different motivations when buying a dwelling; they may be more likely to view their dwelling as a work in progress. This will be explored further in relation to the factors that identify households that had completed energy efficiency improvements and those that had not.

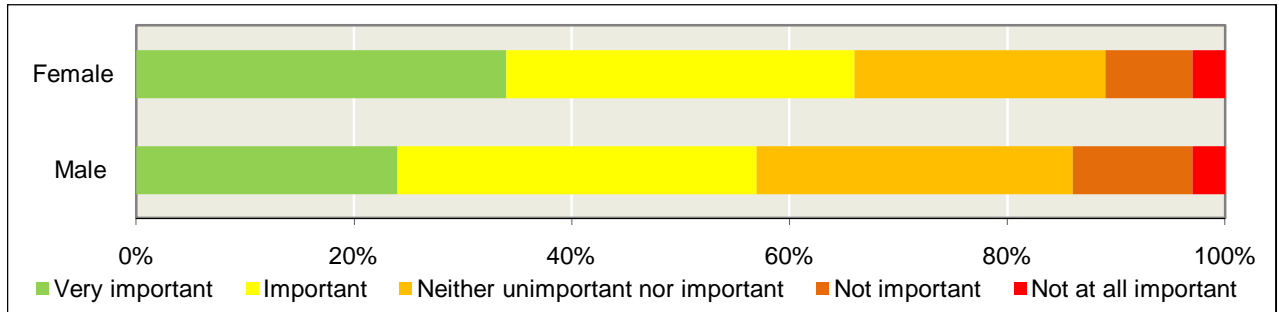
Figure 15 The importance of type of heating system by homeowners' energy efficiency behaviour



Base: All homeowners (N=3,151)

Women and men responded differently to eleven of the twelve factors; however there were no differences in attitude in relation to the importance of location. There were notable differences for utility costs and the price of property between these two groups. The women in the sample were more likely than the men to consider the potential costs. The potential utility costs were considered very important by 34% of women, compared to 24% of men (see Figure 16).

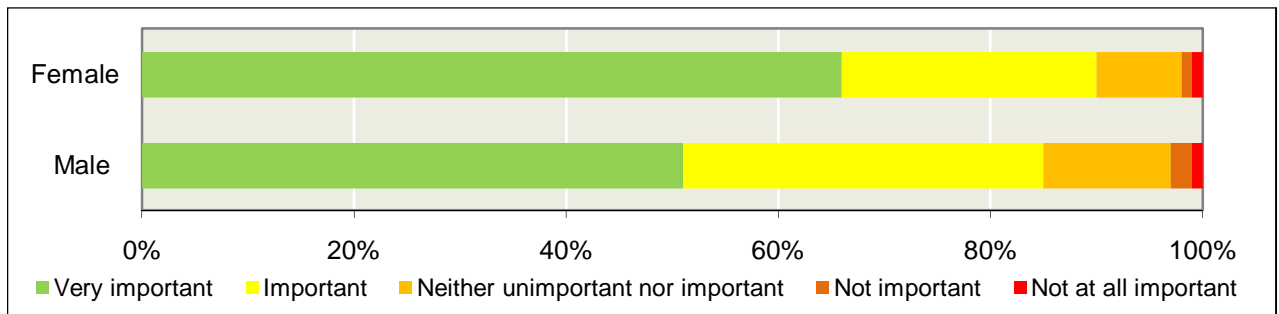
Figure 16 The importance of potential utility costs by the sex of the respondent



Base: All homeowners (N=3,155)

Overall, the price of the property was important to the majority of men and women (Figure 17), although it was notable that it was very important to two-thirds (66%) of the women and just over half (51%) of the men.

Figure 17 The importance of the property price by the sex of the respondent



Base: All homeowners (N=3,166)

5.4 Discussion

Overall, homeowners focus on non-energy-related factors when considering home-buying. Potential utility costs were ranked the ninth most important factor out of twelve possibilities by all homeowners, although it was notable that women were more likely than men to rate this particular issue important. Utility costs were also an important factor of differences between countries. Homeowners from Germany were more likely than any other country to rate this issue important; this may be related to the fact that there were more women in the sample from Germany.

The differences between countries centred on two issues: the importance of property condition and utility costs. The importance of the property condition was a difference between countries. This may relate to the profile of the housing stock in the country, and the types of houses that were purchased. In Germany, a third of homeowners purchased dwellings that were built after the year 2000. Homeowners in the Netherlands and England were living in older properties than those in Germany. In England, 20% of homeowners lived in properties built before 1919. It is possible that these factors influenced homeowners' attitudes to the question about condition, as it suggests that each country had different levels of expectations in relation to the condition. Those homeowners in Germany may well have preferred to build their own, or buy newly built properties; in Germany 60%³⁴ of new build properties were self build. This is distinct from the situation in England where it is 16% and in the Netherlands where it is 30%.

The condition of the property was rated more important by homeowners who had not completed energy efficiency improvements. The reasons for this may relate to the housing profile of the sample; 43% of homeowners who described their dwellings to be in a good condition lived in properties built after 2000. Those homeowners in recently-built properties may have less need to carry out energy efficiency improvements compared to households in older properties. The older properties are likely to need general improvements as well as specific energy efficiency improvements. This finding may also provide insight into a group of home buyers who are not interested in buying properties that are in need of renovation. The study will examine whether the EPC caters for this group.

³⁴ NASBA (2008)

6 The current condition of homeowners' dwellings

This section assesses the condition of the dwellings purchased by homeowners in the sample. This information provides some insight into the energy efficiency behaviour of homeowners, as it will analyse the condition of the dwelling, the level of comfort, and the energy efficiency needs of the homeowners' current dwelling.

6.1 General findings

Over half of homeowners reported that they purchased a property that was in a good condition, and just over a fifth purchased properties that they described as in poor condition. The average living room temperature during the winter was 21°C (mean 20.69 with a 95% confidence interval 20.61°C – 20.77°C). Homeowners rated their level of comfort in their living room, based on its temperature during the winter. Overall, 51% of homeowners were comfortable in their dwellings, with a third reporting that they were 'comfortably warm'. Less than 10% of homeowners were either 'uncomfortably cold' or 'uncomfortably hot'. The mean temperature for homeowners was analysed by comfort level (see Table 13). The average temperature was 21°C. It was at least two degrees lower for those reporting that their living room was 'comfortably cool' or 'uncomfortably cold'. Those homeowners reporting that the living room was 'comfortably warm' recorded an average temperature of 22°C.

Table 13 Average temperature (°C) of the living room during the winter by rating of comfort level

		Uncomfortably cold	Comfortably cool	Comfortable	Comfortably warm	Uncomfortably hot
Mean		17.64	19.22	20.51	21.53	23.33
95% Confidence Interval for Mean	Lower Bound	16.89	18.95	20.42	21.42	21.34
	Upper Bound	18.40	19.49	20.61	21.64	25.33
Median		18	19	21	22	24
Std. Deviation		3.285	1.767	1.531	1.582	2.598
N		76	165	1,091	780	9

Thirty-six percent of homeowners reported having notable problems with one or more of the following energy-related problems in their current dwelling:

- Draughts from windows and/or doors
- High energy bills
- Problems with their heating system
- The temperature in the home

Homeowners also faced a range of other problems that were not energy-related. Generally, this involved work to the interior or exterior of the building. Where this was specified it has been possible to review some

of the issues that new homeowners deal with. Table 14 provides a breakdown of the issues raised by homeowners who reported other issues with their properties.

Table 14 Non-energy-related problems faced by homeowners

	An issue	No issue	Total
General problems with exterior and or interior	54%	46%	925
Other issue	18%	82%	925
Water damage	16%	84%	925
Damp and condensation	16%	84%	925
Electrical repairs	10%	90%	925
Poor workmanship	5%	95%	924
Pest control	3%	97%	925

Base: Homeowners reporting other problems (N = 925)

6.2 Country-specific factors

The homeowner’s country was a factor that influenced the condition, temperature, level of comfort and the type of energy-related problems likely to be reported.

Figure 18 highlights the range of response about the current condition of dwellings in the sample by country. It was notable that homeowners in Denmark, Germany and Finland rated the condition of their current dwelling differently from homeowners in the Netherlands and England. Over 30% of homeowners in Denmark, Germany and Finland bought dwellings that were in a ‘very good’ condition, less than a fifth of homeowners in either the Netherlands or England rated their dwellings to be in a ‘very good’ condition and over a fifth of dwellings in these countries were rated in a poor condition at the time of purchase.

Figure 18 Current condition of the dwelling by country

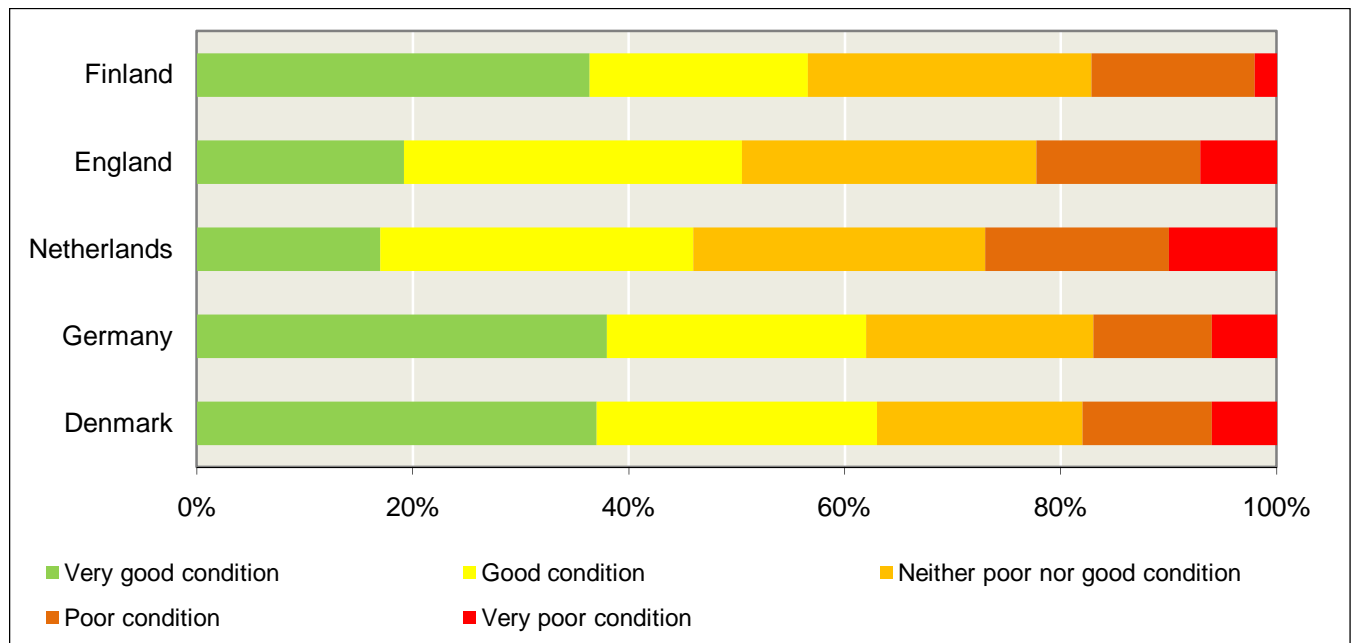


Table B25 in Appendix B

An estimate of living room temperature during the winter provides the possibility of comparing tolerable living room conditions between countries. The percentage of homeowners able to estimate the winter temperature in their living room varied in each country, from 90% of homeowners in the Netherlands, to 49% of homeowners in England. However, the data provides clear differences in the temperature experienced by homeowners in the Netherlands and England compared to homeowners in Denmark, Germany and Finland. The median temperature in both the Netherlands and England was 20°C. In the other countries this was one or two degrees higher (see Table 15).

Table 15 Average temperature (°C) of the living room during the winter by country

		Denmark	Germany	Netherlands	England	Finland
Mean		21.12	21.42	19.68	19.69	21.35
95% Confidence Interval for Mean	Lower Bound	20.98	21.30	19.54	19.43	21.04
	Upper Bound	21.25	21.54	19.82	19.94	21.67
Median		21.00	21.00	20.00	20.00	22.00
Std. Deviation		1.522	1.707	1.596	2.265	1.494
Minimum		15	15	10	10	18
Maximum		29	30	28	28	26

There were also notable differences between the countries in their response to the level of comfort in their dwelling. Homeowners in Finland and England responded differently from homeowners in Denmark, Germany and the Netherlands. In both Finland and England almost 30% of homeowners reported being ‘uncomfortably cold’ or ‘comfortably cool’ in their current dwelling. More homeowners in Germany than in any other country reported to be comfortably warm, with 44% rating their dwelling as such, compared to 14% in Finland (see Figure 19).

Figure 19 Level of comfort in the home

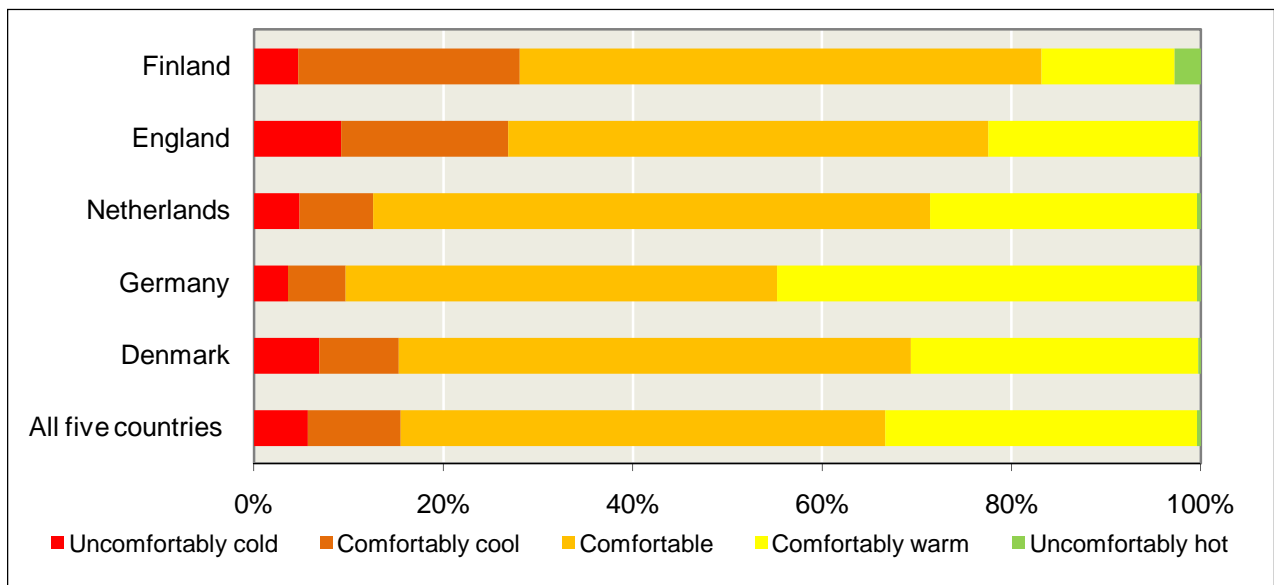


Table B31 in Appendix B

After the purchase of their current dwelling, 29% of homeowners had to respond to problems that were not energy-related. In our sample, this ranged from 16% of homeowners in Germany to 46% of homeowners in England. The types of issues are documented in Table 14. While the vast majority of homeowners did not report notable energy-related problems with their current dwelling, there were country-specific differences for all four potential energy-related problems.

Around 10% of homeowners in Germany faced problems with draughts from windows and doors; this was the lowest percentage of all the countries. Figure 20 also shows that over 20% of homeowners in the Netherlands, England and Finland reported notable problems with draughts.

Figure 20 Percentage of households with notable problems with draughts from windows or doors

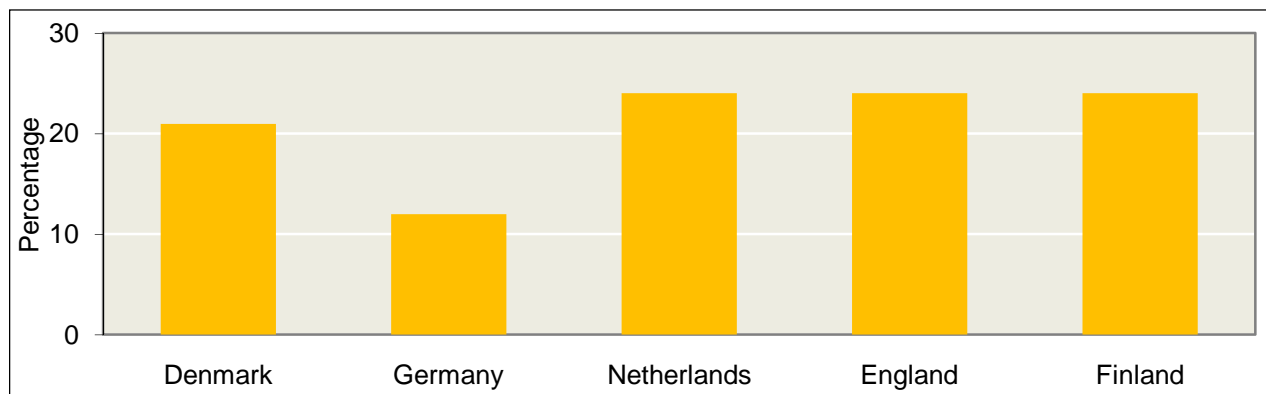


Table B26 in Appendix B

There were also differences by country for responses to problems related to high energy bills (see Figure 21). Twenty-seven percent of homeowners in England experienced problems with high energy bills; a similar proportion (22%) had the same problem in the Netherlands. This was different from homeowners in Germany, where 12% had experienced problems.

Figure 21 Percentage of households experiencing notable problems with high energy bills

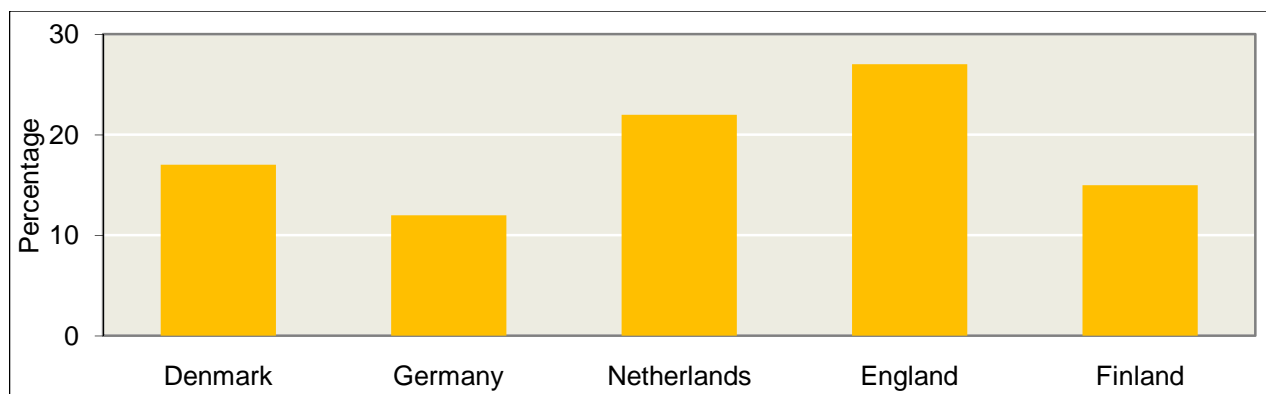


Table B27 in Appendix B

National statistics show that, on average, households spend between 3% and 7% of their expenditure on energy (see Table 16). In England this ranged from 3% for households in the highest income decile to 9% for those in the lowest income decile. Therefore, household income may be the reason for the differences. It may also be possible that homeowners in England were unaware of the potential cost of energy in their

homes. Homeowners in England and the Netherlands bought the oldest properties, and were also the least likely to consider utility cost during the home-buying process. Higher proportions of households in Denmark, Germany and Finland considered utility costs at the buying stage; this may explain why fewer reported problems with high energy bills in their current homes.

Table 16 National statistics on percentage of energy expenditure for households by country

	Denmark ³⁵	Germany ³⁶	Netherlands ³⁷	England ³⁸	Finland ³⁹
Energy expenditure for households	7.0%	6.2%	6.2%	5.0%	3.4%

Figure 22 confirms that there were differences between the countries related to problems with their heating systems. Respondents in England were noticeably different from those in the other four countries. Over 30% of homeowners in England had a problem with their heating system. This was much higher than the 13% and 12% of households in Denmark and Germany.

Figure 22 Percentage of households experiencing notable problems with their heating system

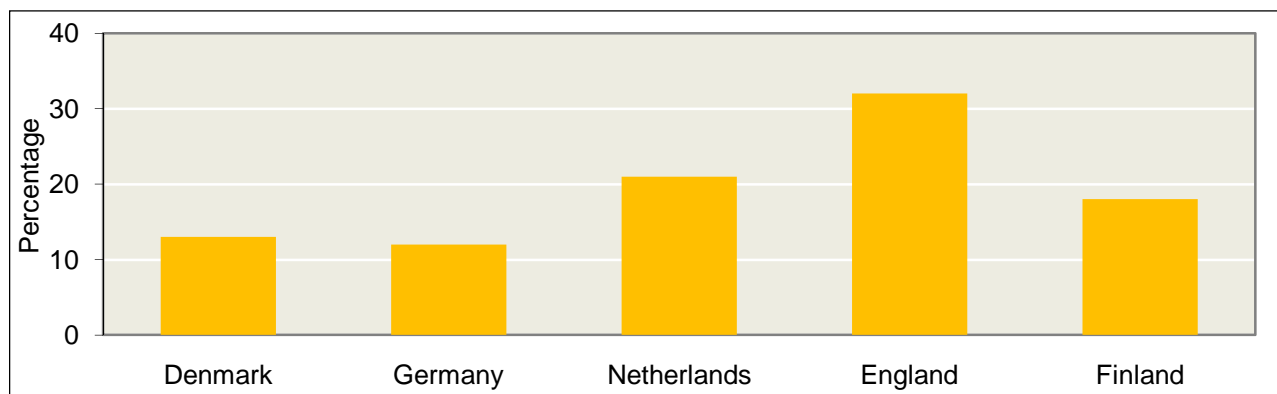


Table B28 in Appendix B

The final energy efficiency issue relates to the temperature of the property. Less than 20% of all homeowners experienced notable problems in keeping their property at a comfortable temperature, although there were again differences by country (Figure 23). There were particular differences between Germany and the other countries. Once again, it was households in England that reported the most problems. Twenty-seven percent of households in the sample from England experienced issues with the temperature, compared with 10% of homeowners in Germany.

³⁵ <http://www.statistikbanken.dk/>

³⁶ Destatis (2008)

³⁷ <http://statline.cbs.nl/statweb/>

³⁸ Office for National Statistics (2010)

³⁹ Official Statistics of Finland(2011)

Figure 23 Percentage of households that experienced notable problems keeping property at a comfortable temperature

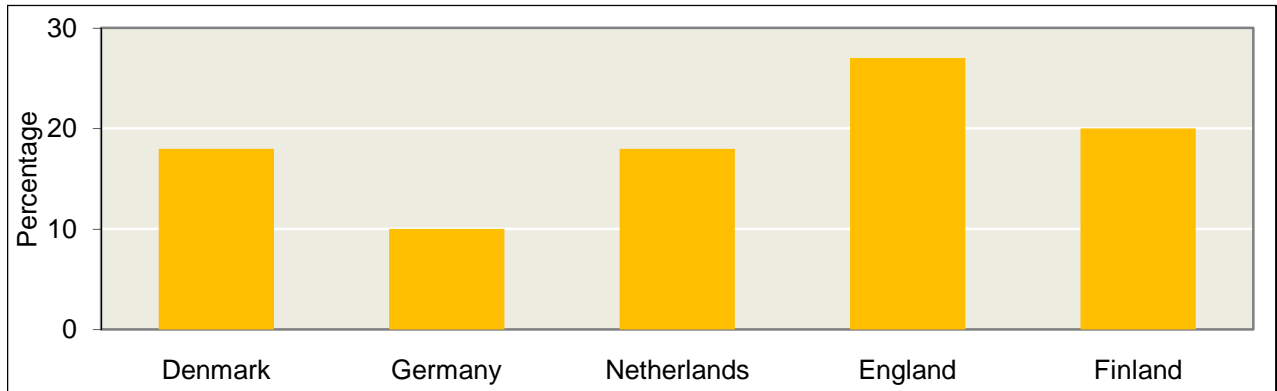


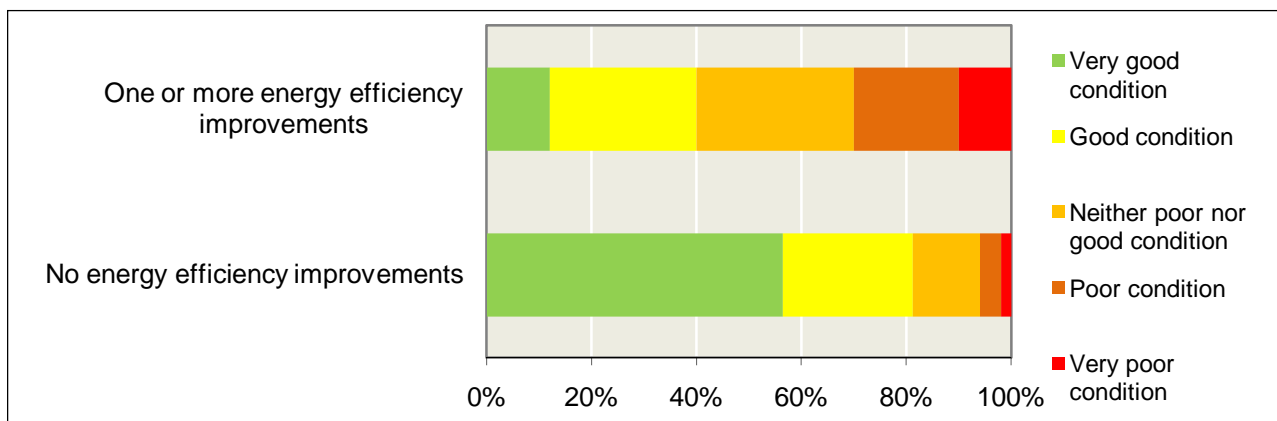
Table B29 in Appendix B

6.3 Other factors related to the condition of homeowners' current dwellings

There was a small, albeit significant, difference in homeowners' rating of the condition of their current dwelling, depending on the Energy Performance Status of the household. There was also a significant difference between households with recommendations and households without a label or recommendations.

Figure 24 also confirms the results of tests that indicate that there was a significant difference between households, depending on whether they had completed energy efficiency home improvements. Thirty percent of homeowners who had completed energy efficiency measures rated their current property in a poor condition at the time of purchase; this was the case for only 6% of homeowners who had not completed home improvements.

Figure 24 Homeowners' rating of the condition of current dwelling by energy efficiency behaviour



Base: All homeowners (N=2,749)

6.4 Discussion

While the majority of recent homeowners did not have immediate or pressing home improvements needs when they purchased their property, a third reported an energy-related problem with their dwelling and around 30% had general problems with their property. Many of these homeowners may have had little choice but to consider taking action to improve their dwelling. For some, issues with draughts can be rectified using a number of affordable measures. However, other issues such as high energy bills, and problems with the temperature in the home, may not be easily solved.

There were also issues related to general problems that may have needed immediate work. Whether this work prevents homeowners from thinking about other factors, or whether it leads to energy efficiency measures being implemented, was uncertain.

7 Home Improvements

The previous chapters have provided information on the type of homeowners in the study, alongside information about their household and dwelling. This section provides details of homeowners' completed home improvements and their plans for improvements. This section examines homeowners' 'efficiency behaviour'⁴⁰. It collates information about the type of improvements that were prioritised by homeowners; and provides details of actual investment behaviour, and the place of energy efficiency behaviour, in relation to other improvements.

7.1 General findings

Three-quarters of homeowners surveyed had completed some form of home improvement at the time of the survey. All homeowners chose from a list of nineteen improvements that included general improvements and specific energy efficiency ones. There was also an opportunity for them to list other improvements. However, the current focus is on the following nineteen improvements:

- Build an extension/conservatory
- Change the garden/outdoor space
- Change the heating controls
- Draught-proof windows and/or doors
- Fit a new or improved bathroom
- Fit a new or improved kitchen
- Fit double glazing or energy-efficient glazing
- General decoration
- Improve the air tightness of the building
- Install cavity or solid wall insulation
- Install floor insulation
- Install loft insulation
- Install new boiler/heating supply
- Install renewable energy technologies
- Install ventilation system with heat recovery
- Install wood burning stove or fire place
- Insulate the hot water tank
- Insulate the water/heating pipes
- Replace light bulbs with energy-saving light bulbs

The median number of these home improvements being carried out by all homeowners was four; the median increased to five for homeowners who had carried out at least one improvement at the time of the survey. Eighty-six percent of homeowners who had completed at least one improvement had decorated their dwelling; two-thirds had changed the garden or outdoor area, and a similar proportion had replaced light bulbs with energy-efficient bulbs.

⁴⁰ Martiskainen (2007) cited in Brohmann *et al* 2009

Costlier improvements such as installing or improving a kitchen or bathroom were carried out by 52% (for kitchens) and 46% (for bathrooms) of homeowners who had completed improvements. Around a third of these households had installed a new boiler or heating supply; the same proportion had improved the glazing and a similar number of homeowners had installed loft insulation. Nine percent had installed some form of renewable technology.

Figure 25 The percentage of all households that had completed energy-efficient improvements

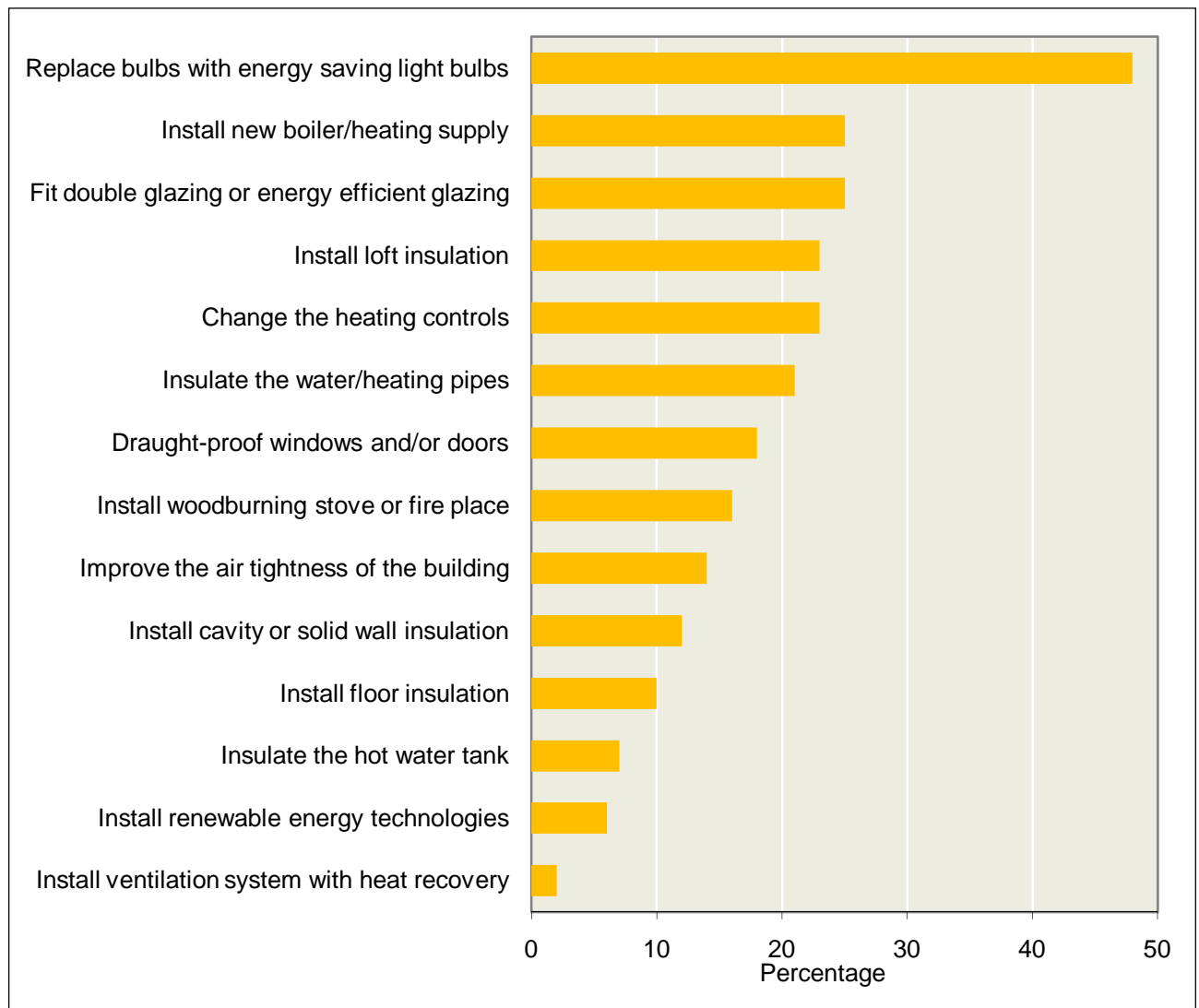
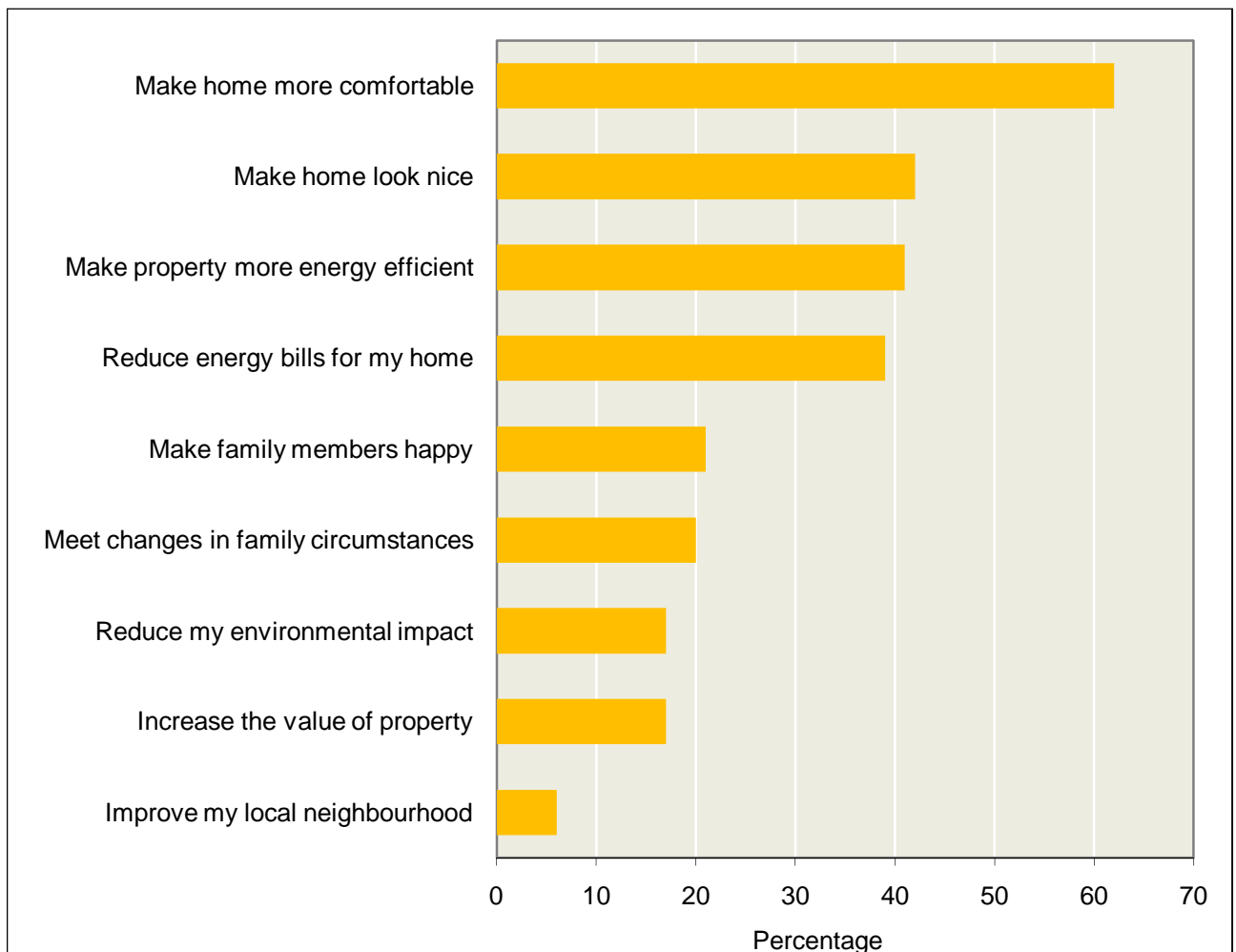


Table C2 in Appendix C

Figure 25 highlights that a quarter or fewer homeowners were carrying out specific energy efficiency improvements, apart from changing light bulbs. Renewable technologies had been installed by just over 5% of all households. The most common renewable technology installed was a solar water heating system; 110 households had this installed in their dwelling, while 50 had installed a wood-fuelled heating system, and 49 had installed a solar electricity system. Wind turbines had not been installed in any of the dwellings in the sample at the time of the survey.

Homeowners rated the importance of nine reasons for carrying out all types of home improvements. While some homeowners may have completed more than one improvement, the reasons are still likely to provide an indication of factors that motivate homeowners in general. Figure 26 provides details of the percentage of homeowners who rated each factor 'very important'. Comfort was very important for the majority (62%) of homeowners completing an improvement. Improving the appearance of the home was also an important factor for 42% of homeowners, as were energy efficiency (41%) and reducing energy bills (39%) for homeowners who had completed an improvement. It was notable that less than a fifth (17%) of homeowners rated 'increasing the value of the property' very important.

Figure 26 Reasons for completing improvements rated very important by homeowners



Tables C9 – C17 in Appendix C

Over half (55%) of the homeowners surveyed expected to carry out home improvements in the next three years. General decoration was in the three-year plan for 61% of homeowners, changes to the garden/outdoor area for 45%, fitting a new bathroom for 32% and a kitchen for 24%. In terms of energy efficiency improvements (see Figure 27), loft insulation was planned by 22% of homeowners and renewable technology by 14%. One hundred and forty-four households planned to install solar water heating systems, and 127 households were planning to install a solar electricity system. A small number of households (19) were planning to install a wind turbine.

Ecofys (2005) states that efficient lighting and insulation are “promising and profitable measures to reduce the energy use in buildings”⁴¹. Fifty-two percent of households had either improved their lighting or planned to, and 48% of households had installed some form of insulation.

Figure 27 The percentage of all households that planned energy-efficient improvements

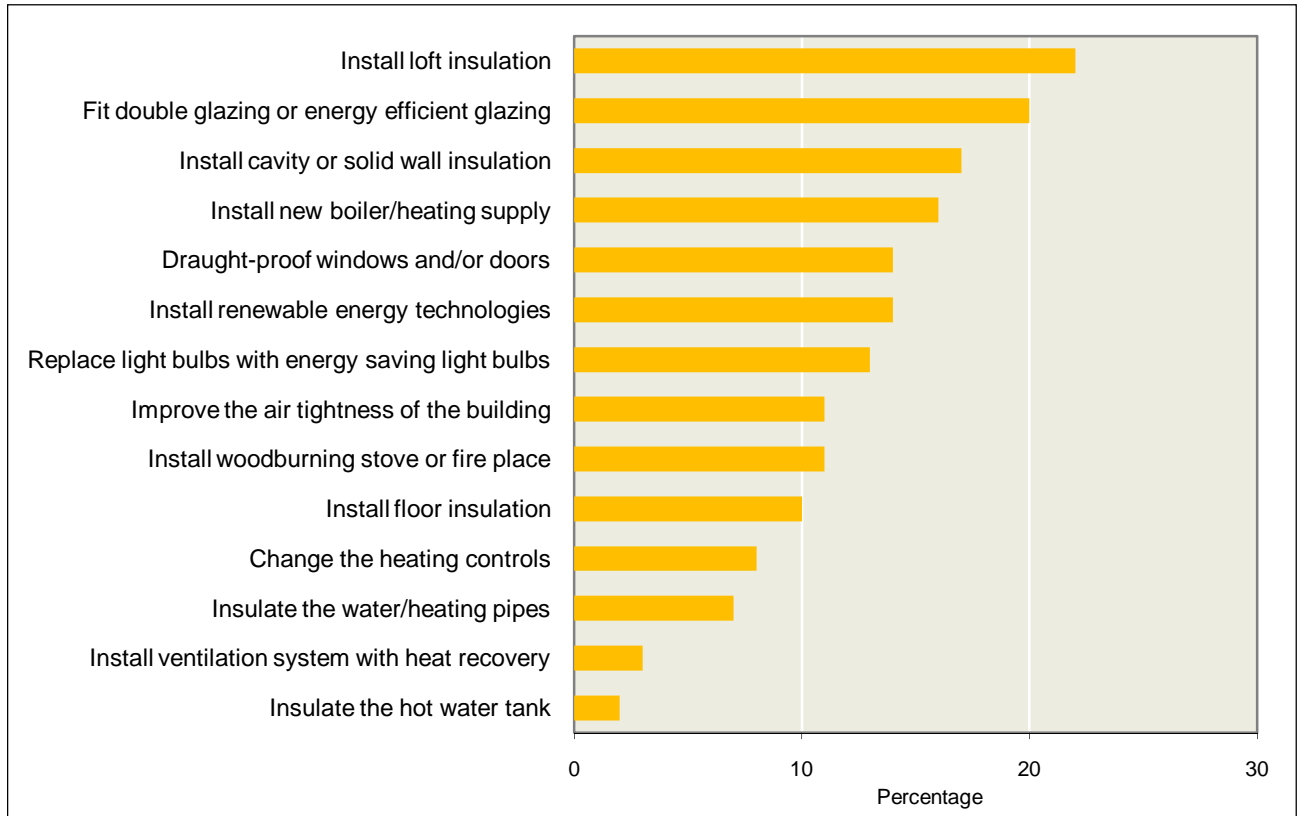


Table C19 in Appendix C

Half of all homeowners had completed works and planned further works in the next three years. The sample can be divided into six categories, based on the households' home improvements status at the time of the survey and their intended behaviour in the next three years:

- 50% had completed improvements and planned further improvement in the next three years
- 16% had completed improvements but had no improvement plans for the next three years
- 10% had completed improvements but were uncertain about any future investment
- 13% had not improved their home and did not plan improvements in the next three years
- 6% had not improved their home but planned to do so in the next three years
- 5% had not improved their home and were uncertain about any future investment

The largest group (50%) of homeowners had completed improvements at the time of the survey and were intending to make further improvements in the following three years. This group differed from other homeowners. Their current dwelling tended to be older than the other groups and its condition poorer. Fifteen percent of homeowners who had completed improvements and intended to do further work lived in properties that were built in or after 1991, compared with 75% of other households. Fifteen percent of

⁴¹ Ecofys 2005 cited in Brohmann *et al* 2009

homeowners who had completed improvements and planned further improvement in the next three years lived in properties built before 1919, compared to 5% of those household not in this category.

There was also a marked difference between these groups related to their EPC status. Thirty-five percent of households that had both completed and planned improvements had an EPC and were aware of recommendations, compared to 19% of homeowners in the other group. There were also slightly fewer households in the group that had both completed and planned improvements that did not have an EPC (see Table 17).

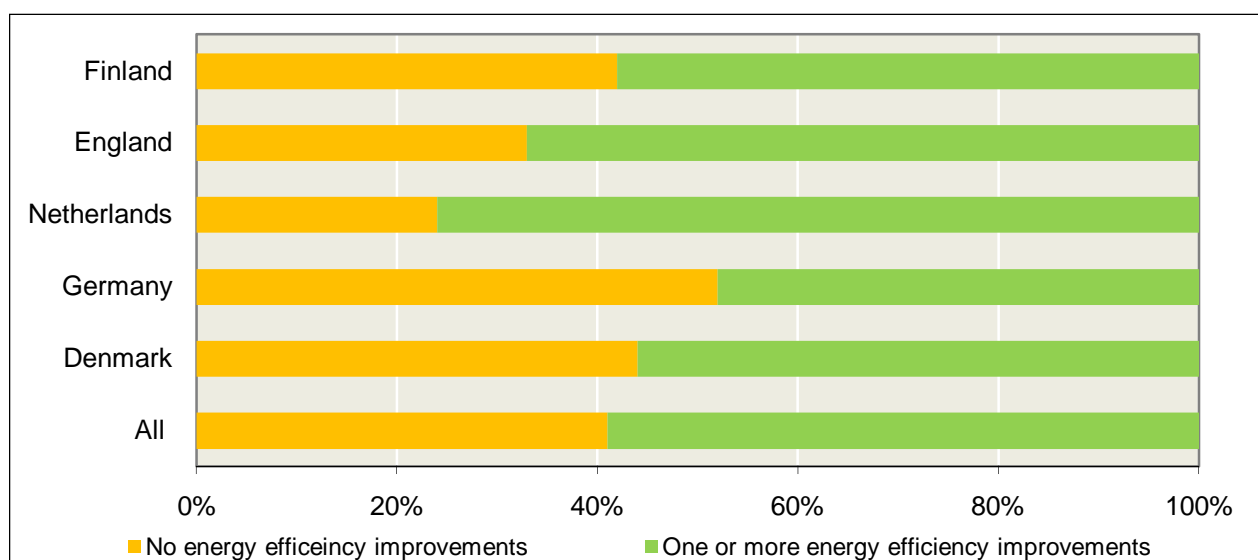
Table 17 Percentage of homeowners by EPC status and home improvement behaviour

	All other improvement behaviour	Both completed and planned improvements
Household aware of EPC and recommendations	19%	35%
Household aware of EPC but not recommendations	37%	27%
No EPC	44%	38%
Total	100%	100%

7.2 Country-specific factors

In the Netherlands 76% of homeowners had implemented energy efficiency measures; in Germany this figure was less than 50% (Figure 28).

Figure 28 Whether energy efficiency measures were completed since the purchase of current dwelling



Seven energy efficiency improvements featured in the top four most common improvements for all five countries (see Table 18). Changing light bulbs featured at the top of the list for all countries. Two-thirds of homeowners in England had carried out this measure, whereas only a third of households in Germany had. Germany had the lowest percentage of homeowners carrying out energy-efficient improvements, when compared to all the other countries in the study.

Installing a new boiler or heating system was a common improvement in the Netherlands, England and Finland. At the time of the survey, this had been done by 45% of homeowners in the Netherlands, 32% in England and a fifth of homeowners in Finland.

Forty-four percent of households in the Netherlands reported changing the heating controls in their dwelling; this was also the case for 31% of homeowners in England and 22% of homeowners in Finland.

Improving the glazing was a popular choice in the Netherlands, Denmark and Germany. Over a third (38%) of homeowners in the Netherlands had completed this improvement, a quarter (25%) of all households in Denmark and around a fifth (19%) of households in Germany.

Loft insulation was in the top four most common energy efficiency measures for England, Denmark and Germany. A third, (33%) of homeowners in England had completed this improvement. In Denmark and Germany, these figures were 22% and 19%. Draught proofing was common in Finland (32%) and Denmark (20%) and in Germany nearly a quarter of homeowners reported that they had insulated their water/heating pipes.

The most popular planned energy efficiency improvements generally mirrored the top four most common completed improvements. However, there were some notable additions; wall insulation featured in the top four planned improvements in Germany and Denmark. In Germany 23% of homeowners were planning this improvement, and in Denmark, 20%. The installation of renewable energy technology was also in the top four planned improvements in Germany, the Netherlands and Finland. In Germany 19% of homeowners planned this type of improvement, 17% in the Netherlands and 13% in Finland.

Improvement to glazing was in the top four planned improvements in England, where 14% of homeowners expected to do this in the next three years.

Table 18 The four most common energy efficiency improvements completed and planned in each country

Denmark	Completed	Planned
Most common EE improvement	44% Installed energy-efficient lighting	28% Improve glazing
	25% Improved glazing	27% Install loft insulation
	22% Installed loft insulation	20% Install wall insulation
	20% Draught proof	20% Draught proof
Germany	Completed	Planned
Most common EE improvement	38% Installed energy-efficient lighting	25% Install loft insulation
	23% Insulated the water/heating pipes	23% Install wall insulation
	19% Improved glazing	19% Install renewable energy technologies
	19% Installed loft insulation	17% Improve glazing
The Netherlands	Completed	Planned
Most common EE improvement	55% Installed energy-efficient lighting	25% Install new boiler/heating supply
	45% Installed new boiler/heating supply	22% Improve glazing
	44% Changed the heating controls	19% Install loft insulation

	38% Improved glazing	17% Install renewable energy technologies
England	Completed	Planned
Most common EE improvement	66% Installed energy-efficient lighting	19% Install new boiler/heating supply
	33% Installed loft insulation	16% Install loft insulation
	32% Installed new boiler/heating supply	14% Improve glazing
	31% Changed the heating controls	13% Install energy-efficient lighting
Finland	Completed	Planned
Most common EE improvement	54% Installed energy-efficient lighting	28% Draught-proof
	32% Draught-proofed	16% Install energy-efficient lighting
	22% Changed the heating controls	13% Improve glazing
	20% Installed new boiler/heating supply	13% Install renewable energy technologies

The least common completed energy efficiency improvement varied by country. The three least favoured improvements were installing renewables, installing a ventilation system with heat recovery, and insulating the hot water tank. Renewables were the least popular improvement in Denmark with only 3% of homeowners reporting that they had completed any of these types of works. One or two percent of households in Germany, the Netherlands and England had installed a ventilation system with heat recovery and 2% of homeowners in Finland had insulated their hot water tank. The least-favoured planned improvement in all countries centred on three types of improvements. These were insulating the hot water tank (Denmark and Germany) installing ventilation system with heat recovery (the Netherlands and England) and installing a new boiler/heating supply, which was planned by 3% of homeowners in Finland.

There were 207 households that had installed renewable energy technologies at the time of the survey. Over half (54%) of these households were in Germany, a fifth (22%) were in the Netherlands and 10% were in Denmark. Seventy percent of the 112 households in Germany that reported installing renewable energy technology had a solar water heating system, around 30% had a solar electricity system and another 30% had a wood-fuelled heating system. The majority of renewable technologies installed in German households in the sample were visible from the outside of the dwelling. This may relate to Jensen's (2004) suggestion that "residents are most likely to realize energy savings if these are both visible and contribute positively to his/her symbolical communication with others"⁴². Homeowners in Germany were also the most likely to be planning to install renewable energy technology in the next three years; 43% of all homeowners planning this type of improvement were in the German sample, compared with 20% from the Netherlands and 17% from England.

Homeowners in Germany also reported the greatest awareness of friends and neighbours installing renewable energy technology. Of the 157 households that were aware that their neighbours had installed renewable energy technology, around 60% were from the German sample. Just over 40% of households aware of family or friends installing renewables were from Germany, with 24% from Denmark. Bruppacher and Ulli-Ber (2001) propose that people's social surroundings, such as friends, family, colleagues,

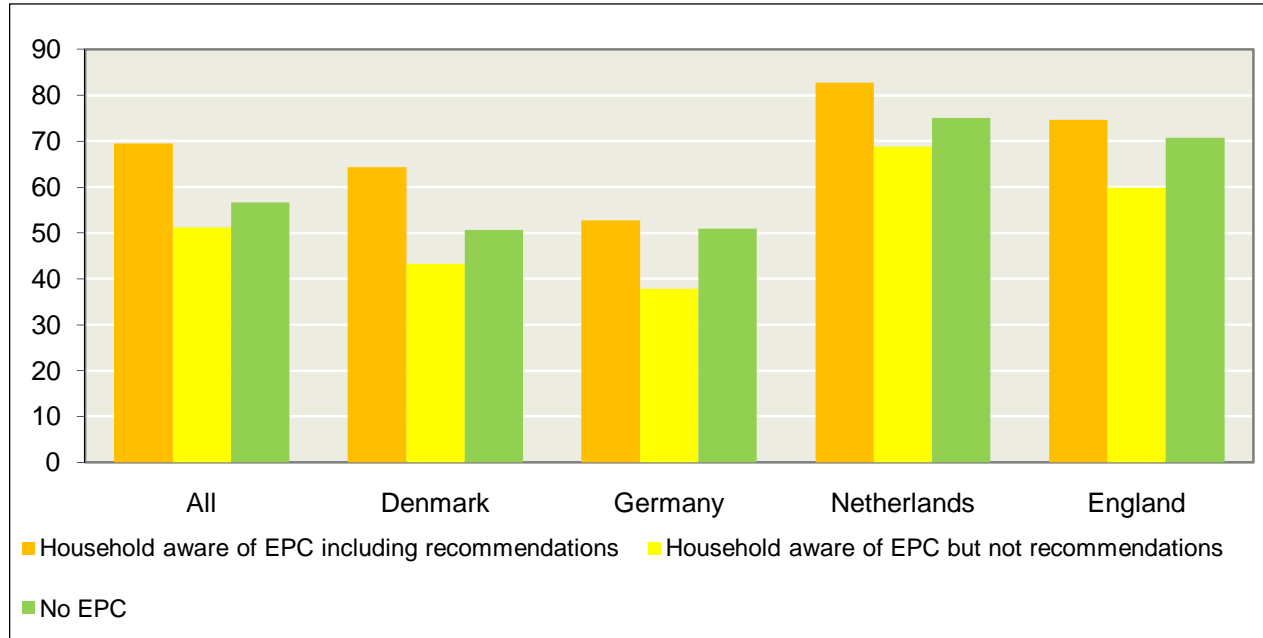
⁴² cited in Brohmann *et al* 2009

neighbours, or other peer groups, can strongly influence their perceptions, opinions and behaviour⁴³. Although there were only a few cases of homeowners being aware of the installation of renewable technologies by neighbours, family and friends, these parties may have an influential role to play in decision-making. This is most notable in the case of German households.

7.3 Other factors

There was a difference in the energy efficiency behaviour of households associated with their EPC status. More households with an EPC and recommendations had completed energy efficiency improvements, compared to households with an EPC but who were unaware of the recommendations, or households without an EPC. There was no difference between households with an EPC but unaware of the recommendations and households without an EPC. Figure 29 shows the differences between the groups. In four countries, Denmark, Germany, the Netherlands and England the proportion of homeowners who had carried out energy efficiency home improvements was greater if the homeowner had a full EPC and had knowledge of the recommendations on the certificate. It was notable that 69% of homeowners with a full certificate with recommendations had carried out energy efficiency improvements, compared to 51% of homeowners with an EPC but who were not aware of the recommendations. In the final group, 57% of homeowners had carried out energy efficiency improvements despite not having an EPC for their home.

Figure 29 Percentage of households that had carried out one or more energy efficiency home improvements by their EPC status



Base: All homeowners (N=3,098)

However, there are other factors at play in determining whether energy efficiency measures take place, such as the need for this type of work determined by the condition and age of the dwelling. Table 19 highlights that 88% of homeowners who lived in property built after the year 2000 had not completed energy efficiency works; it is unlikely that energy efficiency measures were needed for these properties.

⁴³ Best-Waldhober *et al* (2009)

Table 19 Percentage of dwellings in each age category by whether energy efficiency improvements completed

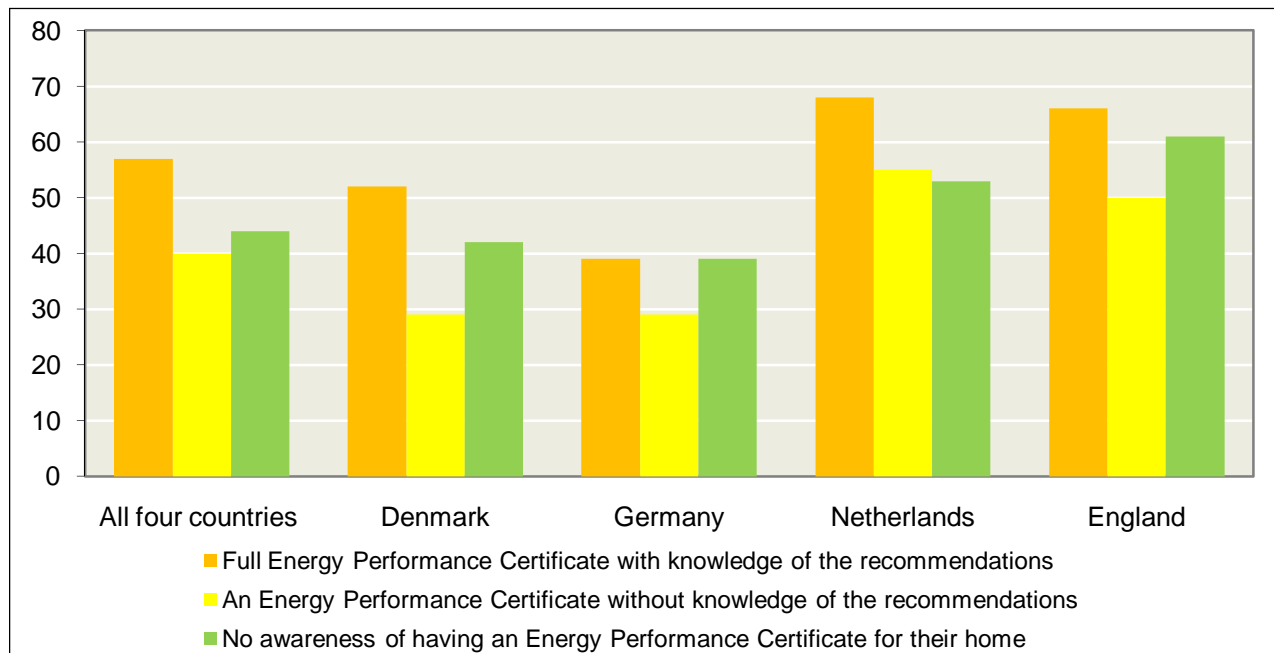
	No energy efficiency improvements	One or more energy efficiency improvements	N
Before 1919	27%	73%	370
1919-1945	21%	79%	412
1946-1970	23%	77%	703
1971-1980	25%	75%	406
1981-1990	41%	59%	275
1991-2000	54%	46%	276
After 2000	88%	12%	609

While each EPC is dwelling dependent, there are six energy efficiency measures that can be considered a proxy for the influence of the EPC, since these are the measures that are likely to be specified on an EPC in any of the countries. These recommendations are:

- Insulate roof and or loft
- Insulate walls
- Improve glazing
- Upgrade and or install boiler
- Improve central heating system
- Use or install solar energy system

Figure 30 shows that 57% of households in Denmark, Germany, the Netherlands and England that had an EPC with recommendations had carried out one or more of the recommendations likely to feature on an EPC recommendations report. The percentage of households in the other EPC categories carrying out these types of measures was much lower, 40% (EPC without recommendations) and 44% (households without an EPC). There were also differences between countries. Almost 70% homeowners in the Netherlands with an EPC with recommendations had carried out these energy efficiency measures. In Denmark, 52% of households with a full EPC including recommendations had completed at least one measure, compared with 29% of households in the group that had an EPC but were not aware of recommendations.

Figure 30 Percentage of households that had carried out one or more EPC related energy efficiency home improvements by their EPC status



Base: All homeowners (3,098)⁴⁴

7.4 Discussion

Homeowners in the sample demonstrate a tendency to invest in their dwelling. The majority of homeowners had improved their dwellings. Many of the works related to improving the décor, the kitchen and bathroom. Jensen (2004) suggested that kitchens and bathrooms were a priority for homeowners. However, energy efficiency measures were completed by around 60% of homeowners. The most common 'efficiency behaviour' was the installation of energy-efficient lighting. However, homeowners in all countries were making significant investments; for example, between 19% and 33% of homeowners in Denmark, Germany and England had installed loft insulation, and between 19% and 38% of homeowners in Denmark, Germany and the Netherlands had improved the glazing of their dwelling. Homeowners continued to plan further works, with around a fifth of homeowners in Denmark and Germany planning to install wall insulation and between 13% and 19% of homeowners in Finland, the Netherlands and Germany planning to install renewable technologies.

The reasons for completing improvements were generally reported to be to improve the comfort of the home, followed by improving its appearance. Both improving energy efficiency and reducing energy bills were also motivating factors for more than two-fifth of homeowners.

The EPC also played a role in determining energy efficiency behaviour, as more homeowners with an EPC with a recommendations report had carried out energy efficiency improvements than other homeowners, although the differences were not noticeable in all countries. When specific energy efficiency measures were considered (those that were common to recommendations reports in Denmark, Germany, the Netherlands and England), there was a marked difference in the proportion of households that had carried out energy efficiency measures, with more households with a full EPC completing improvements.

⁴⁴ Insufficient data for Finland

Homeowners who had an EPC and were aware that they had received an energy efficiency rating for their dwelling but were not aware of a recommendations report, were the least likely to have completed at least one energy efficiency measure. In most countries this group differed from those homeowners who reported not to have, or not to be aware of having, an EPC for their dwelling.

While the EPC seems to have an influence, there were still a number of homeowners without a recommendations report who had completed energy efficiency measures. Whether this was because these measures are being discussed in the mass media or because there was a need to carry out a particular repair, or to invest in a measure because of problems with the comfort in the home, will be considered later in this study.

8 The Energy Performance Certificate as a source of information

The literature suggests that information is an important factor in determining energy efficiency behaviour⁴⁵. ICF (2010) provides five categories of energy advice, ranging from the lowest, which is 'all marketing and information that raises awareness of the need for action' to the highest, which is 'detailed advice specific to [the] home— involving home visit and support to implement actions'. The position of the EPC depends on the way it is implemented. The level of detail provided in the EPC and the way it is implemented is different in each member state⁴⁶. This section explores homeowners' general awareness of EPCs, as well as their specific knowledge about the document.

8.1 General findings

8.1.1 General awareness of EPCs

Less than 10% of homeowners reported any difficulty in accessing information on how to improve the energy efficiency of their home, and just over 60% of homeowners considered access to energy efficiency information 'easy' or 'very easy'. The vast majority (88%) of homeowners had heard about the EPC. Two-thirds (67%) of homeowners had seen a label; a fifth had heard of the label but had not seen it.

Figure 31 Homeowners' source of knowledge of Energy Performance Certificate

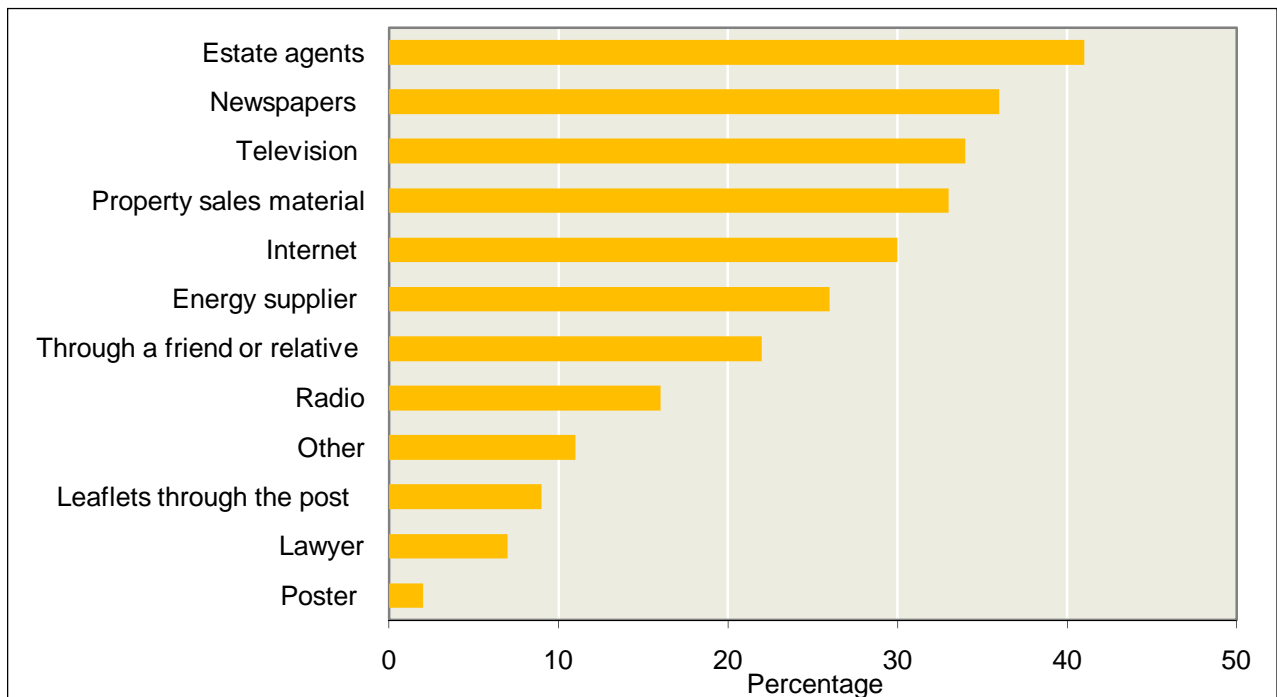


Table D2 in Appendix D

⁴⁵ Brohmann *et al* (2009)

⁴⁶ Tuominen and Klobut (2009)

Figure 31 shows that over 40% of homeowners were made aware of the EPCs through an estate agent, around a third found out through a newspaper, and a similar proportion were made aware via the television. Property sales material was also a common source of information for over 30% of all homeowners.

8.1.2 Homeowners with an EPC

Only 25 homeowners in the sample from Finland had an EPC, as this is a very small sample. Data from Finland are not included in the following findings, although information on homeowners from Finland with an EPC is available in Appendix E.

About 60% (1,912) of all homeowners reported that they had an EPC. Over 70% of homeowners with an EPC had one because they had purchased a property and 17% voluntarily acquired one.

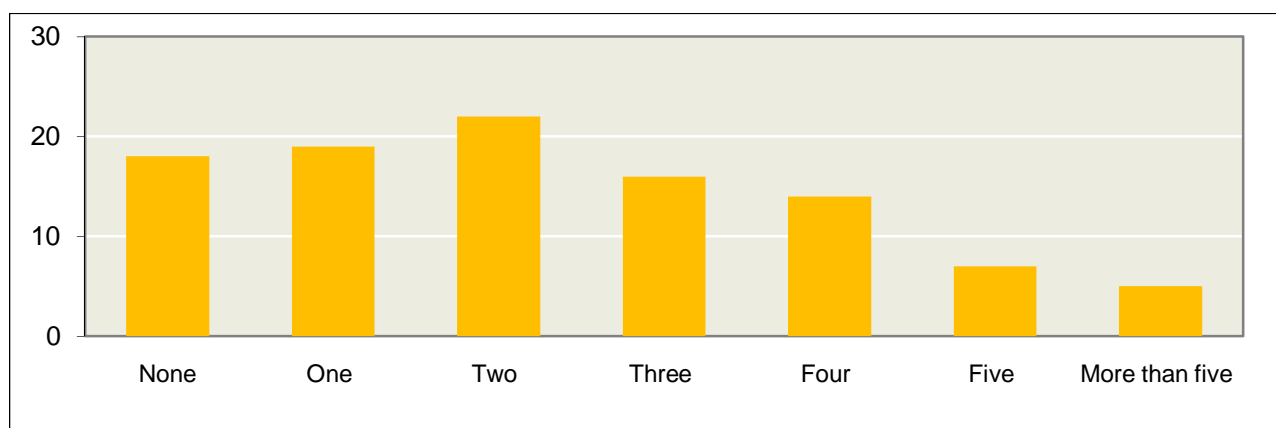
Fewer than half of homeowners who had an EPC because they had purchased a property were shown the EPC before they made an offer on their current property. Only a third reported that it was an important factor in their decision to make an offer on their current dwelling.

Only 8% of homeowners who had received an EPC because they purchased a property used the information to negotiate on the price of their home, which corroborates previous reports in the UK⁴⁷. Almost half (46%) of home buyers with an EPC reported that the document was not an important factor in the decision to purchase their current dwelling. It was notable that around half of recent homebuyers saw the EPCs for other properties during the process of looking for a home.

While two-thirds of the sample were aware that they had an EPC, a smaller group of these was aware of some of the details contained in the document, such as the energy efficiency rating and the energy efficiency recommendations. Almost 70% of homeowners who had an EPC for their home could recall its energy efficiency rating.

Nine hundred and forty six homeowners could recall the recommendations from their EPC. However, almost a fifth (18%) of these reported that they did not receive any recommendations. The remaining 82% could recall one or more of the energy efficiency measures stated on the document. Over a fifth of homeowners could recollect two of the recommendations (Figure 32).

Figure 32 Number of recommendations stated/recalled



Base: Homeowners with an EPC that could recall that the EPC included recommendations (N=946)

⁴⁷ Royal Institution of Chartered Surveyors (2010)

These findings were based on homeowners' recollection of the recommendations and therefore do not suggest that these are the number of recommendations that were received. Equally, when reviewing the type of recommendations, it is important to note that these also reflect those that were recalled; it is not a comprehensive list of recommendations received by homeowners.

Over half (53%) of the homeowners who could recall one or more energy efficiency measure recalled the measure to insulate the roof or loft. Insulating the walls was recalled by 43% of these homeowners and improving glazing by 42%. A third of homeowners who could recollect at least one energy efficiency measure had not spent any money to implement these recommendations.

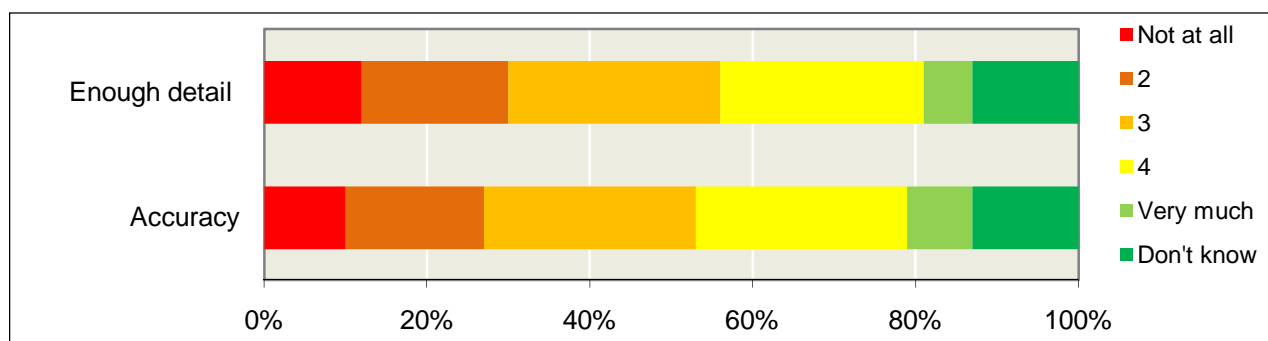
Of the two-thirds of homeowners who had spent money on recommendations, over a third had spent up to €1,000, 45% had spent between €1,000 and €10,000 and 20% had spent over €10,000 (see Table 20).

Table 20 Amount of money spent on energy efficiency recommendations

	Money spent	Future spending
Less than €500	21%	16%
€501 - €1,000	14%	17%
€1,001 - €5,000	27%	38%
€5,001 - €10,000	18%	17%
€10,001 - €20,000	9%	6%
More than €20,000	11%	6%
N	471	432

Generally, homeowners with an EPC found the document easy to understand, with 30% reporting that it was 'very easy' to understand. However, there was uncertainty about the accuracy that the EPC provided about the energy efficiency of the home; 13% of homeowners reported that they 'don't know'. The largest response was by homeowners who marked the middle of the five-point scale. A similar response was given by homeowners who responded to the question about the level of detail provided in the EPC, results for both of these questions are provided in Figure 33.

Figure 33 Homeowners' response to the level of detail and accuracy on energy efficiency provided by the EPC

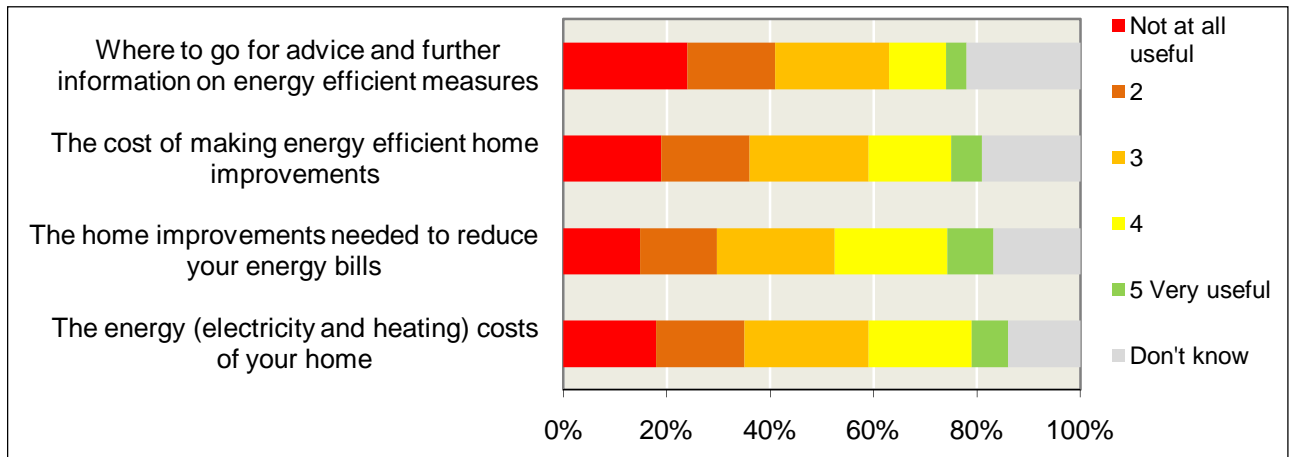


Tables D40 and D41 in Appendix D

Around a fifth of all homeowners with an EPC were uncertain about the usefulness of the document as a source of advice on where to find additional information, or in relation to the cost of energy efficiency measures, or as a source of information on home improvements or the energy costs. In addition, between 30% and 40% of homeowners with an EPC reported that the EPC did not provide useful information on

these four services. However, 31% thought it was useful as a source of information on home improvements needed to reduce energy bills and 27% considered it a useful resource about the energy costs of their home (Figure 34).

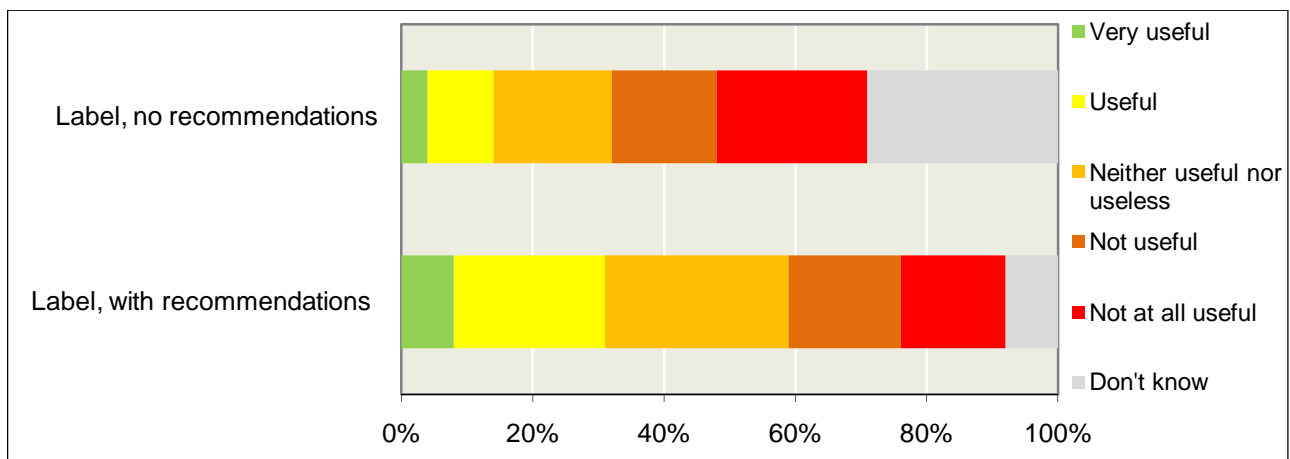
Figure 34 Usefulness of the Energy Performance Certificate as a source of information on the following:



Tables D42 and D45 in Appendix D

Figure 35 shows that homeowners who were unaware of the EPC’s recommendation report were less certain about the usefulness of the document as a source of information on improvements. Thirty-one percent of homeowners who were aware of the recommendations report found the document useful, although 33% did not.

Figure 35 Usefulness of the Energy Performance Certificate as a source of information on the home improvements needed to reduce energy bills, by EPC status



Base: All homeowners with an EPC (N=1,894)

8.2 Country-specific factors

The findings from homeowners in various countries differed in relation to a number of issues around energy efficiency information. This included access to energy efficiency information, awareness of the EPC, knowledge and experience of the EPC, and the level of trust in the EPC.

8.2.1 Access to energy efficiency information and awareness of EPCs

More homeowners in the Netherlands than in any other country found it easy to access information on energy efficiency. This contrasts with information from the stakeholder interviews in the Netherlands, which reported a lack of information about energy efficiency as a barrier to the successful implementation of the EPC⁴⁸. In the Netherlands, 39% of homeowners considered accessing specific energy efficiency information to be 'very easy'. In Germany and Finland, less than a fifth of homeowners considered accessing energy efficiency information to be 'very easy'. In Finland, a fifth considered this task difficult (Figure 36).

Figure 36 Homeowners' level of access to energy efficiency information

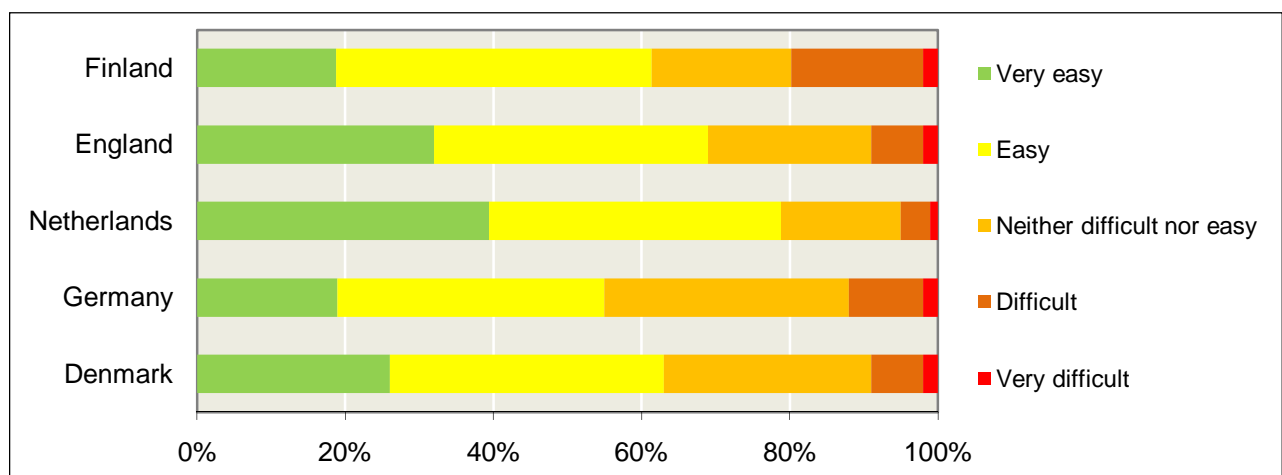


Table F5 in Appendix F

In the Netherlands, 99% of homeowners had heard of the EPC compared to 80% in England. Two-thirds (67%) of homeowners in Denmark, Germany, the Netherlands and England had seen an EPC. This was as high as 91% in the Netherlands but as low as 43% in Germany.

Knowledge of the EPC had been gained from various sources, depending on the country of the homeowner. There was a marked difference between these countries in relation to the energy supplier as a source of information; 41% of German homeowners were made aware of the EPC from their energy supplier, and yet this was the case for only 17% of homeowners responding from England. In England over 60% of homeowners were informed about the EPC through their estate agents, compared with 24% of homeowners in Germany. Property sales material was the source for 60% of respondents from Denmark, 46% from England, 26% from Germany and 22% from the Netherlands.

8.2.2 Homeowners with EPCs

It was notable that the percentage of homeowners with an EPC varied by country. Eighty-one percent of homeowners in the Netherlands had an EPC; this figure was 79% in Denmark, 69% in England and 38% in

⁴⁸ Tuominen and Klobut (2009)

Germany. There was a marked difference in the percentage of homeowners with an EPC in Germany compared to the other countries. The study sampled recent homebuyers in both England and Germany, because most would have purchased their current dwellings when an EPC was mandatory. However, the notable differences in these findings may be due to the fact that the implementation date of EPCs in Germany was around a year later than in England. However, Table H6 in Appendix I shows that homeowners in Germany were acquiring the EPC before they were mandatory. It was also interesting that even when EPCs were mandatory, there were still fewer than 50% of recent homebuyers that had an EPC for their current dwelling. This suggests that there may be issues with the implementation strategy in Germany.

Denmark and the Netherlands sampled dwellings that were known to have an EPC; therefore, it was expected that they would have high proportions of households with an EPC. Even so, there were still a fifth of homeowners in these countries that report that they did not have an EPC. Whether this was because of a lack of awareness or because they had not seen/received one is debatable.

Homeowners in the Netherlands and Germany had a choice about the type of EPCs that were available to them. In the Netherlands, homeowners had the choice of a standard energy label 'standaard energielabel' or tailor-made energy advice 'maatwerkadvies'. The 'standaard energielabel' is based on standardised average household characteristics. The label contains an energy rating, an estimation of energy consumption, and automatically generated standardised suggestions for home improvements. The 'maatwerkadvies' provides additional information. This includes the estimation of the energy consumption based on the specific actual household characteristics and detailed descriptions of the technical measures possible, including the cost and benefits. More than three-quarters of homeowners who had an EPC and could recall the type had the 'standaard energielabel', the rest (23%) had a 'maatwerkadvies'. In Germany a very small sample could recall whether they had an Energiebedarf or an Energieverbrauchskenwert, the proportion with each was evenly distributed (see Table D7 in Appendix D).

There were notable differences in the reasons that homeowners had an EPC, depending on their country. Over 90% of homeowners in England with an EPC had the document because they had purchased a property; this was the case for only 48% of homeowners in Germany. Around 80% of homeowners in Denmark cited a home purchase as the reason for having an EPC; this was also the case for 64% of homeowners in the Netherlands. In Germany, 49% of homeowners had an EPC because they had acquired one voluntarily; this was the case for 22% of homeowners in the Netherlands. Again, the contrast between Germany and the other countries in relation to the reason for having an EPC may highlight differences in the implementation date and the possibility that it is not regarded as a mandatory part of the home-buying process.

Almost two-thirds (63%) of homeowners in Denmark that had the EPC because of a house purchase received the EPC before making an offer on their current dwelling; in England this was the case for 44% of homeowners in this situation. Such information at this juncture in the home-buying process was deemed 'very important' by 13% of homeowners in Denmark, but by only 5% of homeowners in England. Ten percent of homeowners in Denmark regarded this information as 'not at all important' in their decision to make an offer on their dwelling, compared with 26% of homeowners in England. Over 60% of recent homebuyers in Denmark saw the EPCs for other properties during the process of looking for a home; this was also the case for over half of these homeowners in England⁴⁹.

⁴⁹ While data was collected for the Netherlands and Germany a very small sample from each country falls into this category therefore the figures are not reported here, see Appendix for details.

Figure 37 Homeowners level of understanding of the Energy Performance Certificate

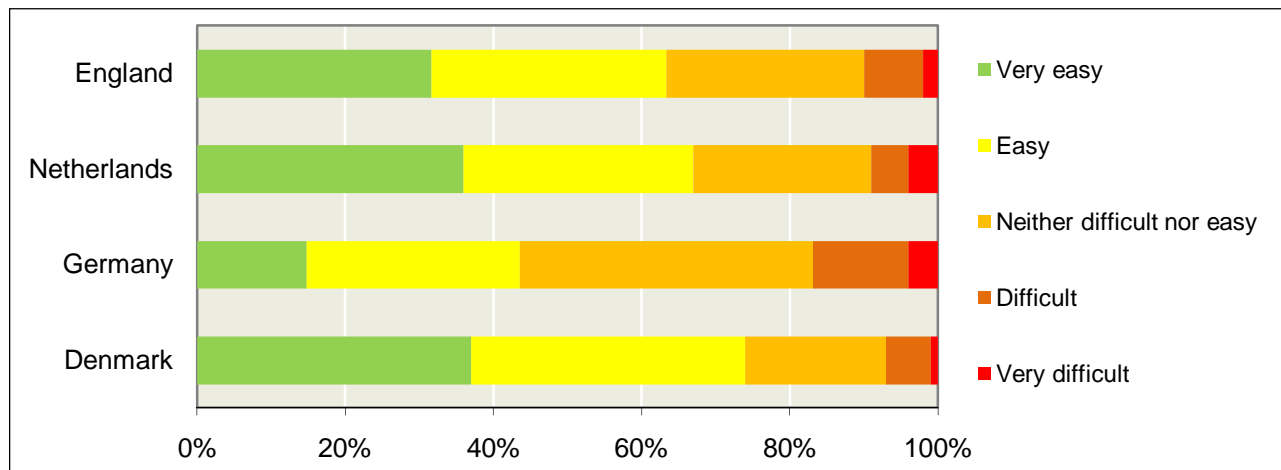


Table D39 in Appendix D

Homeowners generally had a good understanding of the EPC; this was very much the case in Denmark, the Netherlands and England. Less than half of homeowners with an EPC in Germany described it as 'very easy' or 'easy' to understand. This may be because Germany is the only country in the study that does not use an A to G rating for their EPC (Figure 37).

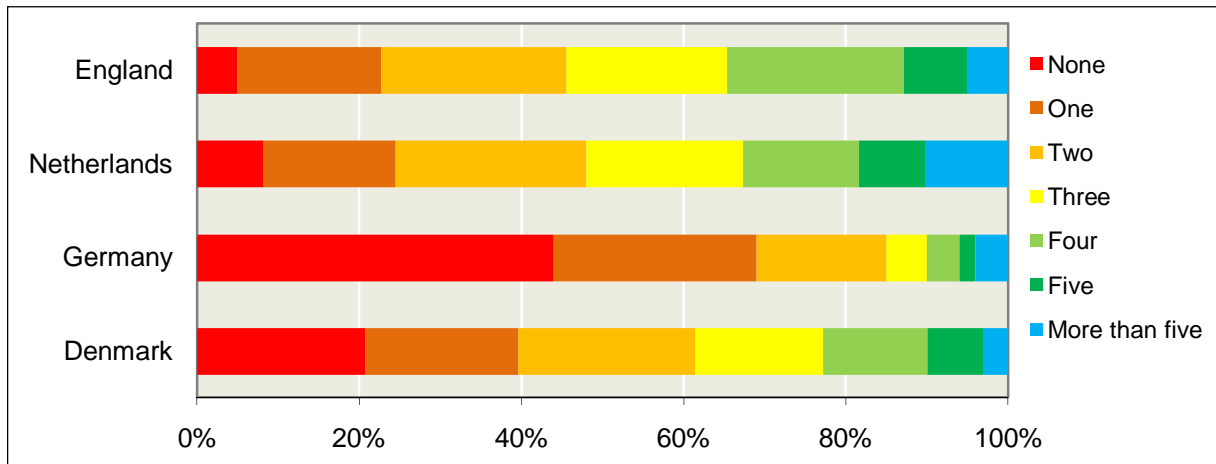
The majority (86%) of homeowners from the Netherlands with an EPC could recall the energy efficiency rating. This was the case for 77% of this group in Denmark and 57% in England, but for less than half of respondents with an EPC in Germany. Details of the energy efficiency ratings are available in Appendix D.

In Denmark, 400 homeowners (54% of the sample) were aware of the EPC's recommendations; this was the case for 44% of the sample in the Netherlands, 28% of the sample in England and 11% of the sample in Germany. While this constitutes 30% of the overall sample, there were notable differences in the level of awareness by country. There were also differences in the type of recommendations that were recalled; 60% of homeowners could recollect recommendations remembered about improving glazing, but this was recalled by only 1% of homeowners in England. Double or secondary glazing is regarded as a further measure in the EPC in England; the NHER (2009) reported that double or secondary glazing was likely to appear on 15% of the recommendation reports.

Insulating the roof was a recommendation that was recalled by two-thirds of homeowners who were aware of their recommendations in Denmark. More than 40% of homeowners in Denmark, the Netherlands and England could recall a recommendation about insulating their walls. In England, recommendations about improving the boiler were recalled by more than 40%; this was mentioned by 20% of homeowners in Denmark. While solar energy was an improvement recalled by 60% of homeowners in Denmark only 10% of homeowners in England recalled this.

Installing renewable energy was an option in Germany and England, and 6% and 10% of homeowners in these countries recalled reference to this measure in their recommendations report. Biomass was a measure recommended in England only and was recalled by 13% of homeowners. In Denmark, 25% of homeowners recalled a recommendation about air tightness. In England, 78% recalled a recommendation about energy-efficient lighting.

Figure 38 Number of recommendations stated/recalled



N=400 Germany N=123 the Netherlands N=249 & England N=174

Figure 38 shows that in Germany more than two-fifths of respondents could not recall the recommendations. The total number of potential recommendations varied in each country. In the Netherlands there were 29 potential recommendations compared to 11 in Denmark.

There were also differences in the amount of money that homeowners in different countries spent on recommendations (see Table 21). Many homeowners in all countries had not invested any money in making improvements, and yet over a quarter of homeowners in Denmark had spent more than five thousand euros. In England the majority providing this information had invested less than five hundred euros; the numbers that had invested in fitting energy efficiency light bulbs, for example, might explain this.

Table 21 Approximately how much money have you spent carrying out these recommendations?

	Denmark	Netherlands	England
None	32%	42%	22%
Less €500	10%	5%	33%
€501 - €1,000	12%	8%	7%
€1,001 - €5,000	16%	18%	19%
€5,001 - €10,000	12%	11%	7%
€10,001 - €20,000	7%	4%	5%
More than €20,000	7%	7%	4%
Don't know	4%	5%	3%
N	316	228	166

When homeowners with an EPC were asked to rate the usefulness of the document, it was noticeable that in some countries a number of homeowners were unable to provide a response. There were however notable differences between the countries in their evaluation of how useful the EPC was as a provider of information on energy costs. In Denmark and Germany, almost two-fifths of homeowners with an EPC considered it a useful document for providing this service, whereas less than a fifth of homeowners in

England and the Netherlands thought the same. Nearly 30% of homeowners in England rated the EPC 'not at all useful' in providing this information (see Figure 39).

Figure 39 Usefulness of the EPC as a source of information on the energy (electricity and heating) costs of your home

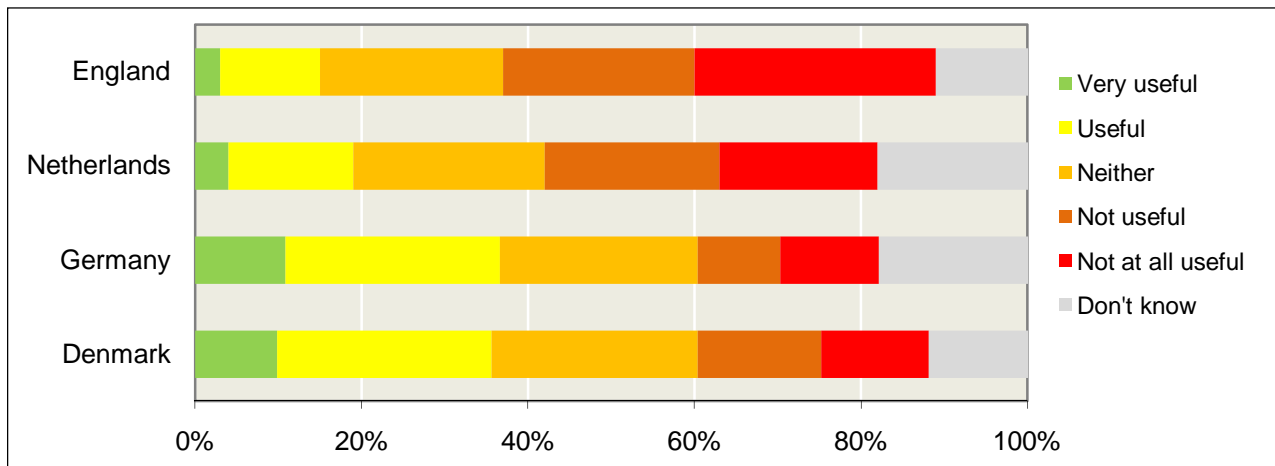


Table D42 in Appendix D

Figure 40 shows that around a fifth of homeowners in Denmark, the Netherlands and Germany thought that the EPC provided useful information on where to go for advice and further information on energy efficiency measures. However, less than 10% of homeowners in England thought this and almost 40% thought that it was 'not at all useful'.

Figure 40 Usefulness of the EPC as a source of information on where to go for advice and further information on energy-efficient measures

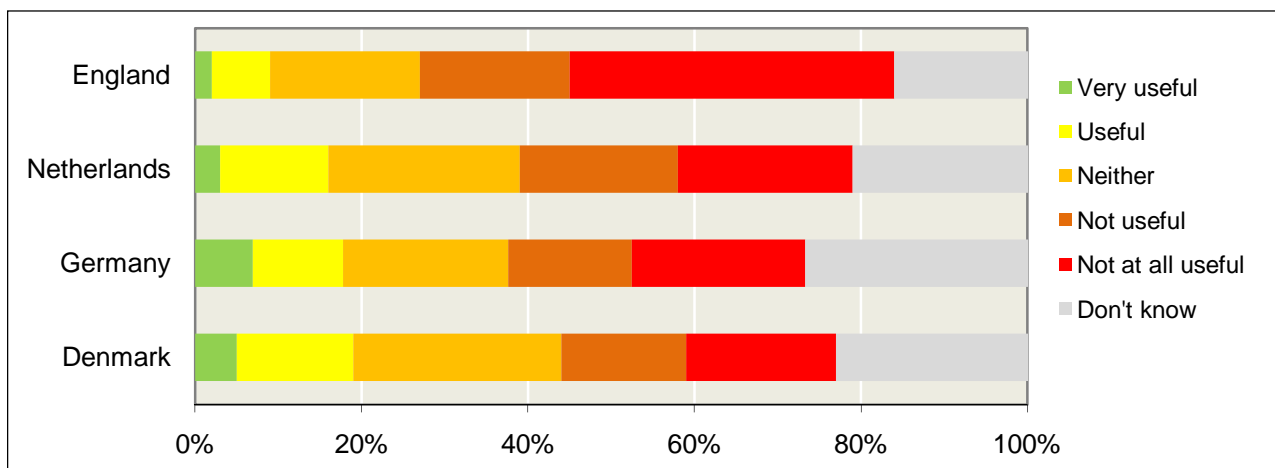


Table D45 in Appendix D

Around 40% of homeowners who were aware of the recommendation report on their EPC rated the EPC 'very useful' or 'useful' at providing information about the home improvements needed to reduce energy bills. In England and the Netherlands, over a quarter of homeowners did not find the document useful (see Figure 41).

Figure 41 Usefulness of the EPC as a source of information on the home improvements needed to reduce your energy bills

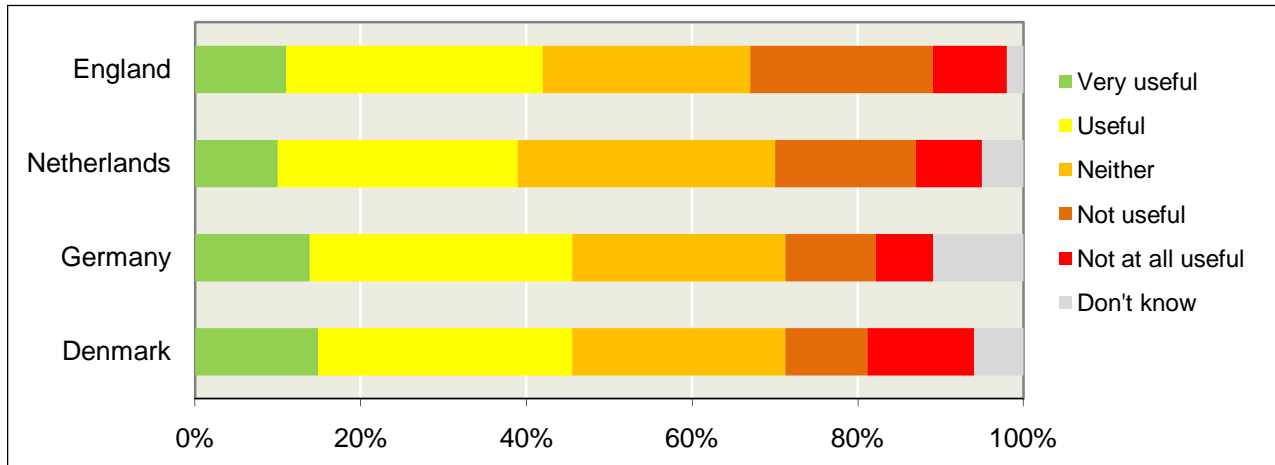


Table D43 in Appendix D

There was also some variation in homeowners' ratings of the usefulness of the EPC in providing information on the cost of making energy-efficient home improvements. More than a third of homeowners in Germany and Denmark found the document useful for providing this service, while less than a fifth of homeowners in England thought the same. More than half of homeowners in England considered the document 'not at all useful' or 'not useful' for providing this level of information (see Figure 42).

Figure 42 Usefulness of the EPC as a source of information on the cost of making energy-efficient home improvements

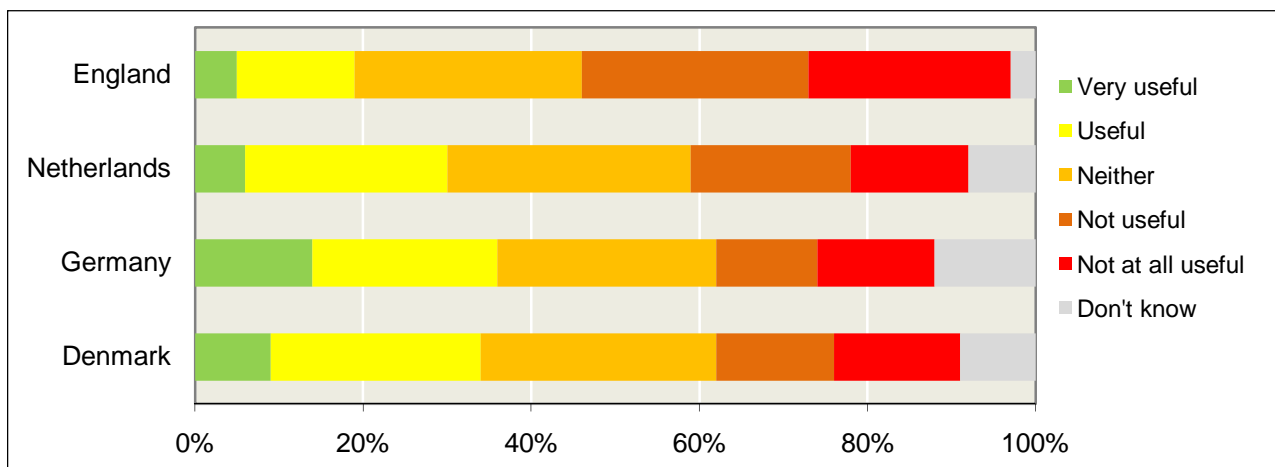


Table D44 in Appendix D

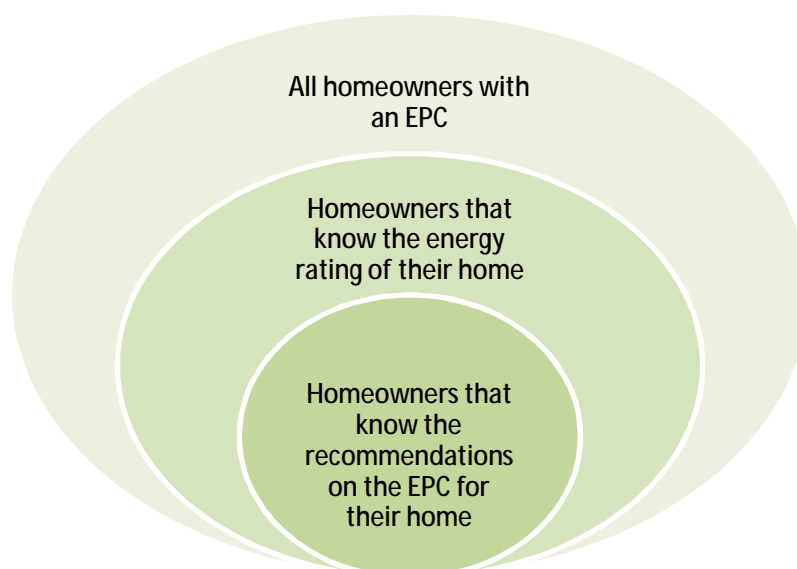
8.3 Discussion

Generally, homeowners were able to access information about energy efficiency, and more than 60% thought that accessing this type of information was easy. The majority had heard about EPCs, but whether they were just aware of the 'label', the energy efficiency rating aspect of the EPC, or more, was not established. There were large differences in the proportion of households that reported that they had seen

an EPC by country; this ranged from 91% of homeowners in the Netherlands to 43% in Germany. German homeowners generally were less aware of the EPC than homeowners in all other countries.

Homeowners generally found out about the EPC via estate agents, newspapers, television and property sales information. How this information is conveyed to homeowners through these sources is unknown, and yet these 'actors' are potentially key players in the homeowners' reaction to the EPC. The Royal Institution of Chartered Surveyors (2010) pointed to the fact that estate agents acting on behalf of sellers were not 'willing to draw attention to [the EPC] because it would damage the sale'. There was also a concern that agents were likely to 'draw attention from the EPC or encourage buyers to discount it'⁵⁰. Whether this practice is repeated across all European countries is uncertain; however, it raises concerns about the level of influence that the EPC can have, depending on how it is introduced to a homeowner.

The figure below highlights the fact that many of the homeowners who may be considered to be informed about the energy efficiency of their dwelling, and the potential energy efficiency improvements, are not. Many homeowners have not retained the information available in the EPC, and therefore their potential to act to improve their energy efficiency, and therefore to reduce carbon emissions, is limited. The information contained in the EPC, and the potential effectiveness of the policy, is being lost. The lack of knowledge about some of the EPC details may be a result of the way that the information is initially distributed, or because of a lack of interest on the part of the homeowner. However, knowing that having an EPC does not necessarily equate to reading, understanding, trusting or using the document is an important finding from this research. A concerted effort needs to be made to publicise the document as a source of information, to enable homeowners to make informed decisions about the house that they purchase and the energy efficiency measures that are needed.



Previous chapters of the report state that homeowners were undertaking energy efficiency works. However, a third of homeowners who were fully aware of the EPC and its recommendation had not spent any money on implementing the recommendations. Around a fifth had spent, or planned to spend, between €1,001 and €5,000, with 11% having spent more than €10,000. Further work to examine the amount of financial

⁵⁰ Royal Institution of Chartered Surveyors (2010)

investment in energy efficiency that homeowners are willing to make would enhance the findings collected here.

There was a mixed picture in terms of homeowners' level of satisfaction with the EPC. The EPC provides some added value to homeowners. Around 40% found a full EPC that includes recommendations 'very useful' or 'useful' for providing information about the home improvements needed to reduce energy bills. However, many homeowners were dissatisfied with the level of detail and accuracy provided by the EPC. Also the lack of signposting to further sources of information was noted as an issue by many homeowners.

9 Energy efficiency information

Information on energy efficiency is available from a variety of sources, from advertisements to specialist Government websites. However, some authors have suggested that the type, medium and quality of information may act as a barrier to energy efficiency behaviour⁵¹. This section explores the level of trust that homeowners have in various sources of information, and provides some insight into the sources that they use to gain further information on energy efficiency.

9.1 General findings

9.1.1 Level of Trust in sources of information about energy efficiency in the home

A number of sources are promoting energy efficiency across Europe, from Government agencies to energy suppliers and hardware shops. It is on the agenda in many public arenas. However, before determining whether these sources of information have an impact on homeowners' decision-making, it is important to assess the level of trust that homeowners have in each individual source.

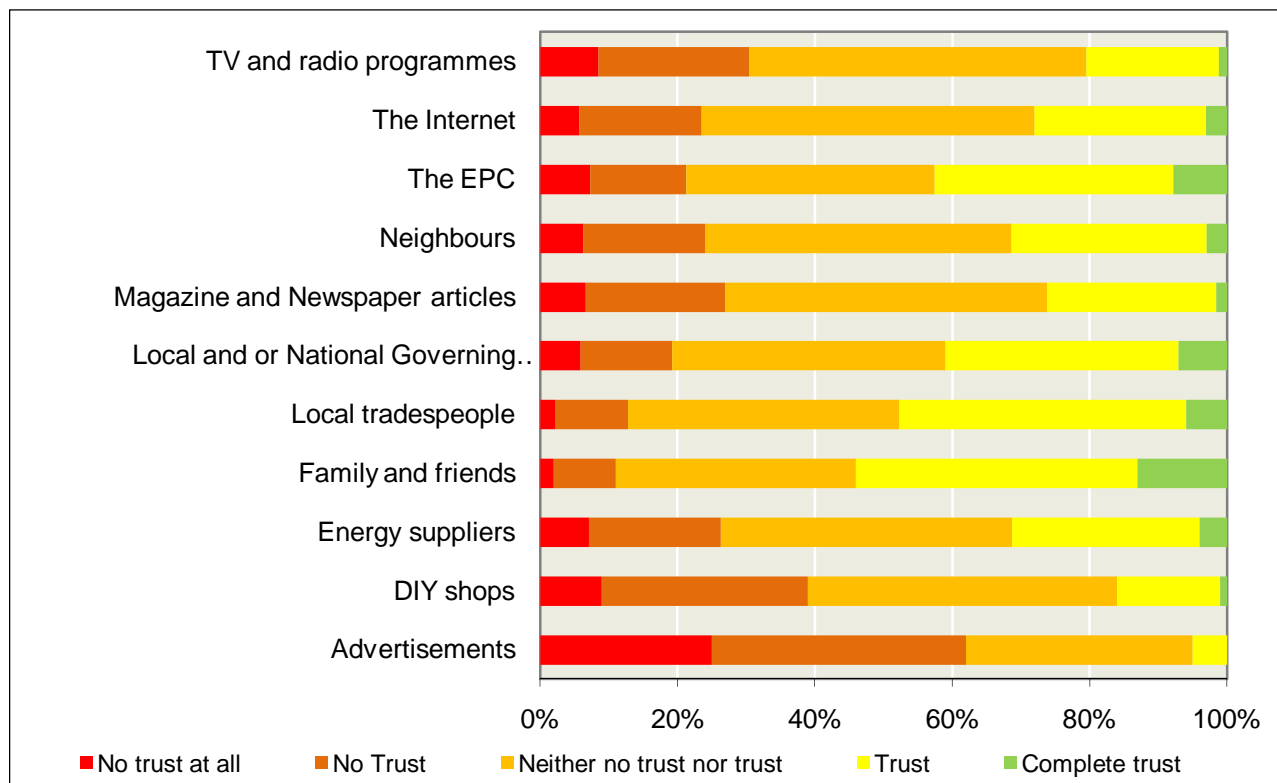
Over 60% of homeowners did not trust advertisements as a source of information on energy efficiency in the home. Figure 43 shows that DIY shops were not trusted by 39% of homeowners, and TV and radio programmes were not trusted by 30% of homeowners. Family and friends were the most trusted source of information, as 54% of homeowners trusted this source. Local tradespeople were also trusted, by around half (48%) of homeowners. While the EPC was trusted by 43% of all homeowners; 21% did not trust it.

Overall, 41% of homeowners reported trust in local and/or national authorities as a source of information about energy efficiency in the home. Twenty-seven percent of homeowners reported that they 'neither trust nor distrust' energy suppliers as a source of information. Homeowners were also uncertain about magazines and newspaper articles as a source of information on energy efficiency in the home. Almost half (47%) of all homeowners reported that they 'neither trust nor distrust' this source, while 27% did not trust it. A large response (45%) was received from homeowners who were uncertain about their neighbours as a source of information. International statistics⁵² report that between 79% and 89% of the population in the five countries in the sample were internet users. In this study almost 50% of homeowners neither trusted nor distrusted the internet as a source of energy efficiency information.

⁵¹ Best-Waldhober *et al* (2009)

⁵² See Table H5 in Appendix H

Figure 43 Homeowners' level of trust in various sources of information on energy efficiency for the home



Tables F7 – F17 in Appendix F

9.1.2 Sources of information sought by homeowners on energy efficiency

Having established the level of trust homeowners had in a number of potential sources of energy efficiency information, the questionnaire asked which sources they would seek for further information on this topic. Overall, the list of available sources of information is similar in most countries, although there are some differences. For example, homeowners in England were not asked about non-governmental organisations (NGOs).

Figure 44 shows the spread of responses for these sources of further information. The top three sources of information were:

- Government-funded body providing information and advice on energy
- General web search
- Friends or family members and suppliers of energy-saving products or services

Denmark, England and Finland offered the specific option of a government-funded body. In Denmark, the organisation the Elsparefonden/Centre for energibesparelser provides information and advice on energy. The Elsparefonden (the Energy Saving Trust) was renamed Centre for energibesparelser (Centre for Energy savings) in 2010. The 'Centre for energibesparelser' is government-funded. In England, the Energy Savings Trust is a quasi-autonomous non-governmental organisation. The Government also funds Motiva, the Finnish energy advice organisation.

Figure 44 Sources of further information on energy efficiency improvements

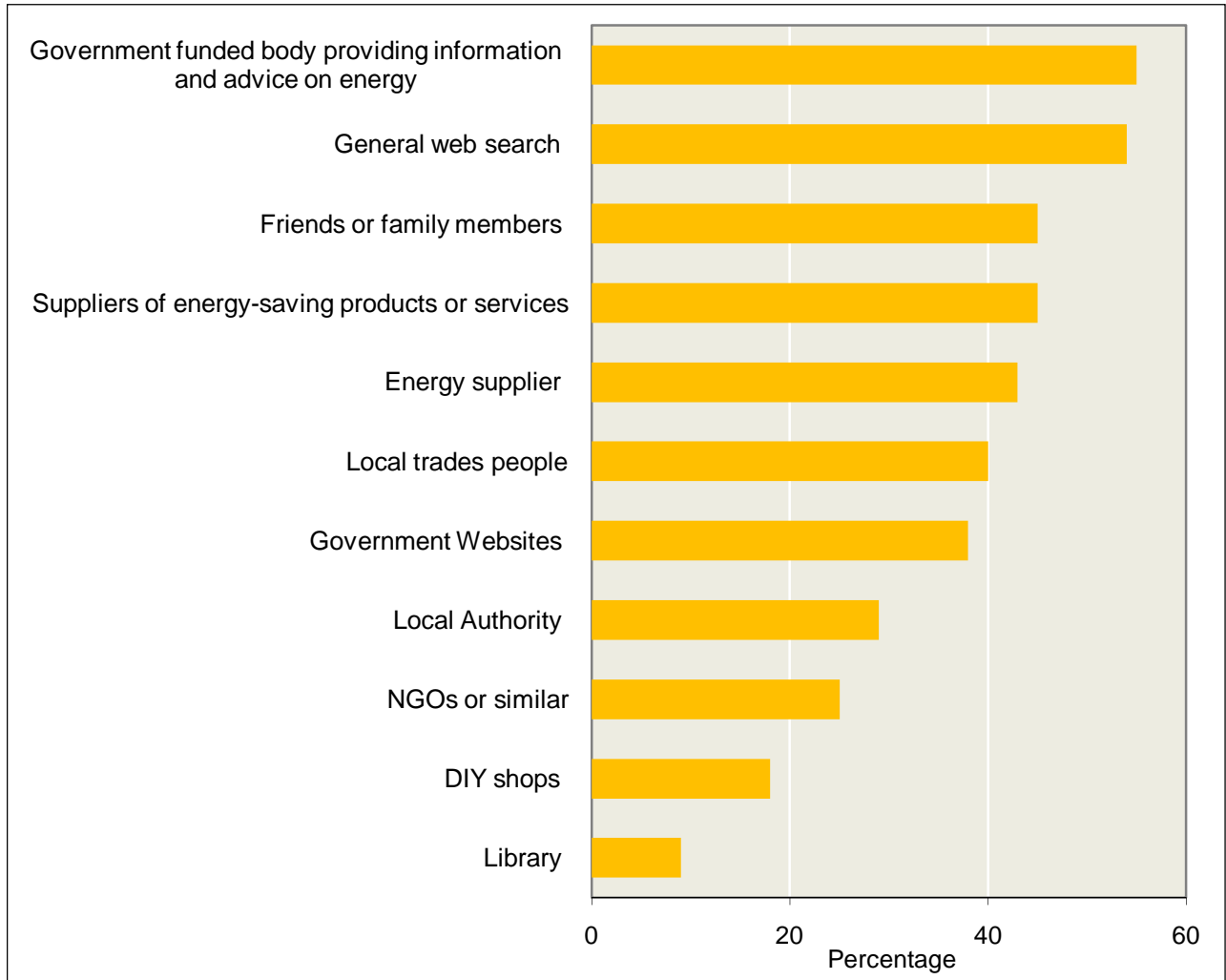


Table F19 in Appendix F

The social network, in the form of family and friends, was viewed as a source of further information by 45% of all homeowners; the same percentage of homeowners also reported that they would seek further information from suppliers of energy-saving products or services.

The internet, in the form of a general web search, was an important source of further information for all homeowners. However, data presented above suggests that almost half of homeowners neither trust nor distrust the internet, with less than 30% of homeowners confident enough to state that they trust the internet.

9.2 Country-specific factors

9.2.1 Level of trust in sources of information about energy efficiency

Respondents in different countries reported various levels of trust in different sources of information. Two-thirds of German homeowners reported trusting family and friends, while less than a third of homeowners in Finland reported trusting this group for energy efficiency information.

The level of trust in local tradespeople was lowest for homeowners in England; only 28% of these homeowners trusted this source of information. This is a higher percentage than found in a previous study of British households, which reported that one in six would trust installers, builders and tradesmen for this type of advice⁵³. Figure 45 shows that in the current survey there were noticeable differences in the way in which each country responded to information from this source.

Figure 45 The level of trust in local tradespeople as a source of information

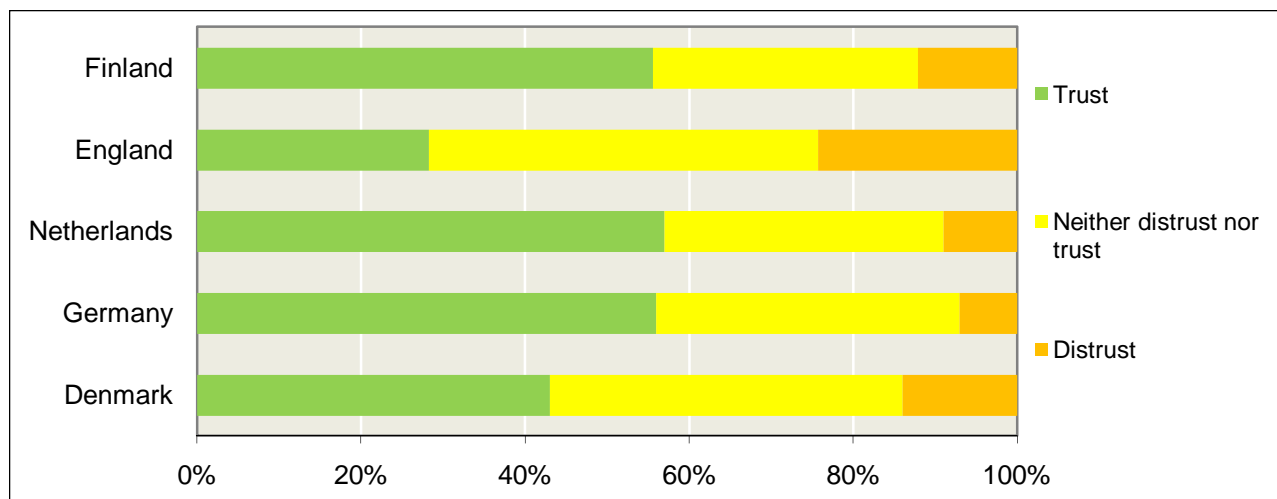


Table F11 in Appendix F

Figure 46 indicates that homeowners in each country seemed to respond differently. Homeowners in Finland and Denmark trust the EPC the most, with over 50% of homeowners reporting that they trust the label. Homeowners in the Netherlands report the highest level of distrust in the label (31%), while the same proportion distrusts the label.

⁵³ EEPH (2010)

Figure 46 The Level of trust in the EPC as a source of information

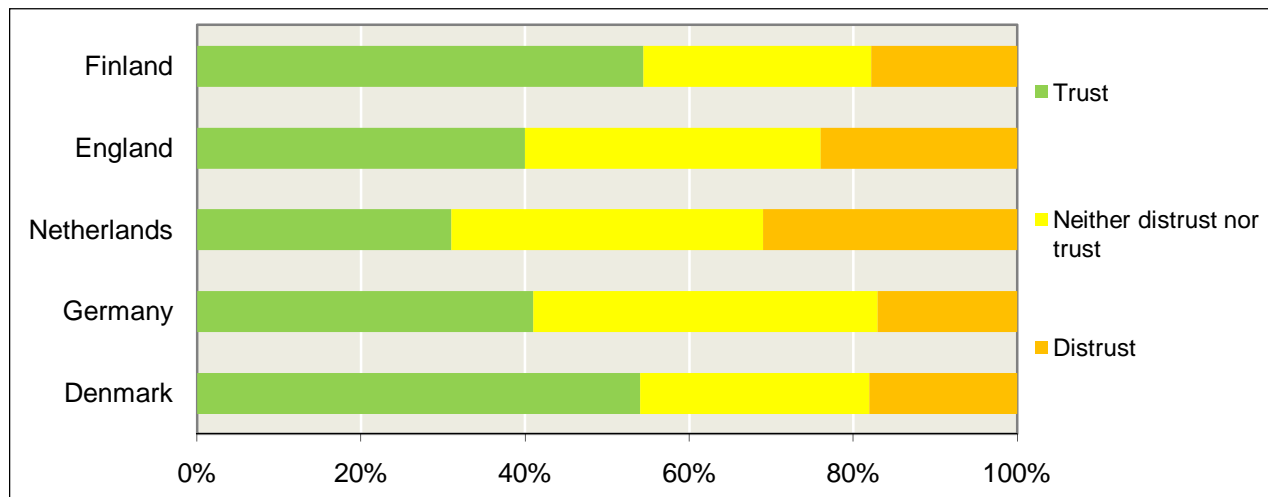


Table F15 in Appendix F

Over 60% of all homeowners did not trust advertisements. In Finland this figure was 77%. In both Denmark and Finland, more than a quarter of homeowners reported trust in information about energy efficiency from radio and television programmes.

Overall, 41% of homeowners reported trust in local and/or national authorities as a source of information about energy efficiency in the home. In Germany, 33% of homeowners trusted this source, while 65% trusted this source in Finland. Denmark and England responded significantly differently from Germany, the Netherlands and Finland. In both Denmark and England, around 50% of homeowners trusted this source of information. A concerted effort is being made by local authorities in the UK to provide households with information on energy efficiency. ICF (2010) lists the legislative and regulatory instruments in the UK that may have triggered local authorities into action. This includes the Climate Change Act and the National Indicators 186 and 187. The ICF study states that local authorities provide a range of services, including general energy information, offering grants and directing households to expert advisors. Homeowners in Finland responded significantly differently from homeowners in the other four countries, indicating a great deal of trust in this source of information.

Almost half of homeowners in Denmark (46%) trusted information from energy suppliers (Figure 47). Homeowners in Germany reported less trust in energy suppliers than those in Denmark, but more than those in the other three countries.

Figure 47 Level of trust in energy suppliers as a source of energy efficiency information

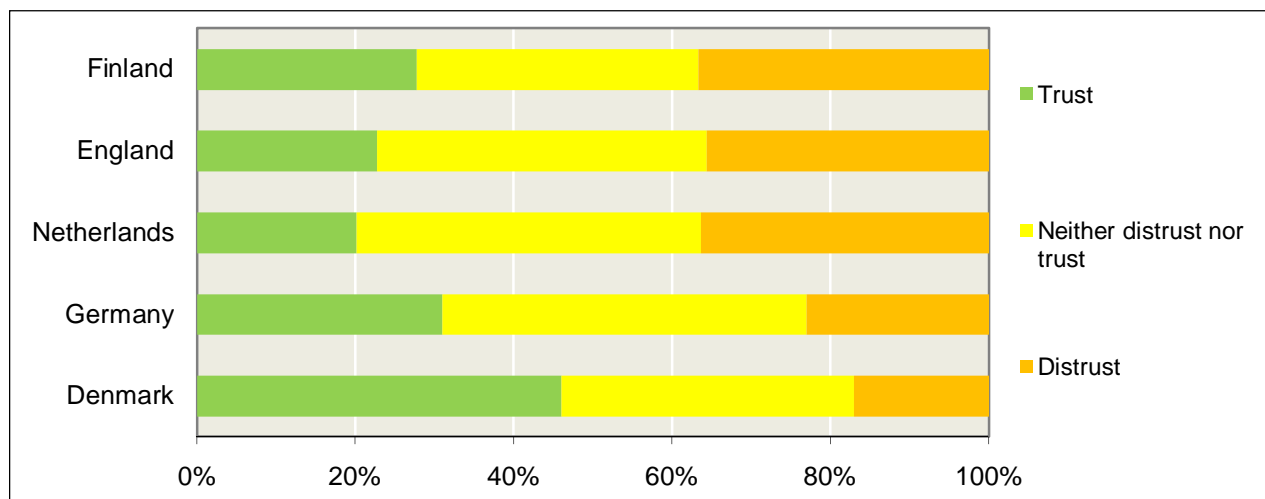


Table F9 in Appendix F

9.2.2 Sources of information sought by homeowners on energy efficiency

Homeowners in each of the five countries reported differences in the top three sources of information that they would use to gain further energy efficiency information. A general web search scored highly in all countries, with over 50% of homeowners considering this source for further information. In Finland this figure was 73% (see Table 22).

Table 22 Source for further information on energy efficiency improvements

	All five countries	Denmark	Germany	Netherlands	England	Finland
Your energy supplier	43%	48%	42%	32%	50%	30%
Friends or family members	45%	35%	57%	30%	50%	30%
Suppliers of energy-saving products	45%	40%	50%	41%	44%	39%
DIY shops	18%	17%	16%	13%	22%	36%
Government-funded body providing information and advice on energy ¹	55%	56%	N/A	N/A	56%	40%
Local trades people ²	40%	33%	52%	N/A	25%	N/A
Government Websites	38%	34%	32%	33%	55%	41%
Local Authority ³	29%	N/A	25%	19%	48%	25%
Library	9%	7%	6%	5%	16%	14%
General web search	54%	52%	52%	52%	56%	73%
NGOs or similar ⁴	25%	30%	N/A	19%	N/A	22%
Other	2%	1%	1%	4%	1%	4%

¹ This question was not an option in Germany and the Netherlands, ² This question was not an option in Netherlands and Finland,

³ This question was not an option in Denmark, ⁴ This question was not an option in Germany and England

Denmark's top two sources of information mirrored the response from all homeowners, as 56% of homeowners would seek further information from the Centre for energibesparelser (Centre for Energy savings), and 52% would carry out a general web search. The third option in Denmark was the homeowners' energy supplier. Homeowners in England gave a similar response.

The majority (57%) of homeowners in Germany would seek further information from family and friends. Local tradespeople also scored highly in this regard; 52% of homeowners would access this group for more information. A third of homeowners in Denmark and a quarter of homeowners in the Netherlands chose this option.

Homeowners in the Netherlands opted for further information through the internet, as two of their top three sources of information were a general web search and Government websites. Just over 40% of homeowners in the Netherlands would seek further information from suppliers of energy-saving products or services.

In England, the internet was popular as a tool for further information, as was the case in the Netherlands. However, it was notable that more homeowners in England than in the Netherlands opted for both the general web search and government websites. In England 56% of homeowners were also likely to access further information on energy efficiency improvements from the Energy Savings Trust. This organisation provides consumers with help and advice via a website and a free phone number⁵⁴.

In Finland, a general web search would be the option for accessing further information for 73% of homeowners. Government websites would be sought by 41% of the sample and Motiva⁵⁵ (the Government-funded body providing information and advice on energy) would be considered a source for further information by 40% of this group.

9.3 Discussion

Overall, the EPC was trusted by over 40% of homeowners, although a fifth of homeowners distrusted it. There were notable differences in the levels of trust in the EPC, depending on the country of the homeowner. For example, in the Netherlands only 30% of homeowners trusted this document. The Dutch EPC has changed a number of times since it was introduced, and it is possible that the consumer does not trust a document when it is frequently amended. The general picture was that the EPC was not widely trusted by homeowners as a source of information. This was true even in Denmark, where some form of energy label for dwellings has been available since the 1980s, and yet less than half of all homeowners trusted the EPC as a source of information. Improving homeowners' attitude to the EPC may improve its usefulness as a source of information.

There were notable differences between countries in the level of trust for a range of information sources. In England just over a quarter of homeowners trusted installers, compared with almost 60% in the Netherlands. Almost half of homeowners in Denmark trusted their energy suppliers, compared with around a quarter of homeowners in England. There clearly is not a one size fits all approach to the provision of information. Therefore, country-specific differences should be considered when deciding the best way of providing information to homeowners.

The internet, in the form of a general web search, was an important source of further information for homeowners in all countries. However, almost half of homeowners neither trust nor distrust the internet, with less than 30% confident enough to state that they trust it. There are many good-quality sources of information that are hosted on the internet, such as the Government-funded websites: 'Centre for energibesparelser', the Energy Savings Trust and Motiva. Although it was clear that homeowners take different approaches to the internet, it may be that improving the quality of information on the internet would encourage more homeowners to seek further information from particular 'official' internet sources.

⁵⁴ <http://www.energysavingtrust.org.uk/>

⁵⁵ <http://www.motiva.fi/en/>

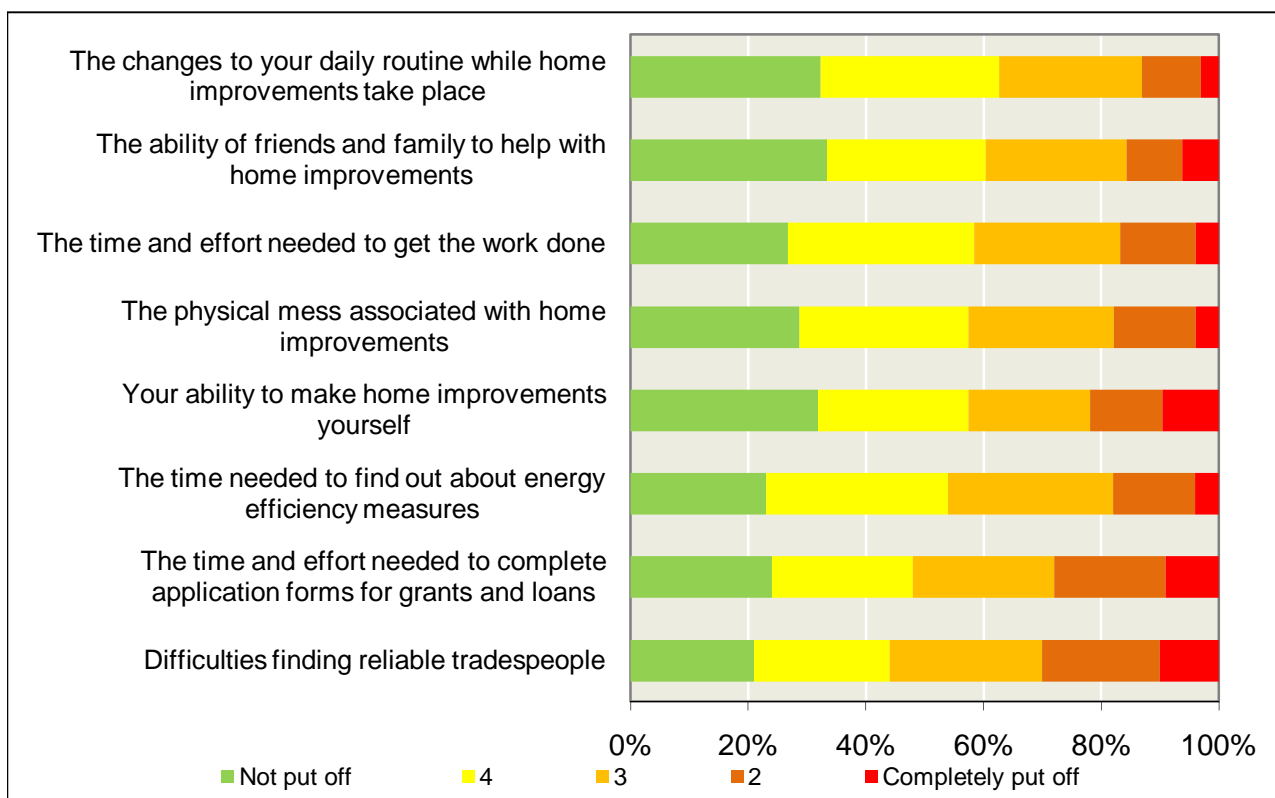
10 Practical issues related to home improvements

The literature⁵⁶ suggests that non-technical and non-economic factors should be considered in any attempt to map homeowners' behaviour towards energy efficiency home improvements. This section explores the extent to which practical issues are part of homeowners' decision-making about home improvements.

10.1 General findings

Eight practical issues were rated by homeowners, to assess the extent to which they played a part in their decision-making about home improvements. Over 40% of homeowners were not discouraged by any of the practical difficulties that were presented in the survey (see Figure 48).

Figure 48 Practical issues involved in improving the home



Tables F38 – F45 in Appendix F

The most common difficulties were finding reliable tradespeople, the time and effort to complete application forms for grants and loans, and the homeowners' ability to make home improvement themselves.

While 30% of homeowners considered finding a reliable tradesperson something that would 'put them off' making home improvements, 44% said that this would 'not put them off'. Difficulties with grants and loans

⁵⁶ Jensen 2004, 2007, Gram-Hansen et al. 2007, Uitdenbogerd 2007 cited in Brohmann *et al* (2009)

discouraged 28% from doing work, but this was not an issue for 48%. Similarly, the ability to 'do it yourself' prevented 22% but was not seen as an issue for 57%. Homeowners were also asked to rate how easy it was to access the most appropriate people to carry out energy efficiency home improvements. Over 50% of all homeowners considered this 'easy' or 'very easy'.

10.2 Country-specific

There were country-specific differences in the responses to the practical issues surrounding home improvements. The greatest differences between countries related to two factors: 'The time and effort needed to complete application forms for grants and loans' and 'Difficulties finding reliable tradespeople'. Over 50% of homeowners in Germany and Denmark would not be discouraged by the time and effort needed to complete application forms for grants and loans; and yet this would discourage over 40% of homeowners in the Netherlands and Finland (Figure 49).

Figure 49 Impact on decision to do work: The time and effort needed to complete application forms for grants and loans

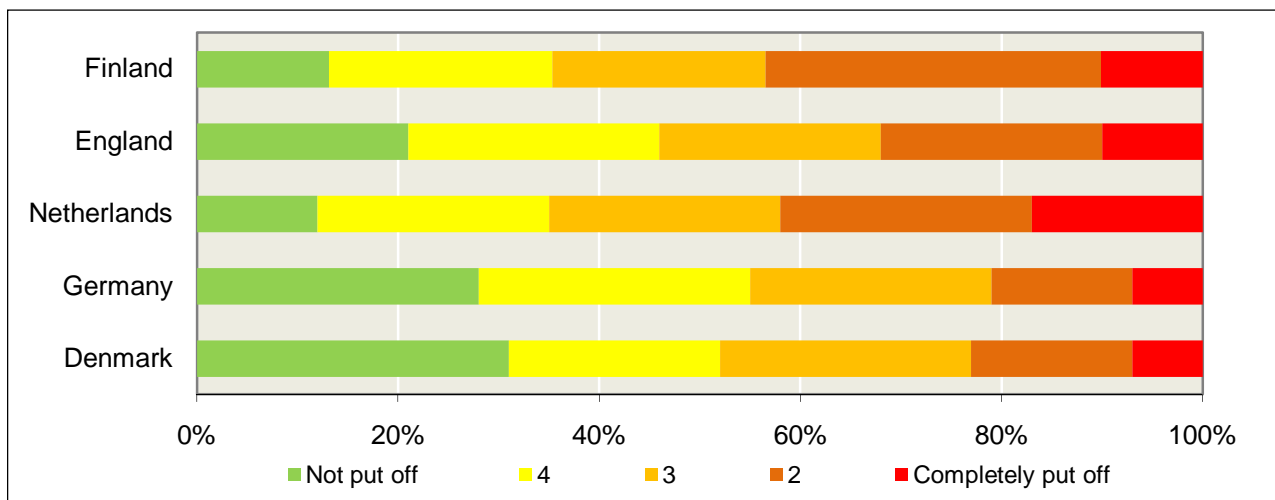


Table F40 in Appendix F

This issue related to tradespeople would discourage more homeowners in England than in the other countries. The difficulty in finding reliable tradespeople would discourage 42% of homeowners in England, compared with 23% in the Netherlands. There was a significant difference between Germany and Netherlands, as fewer homeowners in Netherlands would be discouraged by this compared with homeowners in Germany (Figure 50).

Figure 50 Impact on decision to do work: Difficulties finding reliable tradespeople

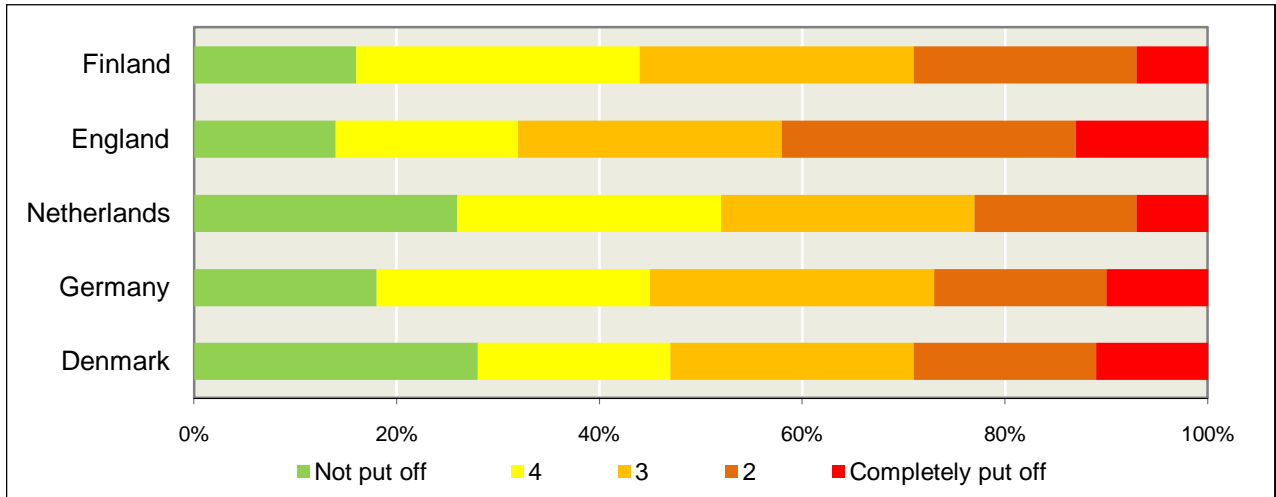


Table F42 in Appendix F

Figure 51 shows that there were notable differences in opinion on how easy it was to access to the most appropriate people to carry out energy efficiency home improvements across the countries. Only 20% of homeowners in Finland were able to access installers easily, while 58% of homeowners in the Netherlands did not regard this as a problem.

Figure 51 The level of access to installers of energy efficiency home improvements

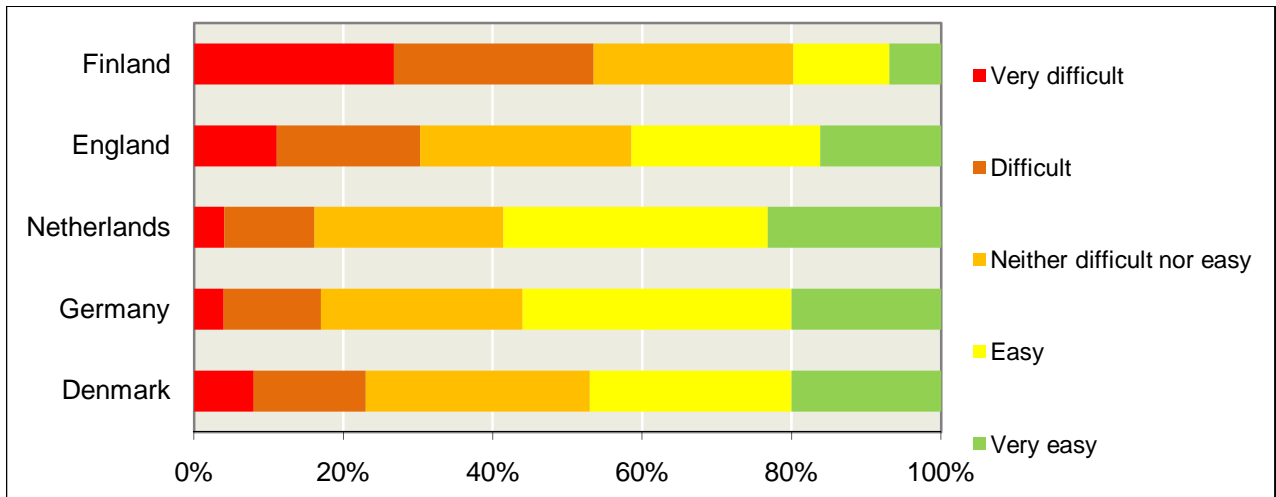


Table F6 in Appendix F

10.3 Discussion

One of the key aims of this study was to examine likely barriers to homeowners' implementing energy efficiency improvements. An investigation of the practical issues involved in decision-making showed that nearly all the proposed potential practical issues were not critical barriers for more than half of all homeowners. Clearly, the type of home improvements planned may cause various levels of disturbance or warrant various levels of time and commitment from homeowners. However, the general picture shows that the majority of homeowners were not discouraged by these issues. This was demonstrated by the fact that over 60% were not worried by the potential disruption to their daily routine that could be caused by home improvements.

While overall these issues were inconsequential for many homeowners, in Finland and the Netherlands over 40% would be discouraged from carrying out works because of the time and effort needed to complete application forms for grants and loans. As subsidies are hailed as important drivers to encouraging energy efficiency this finding may be problematic. Homeowners in these countries may need convincing that applying for grants and subsidies is not resource-intensive.

Equally, the message from homeowners in England was that it is difficult finding a reliable tradesperson. This issue would discourage more than 40% in this country. As energy efficiency measures are optional for most homeowners, it is worth examining any issues that may discourage them, and considering ways and means of changing attitudes. In this aspect, England differs from all the other countries involved in the study. Investigating the systems in place for finding tradespeople in the other countries may provide a useful model, which could be adopted in England and other countries where this may be a problem.

11 Potential support mechanisms for homeowners

Information on energy efficiency is available from a variety of sources, from advertisements to specialist Government websites. However, some authors have suggested that the type, medium and quality of information may act as a barrier to energy efficiency behaviour⁵⁷. This section reports the findings of homeowners' suggestions for the type of information that they would like to have. This section also explores homeowners' levels of interest in a number of monetary and fiscal incentives.

11.1 General findings

11.1.1 Type of information

Homeowners identified which measure would help them to decide on the action necessary to improve the energy efficiency of their home. Figure 52 shows that 'talking to an energy professional' was preferred by 53% of all homeowners. The next measure deemed popular by homeowners was 'better information from my energy supplier'; over 40% of homeowners thought that this would be beneficial. The media and the internet were the least popular choices, with less than 30% opting for further information from these sources.

Figure 52 Potential policy measures

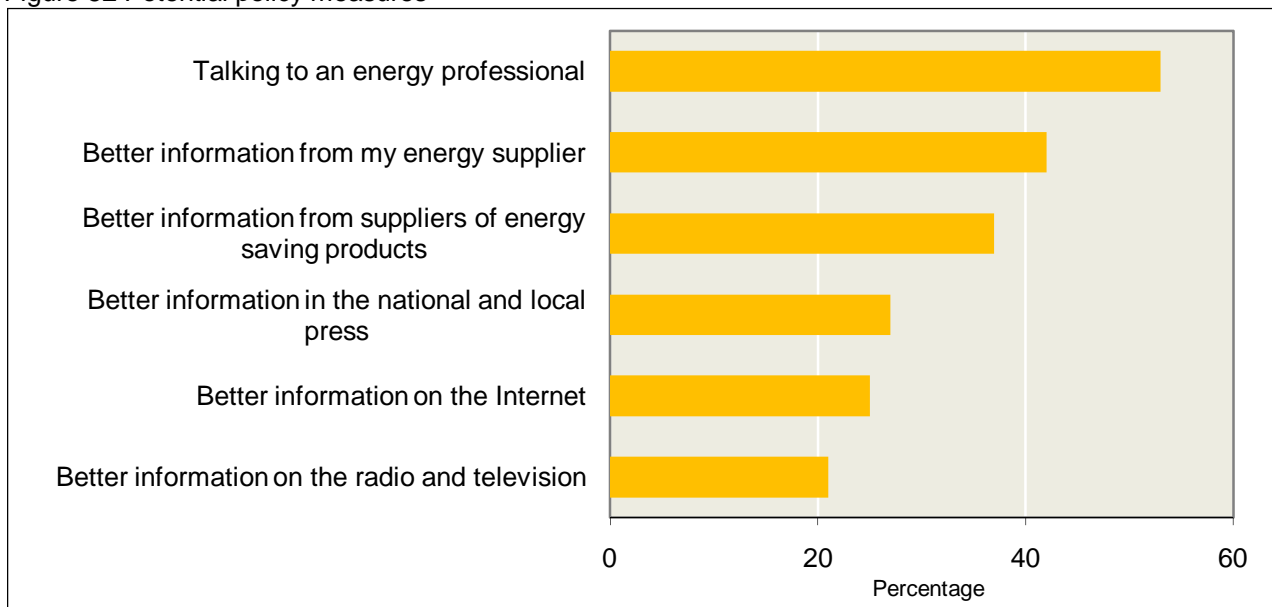


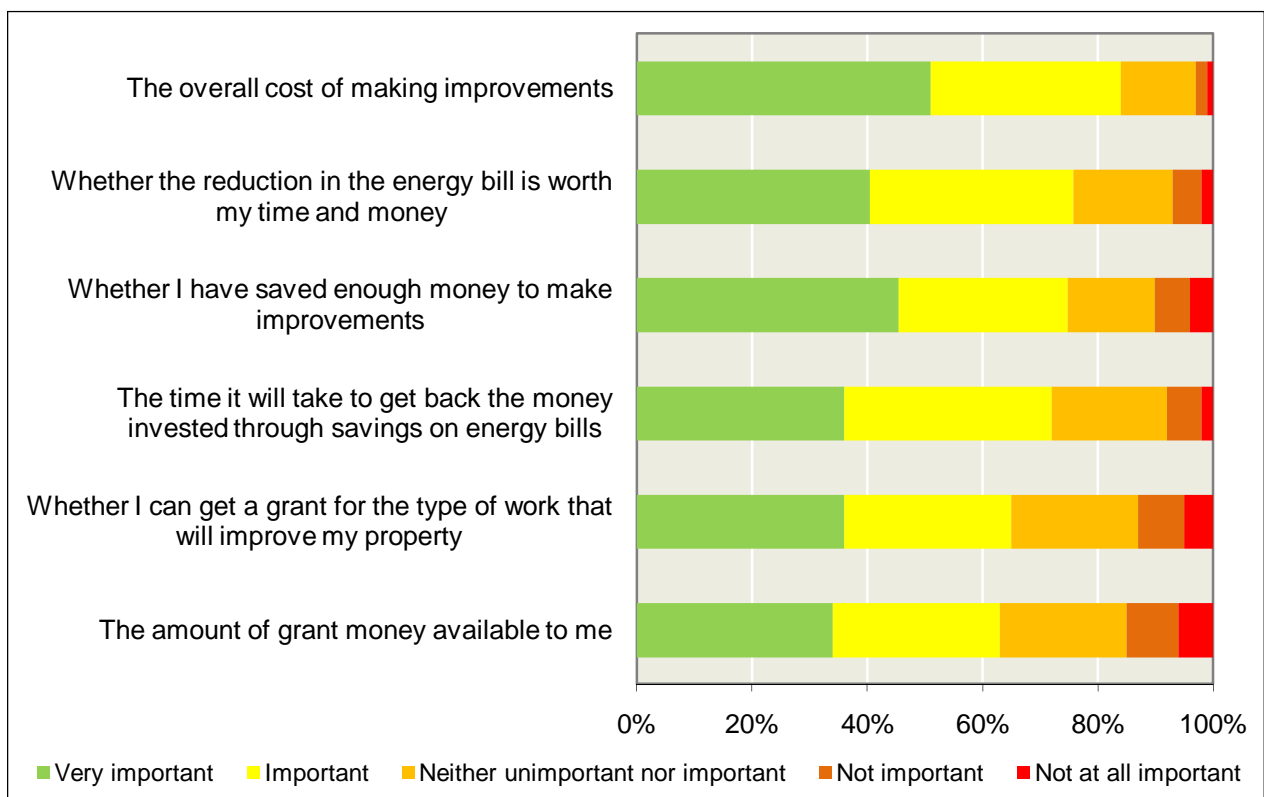
Table F18 in Appendix F

⁵⁷ Best-Waldhober *et al* (2009)

11.1.2 Monetary and fiscal scenarios and incentives

Sunikka (2005) and Gelissen (2008) state that long payback times are currently one of the main barriers to energy-efficient improvements in the domestic sector. Other authors have recommended a number of economic incentives, from tax exemptions for energy-efficient housing to the increased use of ‘green mortgages’⁵⁸. Homeowners were asked to rate the importance of six relevant financial issues. Figure 53 shows that the majority of homeowners rated monetary issues to be important. The overall cost of making improvements was important for 85% of homeowners; 51% considered it ‘very important’.

Figure 53 The importance of monetary factors and incentives



Tables F27 –F32 in Appendix F

In all five countries, there are existing incentives and subsidies available for energy efficiency improvements. The survey asked homeowners to rate their interest in five monetary and fiscal scenarios. They were not specific to individual countries but were based on existing schemes⁵⁹ and policy ideas discussed in the literature⁶⁰.

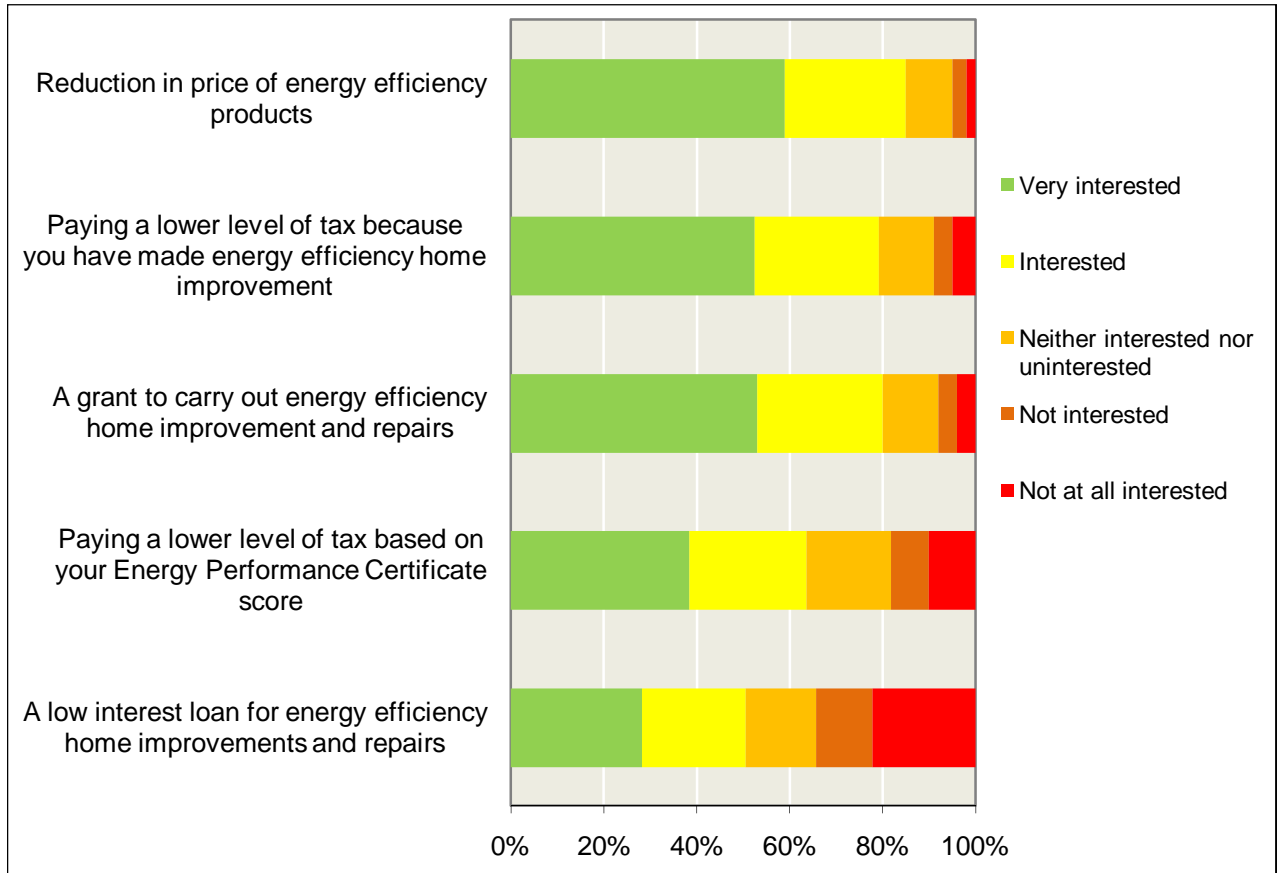
More than half of all homeowners were ‘very interested’ in a grant to carry out energy efficiency improvements and repairs, paying a lower level of tax because they had made energy efficiency improvements, and a reduction in the price of energy efficiency products. A fifth were ‘not at all interested’ in a low interest loan for energy efficiency home improvements and repairs, and 10% were ‘not at all interested’ in paying a lower level of tax based on their EPC score (Figure 54).

⁵⁸ Brohmann *et al* 2009

⁵⁹ Tuominen and Klobut (2009)

⁶⁰ Brohmann *et al* 2009

Figure 54 Level of interest in monetary and fiscal incentives



Tables F33 – F37 in Appendix F

11.2 Country-specific factors

Homeowners in each country reported varying levels of support for each potential type of energy efficiency information. There were also notable differences in the type of monetary and fiscal incentives favoured by homeowners in each country.

11.2.1 Type of information

Table 23 presents the percentage of homeowners in each country that favoured each potential source of information. Homeowners in the Netherlands displayed the lowest level of support for five of the six measures presented. The greatest difference between countries was between Denmark and the Netherlands for the measure ‘talking to an energy professional’.

Table 23 What would help you to decide how to improve the energy efficiency of your home

% of homeowners who would support the following:	Denmark	Germany	Netherlands	England	Finland
Talking to an energy professional	66%	55%	39%	45%	51%
Better information from my energy supplier	46%	45%	28%	47%	39%
Better information from suppliers of energy-saving products	34%	38%	31%	46%	37%
Better information in the national and local press	20%	33%	19%	28%	39%
Better information on the internet	19%	28%	21%	30%	30%
Better information on the radio and television	22%	19%	16%	26%	31%

Table F18 in Appendix F

Talking to an energy professional scored highly in Denmark, as 66% of homeowners thought that they would benefit from this. Homeowners in the other four countries were also positive about this source of information, although less than 40% of homeowners in the Netherlands thought that this would help them to make decisions about energy efficiency improvements in their home.

11.2.2 Monetary and fiscal scenarios and incentives country

There were some differences between homeowners, depending on their country, when they were asked about the importance of monetary issues. However, on the whole, there were small differences related to the importance of the cost of the improvements and the issues of payback times. There were differences by country in the response to the importance of both the amount of grant money and the type of grant. Figure 55 shows that homeowners in Denmark did not rate this issue as highly as homeowners in other countries; 43% considered this important compared with 75% in Germany.

Figure 55 The importance of the amount of grant money by country

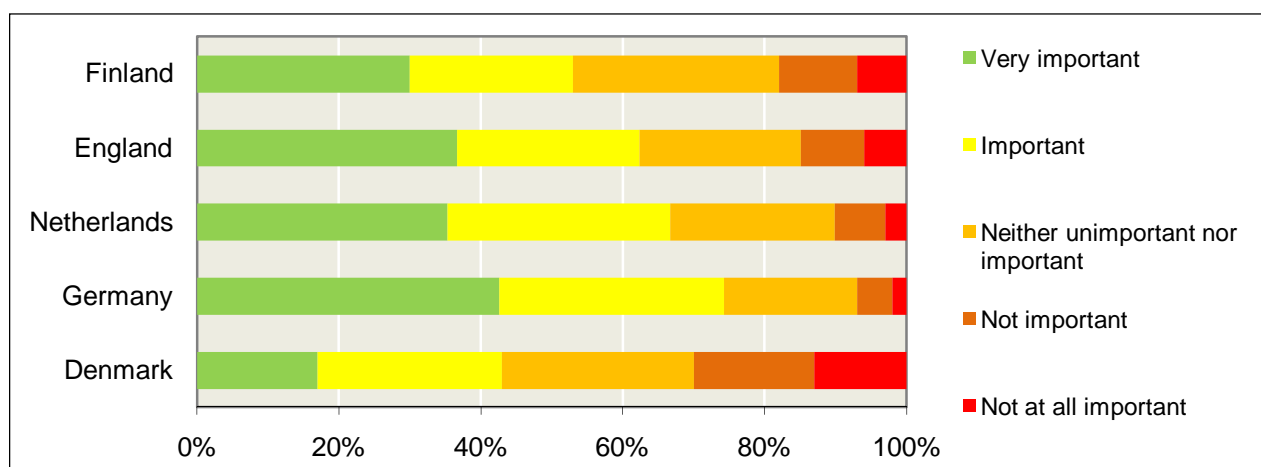


Table F32 in Appendix F

This issue was very important to between 30% and 37% of homeowners in the Netherlands, England and Finland. Denmark was distinct from all other countries, as the amount of grant money was less important

for homeowners; in fact, 30% reported that it was not important. Homeowners in Germany were different from respondents elsewhere, as less than 10% of homeowners felt that it was unimportant.

The response to the importance of the type of grant for the property also differed by country. In a similar way to the previous issue about the amount of grant money available, homeowners in Denmark did not rate this issue as highly as homeowners did in other countries. Less than half (46%) of homeowners in Denmark considered this important, compared with 76% of homeowners in Germany.

Some form of a grant is available in all countries, although the type and size of grant vary in each country. Incentives and subsidies have been available in Denmark since the 1970s. These are often small, targeted subsidies; the current subsidy is for heat pumps to replace individual oil burners. In Finland, local authorities distribute grants for energy audits, home repairs or improvements, and the implementation of renewable energy sources grants. Germany's on-site consulting programme noted a significant drop in consultations when they reduced their fund from 50% to 25% of the costs of the consultation⁶¹. This concurs with the survey data, which suggests that in Germany homeowners focus on both the amount of the grant and the type of grant available.

There are wide varieties of energy efficiency improvements that may be applicable to any dwelling; each has its associated cost. More than three-quarters of homeowners in each country rated the overall cost as important. However, there were some differences between countries in the level of importance that this issue was given. For example, in Germany and England the overall cost was rated 'very important' by around 60% of homeowners, but in Denmark only 36% considered the overall cost to be 'very important'.

There were small differences in homeowners' responses to the importance of payback. Both the issue of time and money associated with the reduction in energy bills, and the traditional concept of payback were important to homeowners in all countries.

Figure 56 shows that there were clear differences in the importance of having saved sufficient funds to carry out energy efficiency improvements. Finnish homeowners do not seem concerned by this issue, with 55% rating it important compared to 82% of German homeowners. In England, it was considered 'very important' to almost half of homeowners (48%).

⁶¹ Tuominen and Klobut (2009)

Figure 56 How important: Whether I have saved enough money to make improvements

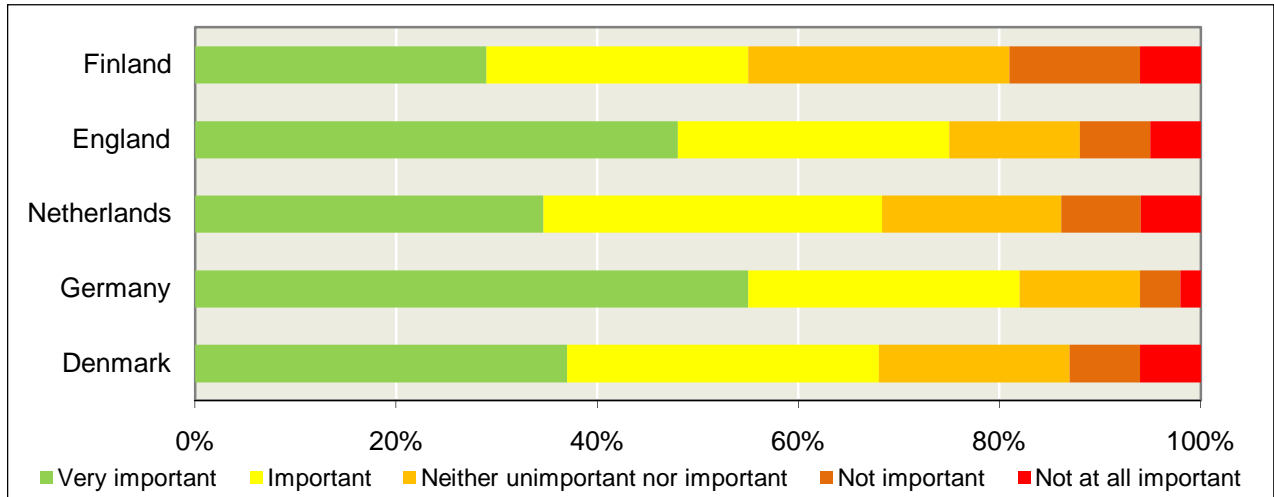


Table F27 in Appendix D

A notable difference between countries related to homeowners' level of interest in a low-interest loan (Figure 57). Given that this is one of many incentives that have been proposed to initiate behaviour change, it is interesting that there was a lack of consensus by homeowners in different countries. The majority of homeowners in the Netherlands and England, 58% and 57% respectively, were not interested in the idea of a low-interest loan for energy efficiency improvements. Homeowners in Germany were very keen on this idea, with 75% of homeowners reporting interest in this measure. Forty to fifty percent of homeowners were interested in Denmark and Finland. In Denmark, the EPC provides costs savings that take account of the cost of a loan. However, the impact that this has on homeowners' decision-making in this country has not been explored.

Figure 57 Interest in a low-interest loan for energy efficiency improvements

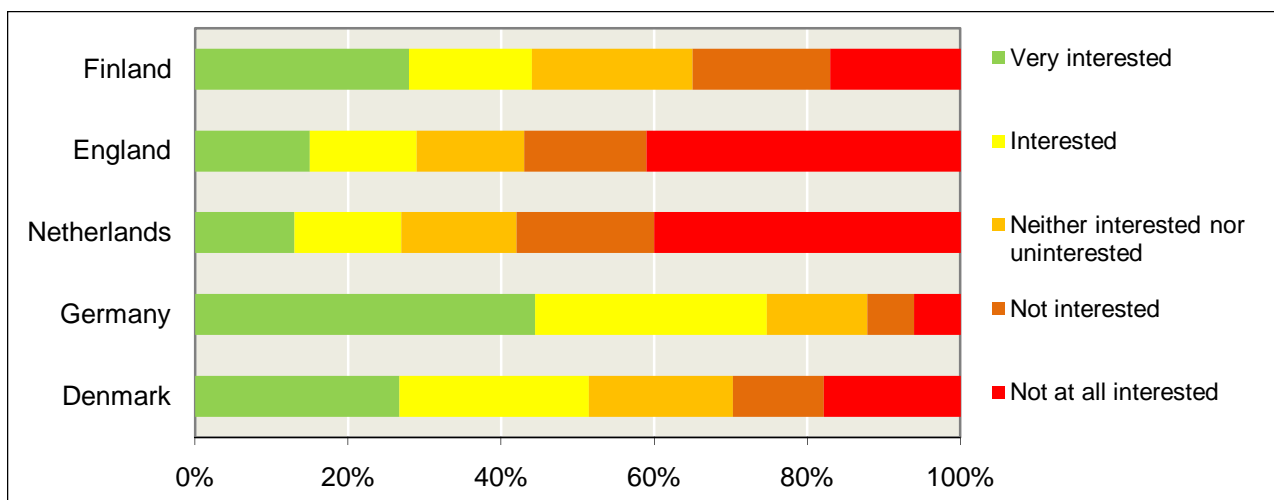
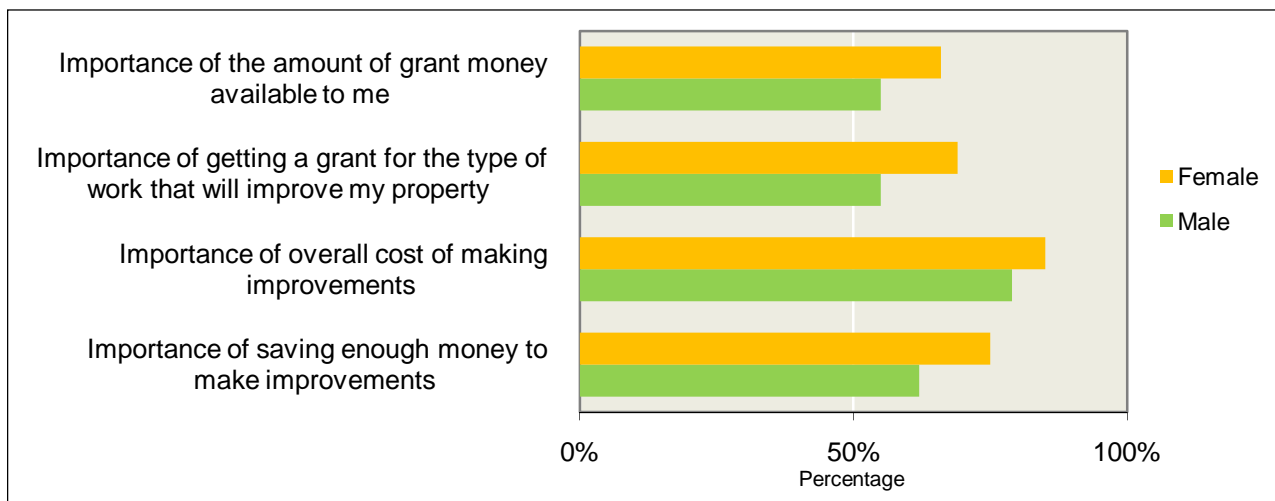


Table F33 in Appendix F

11.3 Other factors

Previous analysis had identified that there was a gender divide in relation to monetary factors. Therefore, the responses of men and women to the proposed monetary and fiscal incentives were considered. Figure 58 shows that there were differences in the response between men and women to four issues. More women rated each of these of these monetary factors more important when compared with men.

Figure 58 Importance of monetary issues by sex of the respondent



11.4 Discussion

Homeowners were clear that they would find talking to an energy professional useful when deciding on the action to improve the energy efficiency of their home. Individuals that receive an EPC because they buy a property do not have contact with the energy professional that produces the document. Therefore, the opportunity to discuss recommendations, for example, is missed. Improving the link between these parties may ensure that the EPC is a document that is more visible to homeowners.

The overall cost of improvements is an important factor for the majority of households, and clearly has an impact on decision-making. One of the cheapest energy efficiency measures, installing energy-efficient light bulbs, was carried out by nearly half of all homeowners who had completed any improvements; while installing renewables, a somewhat more expensive measure, was completed by a mere 5%. The method that homeowners may choose to pay for these measures should also be considered. A large proportion thought that their level of savings was important when they were thinking of energy efficiency. Some households also considered the impact of a grant. The ability to link the appropriate incentive to specific energy efficiency measures may prove a useful tool in motivating homeowners.

Low-interest loans as an incentive to energy efficiency may be a useful tool, but the level of interest from homeowners varied by country. Over half of homeowners were interested in a low-interest loan for energy efficiency, although a fifth were clear that they were 'not at all interested'. There were notable variances between countries in their level of interest in loans for energy efficiency measures. Homeowners in Germany were very keen on this idea, although this was not the case in the Netherlands and England. In these countries less than a third of homeowners were interested in this form of incentive.

12 Environmental awareness

This section examines homeowners' levels of knowledge of key environmental terms. It also explores the number and type of environmental activities carried out by households, and finally assesses whether being energy conscious was an important factor for homeowners. These issues will help to form some broad understanding of how homeowners' attitudes to environmental issues can be linked to their use of the EPC.

12.1 General findings

Homeowners were knowledgeable about the following four environmental terms: climate change, global warming, energy efficiency and the term 'environmentally friendly'. Figure 59 shows that 5% or less of homeowners in the survey knew nothing about these terms.

Figure 59 Homeowners' knowledge of four environmental terms

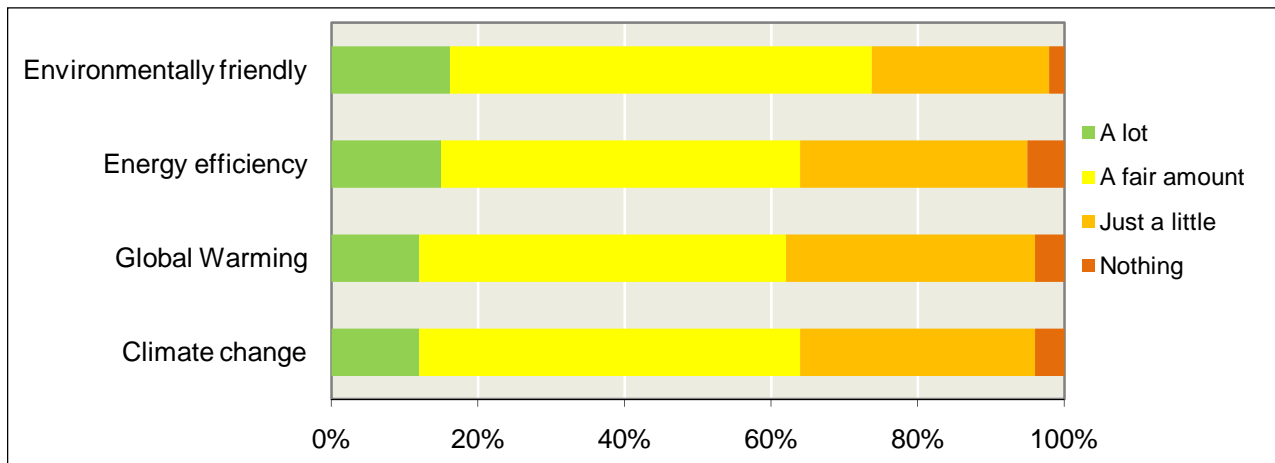


Table F1 – F4 in Appendix F

Homeowners were asked about their households' environmental activities in the last year. This followed Hering's (2007) premise that "an individual's attitude to 'green' issues will influence whether they adopt an energy-efficient measure or not"⁶². The list of environmental activities included recycling, composting, and buying goods made out of recycled material. The majority of homeowners reported doing at least one activity in the last year; the median was four activities. Figure 60 shows that over 90% of households had recycled household waste in the last year; this was by far the most frequently carried-out environmental activity. The next most common activity carried out by more than 60% of homeowners was to reduce the amount of electricity or gas used in the household.

⁶² Brohmann *et al* 2009

Figure 60 Regular environmental activities carried out in the last year by households

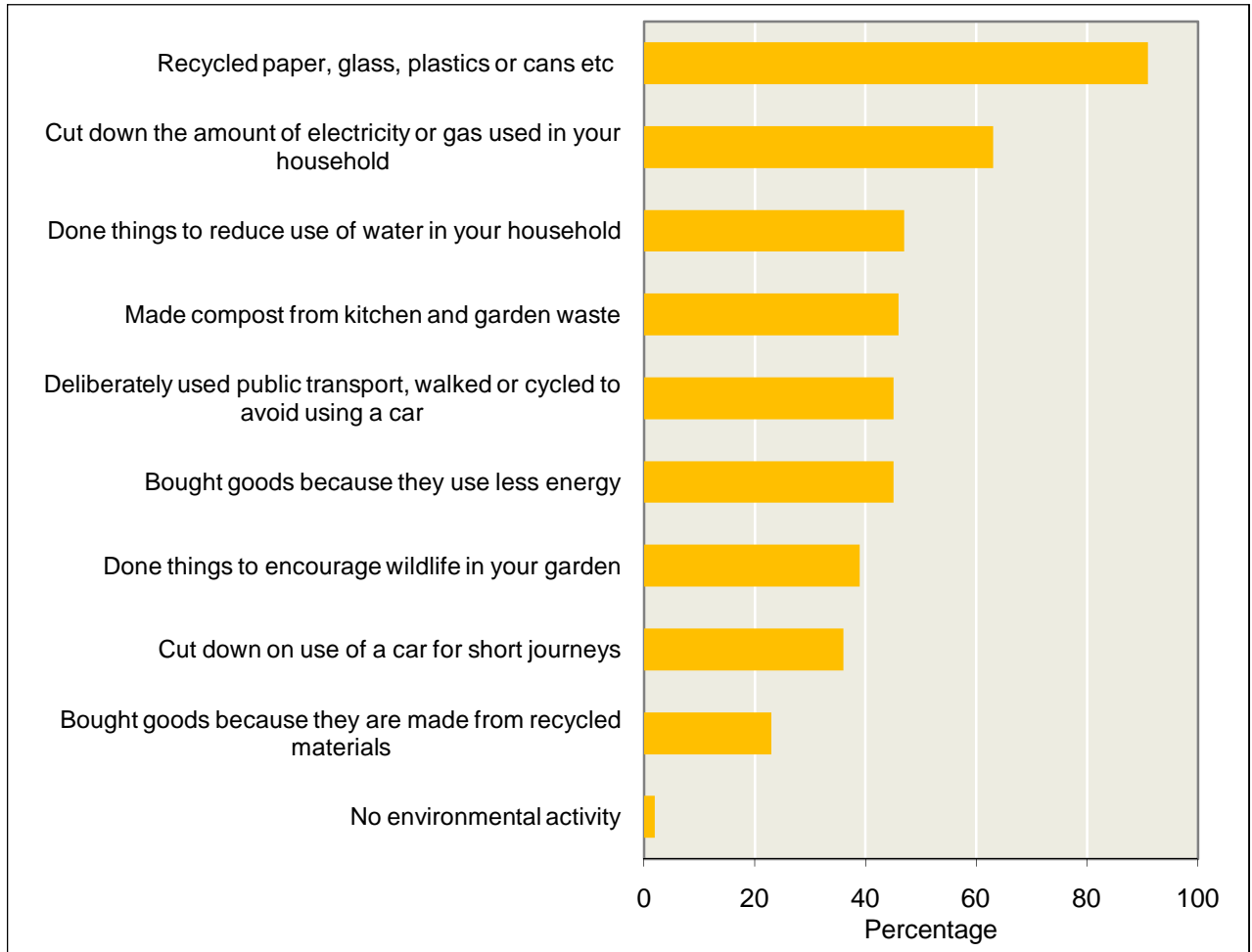
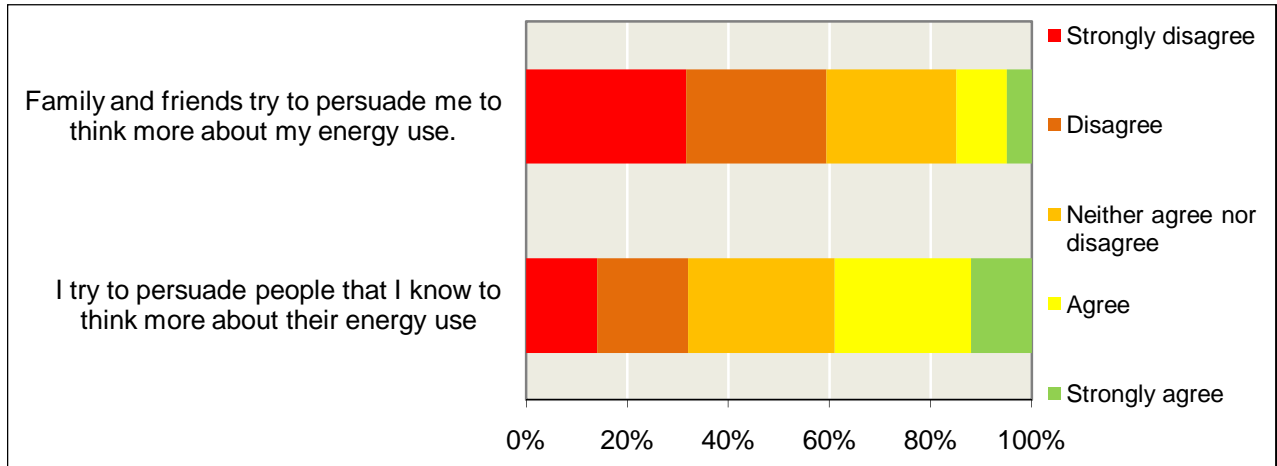


Table G1 – G10 in Appendix G

The survey examined homeowners' attitudes to energy use, and the attitude of the homeowners' social network to energy use. Figure 61 shows that less than 20% of homeowners agreed with the statement 'Family and friends try to persuade me to think more about my energy use'; however, almost 40% of homeowners in the survey agreed with the statement 'I try to persuade people that I know to think more about their energy use'.

Figure 61 Promotion of energy consciousness



Tables F25 & F26 in Appendix F

12.2 Country-specific factors

There were country-specific differences in homeowners’ knowledge and awareness of some of the environmental terms. More homeowners in Germany (42%) than in any other country report that they have ‘just a little’ knowledge of the term ‘energy efficiency’. In the Netherlands and Finland, only 19% of homeowners report having ‘just a little knowledge’ of this (see Figure 62).

Figure 62 Knowledge of the term ‘energy efficiency’ by country

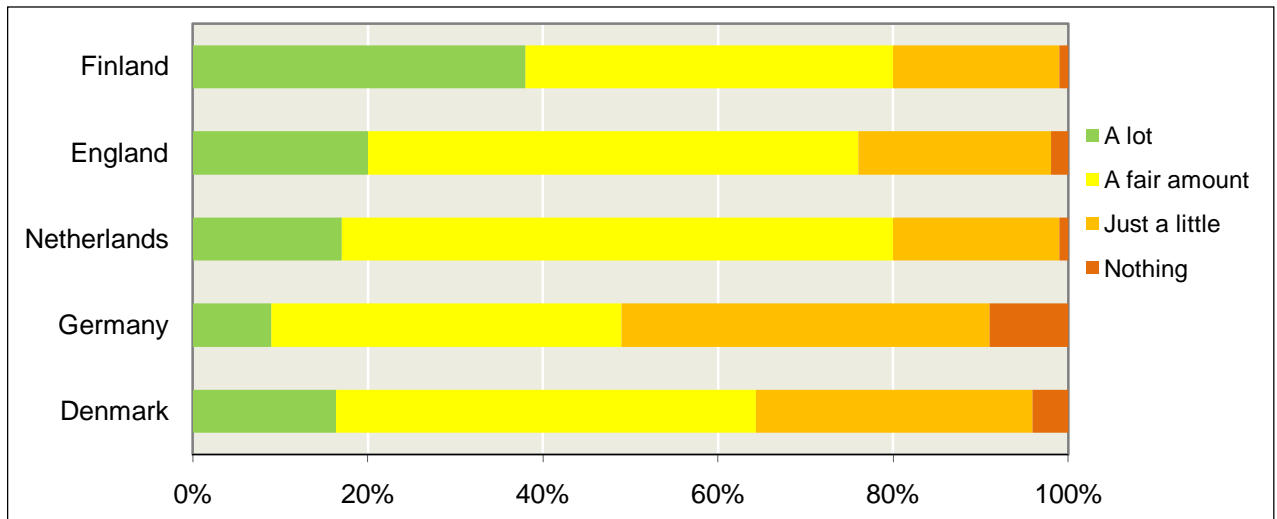


Table F3 in Appendix F

Homeowners were asked about their households’ environmental activities during the previous year. There were some differences between countries, with over 70% of homeowners in England reporting that they had recycled in the last year, whereas less than 60% of homeowners had done this in Finland, the Netherlands and Denmark.

In Finland, more homeowners than in other countries agreed with the statement ‘Family and friends try to persuade me to think more about my energy use’. Figure 63 clearly presents the differences in response

between Finland and the other countries. In all the other countries, less than a fifth of homeowners agreed with the statement.

Figure 63 Homeowners' attitude to energy use in all countries Family and friends try to persuade me to think more about my energy use.

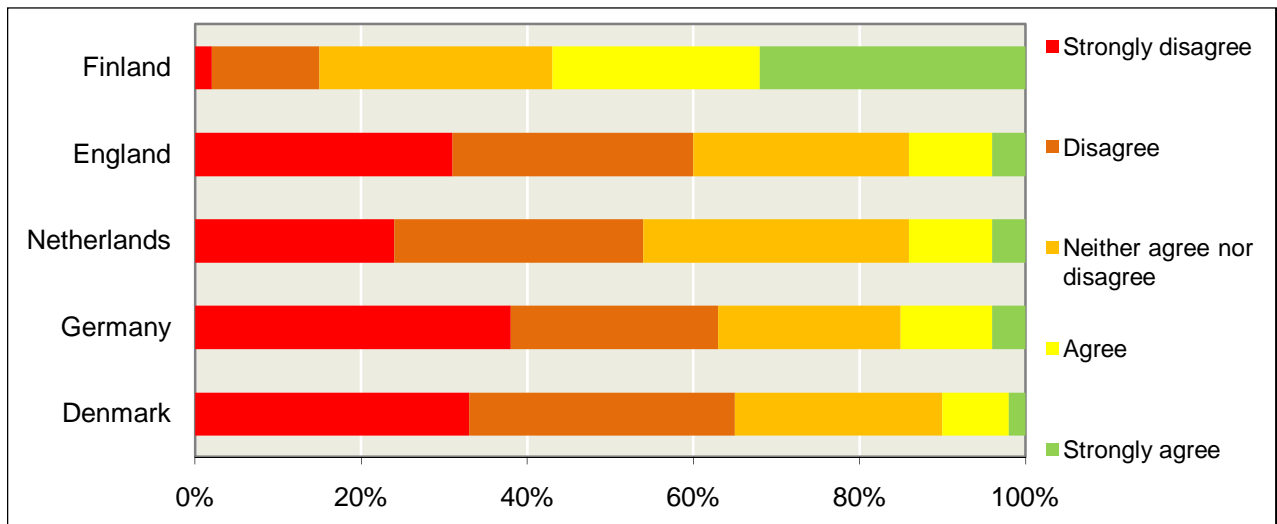


Table F26 in Appendix F

Figure 64 shows that less than 20% of homeowners in Denmark and Germany agree with the statement 'I try to persuade people that I know to think more about their energy use'. This is considerably lower than in Finland, England and the Netherlands.

Figure 64 'I try to persuade people that I know to think more about their energy use

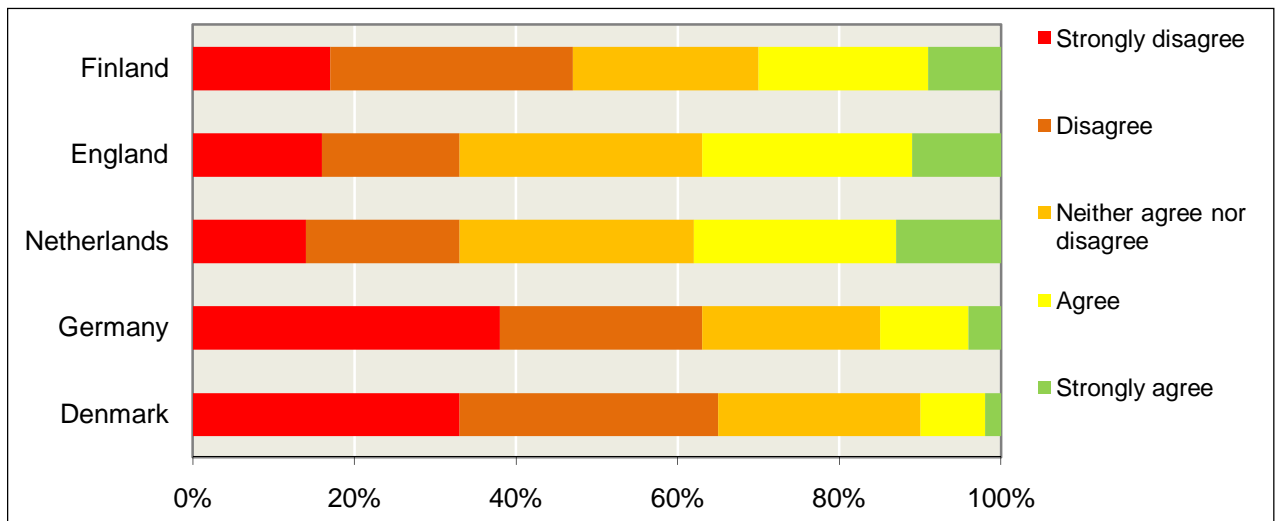


Table F25 in Appendix F

12.3 Other factors

When the sample was divided into households that had carried out energy efficiency improvements and those that had not, there were no significant differences between homeowners' responses to the two questions about their energy consciousness ('I try to persuade people that I know to think more about their energy use' and 'Family and friends try to persuade me to think more about my energy use'). However, more homeowners with a full EPC agreed with the statements than those with an EPC without recommendations, and those without an EPC at all. More than a third (34%) of homeowners with an EPC but without knowledge of the recommendations disagreed with the statements.

12.4 Discussion

Generally, homeowners were aware of key environmental terms such as 'climate change' and 'energy efficiency', although over 40% of homeowners in Germany had very little knowledge of the term 'energy efficiency'. The survey did not investigate the extent to which knowledge of these terms informs decision-making, but it was useful to collect information on the level of knowledge that homeowners have about a term like 'energy efficiency', which is widely used in the mass media.

The majority of households were carrying out some form of environmental activity, ranging from recycling to reducing car journeys. These factors may suggest that a household is energy-conscious; however the extent to which these environmental activities might indicate whether energy efficiency improvements might be completed are yet to be tested.

The energy-consciousness of an individual may inform the decision to carry out energy efficiency improvements. However, the majority of homeowners did not report a great deal of personal energy-consciousness. Around 40% of homeowners agreed that they tried to persuade people to think about their energy usage, but whether this contributes to an increase in action is uncertain.

13 Factors influencing energy efficiency behaviour in dwellings

So far, the study has examined a number of factors related to the individual homeowner, their household and type of dwelling. It has explored the importance of various factors, including the type of information available to the homeowner i.e. in the form of the EPC, homeowners' attitudes to energy efficiency, and their level of knowledge and activity around environmental issues. Some of these issues have been shown to play a role in determining homeowners' energy efficiency behaviour. This section brings some of these important factors together; to examine which of them drive homeowners' energy efficiency behaviour, and to examine whether, and to what extent, the EPC is influential in this behaviour. Homeowners in Denmark, Germany, the Netherlands and England were included in this final evaluation of the effectiveness of the EPC. Data from Finland was not included in this analysis because the sample was too small.

A binary logistic regression model was used to investigate this issue; details of this statistical test and detailed results are available in Appendix H. The purpose of the test was to determine which factors have an effect on whether a homeowner:

- a. completed one or more energy efficiency measures at the time of the survey
- b. had not completed any energy efficiency measures at the time of the survey

In order to ensure that the test was sufficiently robust, only factors that could be gathered from over 60% of the sample were used. The factors that were included in the test fall into a number of categories: demographics, household type, dwelling condition, environmental awareness, and homeowners' attitude.

The following factors were included in the test:

- EPC status
- Country of homeowner
- Household type (household size, number of children)
- Environmental activity
- Time since dwelling purchased
- Age of the respondent
- Sex of the respondent
- Age of the dwelling
- Homeowners' attitude to utility cost during the home-buying stage
- Homeowners rating of the condition of their current dwelling
- Whether homeowners faced energy-related problems since they purchased their dwelling
- Whether households had completed any home improvements

The reason for the inclusion of each factor is discussed below.

EPC status: There were three distinct categories of homeowners in relation to their awareness of an EPC for their current dwelling. Some homeowners were fully informed, while others had some awareness of the energy efficiency rating of 'the label', while others reported that they did not have a label for their dwelling. There were differences in the proportion of homeowners in each of these groups that had completed energy efficiency improvements, suggesting that the EPC has an influence on behaviour. This test will explore further the impact of the EPC when it is included within a multitude of factors.

Country Previous findings reveal differences in the energy efficiency behaviour of homeowners by country. For example, 76% of homeowners in the Netherlands had completed energy efficiency measures compared to 48% of homeowners in Germany.

Household Household size and the number of children in the household affect the energy usage of a household, and therefore these variables were entered into the model.

Environmental awareness Previous studies suggest that “an individual’s attitude to green issues will have an impact on whether they adopt energy efficiency measures”⁶³. Therefore, the number of regular environmental activities carried out by the household was included.

Time For the majority of homeowners in this sample, the EPC was provided at the time a house was purchased. In this sample the majority of homeowners had purchased their dwelling between six months and two years before the survey was conducted. Therefore, the inclusion of this factor may determine the role that the time since purchase plays in energy efficiency behaviour.

Age and sex of respondents While the majority of homeowners completing the survey occupied their dwelling with at least one other person, the respondent in this sample represents the household. There were differences in the mean age of respondents by country. There were also differences in the way that women and men responded to some issues, and therefore both these factors were entered into the model.

Age of dwellings There was a range of dwelling ages in the sample; older dwellings are generally in need of more energy efficiency measures than newer ones. Previous findings in this study identified a number of differences related to the condition and age of dwellings.

Homeowners’ attitude to utility cost during the home-buying stage Homeowners rated the importance of utility costs at the home-buying stage differently, depending on their country.

Condition of current dwelling This includes homeowners’ rating of the condition of their current dwelling and whether they faced energy-related problems after they purchased their dwelling. The condition rating was different depending on whether energy efficiency improvements had been made.

Whether households had completed any home improvements There were a number of households that had not completed any improvements. It would be interesting to find out if there were differences between this group and the rest.

While these factors met the criteria for the test, there were a number that could not be included because of insufficient data. These factors were household income, energy efficiency rating, homeowners’ promotion of energy usage and their level of trust in the EPC.

The test was carried out on two groups in the sample. Group one included all homeowners living in a house, and group two included all homeowners living a house that was purchased between 6 months and 24 months of the survey. Only 11% of the sample did not live in a house, and therefore it was possible to exclude this group without reducing the sample significantly. Homeowners living in a house are likely to have an opportunity to carry out more energy efficiency measures, and will have sole responsibility for the measures that are implemented. Because of the sampling methodology, a large number of homeowners in the sample purchased their current dwelling between 6 months and two years before the survey. A number

⁶³ Hering (2007)

of commentators⁶⁴ have also discussed the importance of life events in energy efficiency behaviour, such as the change of dwelling, and this group could be regarded as having a 'window of opportunity'⁶⁵ to implement some energy efficiency measures. Therefore it would be useful to examine which factors motivated this particular group.

13.1 The findings

Group 1: all homeowners

The sample included 2,836 homeowners who lived in a house. Since the regression included cases where there was a response to all variables, only 64% (1,804) of them were included in this binary logistic regression. The test works by choosing the relevant variables during a series of steps. The 'forward-wise' process adds a relevant variable during each step until the model is complete. The test resulted in the following factors being accepted into the model to determine energy efficiency behaviour:

- EPC status
- Environmental activity
- Time since purchase of property
- Age of dwelling
- Condition of dwelling at purchase

Only specific elements of each variable were significant in the analysis. Figure 65 highlights the factors of influence. All the factors are on the right of the dotted line (i.e. 1 and above); this indicates that they increased the likelihood that an energy efficiency measure would be completed.

The age and condition of the dwelling affected the likelihood that an energy efficiency measure would be completed. The poorer the condition of the homeowners' current dwelling, the more likely they were to have carried out one or more energy efficiency measures; those households with dwellings in a 'very poor condition' were about 18 times more likely to carry out improvements than someone living in a dwelling rated in a 'very good condition'. This compares with homeowners rating their properties in a 'poor condition' who were five times more likely to make an improvement. Homeowners who rated their dwelling to be in a 'good' condition were still more likely to carry out energy efficiency improvements than someone living in a dwelling rated in a 'very good condition'. The energy efficiency behaviours considered include a wide range of measures, from draught proofing to installing renewable energy; and therefore it is likely that a homeowner with a reasonably good property may seek to invest in one or more of these measures.

Homeowners in older dwellings were also more likely to have carried out an energy efficiency measure. This was notably the case for a dwelling built between 1919 and 1970, where there was around four times the likelihood that an energy efficiency measure would be completed compared to homeowners living in a dwelling built after 2000.

Homeowners with an EPC with recommendations were up to twice as likely to have carried out one or more energy efficiency measures when compared to homeowners without, or unaware of, the EPC for their home.

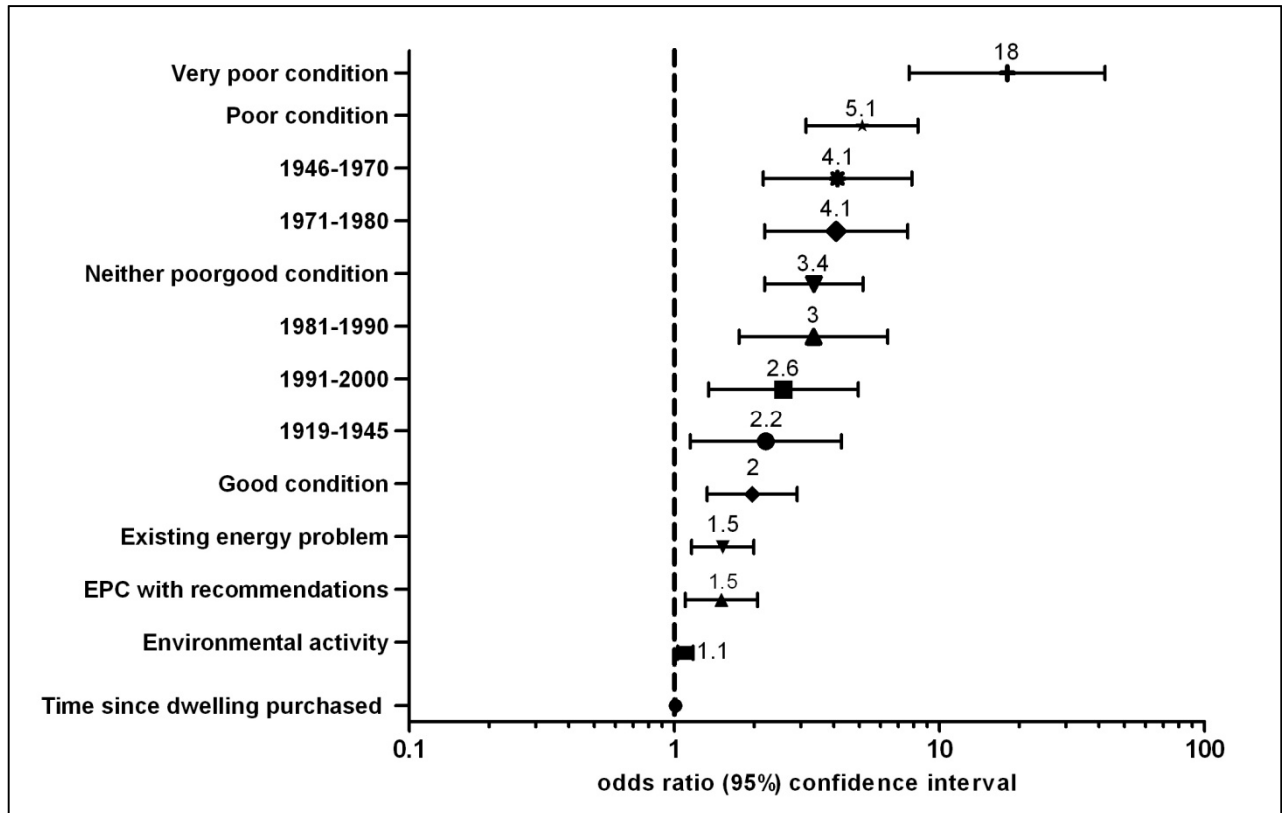
There was also an increase in the likelihood that an energy efficiency measure would be completed if a homeowner was aware of an energy-related problem with their dwelling; the study identified these issues

⁶⁴ Brohmann *et al* 2009

⁶⁵ Throne-Holst *et al* (2006)

as high energy bills, difficulties keeping the dwelling at a comfortable temperature and problems with the heating system.

Figure 65 Factors influencing the energy efficiency behaviour of all homeowners



The number of regular environmental activities carried out by the household, and the length of time since the purchase of the dwelling, had a minimal impact on whether an energy efficiency measure was completed.

Caveats

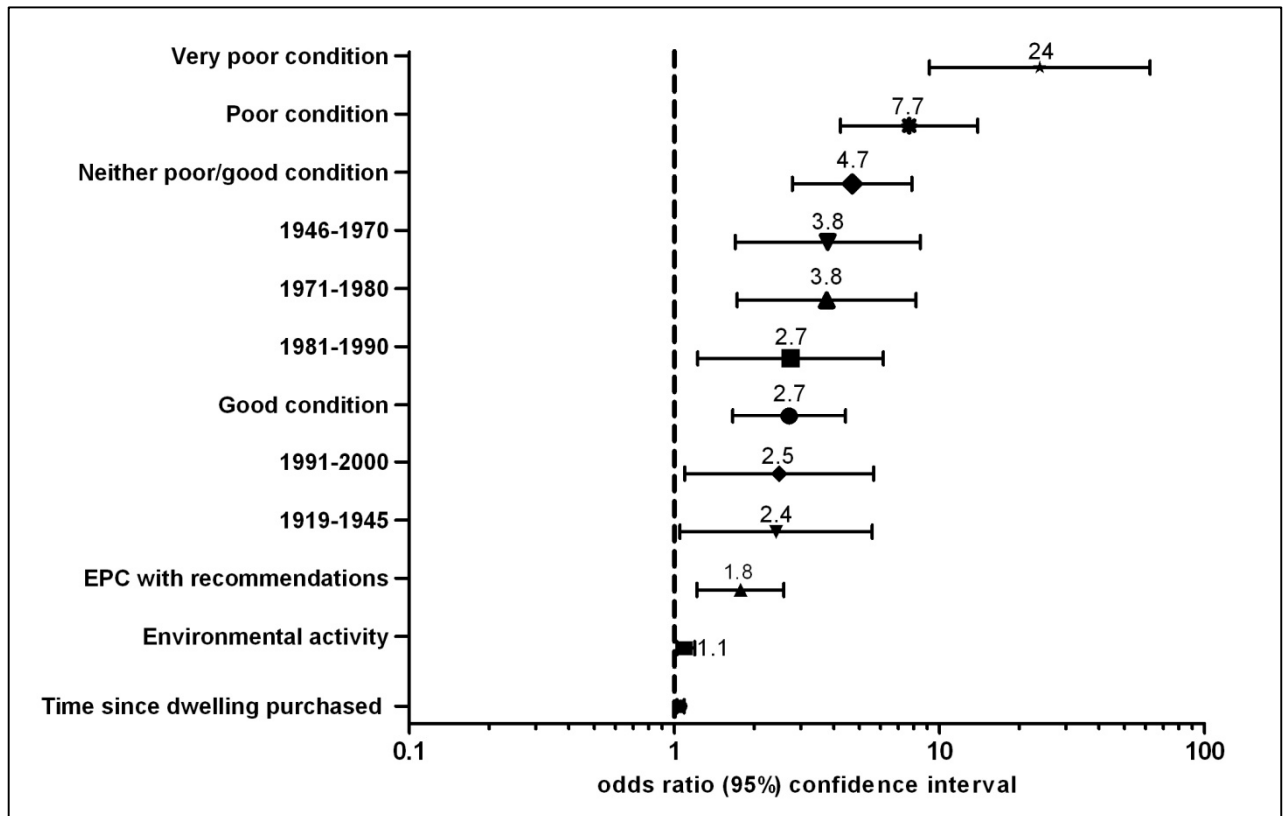
The model cannot and does not explain all the reasons for energy efficiency behaviour; however, it does provide information on some of the drivers and barriers to energy efficiency behaviour.

Group 2: all homeowners who had purchased dwellings between six and twenty four months before the survey

There were 1,908 homeowners who lived in a house and purchased their dwelling between six and twenty-four months before the survey; 1,243 of them (65%) were included in this binary logistic regression. There were some small differences between group 1 and group 2; for example the factor 'existing energy-related problems' was not included in the model for the latter group. Figure 66 shows that the condition of the homeowners' current dwelling was again an important factor; the age of the dwelling was also important. For this group those households rating their dwelling in a 'very poor' condition were 24 times more likely to make an energy efficiency improvement than homeowners who rated their dwelling to be in a 'good'

condition. Households with an EPC and awareness of the recommendations were more than twice as likely to have carried out one or more energy efficiency measures as homeowners without, or unaware of, the EPC for their home.

Figure 66 Factors influencing the energy efficiency behaviour of homeowners purchasing a house between six and twenty four months before the survey



14 Conclusions

Homeowners in the sample were recruited from five different member states, with five different EPC implementation strategies. This report considers the shared experiences of recent homebuyers, either with or without an EPC. The experience of homeowners in these five member states therefore provides a useful indication of the impact of EPCs on homeowners.

This sample suggests that homeowners have implemented a number of energy efficiency improvements. The most common improvements were the installation of a new boiler or heating systems, improved glazing and loft insulation. A number of homeowners also planned to install both loft and wall insulation. More than a third of homeowners who were actively improving their dwellings were aware of the EPC for their dwelling, including the recommendations, compared with less than a fifth of all other homeowners.

14.1 What drives homeowners to implement energy efficiency measures?

There were three main factors that appear to be the most influential in driving homeowners to complete at least one energy efficiency improvement. These were their perception of the condition of their dwelling, its age and the EPC. Other factors were also reported to drive homeowners' decision-making, but to a lesser extent.

Physical condition Dwellings perceived by their owners to be in a poor condition were most likely to be improved. The poorer the condition of the homeowner's current dwelling, the more likely they were to have carried out one or more energy efficiency measures. Households living in a dwelling which was rated to be in a 'very poor' condition were about 18 times more likely to carry out improvements than someone living in a dwelling rated to be in a 'very good condition'. Similarly, households that rated their properties to be in a 'poor' condition were five times more likely to make an improvement. Therefore, the perceived condition of the property may be regarded as the most influential motivator driving homeowners to make energy efficiency improvements.

The age of the dwelling While the physical age of the dwelling cannot motivate an individual to act, it is worth realising that dwellings built at different times were built with differing levels of insulation and using different methods of construction. Knowledge of these differences is likely to motivate homeowners to complete energy efficiency measures. Homeowners living in dwellings built between 1919 and 1970 were found to be around four times more likely to have completed an energy efficiency measure than homeowners living in dwelling built after 2000. The likelihood decreases for homeowners living in dwellings built before 1919. This may be because some of the older buildings may be harder to improve, as energy efficiency measures may be more costly or the measures may be harder to implement.

The Energy Performance Certificate Awareness of this document played a role in determining whether homeowners carried out energy efficiency measures. The EPC on its own is not the strongest driver influencing whether homeowners will purchase a dwelling or carry out improvements, but homeowners with an EPC with recommendations were up to twice as likely to have carried out one or more energy efficiency measures as homeowners without, or unaware of, the EPC for their home. It was particularly notable that 60% of homeowners who were aware of the recommendations given with their EPC had carried out one or more energy efficiency measures, compared with just over 40% of households with an EPC who could not

recollect, or were unaware of, the recommendations. Therefore, increasing the availability of this tool and creating wider use and understanding of it may enhance the likelihood that more energy efficiency measures will take place.

The need for remedial improvements The results suggest that some homeowners were faced with immediate energy-related problems when they purchased their dwelling. Provided that the improvements were affordable, or the cost of these improvements had been considered in the purchasing process, this need may have motivated some to improve their dwelling.

Comfort The majority of homeowners appear to be motivated to improve their dwelling in order to improve the comfort in their home. This was a motivating desire for both general improvements and energy efficiency ones. Improving the appearance of the home, energy efficiency and reducing energy bills were also important factors for around 40% of homeowners.

14.2 What barriers do homeowners face when implementing energy efficiency measures?

Awareness of the EPC There were differences in the proportions of households in each country that were aware of the EPC. This in part may be due to the way that each country may have chosen to inform homeowners about EPCs. In the Netherlands, 99% of homeowners had heard of the EPC compared to 80% in England. In the Netherlands 91% of homeowners had seen the label, but this was as low as 43% in Germany. The German sample was made up solely of recent homebuyers. The lack of awareness of the EPC in this group suggests that its implementation is not yet a prescriptive part of the home-buying process in Germany.

Visibility of the EPC at the home-buying stage The EPC was not used to inform decision-making at the home-buying stage, because the majority of homeowners did not see it until after a decision to purchase a property had been made. Less than half the homeowners who had an EPC because they had purchased a property were shown the EPC before they made an offer on the property.

Reluctance to use the EPC to inform a home purchase decision The information provided in the EPC was not a major factor in homeowners' decision-making. Very few homeowners were informed about the energy efficiency of their potential dwelling when they were in a position to act on it, while even those who were informed did not utilise the information. Only a third of homeowners who saw the EPC before making an offer reported that it played an important role in their decision to make an offer on their current dwelling.

Home-buying priorities Energy efficiency was not a major consideration for homebuyers. The potential energy cost of running a property was ranked ninth out of twelve home-buying priorities, suggesting that it does not feature highly in the minds of home buyers. The availability of garden/outdoor space, price, location, the neighbourhood, size, condition, the layout of rooms and the availability of local amenities were considered more important.

The competition between general and energy efficiency improvements With the majority of homeowners carrying out some form of home improvement within a few years of moving into their dwelling, energy efficiency measures must compete with other home improvement measures. Around half of all homeowners who had completed improvements had installed/improved a kitchen or bathroom. The installation of a new boiler or heating supply, improving the glazing, and the installation of loft insulation were each carried out by around a third of homeowners who had completed improvements. Nine percent of these homeowners had installed some form of renewable technology.

Level of trust in the EPC Homeowners may be more likely to utilise the EPC if they trust the information provided in the document. Around 40% of homeowners trusted the EPC; however, this varied in each country. Homeowners in Finland and Denmark trust the EPC the most, with over 50% of homeowners in these countries reporting that they trust the label. In the Netherlands, around 30% trusted it; this was the lowest level of all countries.

The role of estate agents Estate agents play a pivotal role in informing homeowners about the EPC. Over 40% of homeowners were made aware of the EPC through an estate agent. This varied in each country; in England over 60% of homeowners were informed about the EPC through their estate agents, compared with 24% of homeowners in Germany. Property sales material was the source for 60% of respondents from Denmark, 46% from England, 26% from Germany and 22% from the Netherlands. Therefore, these 'actors' are potentially key players in the homeowners' reaction to the EPC. Previous research suggests that estate agents may not encourage buyers to utilise this source of information. This raises concerns that the level of influence the EPC may vary, depending on how it is introduced to a homeowner.

Visibility of the recommendations report Homeowners who were aware of the details provided in a full EPC were more likely to carry out improvements. Therefore it is worrying that a number of homeowners with some recollection that they received an energy label did not link this information to the complete document. Whether this was because it was forgotten, or because it was associated with other documents, may vary between countries. However, this group clearly failed to utilise the information provided in the full EPC.

Choosing the right media to disseminate energy efficiency information The use of mass media to convey information about energy efficiency may not appeal to homeowners. Homeowners reported a high level of distrust in advertisements as a source of information on energy efficiency for the home.

The role of local tradespeople Local tradespeople may be carrying out other works in the home, but if they are not trusted by homeowners they are not able to convey energy efficiency information that homeowners will rely on. Less than half of homeowners trusted their local tradespeople for energy efficiency information. Another issue was that the inability to find reliable tradespeople would discourage up to two-fifths of homeowners in each country from carrying out improvements. This issue needs to be addressed in all countries.

14.3 Are EPCs useful tools for homeowners' in all five member states?

Understanding the EPC The majority of homeowners in Denmark, the Netherlands and England found the EPC easy to understand; however, less than half of homeowners in Germany found the document easy to understand. One of the differences between these countries is that Germany does not use a banded A to G rating to depict the energy efficiency rating.

Information on home energy costs The way that the EPC provides information on the energy costs of the home is inconsistent. In Denmark and Germany, almost two-fifths of homeowners with an EPC considered it a useful document for providing information on the energy costs of the home; and yet less than a fifth of homeowners in England and the Netherlands thought the same. Nearly 30% of homeowners in England rated the EPC 'not at all useful' in providing this information.

Information on sources of advice and further information on energy efficiency The EPC provides some information about energy efficiency, but homeowners with an appetite for more information may not be catered for in this document. Again, there may be differences in the approach in each country, although generally homeowners did not seem well served in this regard. Around a fifth of homeowners in Denmark,

the Netherlands and Germany thought that the EPC provided useful information on where to go for advice and further information on energy efficiency measures; however, less than 10% of homeowners in England thought this and almost 40% thought that it was 'not at all useful'.

Added value The EPC with recommendations can be a valuable resource for homeowners. Around 40% of homeowners with the report in all four countries found it 'very useful' or 'useful' for providing information about the home improvements needed to reduce energy bills.

Details of the cost of home improvements The level of information provided on the EPC in each country varies. This explains some of the variation in homeowners' rating of the usefulness of the EPC, in providing information on the cost of making energy-efficient home improvements. More than a third of homeowners in Germany and Denmark found the document useful for providing this service, while less than a fifth of homeowners in England thought the same. More than half of the homeowners in England considered the document 'not at all useful' or 'not useful' in providing this level of information.

14.4 Other factors that may influence decision-making

Cost The overall cost of improvements was an important factor for the majority of households. Many homeowners also considered whether they had sufficient savings to invest in improvements. Homeowners were keen to consider the payback of their investment in terms of their time as well as financially. Grants were the least important monetary consideration.

Loans Low-interest loans as an incentive to improve energy efficiency may be a useful tool, but the level of interest from homeowners varied by country. More than half of the homeowners were interested in a low-interest loan for energy efficiency, although a fifth of homeowners were clear that they were 'not at all interested'. There was notable variation between countries in their level of interest in loans for energy efficiency measures. Homeowners in Germany were very keen on this idea, although this was not the case in the Netherlands and England. In these countries, less than a third of homeowners were interested in this form of incentive.

Fiscal incentives It is not clear what part existing incentives played in motivating homeowners to carry out energy efficiency improvements. However, homeowners were generally interested in fiscal incentives. More homeowners were interested in paying a lower level of tax because they had completed home improvements than in linking the level of tax to the energy performance rating of their home.

Practical issues The majority of homeowners were not discouraged from carrying out home improvements because of practical issues like the potential physical mess, or disturbance to routines, that might be caused. However, these practical issues were a consideration for about a third of homeowners.

Information as a support mechanism Homeowners may be more likely to carry out energy efficiency improvements if they receive good-quality information. More than half of homeowners would wish to talk to an energy-professional to gain clear instructions about how to improve the energy efficiency of their home.

'Green bling' and solar energy The visibility of some forms of renewable technology to friends and neighbours is likely to be attractive to some homeowners. While 5% of homeowners had installed renewable technologies at the time of the survey, many more were planning this type of work in the next three years. Solar was the most popular form of renewable energy. Over 100 households had installed solar water heating systems, and over 200 households planned to install some form of solar power in the next three years. The majority of households installing or planning this type of improvement were from the

German sample. Homeowners in Germany also reported the greatest awareness of friends and neighbours installing renewable energy technology.

The gender divide Fewer women in the sample reported having an EPC for their dwelling, compared with the men in the sample. Whether this was because women were less engaged in the home-buying process was unclear. Cost seems to be an important factor for women. Women were more likely than men to consider the potential cost of utility bills at the home-buying stage. These differences between the sexes should be considered when communicating messages about energy efficiency.

14.5 Value of the survey

The survey provides a useful insight into the drivers and barriers to the implementation of home improvements, especially in the first year or two of ownership. Homes in poorer condition, and those built before energy efficiency was part of the build process, are most likely to require improvements; and these appear to be where many of the improvements were being made. The presence of an EPC with recommendations also influenced whether energy efficiency improvements were made.

The method of sampling from the five nations varied, but the survey has produced a large database which can be used for continued investigation on a nation by nation basis.

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