



Department for Levelling Up,
Housing & Communities



English Housing Survey

Energy Report, 2020-21



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Introduction and main findings

1. The English Housing Survey (EHS) is a national survey of people's housing circumstances and the condition and energy efficiency of housing in England. It is one of the longest running government surveys and was first run in 1967.

Impact of COVID-19 on the English Housing Survey

2. In a normal year, English Housing Survey statistics on energy and energy efficiency are based on data collected by a qualified surveyor in the home. Due to COVID-19 restrictions, it was not possible to collect data in this way in 2020-21 and data was instead collected from an external inspection of properties (by a surveyor) and supplemented with information about the interior of the dwelling the surveyor collected at the doorstep. More information on the impact of COVID-19 on the English Housing Survey and the modelling methodology can be found in the Technical Report¹.

This report

3. This report focuses on energy efficiency and is split into four chapters. The first chapter gives an overview of the energy efficiency of the English housing stock between 2010 and 2020.
4. The second chapter reports on the prevalence of space and hot water heating systems including low carbon technologies. It then looks at smart meters and parking provision, which is a key component in assessing the potential for home electric vehicle charge points.
5. The third chapter explores household awareness of Energy Performance Certificates (EPCs), and the influence certificates had on the household's decision to buy or rent the home, and whether households or their landlords carried out any of the recommended improvements. It will then report on the costs and impact on annual CO₂ emissions of improving dwellings with an energy efficiency rating (EER) band D or below, to at least an EER band C.
6. Finally, the fourth chapter focuses on the types of homes that are most difficult to improve and therefore considered 'hard to treat'.

¹ <https://www.gov.uk/government/collections/english-housing-survey-technical-advice#technical-reports>

Main findings

The energy efficiency of the English housing stock has continued to increase over the last decade.

- In 2020, 46% were in the highest energy rating bands of A to C, whereas in 2010 14% of the stock had the highest EER bands.

Social rented homes remain the most energy efficient, although the gap between the private sector and social sector has narrowed.

- Dwellings in the social rented sector were generally the most energy efficient in 2020, with over half (63%) having an EER of band C compared with 39% of the private sector. More specifically, housing association and local authority dwellings were more likely to be in the EER of band C (65% and 59%, respectively) compared with private rented and owner occupied (both 39%) dwellings.

London and the South East had the most energy efficient dwellings.

- London was generally more likely to have dwellings in the highest EER bands of A or B (5%) and generally less likely to have dwellings in bands F or G (1%) compared with all other regions. Homes in the South West were more likely to have an EER band of F or G (6%) in comparison to all other regions.

Younger people and those with higher incomes were more likely to live in the most energy efficient homes (A or B rated).

- Households where the HRP² was aged between 16 and 44 years old were more likely to live in a dwelling rated A or B (4%) than households where the HRP was aged 65 or over (2%).
- Households in the highest (5th) income quintile were more likely to have an EER band of A or B (4%) rated home than those in the first (2%), second (2%) and third (3%) quintiles.

Owner occupiers were more likely to have made energy improvements to their home on the basis of an EPC, especially couples aged 60 or over, owners that lived in older dwellings, and those located in Yorkshire and the Humber.

- Of the 1.3 million owner occupiers who remembered seeing an EPC, over half (57%) mentioned carrying out an energy efficiency improvement measure mentioned by their EPC. The remaining 43% had not carried out any works.
- Over two thirds (70%) of owner occupiers in dwellings built between 1919 and 1944 carried out energy efficiency improvement work compared with around half of households in dwellings built between 1945 and 1964 and pre 1919 (51% and 50%, respectively).

² The HRP (household reference person) is the person in whose name the accommodation is owned or rented.

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- Households located in Yorkshire and the Humber were more likely to have done any of the work recommended by the EPC (69%) than households in the West Midlands (47%) and the North West (45%).
 - Couples aged 60 or over were more likely to have done work recommended by the EPC (70%) than couples under 60 (50%).

Landlords of housing association renters were more likely to have done some or all of the jobs recommended by the EPC.

- Landlords of housing association renters were more likely to have done some or all of the jobs recommended by the EPC (74%) than landlords of private renters (40%).

The average cost to improve an EPC band D to G rated dwelling in England to at least a band C was £7,737. Costs tended to be lower in the social sector than the private sector.

- The average cost to improve D to G rated dwellings to a EER band C was £7,737. It would cost less than £10,000 to improve around three quarters (72%) of dwellings to a band C and more than £15,000 to improve around one in ten (9%) dwellings to a band C.
- Social sector homes (8%) were more likely to cost less than £1,000 to improve to an energy efficiency rating band of C than private sector homes (4%).
- Dwellings with a rating of D (27%) were more likely to cost between £1,000 and £4,999 to reach an EER band of C than dwellings rated E (9%) or F or G (8%). Conversely, dwellings that fell into the F or G category (59%) were more likely to cost £15,000 or more to be improved to an EER band of C compared with those in band E or D (31% and 3%, respectively).

For those that were able to be improved to at least a band C, the average annual energy cost savings were £282 per year, with owner occupiers benefitting the most. Overall, this would lead to an annual average CO₂ saving of 1.6 tonnes per dwelling.

- Owner occupied homes had the highest average energy cost savings; £302 per year, followed by private rented dwellings, at £276. Social rented dwellings had slightly lower energy cost savings at £151 for local authority dwellings and £158 for housing association dwellings.
- The average CO₂ savings for dwellings improved to at least a band C were 1.6 tonnes per year, per dwelling. Dwellings with a pre-improvement EER band of F or G had the largest average CO₂ saving at 6.4 tonnes per year.

Acknowledgements and further queries

7. Each year the English Housing Survey relies on the contributions of a large number of people and organisations. The Department for Levelling Up, Housing

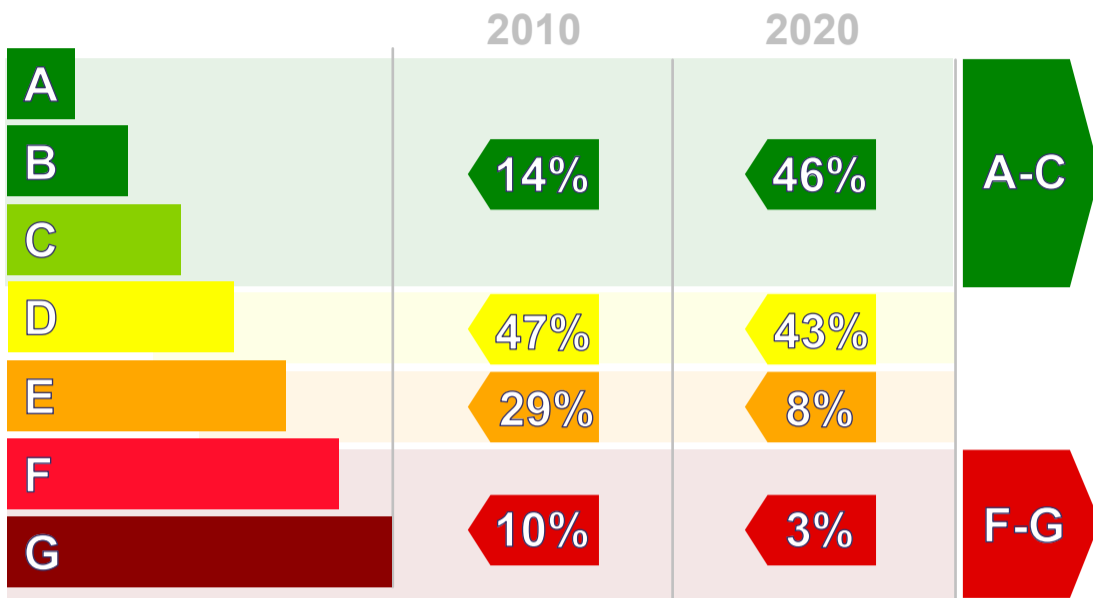
and Communities (DLUHC) would particularly like to thank the following people and organisations, without whom the 2020-21 survey and this report, would not have been possible: all the households who gave up their time to take part in the survey, NatCen Social Research, the Building Research Establishment (BRE) and CADS Housing Surveys.

8. This report was produced by Ana Slater, Emma Munkley, Dan Windsor, Joseph Clinton, and Adele Beaumont at BRE in collaboration with NatCen Social Research and DLUHC.
9. If you have any queries about this report, would like any further information or have suggestions for analyses you would like to see included in future EHS reports, please contact ehs@levellingup.gov.uk
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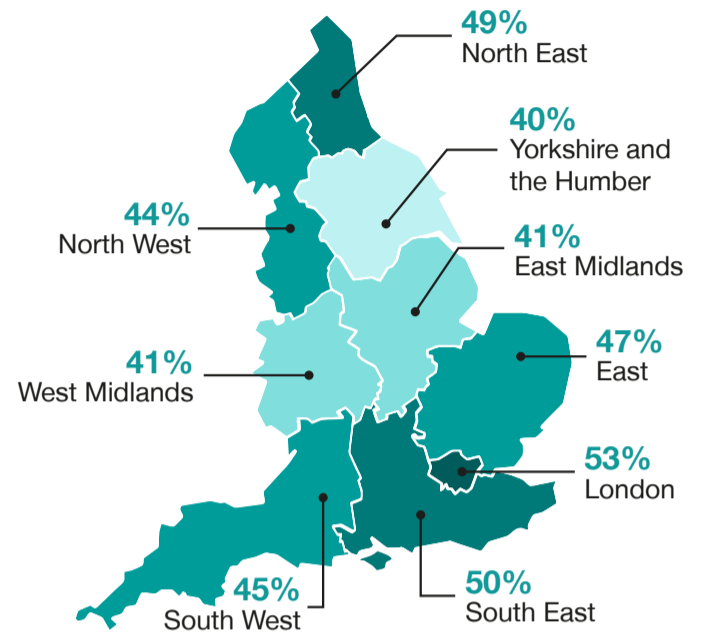


Energy efficiency

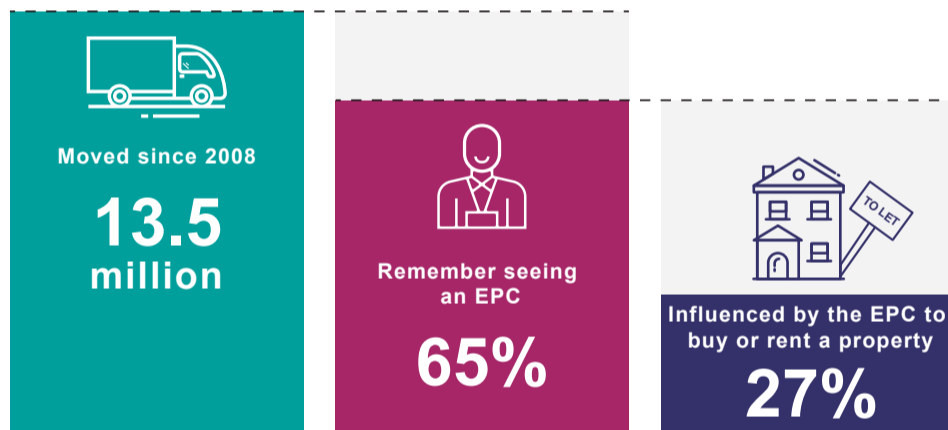
The energy efficiency of the English housing stock has continued to increase over the last decade



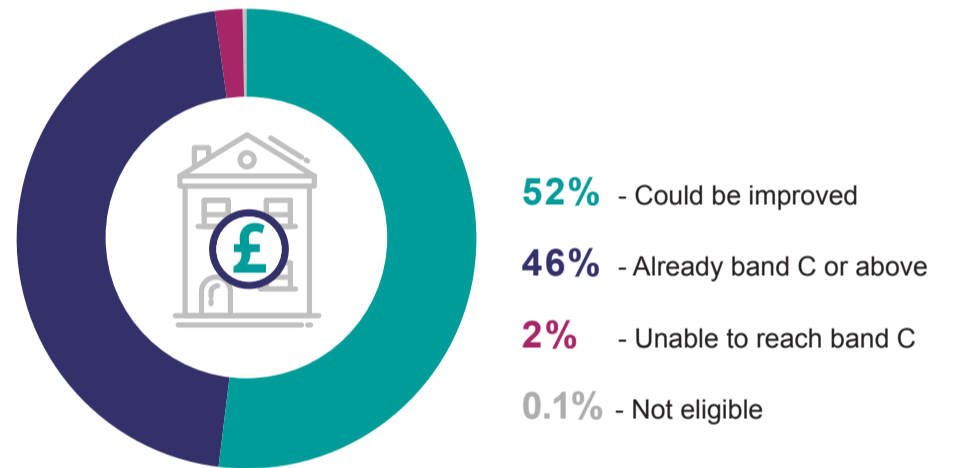
The South East and London were more likely to have A to C rated homes



Of those that remember seeing their EPC, 27% were influenced by their EPC to rent or buy the property



Over half of homes could be improved to band C



The cases unable to reach band C could technically be improved through measures not mentioned in an energy performance certificate (EPC).

A small proportion of dwellings were ineligible to receive any improvement measures and therefore have no estimated costs.

Over two-thirds of owner occupiers in dwellings built between 1919 and 1944 carried out energy efficiency improvement works recommended by the EPC



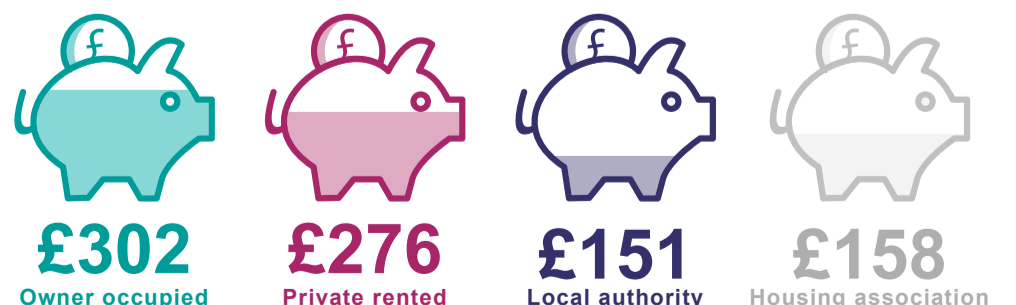
The average cost to improve all dwellings to band C was £7,737



Landlords of housing association renters were more likely to have done some or all of the jobs recommended by the EPC



The average annual energy cost saving when improving all dwellings to band C was £282 in 2021 prices



Chapter 1

Energy efficiency of housing

- 1.1 This chapter presents an overview of the energy efficiency of the English housing stock between 2010 and 2020 and how it has changed among tenures and regions. It also explores how energy efficiency differed in 2020 by dwelling characteristics, such as dwelling type and age. Finally, it reports on household characteristics in relation to the dwelling's energy efficiency rating, to determine whether energy efficiency varies among households according to their age or income.

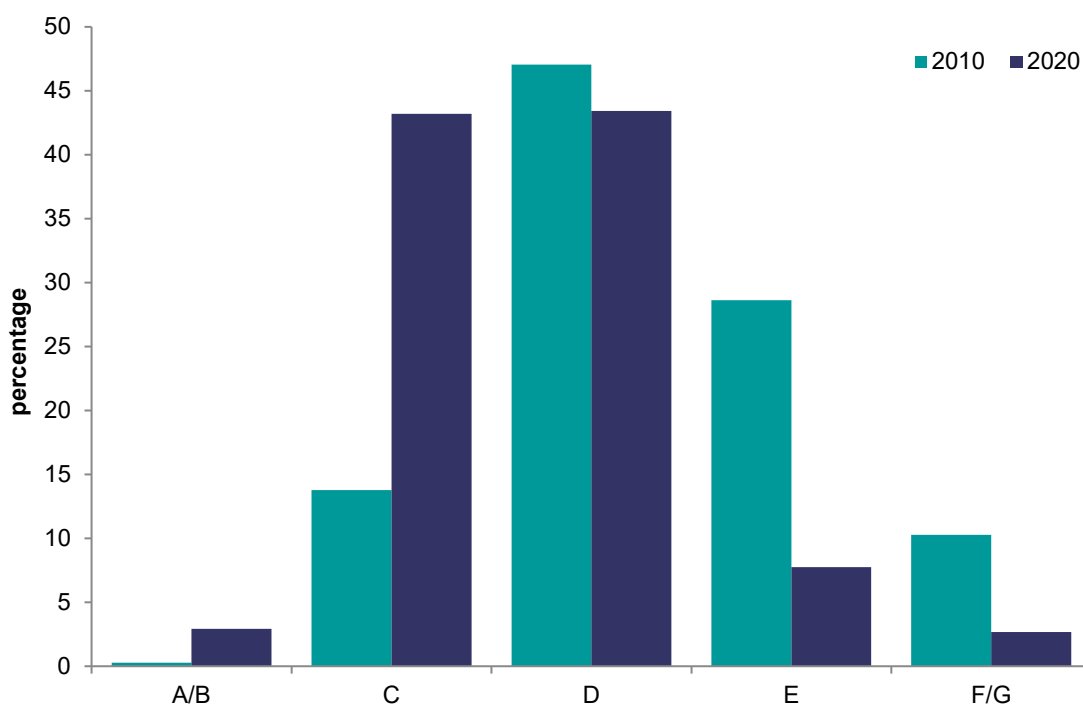
Trends in energy efficiency

- 1.2 The English Housing Survey (EHS) uses the Government's Standard Assessment Procedure (SAP 2012) to monitor the energy efficiency of homes, through the calculation of a SAP energy efficiency rating (EER).
- 1.3 The EER is an index based on calculated energy costs for a standard heating regime and is expressed on a scale of 1 (highly inefficient) to 100 (highly efficient with 100 representing zero energy cost). It is possible for a dwelling to have a rating of over 100 where it produces more energy than it consumes, although such dwellings will be rare within the English housing stock.
- 1.4 The EER is also converted into an A to G banding system, where band A represents high energy efficiency and band G represents low energy efficiency³. The EER is the primary rating presented on an Energy Performance Certificate (EPC).
- 1.5 The mean SAP rating for all dwellings was 66 in 2020, rising from 56 in 2010, Annex Table 1.1. This improvement was reflected by the transition of dwellings from the lower energy efficiency rating (EER) bands to higher EER bands. In 2020, 46% were rated EER band C or above, of which 3% were in the highest bands of A or B, whereas in 2010 14% of dwellings were an EER band C or above, of which less than one percent of the stock had the highest EER bands of A or B. Furthermore, 43% of dwellings were in band C in 2020, compared with 14% in 2010. There was also a decrease in the proportion of dwellings in EER band D of four percentage points, from 47% in 2010 to 43%

³ A SAP rating is an index created by calculating annual lighting, space heating and water heating costs for a standard heating regime and is expressed on a scale of 1 (highly inefficient) to 100 (highly efficient, with 100 representing zero energy costs). See Glossary for further information on SAP and EER bands.

in 2020. Only 3% of dwellings remained in the lowest EER bands of F or G, a decrease from 10% in 2010, Figure 1.1.

Figure 1.1: Energy efficiency rating bands, 2010 and 2020



Base: all dwellings

Note: underlying data are presented in Annex Table 1.2

Source: English Housing Survey, dwelling sample

Tenure

- 1.6 Dwellings in all tenures saw increases in average SAP ratings over the 10-year period. Between 2010 and 2020, the average SAP rating of owner occupied and private rented dwellings increased by 11 SAP points from 54 to 65, while the average SAP rating among social rented dwellings increased by 8 SAP points from 62 to 70. Dwellings in the social sector continued to perform better in 2020, although the gap between the two sectors decreased (a difference of 8 SAP points in 2010 compared with 4 in 2020), Annex Table 1.1.
- 1.7 Reflecting the findings above, dwellings in the social rented sector were generally the most energy efficient in 2020, with over half (63%) having an EER of band C compared with 39% of the private sector. More specifically, housing association and local authority dwellings were more likely to be in the EER of band C (65% and 59%, respectively) compared with private rented and owner occupied (both 39%) dwellings, Live Table DA7101.
- 1.8 A very small proportion of homes in all tenures had an EER in bands A or B in 2010 (less than 1%). However, in 2020 there was a higher proportion of

dwellings in bands A or B among housing association and owner occupied dwellings (4% and 3%, respectively) than local authority dwellings (2%).

- 1.9 The proportion of F or G rated dwellings in the private rented sector decreased from 14% in 2010 to 4% in 2020. Despite this improvement, the private rented sector still had the highest proportion of homes in EER bands F or G in 2020, Annex Table 1.2.

Table 1.1: Profile of the most and least energy efficient dwellings, by dwelling and household characteristics, 2020-21

	A or B rated dwellings are most prevalent/ likely in this group		F or G rated dwellings are most prevalent/ likely in this group	
	<i>percentages</i>			
dwelling characteristics				
<i>Tenure:</i>	housing association	4	private rented	4
<i>Dwelling age:</i>	post 1990	11	pre 1919	8
<i>Dwelling type:</i>	purpose built flat, high rise	17	converted flat	9
<i>Region:</i>	London	5	South West	6
household characteristics				
<i>Age of HRP:</i>	30 to 44	4	65 or over	4
<i>Income:</i>	highest income quintile (5th)	4	lowest income quintile (1st)	3

Notes:

(1) these are trends and may not be statistically significant

(2) underlying data are presented in Live Tables DA7102 and DA7103 and Annex Tables 1.3 and 1.4

Source: English Housing Survey, dwelling sample

Dwelling characteristics

- 1.10 In 2020, 11% of dwellings built after 1990 had an EER band of A or B, and 70% had an EER in band C. Conversely, dwellings built before 1919 were the least energy efficient as they were more likely to have an EER band of F or G (8%) compared with dwellings built after 1919, Live Table DA7101.
- 1.11 Purpose built flats were generally the most energy efficient of all dwelling types. In 2020, 17% of purpose built, high rise flats and 7% of purpose built, low rise flats were in the highest EER bands of A or B. Purpose built flats also had the highest proportion of EER band C dwellings compared with all other dwelling types (low rise, 65% and high rise, 63%).
- 1.12 Generally speaking, mid-terraced dwellings were more likely to have an EER band of C (44%) compared with other house types (27% to 41%), except for medium/large terraced and detached houses, (41% and 42%, respectively). Bungalows and detached houses (both 4%) were generally most likely to be the least energy efficient of all house types (EER bands F or G). Looking at flats, converted flats (9%) were more likely to have an EER band of F or G than purpose built, high rise (2%) and low rise (1%) flats.

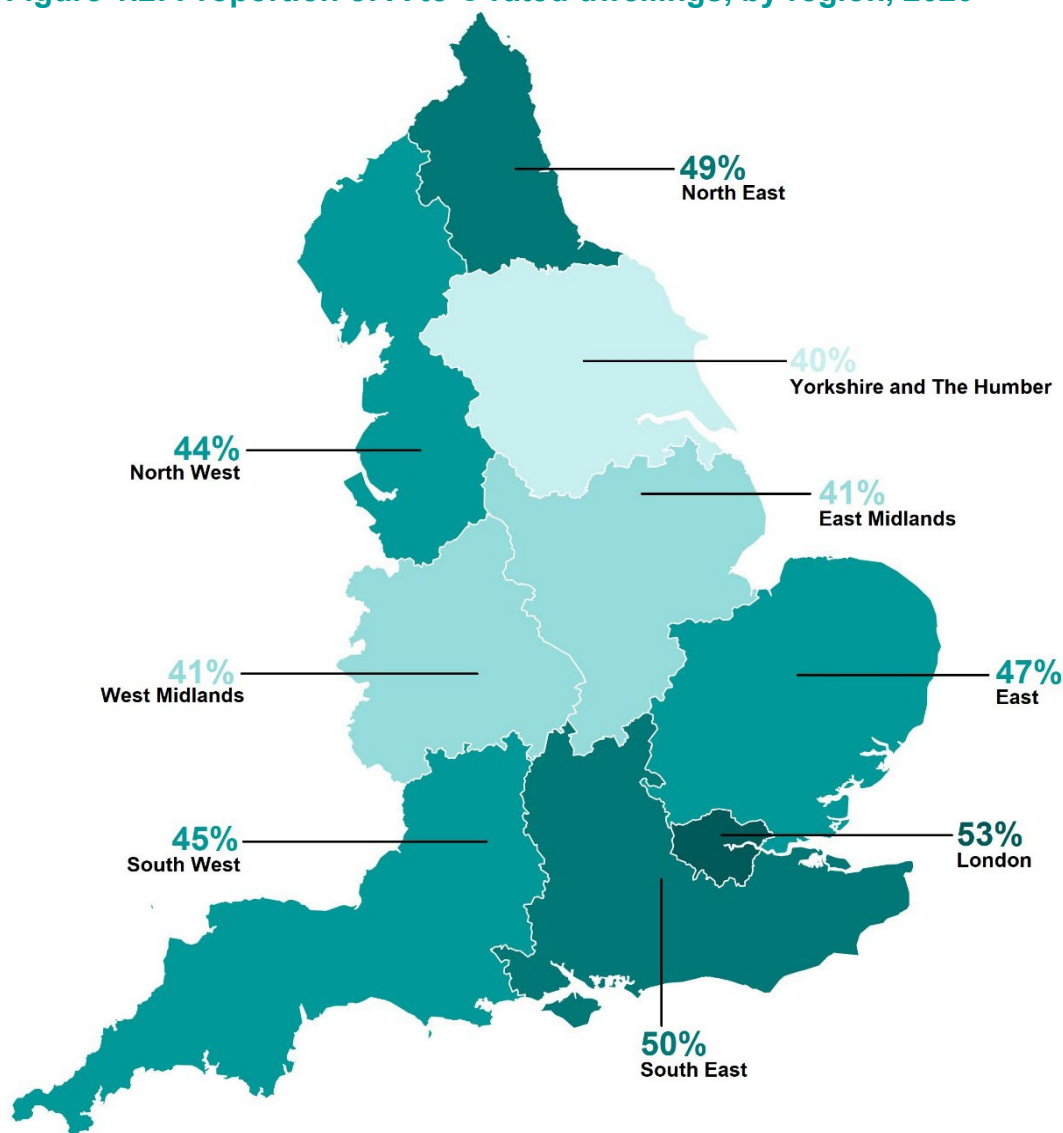
Region

- 1.13 This section summarises how the energy efficiency of dwellings differs across regions. Assumptions on weather conditions, including external temperatures and wind speeds, are standardised for all dwellings when modelling the EER bands under the SAP methodology. Patterns of energy efficiency by region are therefore not affected by differences in regional weather and are instead driven by differences in the physical characteristics of dwellings⁴.
- 1.14 The mean SAP rating increased for all regions over the 10-year period. The largest increases were seen in London⁵ (12 points), the East, South East and West Midlands (all 11 points). Dwellings in London and the North East generally had the highest mean SAP rating in 2020, with 68 points, Annex Table 1.1.
- 1.15 Reflecting the findings for average SAP, in 2020 London was generally more likely to have dwellings in the highest EER bands of A or B (5%) and generally less likely to have dwellings in bands F or G (1%), compared with all other regions. Homes in the South West were more likely to have an EER band of F or G (6%) in comparison to all other regions, Annex Table 1.3.
- 1.16 London had the second largest increase for dwellings in band C (32 percentage points) over the 10-year period, bettered only by the North East with an increase of 33 percentage points.
- 1.17 Dwellings in the West Midlands and the East saw the largest fall in the proportion of F or G rated dwellings (10 percentage points) over the 2010 to 2020 period. These improvements resulted in 3% of dwellings being F or G rated in the East (down from 12%) and 2% having the same rating in the West Midlands in 2020 (down from 13%).

⁴ The mix of tenures, dwelling types, ages of dwellings and building characteristics within each region means that it is hard to quantify the effect of region alone as a driver of energy efficiency and its improvement.

⁵ Differences in London's SAP figures could be partly explained by changes in methodology during the COVID-19 pandemic and should be used with caution.

Figure 1.2: Proportion of A to C rated dwellings, by region, 2020



Base: all dwellings

Note: underlying data are presented in Annex Table 1.3

Source: English Housing Survey, dwelling sample

Household characteristics

1.18 Generally speaking, households with higher incomes were more likely to live in the most energy efficient homes. Households in the highest (5th) income quintile were more likely to have an EER band of A or B (4%) rated home than those in the first (2%), second (2%) and third (3%) quintiles. Households in the lowest (1st) income quintile (3%) were more likely to live in an EER band of F or G rated dwelling than households in the highest income quintiles (4th and 5th, both 2%), Live table DA7103.

1.19 Older people are most at risk of having poor (or poorer) health as a result of living in a cold home and were also less likely to live in the most energy efficient homes. Households where the HRP was aged between 16 to 29 and 30 to 44 years old were more likely to live in a dwelling rated A or B (both 4%)

than households where the HRP was aged 65 or over (2%). Furthermore, households with a HRP aged 65 or over were less likely to live in a band C rated dwelling (36%), compared with households where the HRP was aged between 16 and 29 years (48%), 30 and 44 years (50%), and 45 and 64 years (44%), Annex Table 1.4.

- 1.20 For the least energy efficient dwellings (bands F or G), households where the HRP was aged 45 or over (3% 45 to 64 years and 4% 65 or over) and households where the HRP was aged between 16 and 29 years (3%) were more likely to live in these, compared with households where the HRP was aged between 30 and 44 years (1%).

Chapter 2

Heating systems, smart meters, and access to parking

2.1 The first section of this chapter reports on the prevalence of space and hot water heating systems including low carbon technologies such as solar panels and heat pumps. The chapter then explores the prevalence of smart meters and how uptake varies by dwelling and household characteristics. Finally, the chapter reports on differences in parking provision as this is a key component in assessing the potential for home electric vehicle charge points.

Space heating and hot water systems

2.2 Space and water heating account for a large proportion of domestic energy use. By 2050, buildings will need to be almost completely decarbonised, by making use of a combination of technologies to minimise their carbon emissions and maximising their energy performance⁶.

Space heating and fuel type

2.3 The vast majority of dwellings had a gas⁷ fired heating system (20.7 million or 88%). The second and third most common heating systems were fuelled by electricity (8%) and oil (3%). Less than one percent of dwellings used solid fuel powered heating systems, Live Table DA6101.

Mains gas

2.4 Around 86% or 20.3 million dwellings in England had access to mains gas supply in 2020 (as defined by the presence of a gas meter⁸), Live Table DA2201.

2.5 Mains gas supply was present in 89% of owner occupied dwellings and 88% of local authority dwellings, both of which were more likely to have a mains gas supply than housing association (83%) dwellings. Moreover, private rented (78%) dwellings were least likely to have mains gas compared with other tenures.

⁶ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1033990/net-zero-strategy-beis.pdf

⁷ Gas fired heating systems include dwellings using mains gas, liquefied petroleum gas (LPG) and bottled gas.

⁸ Physical survey data has been used to establish access to mains gas network.

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- 2.6 Dwellings in the East (81%) and South West (78%) were less likely than any other region (85% to 92%) to have a mains gas supply, while dwellings in the North East (92%) and North West (91%) were generally the most likely to have a mains gas supply. Live Table DA2202.

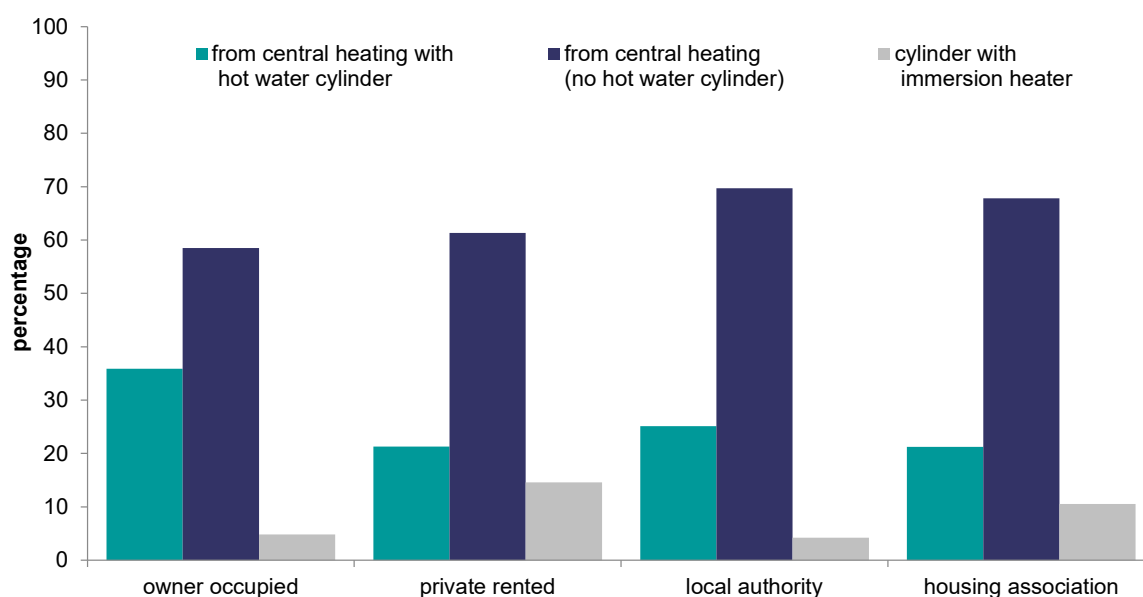
Thermostatic radiator valves

- 2.7 Building regulations state that thermostatic radiator valves (TRVs) must be present on all radiators (except in the room with the room thermostat) on new systems. When replacing a boiler, TRVs are required on at least the bedroom radiators and preferably on all (again with the exception of the room with the thermostat). TRVs can aid efforts to reduce energy consumption. They enable the occupant to control individual room temperatures and save on fuel costs by avoiding overheating commonly caused by manual valves.
- 2.8 In 2020, most dwellings had a central heating system with radiators (90%) followed by storage heaters (4%), room heaters (3%) and communal heating (2%). The remaining 1% had either a warm air system or electric ceiling/underfloor heating (both less than 1% of stock), Annex Table 2.1.
- 2.9 All heating systems, except for storage heaters, could potentially have thermostatic radiator valves present. Of those 22.2 million dwellings, almost half (45%) had TRVs on all emitters, 44% had TRVs on some emitters and 12% had no TRVs present, Annex Table 2.2.

Water heating

- 2.10 Under two thirds (61%) of dwellings in 2020 used their central heating system to provide hot water *without* a separate cylinder. Around a third used their central heating system to provide hot water through a separate hot water cylinder (31%), 7% had a hot water cylinder and immersion heater as the primary means of water heating and less than two percent had an instantaneous water heater or dedicated boiler (1% and 0.3%, respectively), Annex Table 2.3.
- 2.11 A higher proportion of owner occupied dwellings used central heating systems *with* a hot water cylinder for hot water (36%) than local authority (25%), private rented (21%) and housing association dwellings (21%). On the other hand, local authority and housing association dwellings were more likely to use the central heating *without* a hot water cylinder (70% and 68%, respectively) than private rented (61%) and owner occupied (59%) dwellings, Figure 2.1.
- 2.12 Private rented and housing association dwellings were more likely to have cylinder *with* an immersion heater (15% and 11%, respectively) compared with owner occupied (5%) and local authority (4%) dwellings.

Figure 2.1: Most common water heating systems, by tenure, 2020



Base: all dwellings

Note: underlying data are presented in Annex Table 2.3

Source: English Housing Survey, dwelling sample

Solar photovoltaics and solar hot water

2.13 Feed-in tariffs, introduced in 2010, provide small scale generators of electricity, such as those with photovoltaics (PV) panels, with tariff payments on generation, and potentially export renewable and low carbon electricity. The level of Feed-in Tariff available has reduced over time.

2.14 In 2020, there were around 1.2 million dwellings with solar photovoltaic panels and 230,000 dwellings with solar hot water. Private rented dwellings (1%) had a much lower proportion with photovoltaic panels than owner occupied (6%), housing association (5%) and local authority (4%) dwellings, Annex Table 2.4.

Heat pumps

2.15 Heat pumps make use of heat from a source (air, ground, or water) and have the potential to provide heating using less energy than traditional systems. Being electrically powered, they also have the potential to be low carbon if the source of that electricity is itself low carbon. Less than 1% of the stock or 114,000 dwellings had a heat pump for space and/or water heating, Annex Table 2.5.

2.16 Of the 114,000 dwellings that had a heat pump, over two thirds were owner occupied (68%), 16% were owned by housing associations, and 11% were owned by local authorities. The proportion of homes with a heat pump in the private rented sector is too small to report.

2.17 In terms of dwelling types, almost half of dwellings that had a heat pump were detached (45%), under a quarter were semi-detached (22%) and 11% were

bungalows. The proportion of homes with a heat pump in other dwelling types were too small to report.

- 2.18 Over 40% of dwellings with heat pumps were built after 2002 (43%), 19% were built between 1965 and 1980, 13% were built before 1919, 9% between 1945 and 1964, 8% were built between 1919 and 1944 and 7% between 1991 and 2002.

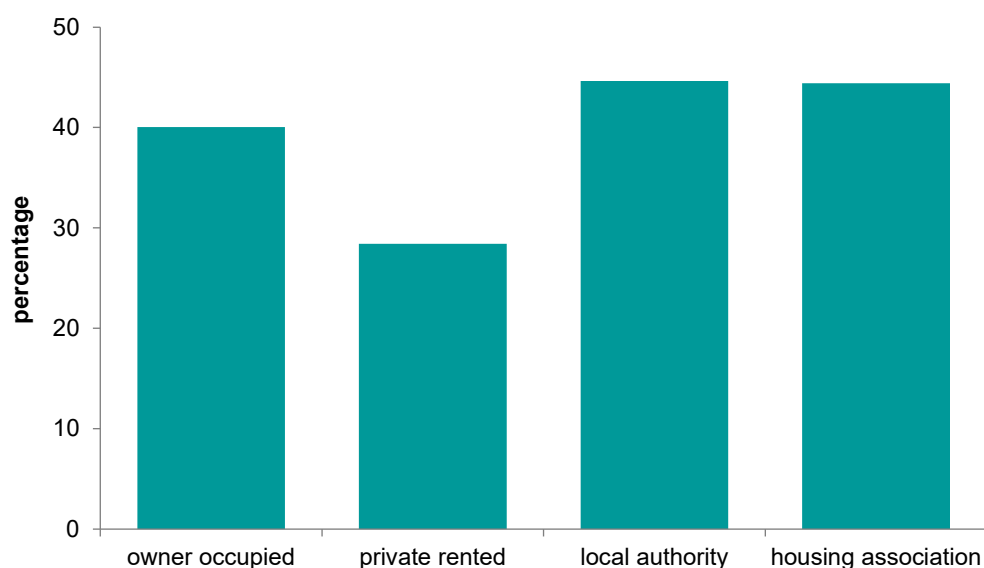
Smart meters

- 2.19 The ongoing effort to replace traditional gas and electricity meters with smart meters is an essential upgrade to national infrastructure that will contribute to making the country's energy system cleaner and more efficient. Smart meters are the new generation of gas and electricity meters which offer a range of new functions. For example, they can tell residents how much energy they are using in pounds and pence via an In-Home Display. Smart meters communicate remotely with the energy supplier, which avoids manual meter readings and provides customers with accurate bills.
- 2.20 In 2020, over a third (39%) of households reported having a smart meter in their home: 31% had a smart meter for both electricity and gas, 8% of households had smart meters for either electricity or gas, 60% did not have a smart meter present at all and 1% of households did not know if they owned a smart meter, Annex Table 2.6.

Dwelling characteristics

- 2.21 Local authority (45%) and housing association (44%) renters were more likely to have a smart meter than owner occupiers (40%) and private renters (28%). Owner occupiers (40%) were also more likely to have a smart meter than private renters (28%), Figure 2.2.

Figure 2.2: Smart meters, by tenure, 2020-21



Base: all households

Note: underlying data are presented in Annex Table 2.7

Source: English Housing Survey, household subsample

2.22 Households living in dwellings built after 1919 (37% to 45%), were more likely to have a smart meter than those living in older dwellings built before 1919 (29%). However, households living in dwellings built after 1990 (37%) were less likely to have a smart meter than those living in dwellings built between 1919 and 1980 (41% to 45%), Annex Table 2.7.

2.23 There were few differences for dwelling types, especially among households living in houses. Households living in houses (40% to 43%) were more likely to have a smart meter present than households living in flats (23% to 31%).

2.24 Households living in London (30%) were less likely to have a smart meter than all other regions in England (36% to 45%). There was a higher proportion of households with a smart meter present living in the West Midlands and North East (45% and 43%, respectively) compared with households in the South East (36%), South West (36%) and London (30%).

Household characteristics

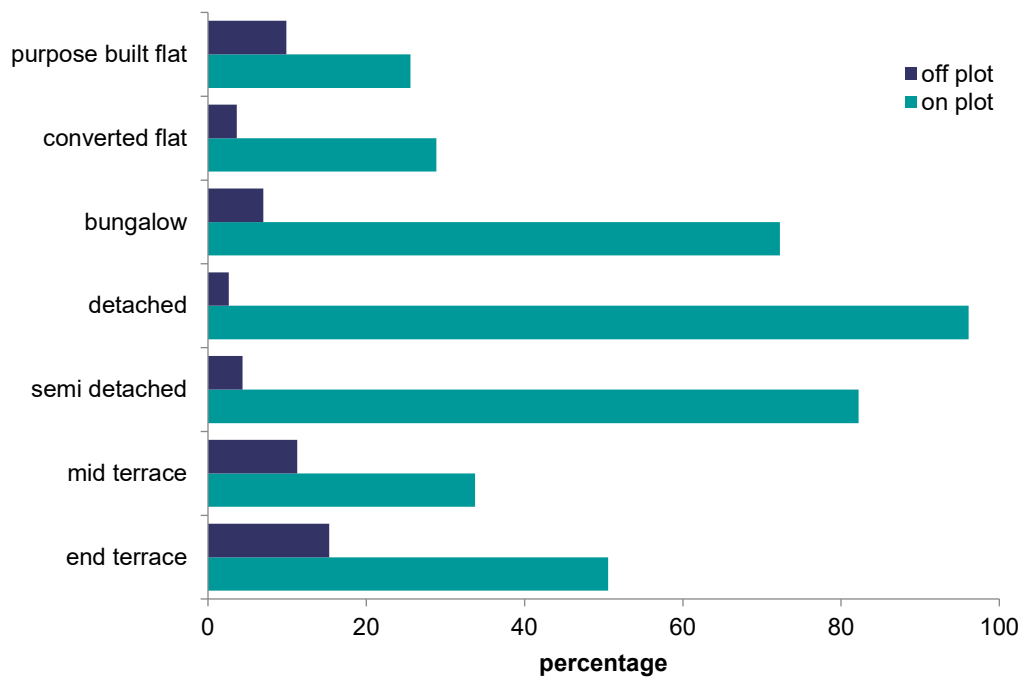
2.25 Smart meter ownership was lower among households where the HRP was aged 16 to 24 years (30%) and 25 to 34 years (36%) compared with other households, Annex Table 2.8.

2.26 There was no clear relationship between household income and smart meter ownership, however, households in the second income quintile (42%) were more likely to have a smart meter than households in the first (37%), fourth (37%) and fifth (37%) income quintiles.

Access to parking: potential for electric vehicle parking

- 2.27 In order to meet the government's short and long-term ultra-low emission vehicle uptake ambitions, the country needs a well-developed charging infrastructure for electric vehicles. This section looks at the types of parking available for English dwellings to help determine the potential for installing residential vehicle charge-points.
- 2.28 For the analysis of parking for all dwellings, where more than one type of parking is available, the parking category reported on is the one deemed to have a higher potential for the installation of a charge-point. For example, a designated parking space is prioritised over any communal parking facilities. Apart from any available parking in communal areas, all other types of parking provision discussed here are for the exclusive use of the survey dwelling.
- 2.29 Overall, on plot parking, which is relatively better suited to the installation of electrical vehicle charge points, was more prevalent than off plot parking. Around 60% or 14 million dwellings had a parking space on the plot, 8% had parking off the plot, 4% had access to some form of communal parking (such as open-air parking bays), and over a quarter (29%) had no designated parking provision at all, Annex Table 2.9.
- 2.30 Detached (96%), semi-detached (82%), bungalows (72%) and end terraces (51%) were more likely to have on plot parking than mid terraces (34%), converted flats (29%) and purpose-built flats (26%). Conversely, end terrace dwellings were more likely to have off plot parking (15%) than mid terraces (11%), purpose-built flats (10%), bungalows (7%), semi-detached (4%), converted flats (4%) and detached houses (3%), Figure 2.3.
- 2.31 For on plot parking at mid terrace and end terrace dwellings, a designated parking space (24% and 32% respectively) was more likely than a garage/car port (10% and 18%). However, for off plot parking, a designated parking space (6% and 8%) was not more likely than a garage/car port (5% and 7%).
- 2.32 Around a quarter of all dwellings in 2020 were flats (5.4 million), with 'purpose built' flats being the dominant flat type (19% of all dwellings). Over a quarter of purpose built flats had access to on plot parking (26%), followed by communal parking facilities (20%) and off plot parking (10%). However, the almost half (45%) of purpose built flats had no access to designated parking at all. Similarly, around two thirds of converted flats had no designated parking provision (62%), over a quarter had on plot parking (29%) followed by communal parking (5%) and off plot parking (4%). For on plot parking at converted flats, a designated parking space (25%) was more likely than a garage/car port (4%).

Figure 2.3: On plot and off plot parking, by dwelling type, 2020



Base: dwelling sample

Notes:

(1) 'on plot' is the combined figures for all on plot parking provisions, including garages, car ports and designated parking spaces. Similarly, 'off plot' is the combined figures for all off plot parking provisions.

(2) underlying data are presented in Annex Table 2.9

Source: English Housing Survey, dwelling sample

2.33 Around 2.8 million dwellings had been built since 2002. These properties were more likely to have access to on plot parking (63%) than off plot parking (19%) and communal parking (5%). The remainder had no parking facilities at all (13%). More specifically, dwellings built after 2002 were more likely to have an on plot designated parking space (34%) than a garage or car port (29%). An off plot designated parking space (14%) was also more likely than an off plot garage or car port (5%). Dwellings built after 2002 were more likely to have off plot parking (19%) than those built before 2002 (2% to 11%).

Chapter 3

Energy Performance Certificates and energy improvements

- 3.1 The first section of this chapter explores household awareness of Energy Performance Certificates (EPCs), and the influence certificates had on the household's decision to buy or rent the home. The chapter will also examine whether there were any variations in the influence of EPCs by dwelling and household characteristics. It will then report on the households that were recommended energy improvement works by the EPC and whether those households or their landlords carried out any of the recommended improvements.
- 3.2 The second part of this chapter explores the costs of improving dwellings with an energy efficiency rating (EER) band of D or below, to at least an EER band of C. It also reports on the differences to annual CO₂ emissions if the least energy efficient dwellings in the stock were to be improved.

Energy Performance Certificates

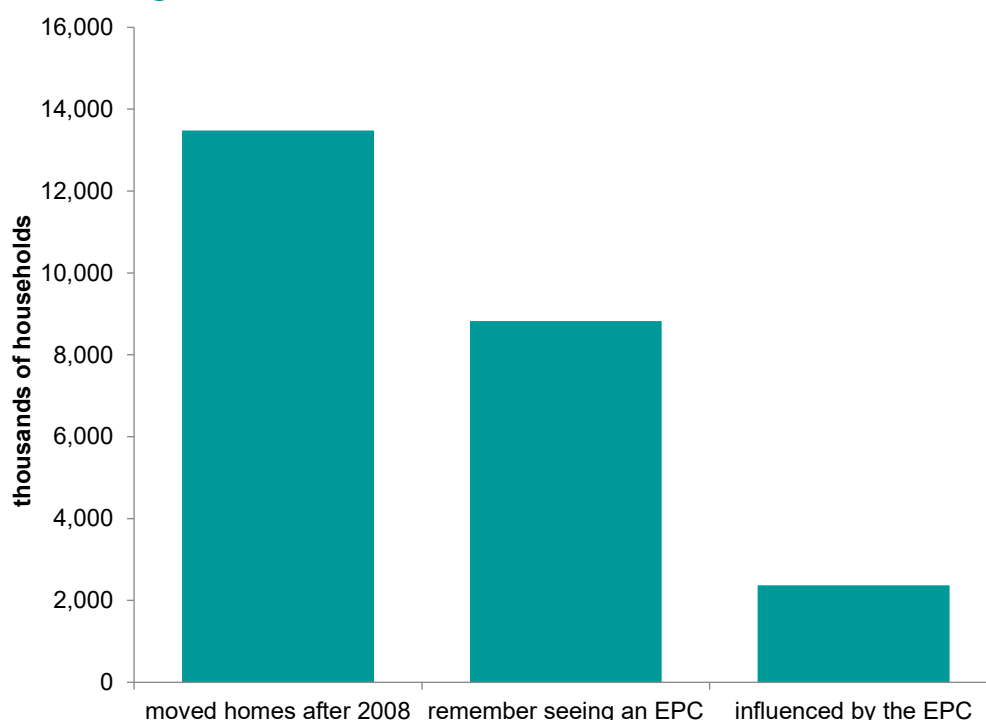
- 3.3 A domestic Energy Performance Certificate (EPC) provides potential buyers and tenants with an indication of the energy efficiency of a dwelling. The certificate contains information about the dwelling's energy costs based on standardised assumptions about occupancy and energy use in dwellings of a similar size and type⁹. It also recommends ways to improve the energy efficiency of the dwelling. The requirement for dwellings to have an EPC when sold or rented was fully implemented by October 2008.
- 3.4 All households who had moved into their current home during or after October 2008 (13.5 million households or 58% of all households) were asked whether they remembered seeing an EPC relating to their new home, Figure 3.1. Of the 13.5 million households who had moved, around two thirds (65% or 8.8 million) remembered seeing an EPC. Over a quarter (27%) said they had not seen one, while 8% spontaneously said that they did not know if they had seen an EPC, Annex Table 3.2.

⁹ EPCs may not reflect how energy is consumed by individual occupants.

Influence of EPCs

3.5 Households who remembered seeing an EPC were asked how far the information on the EPC influenced their choice to buy or rent that dwelling. Over a quarter (27% or 2.4 million) said that the information on the EPC influenced their decision while almost three quarters (73%) said they were not influenced at all, Figure 3.1 and Annex Table 3.3.

Figure 3.1: Number of households who moved homes after 2008, remember seeing an EPC, and whether that EPC influenced their decision to buy or rent the dwelling, 2020-21



Base: all households who moved homes after 2008

Note: underlying data are presented in Annex Table 3.1, 3.2 and 3.3

Source: English Housing Survey, household sub sample

- 3.6 Owner occupiers and private renters were more likely to be influenced by EPCs to rent or buy a property (30% and 27%, respectively) than local authority (15%) and housing association (13%) renters.
- 3.7 Around a third (33%) of households living in newer dwellings, built after 1990, were influenced to buy or rent the dwelling by an EPC. They were also generally more likely to be influenced by an EPC than other households (19% to 27%). On the other hand, households living in dwellings constructed from 1945 to 1964 (81%) were the most likely to have said that the EPC did *not* at all affect their decision to purchase the property (67% to 75%).
- 3.8 Except for converted flats, households living in all other dwelling types were more likely to be influenced by an EPC to buy or rent a property (27% to 33%) than households living in bungalows (16%). Unsurprisingly, therefore, households in bungalows (84%) were more likely to report that the EPC was

not a factor at all in purchasing the property than most other dwelling types (67% to 73%).

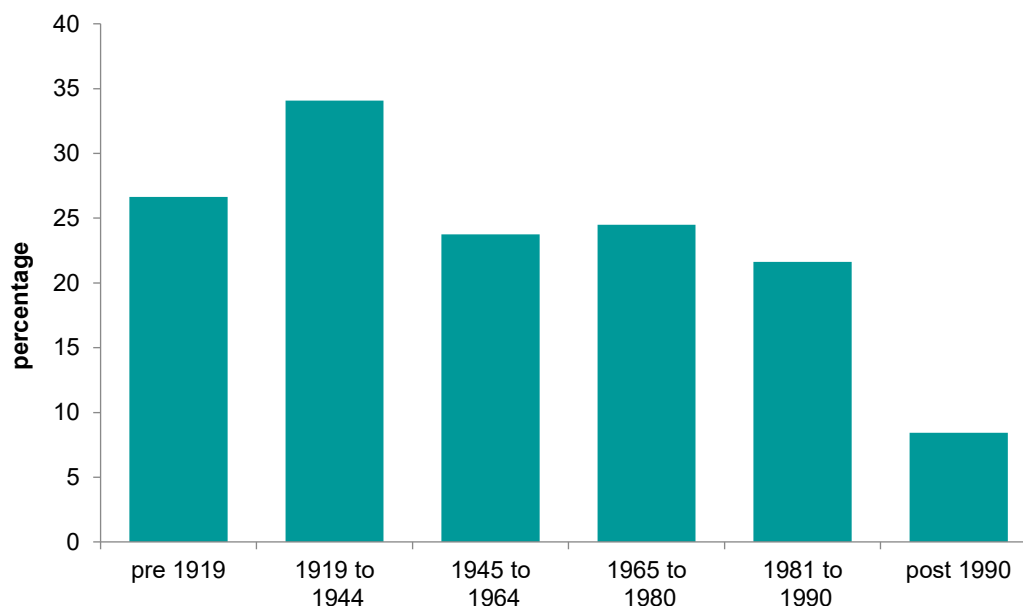
3.9 Overall younger households aged 16 to 44 were more likely to be influenced by their EPC than older households. More specifically, households where the HRP was aged between 16 and 44 years (31% to 32%) were more likely to have the EPC rating affect their decision to buy the property than households aged 45 to 64 (23%) and 65 or over (21%). Whereas older households aged 45 or over (77% to 79%) were more likely to *not* be influenced by EPC when buying or renting than households where the HRP was 44 or younger (68% to 69%), Annex Table 3.4.

Recommendations by the EPC

3.10 Households who remembered seeing an EPC were also asked if the energy performance certificate recommended carrying out any work to improve their home's energy efficiency. Around 20% of households mentioned that their EPC certificate recommended energy improvement works to be carried out while 80% said that theirs did not, Annex Table 3.5.

3.11 Owner occupiers (26%) were more likely to be recommended carrying out work by the EPC than private renters (14%), and both were also notably more likely than local authority (5%) and housing association (6%) renters.

Figure 3.2: Whether the EPC recommended carrying out energy improvement works, by dwelling age, 2020-21



Base: all households who moved homes after 2008 and remember seeing an EPC

Note: underlying data are presented in Annex Table 3.5

Source: English Housing Survey, household subsample

-
- 3.12 Households in dwellings constructed before 1990 were more likely to be recommended to carry out energy improvement works by the EPC (22% to 34%) than households in dwellings built post 1990 (8%). Households in dwellings constructed from 1919 to 1944 (34%) were more likely to be recommended carry out work by the EPC than all other households (8% to 27%), Figure 3.2.
- 3.13 Households in converted flats (12%), purpose built, low rises (11%) and purpose built, high rises (4%) were less likely to be recommended carrying out any work by the EPC than households in any other dwelling type (21% to 27%). Among flats, converted flats (12%) and purpose built, low rise (11%) were more likely to be recommended energy efficiency improvement works than households living in purpose built high rise flats (4%). There were no differences among households living in houses.

Whether homeowners carried out recommended work

- 3.14 Owner occupiers, including shared owners, who remembered seeing an EPC with energy efficiency recommendations were asked if they or anyone in their household had carried out any of the work recommended. Of the 1.2 million applicable households, over half (57%) mentioned carrying out an energy efficiency improvement measure mentioned by their EPC. The remaining 43% had not carried out any works, Annex Table 3.6.
- 3.15 Over two thirds (70%) of owner occupiers who were recommended works, in dwellings built between 1919 and 1944 carried out energy efficiency improvement work compared with around half of households in dwellings built between 1945 and 1964 and pre 1919 (51% and 50%, respectively).
- 3.16 Households located in Yorkshire and the Humber were more likely to have done any of the work recommended by the EPC (69%) than households in the West Midlands (47%) and the North West (45%).
- 3.17 There were few differences across different household types. Couples aged 60 or over were more likely to have done work recommended by the EPC (70%) than couples under 60 (50%), Annex Table 3.7.

Whether landlords carried out recommended work

- 3.18 Renters who remembered seeing an EPC with energy efficiency recommendations (290,000 households) were asked if their landlord or freeholder had carried out any of the work recommended. Of those, around half (44%) had carried out some or all work recommended by the EPC while the other half (56%) had not carried out any work at all, Annex Table 3.8.
- 3.19 Landlords of housing association renters were more likely to have done some or all of the jobs recommended by the EPC (74%) than landlords of private renters (40%). On the other hand, landlords of private renters (60%) were

more likely to have not done any of the jobs recommended by the EPC than landlords of housing association (26%) renters.

- 3.20 There were no clear differences by dwelling age, apart from landlords of households living in dwellings built after 1990 (24%) were more likely to have done some or all jobs recommended by the EPC than landlords for dwellings constructed between 1981 and 1990 (73%).

Cost of improving to EER band C

- 3.21 This section looks at the cost of improving dwellings with an energy efficiency rating (EER) band of D or lower to an EER band of at least C. The Government has set an aspiration for as many homes as possible to be EER band C by 2035 where practical, cost-effective and affordable¹⁰.
- 3.22 For each of the dwellings identified as having an EER band of D or lower, improvement measures were simulated cumulatively using SAP as the underlying methodology. After each improvement, the SAP rating was recalculated until the dwelling reached the threshold for EER band C (SAP rating of 68.5 or higher). The following analysis covers those dwellings that were able to reach an EER band C after modelling (52%). The remaining dwellings in the stock were categorised as already having an EER band of C or higher (46%), receiving at least one improvement measure but were unable to reach EER band C (2%), or not eligible to receive any improvement measures (less than 1%)¹¹, Annex Table 3.9.
- 3.23 In certain cases, a dwelling's energy efficiency rating may also be improved beyond the target band, where a dwelling's energy efficiency rating is already close to the band C threshold. If a measure with a high SAP improvement yield is installed, for example solid wall insulation, then the dwelling may be improved beyond a band C into the band B range.
- 3.24 If all applicable energy improvement measures were applied to all dwellings rated below an EER band C, then 96% of dwellings would shift into an EER band of A to C, whilst just 4% of dwellings would have an EER band of D or lower, Annex Table 3.10.
- 3.25 The average cost to improve dwellings to a EER band C was £7,737, with an overall estimated total cost of between £93 and £95 billion, Annex table 3.11. It would cost less than £10,000 to improve around three quarters (72%) of

¹⁰ <https://www.gov.uk/government/publications/clean-growth-strategy>

¹¹ Some dwellings that were below an EER band C were eligible for certain improvement measures as part of the EPC framework, and therefore have estimated costs attached to them, but were unable to reach a band C using this methodology. However, a small proportion of dwellings were ineligible to receive any measures within the EPC framework, and therefore have no estimated costs.

dwellings to a band C and more than £15,000 to improve around one in ten (9%) dwellings to a band C, Annex Table 3.12.

3.26 Where it was possible for energy efficiency improvement measures to lift dwellings with an EER band D to G into an EER band C or higher, owner occupied homes had the highest average cost; £8,162, compared with private and social rented dwellings. Private rented homes would cost, on average, £7,390 to improve, whereas the average costs to improve both local authority and housing association dwellings were lower, at £5,733 and £5,467 respectively, Figure 3.3.

Figure 3.3: Average cost to improve to an energy efficiency rating band C with average annual energy cost savings, by tenure, 2020



Base: dwellings rated below an EER band C where improvements might be possible irrespective of the ease of installation, e.g. for cavity wall insulation the base is the number of dwellings with cavity walls
Note: underlying data are presented in Annex Tables 3.13 and 3.14
Source: English Housing Survey, dwelling sample

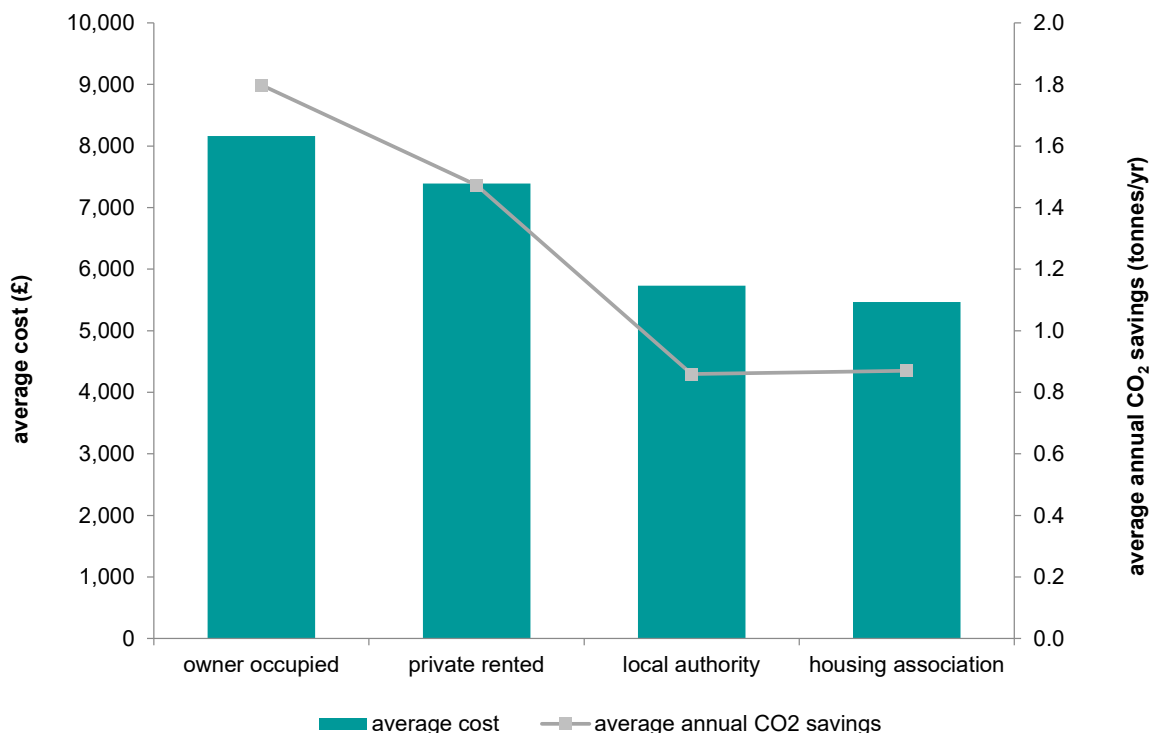
3.27 For those that were able to be improved to band C, the average energy cost savings were £282 per year¹². Similarly, owner occupied homes had the highest average energy cost savings; £302 per year, followed by private rented dwellings, at £276. Social rented dwellings had slightly lower energy cost savings at £151 for local authority dwellings and £158 for housing association dwellings, Annex Table 3.14.

3.28 Owner occupied homes also had the highest average CO₂ savings at 1.8 tonnes per year, followed by private rented dwellings: 1.5 tonnes per year.

¹² This is calculated using 2021 fuel prices, and therefore does not reflect the recent price increases.

Social rented dwelling had marginally lower CO₂ savings, at 0.9 tonnes per year for both local authority and housing association dwellings, Figure 3.4.

Figure 3.4: Average cost to improve to an energy efficiency rating band C with average annual CO₂ savings, by tenure, 2020



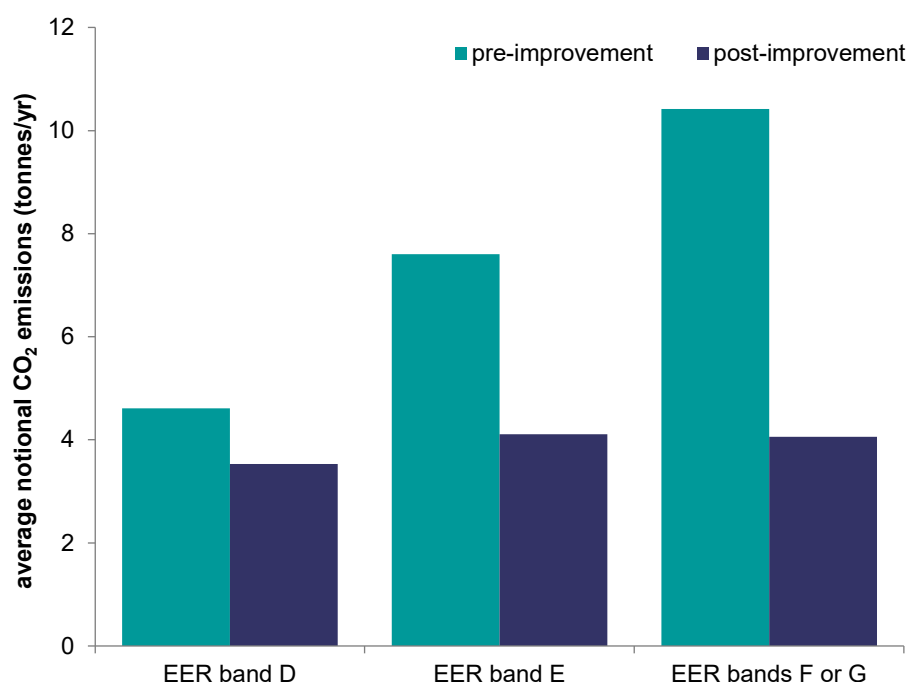
Base: dwellings rated below an EER band C where improvements might be possible irrespective of the ease of installation, e.g. for cavity wall insulation the base is the number of dwellings with cavity walls
Notes:

- (1) Carbon emissions factors are based on SAP 2012 consumption patterns and only reflect direct emissions not emissions generated through electricity generation.
- (2) In certain cases, a dwelling's energy efficiency rating may be improved beyond the target band, which may overestimate carbon savings
- (3) SAP 2012 uses a standardised heating pattern which may overestimate actual consumption, particularly in E-G rated homes
- (4) underlying data are presented in Annex Tables 3.13 and 3.15

Source: English Housing Survey, dwelling sample

3.29 The average CO₂ savings for all dwellings improved to at least a band C were 1.6 tonnes per year. Dwellings with a pre-improvement EER band of F or G had the largest average CO₂ saving at 6.4 tonnes per year, Figure 3.5.

Figure 3.5: Pre- and post-improvement CO₂ emissions, 2020



Base: all dwellings able to be improved to an EER band C

Notes:

- (1) SAP 2012 carbon emissions factors do not reflect the decarbonisation of the grid, it is not a lifetime carbon saving, nor does it include carbon savings related to primary electricity generation
- (2) In certain cases, a dwelling's energy efficiency rating may be improved beyond the target band, which may overestimate carbon savings
- (3) SAP 2012 uses a standardised heating pattern which may overestimate actual consumption, particularly in E-G rated homes
- (4) underlying data are presented in Annex Table 3.16

Source: English Housing Survey, dwelling sample

Dwelling characteristics

- 3.30 It was generally less expensive to improve social rented homes to band C, partially because they already have higher energy efficiency ratings. Of the dwellings that could be improved, social sector homes (8%) were more likely to cost less than £1,000 to improve to an energy efficiency rating band of C than private sector homes (4%). Furthermore, private sector homes (10%) were more likely to cost £15,000 or more to improve to an energy efficiency rating band of C compared with those in the social sector (4%), Annex Table 3.17.
- 3.31 In addition, housing association dwellings (11%) were more likely to cost less than £1,000 in order to improve to an EER band of C compared with all other tenures: private rented (6%), local authority (5%), and owner occupied (4%). Conversely, owner occupied dwellings (11%) were more likely to cost £15,000 or more to improve to an EER band of C than all rented properties; private rented (6%), local authority (5%), and housing association (3%).

-
- 3.32 It would be cheaper to bring newer dwellings up to band C. Newer dwellings, built after 1990 (17%), were more likely to cost less than £1,000 to reach an EER band of C compared with older dwellings (2% to 9%). Similarly, dwellings built between 1981 to 1990 (9%), were more likely to require less than £1,000 to improve to an EER band of C compared with homes built before 1964 (2% to 4%). On the other hand, older dwellings, built pre 1919 (20%) were more likely to require £15,000 or more to reach an EER band of C than all other aged dwellings (2% to 6%).
- 3.33 Low rise purpose built flats (11%) were more likely to cost less than £1,000 to improve to an EER band of C than all other dwelling types (4% to 5%), apart from high rise flats (12%). On the other hand, detached dwellings (20%) were more likely to cost £15,000 or more to improve to an EER band of C than medium/large terraced houses (11%), bungalows (8%), semi-detached houses (7%), small terraced houses (7%), and converted flats (2%).
- 3.34 In relation to current energy efficiency rating bands, dwellings with a rating of D (27%) were more likely to require between £1,000 and £4,999 to reach an EER band of C than dwellings rated E (9%) or F or G (8%). Conversely, dwellings that fell into the F or G category (59%) were more likely to require £15,000 or more to be improved to an EER band of C compared with those in band E or D (31% and 3%, respectively).

Chapter 4

Future improvements for reducing energy consumption

- 4.1 As wall insulation and loft insulation are integral components of government energy efficiency strategies, it is important to understand the scope for energy savings through such measures. This section investigates the relative ease of installing each of these measures within the housing stock and identifies the types of homes that are most difficult to improve and therefore considered 'hard to treat'^{13 14}.
- 4.2 Hard to treat cavity walls are those which are likely to be unsuitable to insulate with standard insulation materials or techniques and are defined as those found in buildings with three or more storeys, narrow cavities (less than 50mm), concrete, metal or timber frame construction¹⁵, dwellings with tiles or cladding, or where the existing wall finish is in a state of disrepair, those located in exposed positions and those where the external wall is of stone construction and therefore the cavity is likely to be uneven.
- 4.3 Hard to treat solid walls are found in solid-walled dwellings (or cavity walled dwellings designated as having hard to treat cavities) that have any of the following four aspects: predominant render finish, predominant non-masonry wall finish (e.g. tile hung), the dwelling is a flat or the dwelling has external features (e.g. bay windows).
- 4.4 External solid wall insulation is applied by fixing insulating boards to the outside of the building and covering them with a weatherproof render and sometimes false stone or brick cladding. Walls with a predominant rendered finish may add to the costs of the work as the render may need to be removed, repaired or treated before the insulation can be installed. Improving dwellings with wall finishes such as stone cladding, tile, timber or metal panels would either add to the cost of the work or even preclude external solid wall insulation where the wall structure itself is stone or timber. Unlike brick walls, these types of wall finish may give an uneven surface on which to attach the

¹³ This analysis seeks to indicate the total number of homes with harder to treat walls or lofts in the housing stock rather than estimate the degree to which multiple difficulties may exist.

¹⁴ The analysis of the relative ease of installing insulation is not intended to provide any definitive guidance on how these homes should or should not be treated in order to make them more energy efficient, as this advice can only be undertaken on a case by case basis.

¹⁵ Both timber framed and 'non-traditional' construction methods, such as concrete and steel framed structures, make the installation of additional wall insulation more problematic. For example, when insulating timber framed dwellings, it is necessary to pay particular attention to preventing damp and its associated timber decay

insulated layer. Installing external solid wall insulation in flats can be problematic for two reasons. Firstly, there are likely to be issues related to dealing with multiple leaseholders (getting their agreement and financial contribution to the work). Also, the height of the module for high-rise flats would present significant complications in applying external solid wall insulation. Fixing insulation around any projections like conservatories, porches or bays requires additional work and therefore additional expense.

- 4.5 The presence of a loft and its type will impact on the relative ease of fitting insulation in the roof space. For example, the installation or upgrading of loft insulation could be more difficult for dwellings with a loft with a fully boarded floor across the joists, a habitable room in the roof, or a shallow pitch or flat roof. The analysis does not include those dwellings that have no loft, e.g. flats that are not on the top floor of a building.

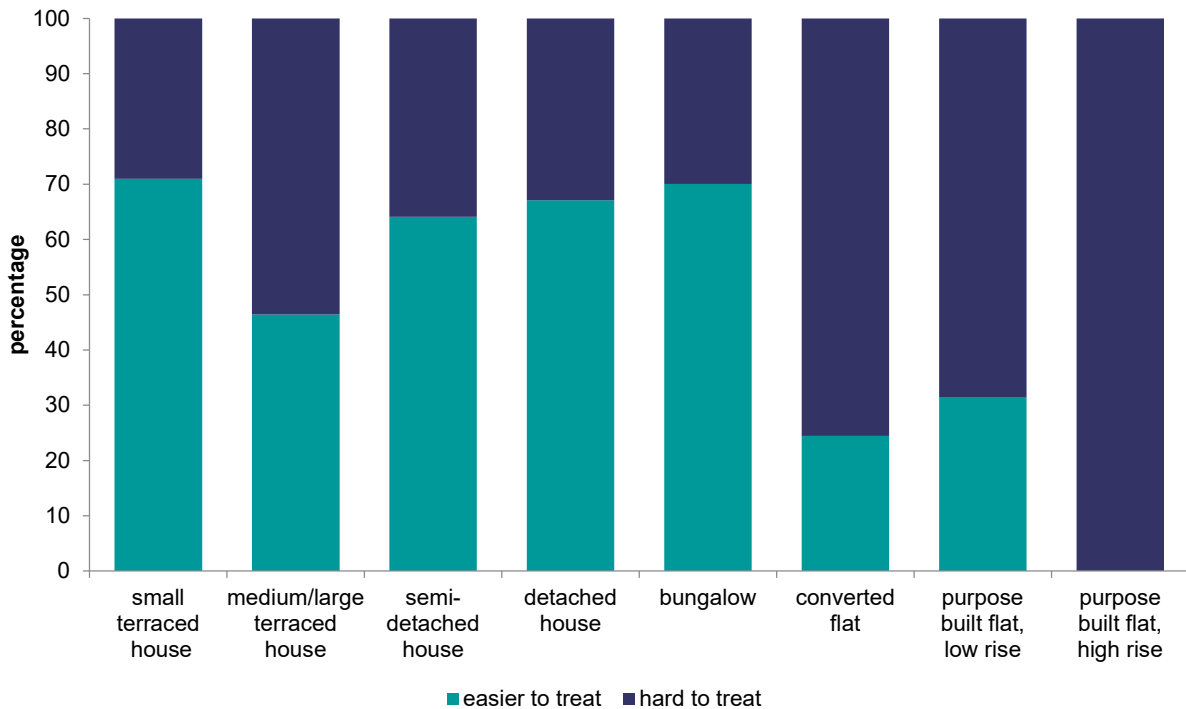
Hard to treat cavity walls

- 4.6 In 2020, there were 16.3 million dwellings of cavity wall construction¹⁶. Some 70% of these were already insulated but of the 4.8 million dwellings with uninsulated cavity walls, 53% had walls which were assessed as being relatively easy to insulate, whilst the remaining 47% (2.3 million) had walls which were considered harder to treat, Annex Table 4.1.
- 4.7 The prevalence of hard to treat cavity walls varied by tenure. Private rented (54%) and local authority homes (60%) had a higher proportion of harder to treat uninsulated cavity walls than owner occupied (44%) and housing association (44%).
- 4.8 These findings are due to the distribution of dwelling types in the tenures, with flats more common in the rented sectors. Due to the height of blocks of flats, all high rise, 69% of low rise purpose built and 76% of converted flats with uninsulated cavity walls were classified as hard to treat. In contrast, the prevalence of hard to treat cavity walls in houses ranged from 29% to 36% for small terraced houses, bungalows, detached and semi-detached), with detached houses being predominantly owner occupied, although medium/large terraced houses had a higher prevalence of hard to treat cavity walls (54%) than these other house types, Figure 4.1.
- 4.9 Older uninsulated cavity walled dwellings had a higher proportion of harder to treat walls than newer homes. Homes built before 1919 had a higher prevalence (62%) of hard to treat cavity walls compared with homes built at any other time, except homes built between 1945 and 1964.

¹⁶ see EHS Headline report 2020-21, Annex Table 2.14

4.10 Dwellings built after 1981 were less likely to have hard to treat cavity walls compared with all older dwellings, with some 36% of dwellings built between 1981 to 1990 and 37% of post 1990 dwellings having harder to treat uninsulated cavity walls.

Figure 4.1: Hard to treat cavity walls, by dwelling type, 2020



Base: all uninsulated cavity walled homes with theoretical potential to install cavity wall insulation

Note: underlying data are presented in Annex Table 4.1

Source: English Housing Survey, dwelling sample

4.11 Regional variations in the distribution of dwelling types and ages contributed to differences in the prevalence of harder to treat uninsulated cavity walls. Dwellings in London (70%) were more likely to have hard to treat cavity walls than any other region, due to a greater proportion of flats, and pre 1919 dwellings in the London region. Dwellings in the East Midlands (28%) were less likely to have hard to treat cavity walls than any other region, likely influenced by the higher proportion of detached houses found in this region¹⁷.

4.12 The variation in prevalence of hard to treat cavity walls by tenure and dwelling characteristics leads to differences being seen in certain household characteristics.

4.13 Households in the lowest income quintile (51%) were more likely to live in dwellings with hard to treat cavity walls than households in the highest income quintile (42%), Annex Table 4.2. This reflects the higher proportion of lower income households being social renters and therefore more likely to be living

¹⁷ See EHS 2020 Regional factsheet

in flats, whereas households in the highest income quintiles were more likely to be owner occupiers living in detached dwellings¹⁸.

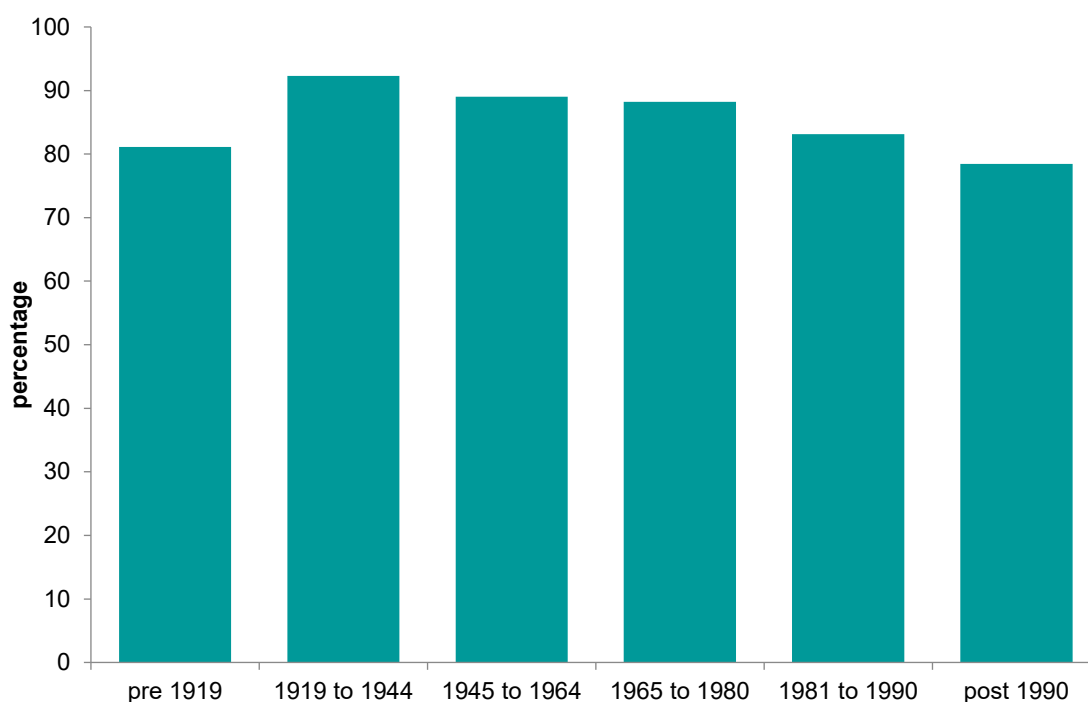
- 4.14 In terms of household composition, couples with no dependent children, both aged under 60 (40%) and aged 60 or over (41%) were less likely to live in dwellings with hard to treat cavity walls than other multi-person (55%), and one person under 60 (58%) and one person aged 60 or over (50%). Households composed of a single person aged under 60 (58%) were more likely to live in dwellings with hard to treat cavity walls than couples with dependent children (46%) and lone parents with dependent children (41%).

Hard to treat solid walls

- 4.15 In 2020, there were 8.7 million dwellings with a construction type that could benefit from having some form of solid wall insulation installed, either externally or internally. This included not only those with uninsulated solid walls, but also other types of non-cavity walls such as system built and timber frame dwellings. Cavity walled dwellings classed as having hard to treat cavity walls for which the type of insulation applied to solid walls provides a potential alternative insulation option were also included. Some 779,000 solid wall dwellings were already insulated, Annex Table 4.3.
- 4.16 Of the 8.7 million dwellings with uninsulated solid walls, 15% had walls which were assessed as being relatively easier easy to insulate, whilst the remaining 85% (7.4 million), Annex Table 4.5, had walls which were considered harder to treat. The main barriers to installing insulation in uninsulated solid walls were due to the dwelling being a flat (30%), the dwelling having a predominantly rendered wall finish (27%), and dwellings having external features (26%), Annex Table 4.4.
- 4.17 Local authority homes (92%) had a higher proportion of homes where it was difficult to install solid wall insulation than all other tenures (owner occupied 85%; housing association 84% and private rented 83%), Annex Table 4.5.
- 4.18 A somewhat lower proportion of homes built before 1919 and homes built after 1990 were hard to treat with solid wall insulation compared with homes built between 1919 and 1980, Figure 4.2. The most common barrier to solid wall insulation varied by dwelling age. For example, half of homes built between 1919 and 1944 were hard to treat with solid wall insulation because of rendered wall finishes (50%), while 33% of homes built before 1919 were hard to treat due to external features, Annex Table 4.7.

¹⁸ See EHS Headline report 2020-21, Annex Table 1.3

Figure 4.2: Hard to treat solid walls, by dwelling age, 2020



Base: all dwellings with theoretical potential to install solid wall insulation

Note: underlying data are presented in Annex Table 4.5

Source: English Housing Survey, dwelling sample

- 4.19 The definition of a harder to treat solid wall meant that all types of flats were considered to be harder to insulate. As flats are more common in the rented sectors the difficulties in applying solid wall insulation to flats were more common in those tenures, particularly in local authority dwellings (67%). The main barriers to solid wall insulation for owner occupied homes were rendered walls (35%) and the presence of external features (33%), Annex Table 4.7.
- 4.20 Small terraced houses with solid or hard to treat cavity walls were somewhat less likely to be hard to treat (58%) than all other house types. This was often due to these other types of homes having external features (44% in detached homes and 42% in medium/large terraced houses).
- 4.21 Similar to the findings for hard to treat cavity walls, regional variations in the distribution of dwelling types and ages contributed to differences in the prevalence of harder to treat uninsulated solid walls. Dwellings in London (97%) were more likely to have hard to treat solid walls than any other region, due to a greater proportion of flats, with the South East (91%) also having a high prevalence of hard to treat solid walls. Dwellings in the East Midlands (65%) were less likely to have hard to treat solid walls than all other regions, excluding Yorkshire and the Humber.
- 4.22 The variation in prevalence of hard to treat solid walls by tenure and dwelling characteristics leads to differences being seen in the certain household characteristics. In contrast to the distribution seen for hard to treat cavity wall

homes, households in the highest income quintile (89%), were more likely to live in dwellings with hard to treat solid walls compared with households in the lowest (83%), second (82%) and fourth (83%) income quintiles, Annex Table 4.8. This reflects the higher proportion of owner occupiers being higher income households and therefore more likely to be living in medium/large terraced, semi-detached or detached houses¹⁹.

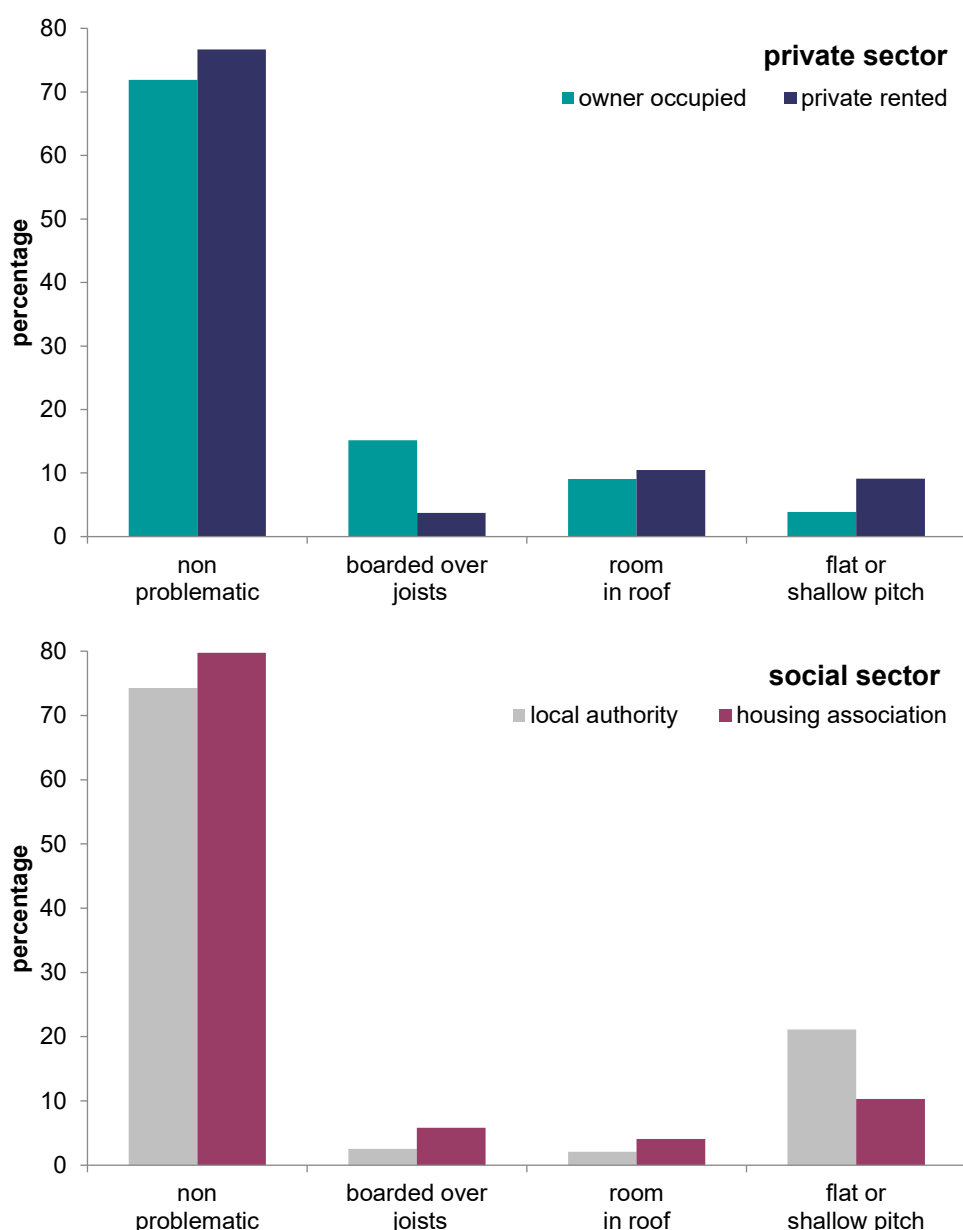
- 4.23 Households with an HRP aged between 16 and 29 (79%) were less likely to live in dwellings with harder to treat solid walls compared with households with an HRP aged between 30 and 44 (86%), and 65 or over (87%). There were no significant differences in the likelihood of living in a harder to treat solid wall home for different types of household composition.

Hard to treat lofts

- 4.24 In 2020, 20 million dwellings (85%) had a loft. Of which, 15 million were insulated to the level recommended on an EPC, leaving around 5 million homes with lofts that could possibly have loft insulation installed or upgraded, as the existing level of insulation was 150mm or less, Annex Table 4.9. It is estimated that 1.3 million of these would be considered as harder to treat with the main barrier in these harder to treat homes as the presence of boarding over the joists (43%, 564,000), a room in the roof (33%, 432,000), and a flat or shallow pitch (24%, 323,000), Annex Table 4.10.
- 4.25 Owner occupied homes (28%) were more likely to have lofts that were problematic to upgrade with thicker insulation compared with housing association homes (20%), Annex Table 4.11. The most common barrier in owner occupied homes was the presence of a boarded loft (15%). This barrier was less common among rented homes, especially local authority homes (3%). A flat or shallow pitched roof was the most common barrier (21%) in local authority homes, Figure 4.3.

¹⁹ EHS Headline report 2020-21, Annex Table 2.1

Figure 4.3: Barriers to installing loft insulation, by tenure, 2020



Base: all dwellings with theoretical potential to improve loft insulation and those that may have insufficient loft insulation

Note: underlying data are presented in Annex Table 4.11

Source: English Housing Survey, dwelling sample

- 4.26 There was a general trend of newer dwellings being less likely to have a harder to treat loft compared with older dwellings. Dwellings built after 1990 (11%) were less likely to have a harder to treat loft compared with dwellings built before 1980 (24% to 31%).
- 4.27 Purpose built high rise flats (91%) were more likely to have a harder to treat loft compared with all other dwellings (19% to 30%). Similarly, dwellings with six or more storeys (82%) were more likely to have a harder to treat loft compared with dwellings with less than six storeys (26%).

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- 4.28 Medium/large terraced houses (30%) and semi-detached houses (29%) were more likely to have harder to treat lofts compared with small terraced houses (20%), detached houses (21%) and bungalows (19%).
- 4.29 Homes in the North East (49%) were more likely to have harder to treat lofts compared with all other regions (16% to 31%), except Yorkshire and the Humber (38%). Additionally, dwellings in Yorkshire and the Humber were more likely to have harder to treat lofts than dwellings in the East Midlands (16%), the East (17%), South East (22%) and South West (20%).
- 4.30 Unlike harder to treat walls, there were no significant differences in the prevalence of a home having a harder to treat loft by the age of the HRP and household income. However, some differences were seen for household composition where other multi-person households (35%) were more likely to live in dwellings with harder to treat lofts compared with households comprising lone parents with dependent children (22%), one person under 60 (24%), and one person aged 60 or over (21%), Annex Table 4.12.

Technical notes and glossary

Technical notes

1. The main parts of this report refer to the physical dwelling, are presented for '2020' and are based on fieldwork carried out between April 2019 and March 2021 (a mid-point of April 2020). The sample comprises 5,288 occupied dwellings only where a physical inspection was carried out. Due to COVID-19 restrictions, the sample does not include vacant dwellings, where in previous years' it did. Throughout the report, this is referred to as the 'dwelling sample'.
2. Some parts of this report also use material from the interview questionnaire. They are presented for '2020- 21' and are based on fieldwork carried out between April 2020 and March 2021 on a sample of 7,474 households. Throughout the report, this is referred to as the 'full household sample'.
3. In a normal year, the dwelling sample is based on data collected by a qualified surveyor in the home. Due to COVID-19 restrictions in 2020-21 it was not possible to collect data in this way. Instead, data was collected from an external inspection of properties by a surveyor and supplemented with energy performance certificate, Google Earth and Rightmove data. However, for some measures, it was not possible to collect data at all using this alternative approach, e.g. on non-decency, HHSRS Category 1 hazards, damp and carbon monoxide alarms. Statistics on these topic have been extrapolated from previous EHS trends.
4. The reliability of the results of sample surveys, including the English Housing Survey, is positively related to the unweighted sample size. Results based on small sample sizes should therefore be treated as indicative only because inference about the national picture cannot be drawn. To alert readers to those results, percentages based on a row or column total with unweighted total sample size of less than 30 are italicised. To safeguard against data disclosure, the cell contents of cells where the unweighted cell count is less than 5 and more than 0 are replaced with a "u".
5. Where comparative statements have been made in the text, these have been significance tested to a 95% confidence level. This means we are 95% confident that the statements we are making are true.
6. Additional annex tables, including the data underlying the figures and charts in this report are published on the website: <https://www.gov.uk/government/collections/english-housing-survey> alongside many supplementary live tables, which are updated each year (in the summer)

but are too numerous to include in our reports. Further information on the technical details of the survey, and information and past reports on the Survey of English Housing and the English House Condition Survey, can also be accessed via this link.

Data quality

7. A full account of data quality procedures followed to collect and analyse English Housing Survey data can be found in the Quality Report, which is updated and published annually²⁰. A summary of the quality assurance processes for data collection and reporting are provided in the English Housing Survey Headline Report.²¹

Glossary

Boiler type: The report covers a number of boiler types:

- **standard:** provides hot water or warm air for space heating with the former also providing hot water via a separate storage cylinder.
- **back:** located behind a room heater and feeds hot water to a separate storage cylinder. They are generally less efficient than other boiler types.
- **combination:** provides hot water or warm air for space heating and can provide hot water on demand negating the need for a storage cylinder, therefore requiring less space.
- **condensing:** standard and combination boilers can also be condensing. A condensing boiler uses a larger, or dual, heat exchanger to obtain more heat from burning fuel than an ordinary boiler, and is generally the most efficient boiler type.

Carbon dioxide (CO₂) emissions: The total carbon dioxide emissions from space heating, water heating, ventilation and lighting, less the emissions saved by energy generation as derived from the Standard Assessment Procedure (SAP; defined below) calculations and assumptions. These are measured in tonnes per year and are not adjusted for floor area, but represent emissions from the whole dwelling. The highest and lowest emitting performers have also been grouped with cut-off points set at three tonnes per year for the low emitters and 10 tonnes per year for the highest. CO₂ emissions for each dwelling are based on a standard occupancy and a standard heating regime.

²⁰ <https://www.gov.uk/government/publications/english-housing-survey-quality-report>

²¹ <https://www.gov.uk/government/statistics/english-housing-survey-2020-to-2021-headline-report>

Dependent children: Any person aged 0 to 15 in a household (whether or not in a family) or a person aged 16 to 18 in full-time education and living in a family with his or her parent(s) or grandparent(s). It does not include any people aged 16 to 18 who have a spouse, partner or child living in the household.

Double glazing: This covers factory made sealed window units only. It does not include windows with secondary glazing or external doors with double or secondary glazing (other than double glazed patio doors, which are surveyed as representing two windows).

Dwelling: A unit of accommodation which may comprise one or more household spaces (a household space is the accommodation used or available for use by an individual household). A dwelling may be classified as shared or unshared. A dwelling is shared if:

- the household spaces it contains are ‘part of a converted or shared house’, or
- not all of the rooms (including kitchen, bathroom and toilet, if any) are behind a door that only that household can use, and
- there is at least one other such household space at the same address with which it can be combined to form the shared dwelling.

Dwellings that do not meet these conditions are unshared dwellings.

The EHS definition of dwelling is consistent with the Census 2011.

Dwelling age: The date of construction of the oldest part of the building.

Dwelling type: Dwellings are classified, on the basis of the surveyor’s inspection, into the following categories:

- **small terraced house:** a house with a total floor area of less than 70m² forming part of a block where at least one house is attached to two or more other houses. The total floor area is measured using the original EHS definition of useable floor area, used in EHS reports up to and including the 2012 reports. That definition tends to yield a smaller floor area compared with the definition that is aligned with the Nationally Described Space Standard and used on the EHS since 2013. As a result of the difference between the two definitions, some small terraced houses are reported in the 2014 Housing Supply Report as having more than 70m².
- **medium/large terraced house:** a house with a total floor area of 70m² or more forming part of a block where at least one house is attached to two or more other houses. The total floor area is measured using the original EHS definition of useable floor area which tends to yield a small floor area compared with the definition used on the EHS since 2013.

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- **end terraced house:** a house attached to one other house only in a block where at least one house is attached to two or more other houses.
 - **mid terraced house:** a house attached to two other houses in a block.
 - **semi-detached house:** a house that is attached to just one other in a block of two.
 - **detached house:** a house where none of the habitable structure is joined to another building (other than garages, outhouses etc.).
 - **bungalow:** a house with all of the habitable accommodation on one floor. This excludes chalet bungalows and bungalows with habitable loft conversions, which are treated as houses.
 - **converted flat:** a flat resulting from the conversion of a house or former non-residential building. Includes buildings converted into a flat plus commercial premises (such as corner shops).
 - **purpose built flat, low rise:** a flat in a purpose built block less than six storeys high. Includes cases where there is only one flat with independent access in a building which is also used for non-domestic purposes.
 - **purpose built flat, high rise:** a flat in a purpose built block of at least six storeys high.

Economic status: Respondents self-report their situation and can give more than one answer.

- **working full-time/part-time:** full-time work is defined as 30 or more hours per week. Part-time work is fewer than 30 hours per week. Where more than one answer is given, 'working' takes priority over other categories (with the exception that all those over State Pension Age (SPA) who regard themselves as retired are classified as such, regardless of what other answers they give).
- **unemployed:** this category covers people who were registered unemployed or not registered unemployed but seeking work.
- **retired:** this category includes all those over the state pension age who reported being retired as well as some other activity. For men the SPA is 65 and for women it is 60 if they were born before 6th April 1950. For women born on or after the 6th April 1950, the state pension age has increased incrementally since April 2010²².

²² For further information see: www.gov.uk/browse/working/state-pension

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- **full-time education:** education undertaken in pursuit of a course, where an average of more than 12 hours per week is spent during term time.
 - **other inactive:** all others; they include people who were permanently sick or disabled, those looking after the family or home and any other activity.

On occasions, **full-time education** and **other inactive** are combined and described as **other economically inactive**.

Energy Company Obligation (ECO) and **Green Deal (GD)** are Government energy efficiency schemes which began operating in 2013. They replaced the previous schemes: Carbon Emissions Reduction Target, Community Energy Saving Programme and Warm Front. Their aim is to improve the efficiency of Great Britain's homes by encouraging the uptake of energy efficiency measures, leading to impacts such as reduced consumer bills and increased comfort in the home.

Energy cost: The total energy cost from space heating, water heating, ventilation and lighting, less the costs saved by energy generation as derived from SAP calculations and assumptions. This is measured in £/year using constant prices based on average fuel prices for 2012 (which input into the 2012 SAP calculations) and do *not* reflect subsequent changes in fuel prices. Energy costs for each dwelling are based on a standard occupancy and a standard heating regime.

Energy efficiency rating (EER, also known as SAP rating): A dwelling's energy costs per m² of floor area for standard occupancy of a dwelling and a standard heating regime and is calculated from the survey using a simplified form of SAP. The energy costs take into account the costs of space and water heating, ventilation and lighting, less cost savings from energy generation technologies. They do not take into account variation in geographical location. The rating is expressed on a scale of 1-100 where a dwelling with a rating of 1 has poor energy efficiency (high costs) and a dwelling with a rating of 100 represents zero net energy cost per year. It is possible for a dwelling to have an EER/SAP rating of over 100 where it produces more energy than it consumes, although such dwellings will be rare within the English housing stock.

The detailed methodology for calculating SAP to monitor the energy efficiency of dwellings was updated in 2012 to reflect developments in the energy efficiency technologies and knowledge of dwelling energy performance. These changes in the SAP methodology were relatively minor compared with previous SAP methodology updates in 2005 and 2009. It means, however that a SAP rating using the 2009 method is not directly comparable to one calculated under the 2012 methodology, and it would be incorrect to do so. All SAP statistics used in reporting from 2013 are based on the SAP 2012 methodology and this includes time series data from 1996 to the current reporting period (i.e. the SAP 2012 methodology has been retrospectively applied to 1996 and subsequent survey data to provide consistent results in the 2013 and following reports).

Energy efficiency rating (EER)/SAP/EPC bands: The 1-100 EER/SAP energy efficiency rating is also presented in an A-G banding system for an Energy Performance Certificate, where Band A rating represents low energy costs (i.e. the most efficient band) and Band G rating represents high energy costs (the least efficient band). The break points in SAP (see below) used for the EER Bands are:

- Band A (92–100)
- Band B (81–91)
- Band C (69–80)
- Band D (55–68)
- Band E (39–54)
- Band F (21–38)
- Band G (1–20)

Energy Performance Certificates (EPCs):

An Energy Performance Certificate (EPC) indicates the energy efficiency of the dwelling. The assessments are banded from A to G, where A is the most efficient in terms of likely fuel costs and carbon dioxide emissions. An EPC is required whenever a dwelling is newly constructed, sold or let. The purpose of an EPC is to show prospective tenants or buyers the energy efficiency of the property. The requirement for EPCs was introduced in phases and fully implemented for domestic properties by autumn 2008. EPCs are valid for 10 years.

Based on current energy performance the EPC provides a range of indicators, such as whether the property would benefit in terms of improved performance from a range of heating, insulation and lighting upgrades and the likely performance arising from the application of those measures. For further information on how the EHS models this, see the Technical Report for further information and also the EPC Improvements Modelling Review report:

<https://www.gov.uk/government/collections/english-housing-survey-technical-advice#methodology-reports>.

EPC modelling in the EHS:

The EHS EPC assessment is based on a simplified form of the energy efficiency SAP known as reduced data SAP (RdSAP). Following revisions to the way that RdSAP software implements improvements as part of the EPC production process, a new EPC methodology has been applied to the EHS data since 2015. Several additional improvement measures have been added to the methodology, and for some existing measures the criteria and/or improvement specification has changed (see the Technical Report for further information and also the EPC Improvements Modelling Review report: <https://www.gov.uk/government/collections/english-housing-survey-technical-advice#methodology-reports>).

The EHS currently provides the following EPC based indicators, calculated using the survey's own approach to:

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- **current and post improvement performance:**
 - *energy efficiency rating* (EER) and bands
 - *environmental impact rating* (EIR) and bands
 - *primary energy use* (kWh/m²/year)
 - *energy cost* (£/year) for space heating, water heating, lighting and renewables
 - CO₂ (carbon dioxide) emissions (tonnes/year)
 - **improvement measures:** The Technical Report provides a list of improvements specified in the updated EHS methodology. These include loft insulation measures, wall and floor insulation measures, boiler upgrades, solar water heating, glazing and lighting measures. They are also listed in the relevant Annex Table.
 - **the notional costs of installing all the recommended measures:** The EHS also estimates the notional costs of installing each of the recommended measures and the total cost of applying all the recommended measures to the dwelling stock. The methodology for estimating these costs has also been revised (see the Technical Report for further information).
 - **the notional costs of improving a dwelling to EER band C:** Analysis has been undertaken to determine the cost to improve dwellings with an EER band of D or lower to an EER band of C. For each of the dwellings identified as having an EER band of D or lower, improvement measures are simulated cumulatively following Appendix T of the SAP 2012 specification. After each improvement, the SAP rating is recalculated until the dwelling reaches the threshold for EER band C (a SAP rating of 68.5 or higher), see the Technical Report for further information.

A small percentage of households are unable to be improved to a band C through installing measures recommended by the EPC improvement methodology. It may be possible for these dwellings to reach the target EER band through methods not recommended by an EPC, however, this is not explored in the current modelling approach. The building characteristics of these dwellings may also mean that they are not eligible to receive improvement measures with a high energy efficiency improvement potential, which would be required for the dwelling to reach a band C. These limitations may be due to the wall type being unsuitable for insulation or a roof that is unable to support PV panels.

Energy tariffs: There are two types of energy tariffs available.

- **fixed tariffs** where the unit price for gas or electricity remains constant for the duration of the plan, usually for one year although fixed tariffs of two or three years also exist
- **variable tariffs** where the unit price for gas or electricity may vary at the discretion of the supplier

Ethnicity: Classification according to respondents' own perceived ethnic group.

Full-time education: Full-time education is education undertaken in pursuit of a course, where an average of more than 12 hours per week is spent during term time.

Gross income of the HRP and partner: The gross annual income of the HRP and partner from wages, pensions, other private sources, savings and state benefits. This does not include any housing related benefits or allowances. This measure is divided by 52 to calculate weekly income. Income is presented in quintiles throughout this report (see income quintiles definition – below).

Gross household income: The gross annual income of all adults living in a household from wages, pensions, other private sources, savings and state benefits. This does not include any housing related benefits or allowances. This measure is divided by 52 to calculate weekly income. Income is presented in quintiles throughout this report (see income quintiles definition – below).

Habitable room: A room in the dwelling that offers 'living accommodation'. Includes bedrooms, kitchens if there is additional space to provide a dining area large enough to accommodate a table and chairs (typically an area of 2m² in addition to kitchen space). A fully converted room in the loft space is classified as a habitable room even if it can only be reached by a fixed ladder or unsafe staircase.

Heating controls:

a) For central heating systems:

- **timers** which control when the heating goes on and off. They range from simple manual timeclocks to complex digital programmers and most include a manual override.
- **room thermostats** which measure air temperature in the home, and switch the space heating on and off. They can be used to set a single target temperature and there may be one or more of these in the dwelling.
- **thermostatic radiator valves** (TRVs) which enable the temperature of radiators in individual rooms to be modified manually.

b) For storage heating systems:

- **manual or automatic charge controls** adjust the amount of heat stored overnight. The more recently introduced automatic controls measure the temperature in the room (or more rarely, outside the house). If the temperature is milder these allow less heat to be stored, saving money.
- **select type controller** has electronic sensors throughout the dwelling linking to a central control device. It monitors the individual room sensors and optimises the charging of all storage heaters individually.

Heating fuel:

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- **gas:** mains gas is relatively inexpensive and produces lower emissions per unit of energy than most other commonly used fuels. Liquefied Petroleum Gas and bottled gas are still associated with slightly higher costs and emissions.
 - **electricity:** standard rate electricity has the highest costs and CO₂ emissions associated with main fuels, but is used in dwellings without a viable alternative or as a back-up to mains gas. An off-peak tariff such as Economy 7 is cheaper than bottled gas but with the same emissions as standard electricity.
 - **oil:** in terms of both costs and emissions, oil lies between main gas and electricity.
 - **solid fuel:** most solid fuels have similar costs to oil, with the exception of processed wood which can be more expensive than off-peak electricity. Fuels included are coal and anthracite, with CO₂ emissions above those of gas and oil; wood, which has the lowest emissions of the main fuels; and smokeless fuel, whose emissions are close to those of electricity. By law, some areas (usually towns or cities) are designated as smoke control areas where the use of solid fuels emitting smoke is illegal.

Heating system: There are three main types of heating covered in this report:

- **central heating system:** most commonly a system with a gas fired boiler and radiators which distribute heat throughout the dwelling (but also included in this definition are warm air systems, electric ceiling/underfloor and communal heating). It is generally considered to be a cost effective and relatively efficient method of heating a dwelling. Communal systems use heat generated in a centralized location for residential space and water heating. This could be from
 - a central boiler using any fuel which supplies a number of dwellings
 - waste heat from power stations distributed through community heating schemes
 - heat from a local CHP (combined heat and power) system
- **storage heaters:** predominately used in dwellings that have an off-peak electricity tariff. Storage heaters use off-peak electricity to store heat in clay bricks or a ceramic material, this heat is then released throughout the day. However, storage heating can prove expensive if too much on peak electricity is used during the day.
- **room heaters:** this category includes all other types of heaters such as fixed gas, fixed electric or portable electric heaters. This type of heating is generally considered to be the least cost effective of the main systems and produces more carbon dioxide emissions per kWh.

Heat pumps: Air source heat pumps absorb heat from the outside air into a fluid which passes through a compressor to increase its temperature. This higher temperature heat is then used to heat radiators, underfloor heating systems, warm air heaters or hot water in the home.

Ground source heat pumps absorb heat from the ground through a loop of pipe buried in the ground containing a mixture of water and antifreeze. The heat is absorbed into the fluid and then passed through a heat exchanger into the heat pump to be used to heat radiators, underfloor or warm air heating systems and hot water. The ground stays at a fairly constant temperature under the surface, so the heat pump can be used throughout the year. The length of the ground loop depends on the size of the dwelling and the amount of heat required. Longer loops can draw more heat from the ground, but need more space to be buried in. If space is limited, a vertical borehole can be drilled instead.

Household: One person or a group of people (not necessarily related) who have the accommodation as their only or main residence, and (for a group) share cooking facilities and share a living room or sitting room or dining area.

The EHS definition of household is slightly different from the definition used in the 2011 Census. Unlike the EHS, the 2011 Census did not limit household membership to people who had the accommodation as their only or main residence. The EHS included that restriction because it asks respondents about their second homes, the unit of data collection on the EHS, therefore, needs to include only those people who have the accommodation as their only or main residence.

Household reference person (HRP): The person in whose name the dwelling is owned or rented or who is otherwise responsible for the accommodation. In the case of joint owners and tenants, the person with the highest income is taken as the HRP. Where incomes are equal, the older is taken as the HRP. This procedure increases the likelihood that the HRP better characterises the household's social and economic position. The EHS definition of HRP is not consistent with the Census 2011, in which the HRP is chosen on basis of their economic activity. Where economic activity is the same, the older is taken as HRP, or if they are the same age, HRP is the first listed on the questionnaire.

Household type: The main classification of household type uses the following categories; some categories may be split or combined in different tables:

- couple no dependent child(ren)
- couple with dependent child(ren)
- couple with dependent and independent child(ren)
- couple with independent child(ren)
- lone parent with dependent child(ren)
- lone parent with dependent and independent child(ren)
- lone parent with independent child(ren)
- two or more families
- lone person sharing with other lone persons
- one male
- one female

Income (equivalised): Household incomes have been ‘equivalised’, that is adjusted (using the modified Organisation Economic Co-operation and Development scale) to reflect the number of people in a household. This allows the comparison of incomes for households with different sizes and compositions.

The EHS variables are modelled to produce a **Before Housing Costs (BHC)** income measure for the purpose of equivalisation. The BHC income variable includes:

Household Reference Person and partner’s income from benefits and private sources (including income from savings), income from other household members, housing benefit, winter fuel payment and the deduction of net council tax payment.

Income quintiles: All households are divided into five equal groups based on their income (i.e. those in the bottom 20%, the next 20% and so on). These groups are known as quintiles. These can be used to compare income levels of particular groups to the overall population.

Insulation: There are two main types of insulation covered in this report:

- **wall insulation**

cavity walls: where a dwelling has external walls of predominantly cavity construction, it is defined as having cavity wall insulation if at least 50% of the cavity walls are filled with insulation. This could have been fitted during construction or retrospectively injected between the masonry leaves of the cavity wall.

solid walls: where a dwelling has external walls of predominantly masonry solid construction, it is defined as having solid wall insulation if at least 50% of the solid walls are fitted with insulation. This could be applied either externally (e.g. insulated board attached to the external face with a render finish) or internally (e.g. insulated plasterboard fitted to the external walls inside each room, with a plaster finish).

other walls: these are any dwellings with predominantly non-cavity or masonry solid walls (e.g. timber, metal or concrete frames). If at least 50% of the walls are fitted with insulation, the dwelling is defined as having other wall insulation.

- **loft insulation:** the presence and depth of loft insulation is collected for all houses and top-floor flats. Insulation could be found between joists above the ceiling of the top floor of the dwelling or between the roof timbers where the loft has been converted to a habitable space. Where insulation could not be observed, information was taken from the householder or from imputed estimates based on the age and type of the dwelling.

Insulation – new cavity wall insulation variable: For the 2015 Headline Report, the English Housing Survey introduced a new measure of cavity wall insulation

(variable wins95x). This new measure incorporates more up-to-date information regarding the insulation of buildings built since 1991 and aligns the English Housing Survey methodology to a common method for calculating energy efficiency of buildings.

In compliance with new Building Regulations, an increasing proportion of dwellings built in 1991 or after with cavity walls had insulation fitted at the time of construction (known as 'as built' cavity wall insulation), although compliance could also be achieved through other techniques. The non-intrusive survey undertaken in the EHS would not always be able to identify as built insulation, and the Survey has to assume that these properties have insulation. To align with current RdSAP methodology and to improve our methodology, the English Housing Survey has for 2015 data introduced a new variable, which assumes that properties built in 1995 or after has as built insulation. This is the assumption used in the RdSAP model, which in turn reflects that cavity wall insulation was not used as often as previously thought to comply with the new Building Regulations in the early 1990s.

In the earlier variable (wins90x), properties built in 1991 or after were assumed to be insulated, as it was thought builders used cavity wall insulation to comply with the new Building Regulations. Due to changes in data collection the new variable can only be taken back to 2008. Trends from earlier reports hold, though the exact numbers produced by the new variable are lower (as properties built in 1991 up to 1995 without evidence of retrofitted cavity wall insulation are no longer assumed to be insulated).

Non-dependent children: any person aged over 18 or those aged 16-18 who are not in full-time education living in a family with his or her parent(s) or grandparent(s).

Off-peak electricity: This supply is identified by the presence of a multi-rate meter (as opposed to single rate), and is able to provide discounted electricity tariffs during periods of reduced demand (such as at night). This can reduce the cost of heating, most commonly for those with, storage radiator systems. For cases where presence of off peak electricity was unknown we have assumed this to be not present if there is no off-peak heating or hot water system. Any remaining unknown cases were also assumed to not have off-peak electricity for ease of analysis.

Older households: Households where the oldest person in the household is aged 55 or over.

Parking provision: This represents the 'best' parking available to the dwelling i.e. if the home has both a garage and off street parking, parking provision is coded as 'garage'. The parking provision does not have to be located on the plot of the dwelling – an off street parking space or garage may be in a block further down the street or round the corner.

All types of parking provision recorded are for the exclusive use of the survey dwelling apart from any available parking in communal areas. Communal parking relates to car parking provision for the module or block of which the survey dwelling

is a part. Dwellings may have access to more than one type of communal parking facility. Other off street parking refers to either a designated parking space or a car port at the dwelling plot.

- Adequate parking - street parking generally being available outside or adjacent to the house or block of flats where the surveyed flat is located and the road is sufficiently wide to allow easy passage of traffic.
- Inadequate parking - it is difficult to park outside the house or block of flats where the surveyed flat is located. This might be due to the volume of cars competing for places, or due to legal restrictions on parking.
- None – it is not possible to park outside the house or block of flats where the surveyed flat is located at any time due to either the distance from the road or permanent parking restrictions.

Plot: The EHS records a number of details relating to the land immediately surrounding a dwelling, referred to as the dwelling’s plot. The plot may be private (exclusive access) or shared (shared access, for example where a block of flats have a shared garden). The plot may consist of hard landscaping (e.g. concrete, tarmac, paving, gravel), soft landscaping (e.g. lawn, flower/vegetable beds), or a combination.

Private accommodation: The majority of homes in all three tenures, excluding hotels, bed and breakfast accommodation and institutional residences such as student halls, army barracks and care homes. The EHS only covers private accommodation.

Region: A nine region classification is used to present geographical findings, as follows:

- North East
- North West
- Yorkshire and the Humber
- East Midlands
- West Midlands
- East
- London
- South East
- South West

Renewable energy: Data is collected on the presence of three types of renewable technology:

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- **solar thermal panels:** these are usually roof mounted and use direct sunlight to heat water, providing an additional source of domestic hot water to the internal boiler or other water heater. The most common types are evacuated tube and glazed flat plate collectors.
 - **photovoltaic panels:** a photovoltaic cell is a device that converts light into electric current, contributing to the domestic electricity supply. A large photovoltaic system could provide a surplus of energy, allowing a household to export electricity to the national grid.
 - **wind turbines:** a domestic small-scale wind turbine harnesses the power of the wind and uses it to generate electricity. The sample size of dwellings with this feature is currently too small to provide robust estimates for reporting.

SAP rating: See the entries for the Standard Assessment Procedure and Energy Efficiency Rating

Standard Assessment Procedure (SAP): The Standard Assessment Procedure (SAP) is the methodology used by the Government to assess and compare the energy and environmental performance of dwellings. The SAP is used to calculate the energy efficiency rating (EER) of dwellings, also known as the SAP rating. The EER is an index based on calculated energy costs for a standard heating regime and is expressed on a scale of 1 (highly inefficient) to 100 (highly efficient with 100 representing zero energy cost). It is possible for a dwelling to have a rating of over 100 where it produces more energy than it consumes, although such dwellings will be rare within the English housing stock.

Reduced Data SAP (RdSAP) was introduced in 2005 as a lower cost method of assessing the energy performance of existing dwellings. RdSAP is used in the calculation of the energy ratings on the Energy Performance Certificate, a document which is required every time a home is put up for sale or rent. In 2018 the RdSAP modelling methodology was updated to version 9.93 for half of the 2-year combined dataset. See EHS Technical Report, Chapter 5, for more details of the modelling.

Size: The total usable internal floor area of the dwelling as measured by the surveyor, rounded to the nearest square metre. It includes integral garages and integral balconies but excludes stores accessed from the outside only, the area under partition walls and the stairwell area.

Storeys: The number of storeys *above* ground i.e. it does not include any basements.

Tenure: In this report, households are typically grouped into three broad categories known as tenures: owner occupiers, social renters and private renters. The tenure defines the conditions under which the home is occupied, whether it is owned or rented, and if rented, who the landlord is and on what financial and legal terms the let is agreed.

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- **owner occupiers:** households in accommodation which they either own outright, are buying with a mortgage or as part of a shared ownership scheme.
 - **social renters:** this category includes households renting from Local Authorities (including Arms' Length Management Organisations (ALMOs) and Housing Action Trusts) and Housing Associations, Local Housing Companies, co-operatives and charitable trusts.

A significant number of Housing Association tenants wrongly report that they are Local Authority tenants. The most common reason for this is that their home used to be owned by the Local Authority, and although ownership was transferred to a Housing Association, the tenant still reports that their landlord is the Local Authority. There are also some Local Authority tenants who wrongly report that they are Housing Association tenants. Data from the EHS for 2008-09 onwards incorporate a correction for the great majority of such cases in order to provide a reasonably accurate split of the social rented category.

- **private renters:** this sector covers all other tenants including all whose accommodation is tied to their job. It also includes people living rent-free (for example, people living in a flat belonging to a relative).

Usable floor area: The total usable internal floor area of the dwelling as measured by the surveyor, rounded to the nearest square metre. A new modelling approach adopted since the 2013 report uses assumptions aligned with the Nationally Described Space Standard which was published as part of the Housing Standards Review. It excludes integral garages, balconies, stores accessed from the outside only and the area under external walls. The area remaining represents the total of all room areas, hallways and circulation space including cupboards and stairs. The area under internal partition walls is also included. Loft space is not included unless the loft is habitable, with a fixed stair in place to access it. Dwellings are also grouped into the following five categories:

- less than 50m²
- 50 to 69m²
- 70 to 89m²
- 90 to 109m²
- 110m² or more.

Vacant dwellings: The assessment of whether or not a dwelling is vacant is made at the time of the interviewer's visit. Clarification of vacancy is sought from neighbours. Both properties in between lets and those that are vacant for a longer period are classified as vacant on the EHS. Surveyors are required to gain access to vacant dwellings and undertake full inspections.

Wall finishes: The outer layer or skin of the material of the wall structure or any coating applied to it. Wall finishes include:

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- **Pointed brickwork:** The mortar is placed into a masonry joint after the masonry units (e.g. brick, concrete block or stone) have been laid. This creates a finish to the brickwork and adds resistance to weather
 - **Rendered finish:** The application of, for example, premixed cement or pebbledash. The render may or may not be painted.
 - **Mixed or other finish:** Other types of wall finish include protective and decorative timber, clay or concrete tiles fixed to the wall structure

Wall types: the method of the dwelling construction, including:

- **Cavity wall:** constructed of two brick or block walls separated by a cavity that is at least 50mm wide. They are generally found in houses dating from about 1930 onwards, although some older examples exist. Many dwellings (especially older private sector homes) have a mix of wall types because they have had one or more extensions added at different times. In the EHS dwellings are only classed as 'cavity wall' where at least 50% of the total external wall area is cavity brickwork.
- **Solid wall dwelling:** A dwelling whose structure comprises of solid brickwork i.e. no cavity inside the walls. Solid walls were mainly built until the 1930s in England.
- **Timber frame/concrete frame/other concrete/steel frame dwellings:** This category covers a wide range of building types, ranging from traditional timber frame buildings to non-traditional concrete or steel frame buildings using 'systems' of building focused on speed and economy of construction. They usually use pre-constructed frames of material, e.g. timber, concrete or steel, that are then erected on site. In some cases the frames may be constructed on site. The frames can be clad with other materials or filled to form panels.
- **Masonry walled dwellings:** Dwellings with walls constructed by laying individual masonry units (e.g. brick, concrete block or stone). The masonry units are normally laid with cement mortar, which binds them together to create a structure. They can be either cavity or solid wall.

Water heating controls:

- **Cylinder thermostat:** A thermostat is a device that automatically controls temperature. Thermostats are usually attached to the outside of the hot water cylinder but can also comprise a diverter valve type arrangement with a thermocouple connected to the tank.
- **Time-clock:** A system whereby the water heating is controlled by the same device that controls the central heating or by an independent timer.

Water heating systems: The report covers several types of water heating systems.

- **from central heating with hot water cylinder:** the central heating provides hot water for space heating while also providing hot water via a separate storage cylinder.

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- **from central heating (no hot water cylinder):** the central heating provides hot water for space heating and can provide hot water on demand negating the need for a storage cylinder, therefore requiring less space.
 - **immersion heater:** an electric element heats water in a storage cylinder, used solely for hot water (not for central heating)
 - **instantaneous:** hot water heated as needed by an appliance (not a boiler) fuelled by for example gas or electricity
 - **dedicated boiler:** hot water supplied from a boiler only used for hot water (not central heating)

Younger households: Households where the oldest person in the household is aged less than 55 years

In accordance with the Statistics and Registration Service Act 2007 the United Kingdom Statistics Authority has designated these statistics as National Statistics, signifying that they are fully compliant with the Code of Practice for Statistics.

Designation can be broadly interpreted to mean that the statistics:

- meet identified user needs;
- are well explained and readily accessible;
- are produced according to sound methods, and
- are managed impartially and objectively in the public interest.

Once statistics have been designated as National Statistics it is a statutory requirement that the Code of Practice shall continue to be observed.

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