Chapter 1
Energy performance

1.1. Improving the energy efficiency of a home can not only reduce household energy bills and lower greenhouse gas emissions, it can also improve the quality of life for the household. Since even small changes in energy performance and the way we use our home can have a significant effect in reducing total energy consumption, a number of policy measures and funding initiatives aimed at improving insulation and heating systems in homes have been introduced by successive governments.

1.2. This chapter examines the energy efficiency and carbon dioxide emissions of the English housing stock in 2013, and how this varied by tenure and key household characteristics. It next examines how energy performance has changed since 2001 by tenure, key problematic types of dwelling and key household groups. The chapter then focuses on the varied provision of individual energy efficiency measures such as loft and cavity wall insulation before examining how the prevalence of such measures has improved over time for the whole stock. Finally, some information is provided on the presence of renewable energy measures

1.3. Analysis of primary and secondary heating systems within the stock can be found in Chapter 4 of this report. Additional data on energy performance can be found in the live web tables DA7101 to DA7104[1].

1.4. The assessment of energy performance for the housing stock is not based on actual energy consumption and emissions, but on the consumption (and resulting emissions) assumed under a standard occupancy and standard heating pattern for each dwelling. This enables the performance of the housing stock to be assessed on a comparable basis between different types of stock as well as over time. Further information on this assessment can be found in Chapter 5 of the Technical Report, Annex 6.

[1] https://www.gov.uk/government/collections/english-housing-survey#2013-to-2014

Energy efficiency

1.5. The measures of energy performance of the housing stock used for this chapter are the energy efficiency (SAP) rating and carbon dioxide (CO_2) emissions, Box 1.1. From 2010 to 2012 the EHS used the SAP09 methodology for energy efficiency comparisons, but this report uses the updated SAP12 methodology. Appendix 1 of this chapter summarises the main differences between the two methods and how this change impacts on the EHS data.

Box 1.1: Key measures of energy performance

Energy efficiency rating: The SAP rating is based on each dwelling's energy costs per square metre and is calculated using a simplified form of the Standard Assessment Procedure (SAP) under the 2012 methodology. The energy costs take into account the costs of space and water heating, ventilation, and lighting, less any cost savings from energy generation technologies. The rating is expressed on a scale of 1-100 where a dwelling with a rating of 1 has extremely poor energy efficiency (high costs) and a dwelling with a rating of 100 represents a completely energy efficient dwelling (zero net energy costs per year). It is possible for a dwelling to have a 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 energy efficiency rating is also presented in an A to G banding system for Energy Performance Certificates, where Energy Efficiency Rating (EER) Band A is the most efficient band (i.e. low energy costs) and EER Band G is the least energy efficient band (i.e. high energy costs).

Carbon dioxide emissions: The carbon dioxide (CO_2) emissions of a dwelling are derived from its space heating, water heating, ventilation and lighting, less any emissions saved by energy generation, and are measured in tonnes per year. Unlike the SAP rating, CO_2 emissions are not standardised for the size of the dwelling and are therefore likely to be higher for larger homes.

1.6. The average SAP for all dwellings in England (including vacant homes) was 60 in 2013, although this was a little higher for social sector homes (66) compared with those in the private sector (58), Annex Table 1.1.

1.7. Private rented homes had a similar average SAP rating (58) to owner occupied homes, despite the greater scope for installing many of the key energy efficiency measures in the private rented sector (see Chapter 2 of this report), Annex Table 1.1. The unmet potential for installing energy efficiency measures was generally higher in the private rented sector for a number of reasons including:

- the installation of common energy performance measures such as loft and cavity wall insulation, was problematic for a large proportion of privately rented dwellings (see Chapter 3 of this report).
- the difficulties in incentivising landlords to undertake such measures
- the complications in getting agreement among leaseholder flats.

1.8. The private rented sector also had a higher proportion of dwellings in the lowest SAP rating bands (F and G) (see Chapter 3 of this report). The similar average SAP rating between owner occupied and private rented homes is, however, most likely to be due to the different distribution of dwelling types and ages within each sector, especially the higher proportion of flats (which are a generally more energy efficient configuration, with fewer external heat loss walls) in the private rented sector.

1.9. Not surprisingly the findings for CO_2 emissions largely mirrored those for average SAP ratings: the social sector performed better (3.2 tonnes per annum) than the private sector (5.6 tonnes per annum). This difference in performance is likely to be largely due to:

- the energy efficiency improvements undertaken in the social sector as part of the Decent Homes programme
- the different profile of the social stock, which had a smaller proportion of the oldest homes together with a higher proportion of purpose built flats
- social sector homes generally being smaller than those in the private sector[2]

1.10. Within the private sector, CO_2 emissions were lower among rented homes: 4.7 tonnes per annum compared with 6.0 tonnes per annum among owner occupied homes. This partly reflects the different distribution of dwelling types within each of these sectors, in particular the higher proportion of purpose built and converted flats within the private rented sector. Flats tend to be smaller than houses, and CO_2 emissions are likely to be lower for smaller homes, Annex Table 1.1.

1.11. Chapter 1 of the 2012 EHS Energy efficiency of English housing includes analysis of the average SAP rating and carbon emissions within the private and social sectors for various dwelling and heating characteristics; none of these findings are likely to have changed significantly between 2012 and 2013 and readers are referred to this report for further details on these breakdowns.

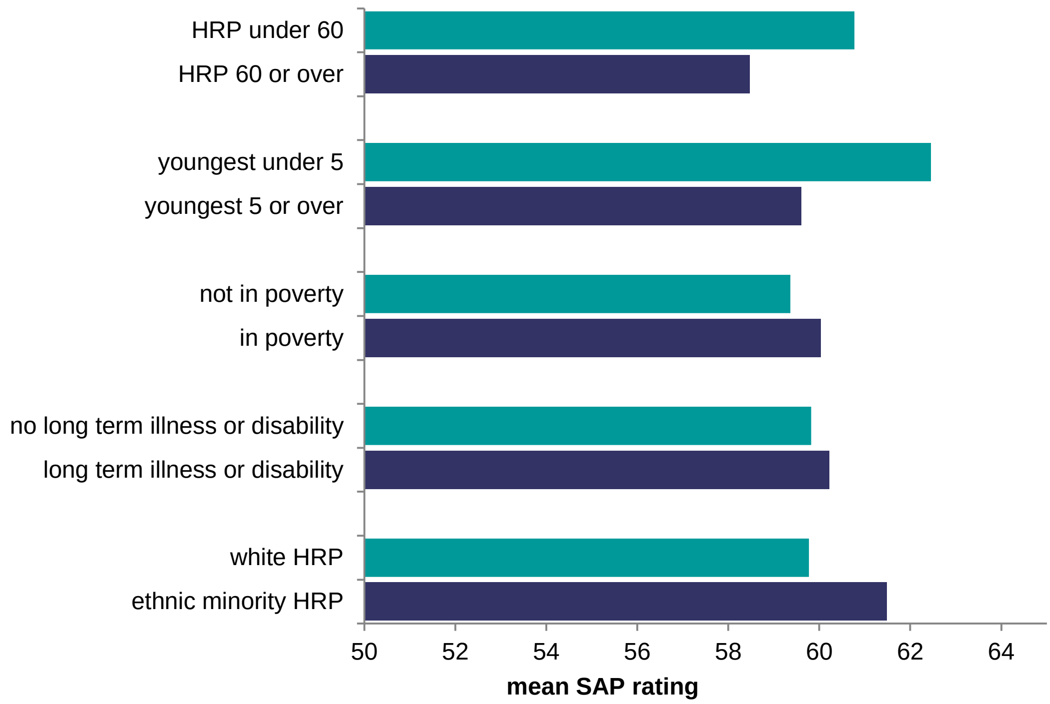
[2] see Chapter 1 of the 2013 Profile of English housing for further information

Energy efficiency – households

1.12. This section examines the energy efficiency in occupied homes only, with particular focus on certain key household groups: households including people who are potentially vulnerable on account of their age, long term illness or disability; and groups which tend to be disadvantaged such as ethnic minorities and those in poverty[3]. The differences in average SAP reflect the different distribution of tenures, dwelling types and ages of homes occupied by each of these household groups, especially the higher proportion of purpose built flats in the rented sectors.

1.13. Across all occupied homes the average SAP rating was 60. This was lower for households where the HRP was over 60 years of age (58) compared with those where the HRP was less than 60 years of age (61). Also, average SAP was higher for households where the youngest person was aged less than 5 years (62) compared with households where the youngest person was above this age (60). Overall, households with an ethnic minority HRP lived in more energy efficient homes (average SAP of 61) compared to their white counterparts (average SAP of 60), Figure 1.1.

Figure 1.1: Mean SAP by household characteristics (all tenures), 2013



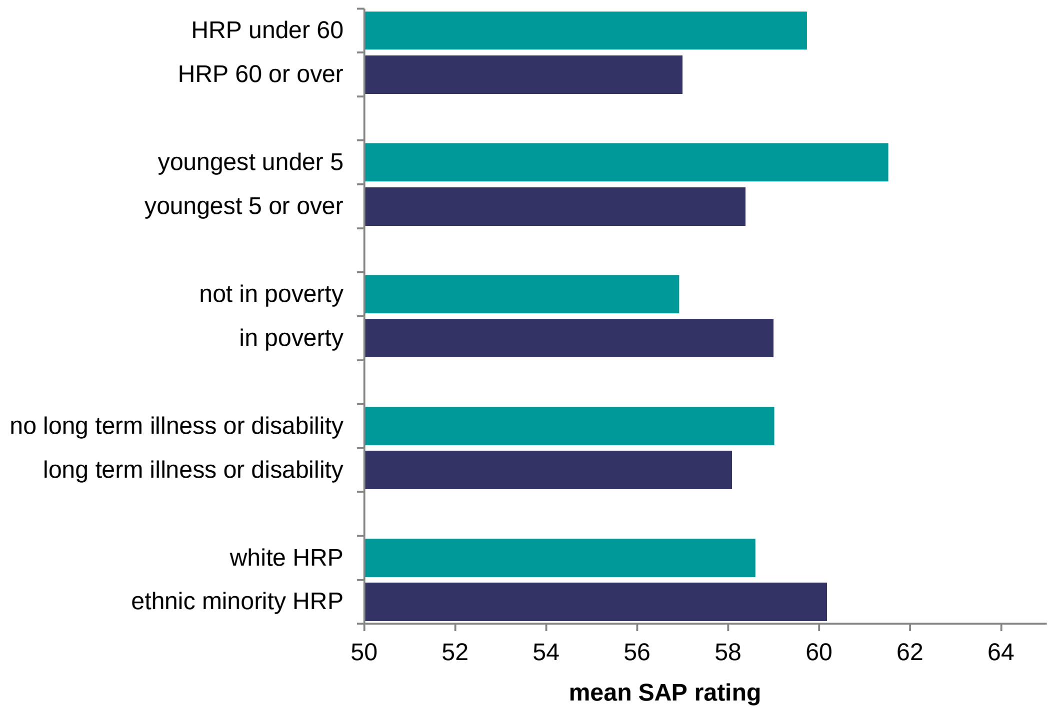
Base: all households
Note: underlying data are presented in Annex Table 1.2
Source: English Housing Survey, household sub-sample

[3] see the Glossary for definitions of these household groups

1.14. For occupied social sector homes, the average SAP rating was 66 and this was similar for all key household groups, Annex Table 1.2.

1.15. Occupied private sector homes had a lower average SAP, of 59, and findings for the key vulnerable or disadvantage groups were more varied than in the social sector, largely mirroring those for all occupied homes. Average SAP was, for example, higher for households where the youngest person was less than five years of age (62) compared with households where the youngest person was five or older (58). Average SAP was, however, lower for households where the HRP was over 60 years of age (57) than households where the HRP was younger (60), Figure 1.2.

Figure 1.2: Mean SAP by household characteristics (private sector homes), 2013



Base: all private sector households
Note: underlying data are presented in Annex Table 1.2
Source: English Housing Survey, household sub-sample

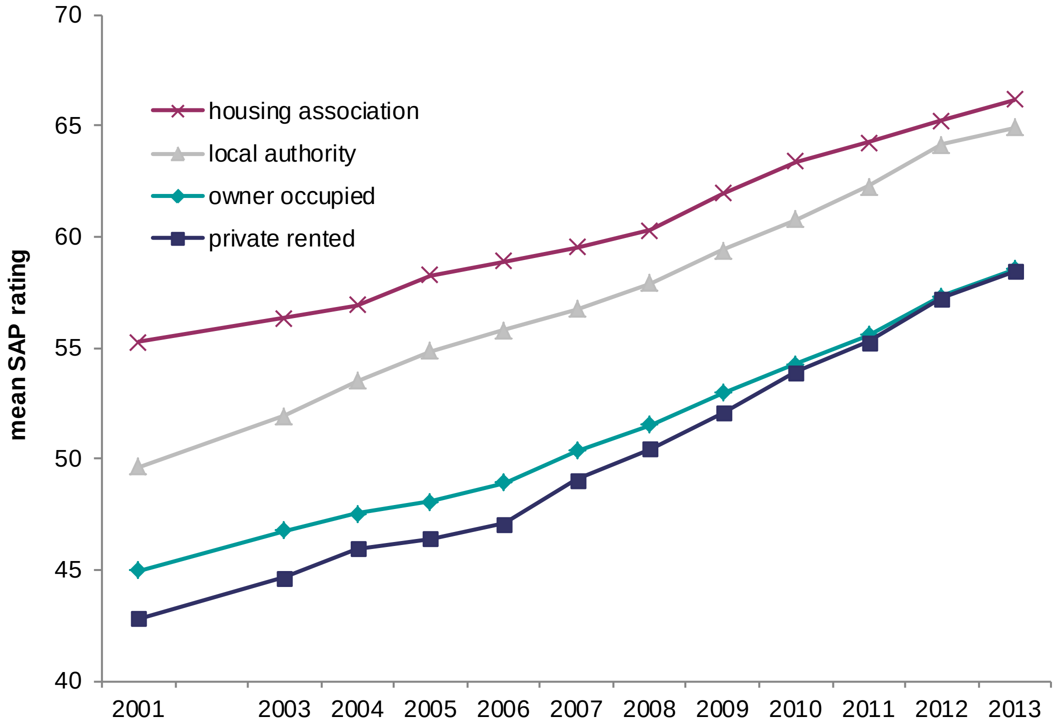
Energy efficiency over time – all dwellings[4]

1.16. The average SAP rating for all dwellings increased by 14 points from 46 in 2001 to 60 in 2013. The private rented and local authority sectors showed the largest increases: average SAP rose by 16 and 15 points respectively. As a result, average SAP for both the owner occupied and the private rented sectors were the same in 2013 and average SAP for both social tenures was

[4] this analysis uses SAP12 for each EHS survey year to ensure a consistent time series

more similar. Housing association properties remained the most energy efficient throughout this period. Figure 1.3

Figure 1.3: Energy efficiency, average SAP rating by tenure, 2001-2013



Base: all dwellings
Note: underlying data are presented in Annex Table 1.3
Sources:
2001-2007: English House Condition Survey, dwelling sample
2008 onwards: English Housing Survey, dwelling sample

Energy efficiency over time – dwellings with lower energy performance

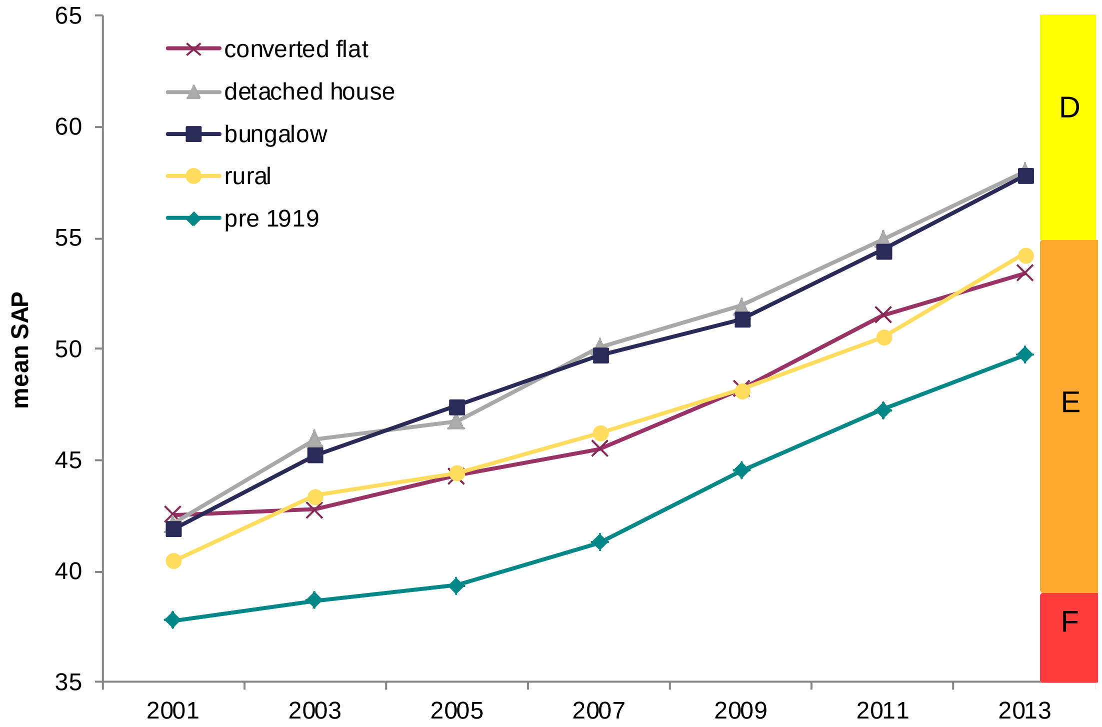
1.17. The following analysis examines some types of homes with the lowest energy efficiency in 2001 to determine how energy performance may have improved over time. These dwelling types are detached houses; semi-detached houses; bungalows; converted flats; pre 1919 built homes; and homes in rural areas.

1.18. Of these groups, detached houses and bungalows showed the greatest increase in average SAP (from 42 in 2001 to 58 in 2013) , Figure 1.4. For detached homes this improvement may be partly explained by the higher proportion of newly built dwellings in this group. The improvement for semi-detached homes almost mirrored that for detached homes and bungalows, Annex Table 1.4.

1.19. For dwellings built before 1919, the increase in average SAP was somewhat more modest (from 39 to 50), reflecting that these homes are among the most expensive and problematic to improve. Progress was slowest for converted flats, a highly variable group of dwellings which are often difficult to improve, although we need to bear in mind that the sample size for these homes is relatively small compared with other dwelling types.

1.20. Despite the improvement in performance for all these types of homes, they continued to have lower than average SAP, and the differences between the housing types persisted over time.

Figure 1.4: Energy efficiency, average SAP rating by problematic dwelling types, 2001-2013

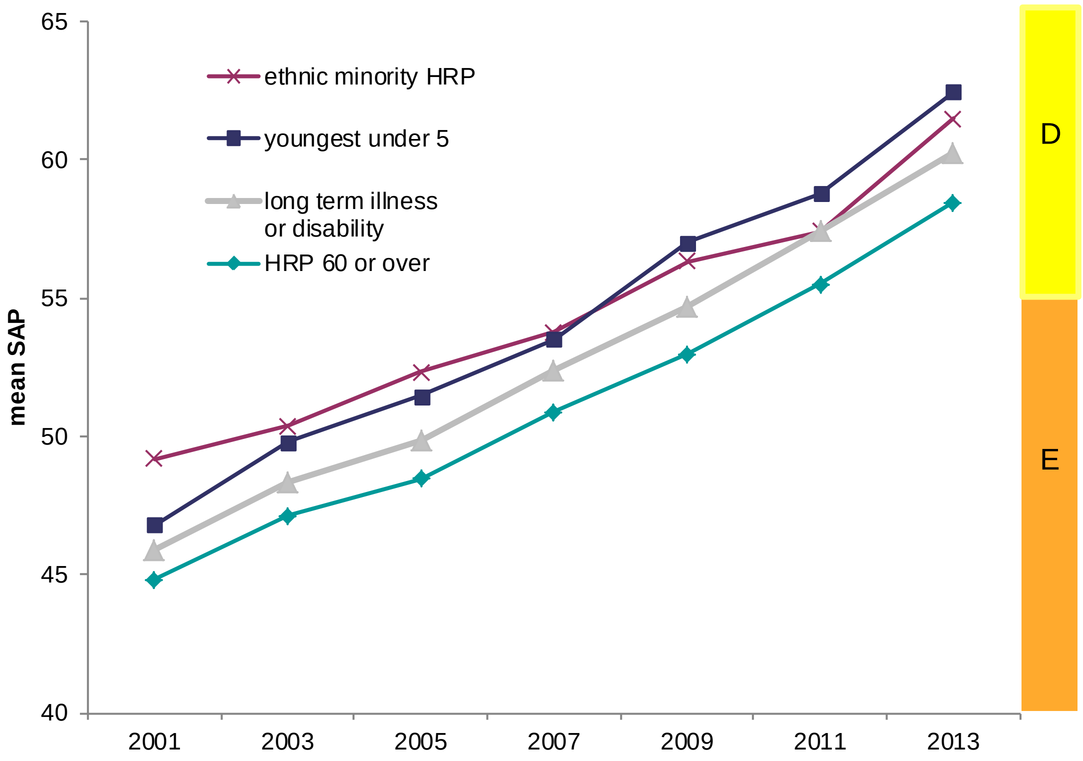


Base: all dwellings
Note: underlying data are presented in Annex Table 1.4
Sources:
2001-2007: English House Condition Survey, dwelling sample
2008 onwards: English Housing Survey, dwelling sample

Energy efficiency over time – occupied homes

1.21. All key household groups saw improvements in mean SAP over this period, especially families with one or more children aged under 5 years of age (from 47 in 2001 to 62 in 2013). Progress was slightly less rapid, but still notable, among ethnic minority HRP households: average SAP rose from 49 to 61 over this period, Figure 1.5. The pattern for households in poverty was very similar to that for all households, see Annex Table 1.5.

Figure 1.5: Energy efficiency, average SAP rating by key household groups, 2001-2013



Base: all households
Note: underlying data are presented in Annex Table 1.5
Sources:
2001-2007: English House Condition Survey, household sub-sample
2008 onwards: English Housing Survey, household sub- sample

Energy efficiency measures

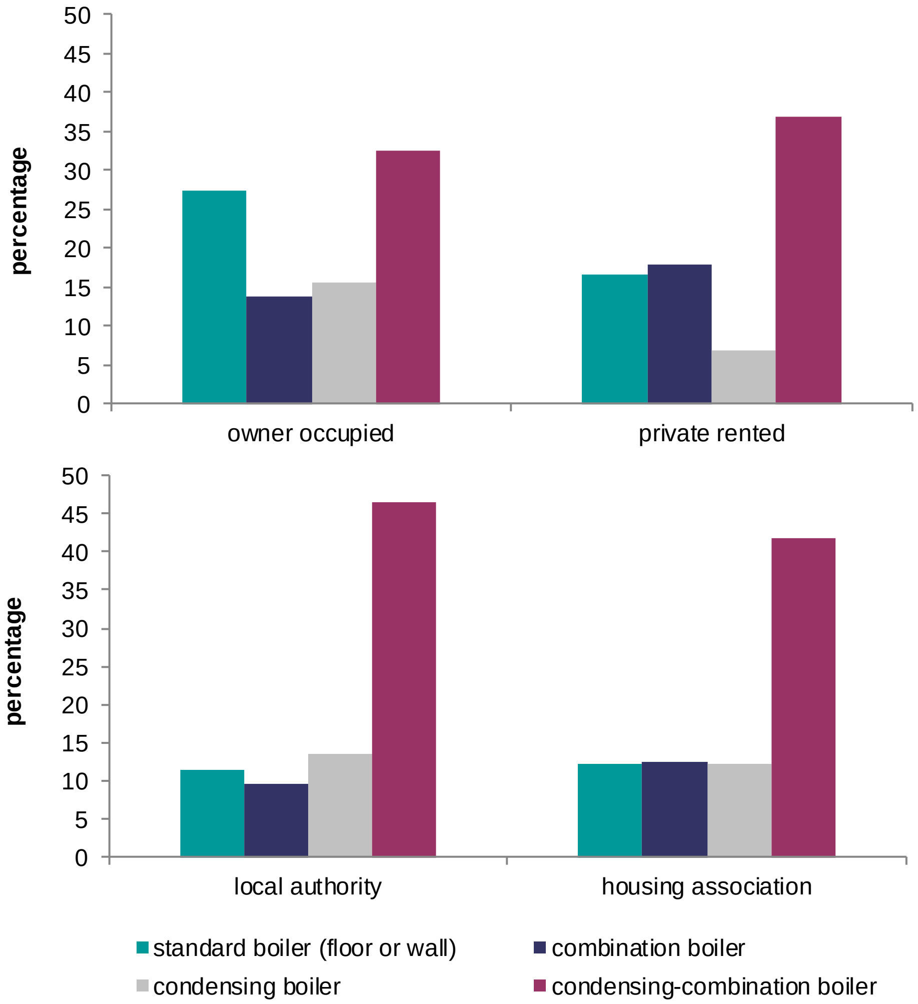
1.22. This section examines the key energy efficiency measures in our homes and how these have changed over time.

Boiler systems

1.23. Modern condensing boilers, if well-maintained, burn their fuel very efficiently, although there is an inevitably a small residual loss of some heat that escapes through the flue. They are more efficient due their having a larger heat exchanger, recovering more heat via the condensation process, and thereby sending cooler gases up the flue. Condensing-combination boilers are a type of condensing boiler that provide heating and domestic hot water without the need for a hot water storage cylinder. In 2013, condensing-combination boilers were the most common type of boiler across all tenures, present in 35% of all homes. In addition, 13% of homes had a condensing boiler with a cylinder, Annex Table 1.6.

1.24. Local authority and housing association homes were more likely to have either a condensing or condensing-combination boiler (60% and 54% respectively) compared with private homes, particularly private rented homes (44%). Owner occupied homes were most likely to have standard non-condensing boilers (27%). Back boilers[5] were the least common, present in just 3% of homes, Figure 1.6 and Annex Table 1.6.

Figure 1.6: Percentages of dwellings with most common boiler types by tenure, 2013



Base: all dwellings
Note: underlying data are presented in Annex Table 1.6
Source: English Housing Survey, dwelling sample

1.25. This analysis looks at the types of boilers used by the 20.2 million households who had some form of boiler provision. Of these households, over half (54%) had either a condensing or condensing-combination boiler whilst just over a quarter (26%) had a standard non-condensing boiler, Annex Table 1.7.

[5] these are located behind a room heater and are designed to provide hot water for space heating, and may also provide domestic hot water indirectly through a separate hot water storage cylinder

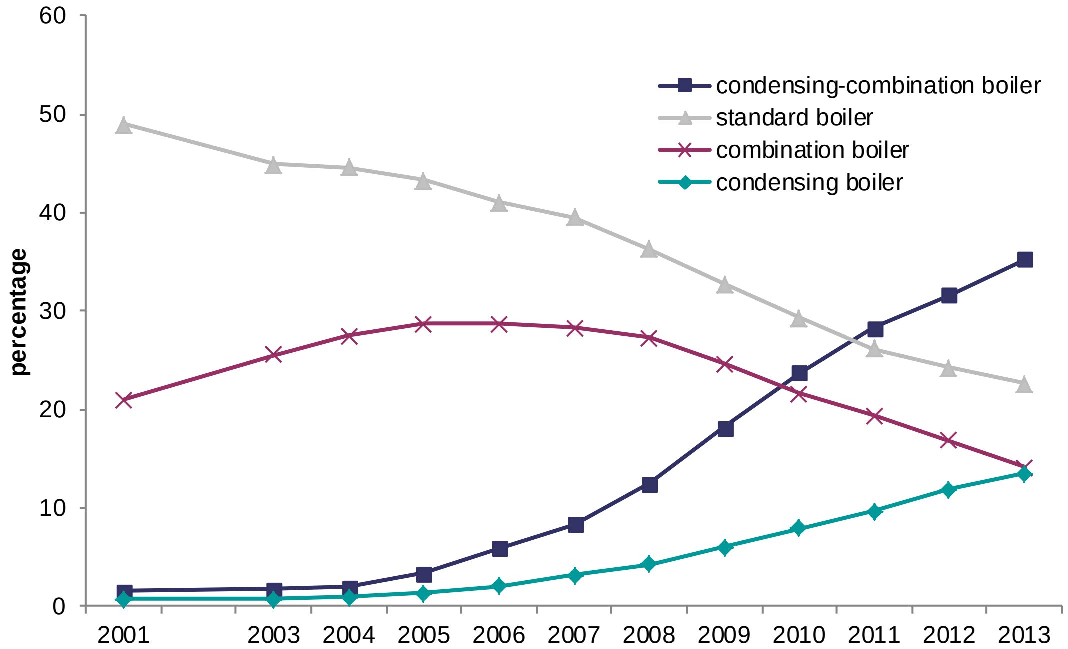
1.26. Households with an HRP aged 60 years or over were less likely to have some form of condensing boiler (51%) compared with those with a younger HRP (56%). These types of boiler were more prevalent among households where the youngest person was under five years of age (62%), Annex Table 1.7.

1.27. The distribution of boiler types was fairly similar irrespective of whether the household was classified as being in poverty. There were some variations in the nature of boiler provision by ethnicity. Overall, households with an ethnic minority HRP were more likely to have the more efficient condensing or condensing-combination boilers (60%) compared with white HRP households (54%). White HRP households were most likely to have a standard non-condensing boiler or a back boiler.

Boiler systems over time – all dwellings

1.28. There was a marked rise in the proportion of homes with either a condensing or a condensing-combination boiler, from 2% in 2001 to 49% in 2013. This rise followed changes to Building Regulations in 2005, which made it mandatory for replacement boilers to be of the more energy efficient condensing types where feasible. In consequence, there has been a steady decline in the proportion of homes with the less energy efficient standard non-condensing boilers and, in more recent years, a decline in the proportion with the non-condensing type of combination boilers, Figure 1.7.

Figure 1.7: Percentages of dwellings with given boiler types, 2001-2013



Base: all dwellings
Note: underlying data are presented in Annex Table 1.8
Sources:
2001-2007: English House Condition Survey, dwelling sample
2008 onwards: English Housing Survey, dwelling sample

Cavity wall insulation

Box 1.2: Cavity wall insulation

During the EHS physical survey, surveyors examine the dwelling for evidence of insulation. External walls of cavity construction normally provide greater energy efficiency than solid walls by reducing heat loss, and from around 1930 onwards this type of construction became more prevalent. Prior to 1990, the space between the two leaves of cavity walls was generally left uninsulated at the time of construction. Many of these walls have, however, been insulated retrospectively by injecting insulating material into this space.

In compliance with Building Regulations, an increasing proportion of dwellings built since 1990 with cavity walls had cavity wall insulation fitted at the time of construction (known as ’as built‘ insulation), although compliance could also be achieved through other techniques.

The EHS attempts to provide the best estimate of the total level of cavity wall insulation in the housing stock. However, the prevalence of ‘as built’ insulation in the post-1990 stock creates additional uncertainty in the results for this age band. Retrospective cavity wall insulation often leaves some evidence that would be recognised by an EHS surveyor, however ‘as built’ insulation can be impossible to identify with a non-intrusive survey. For reporting purposes therefore, all cavity-walled, post-1990 dwellings where there is no evidence of insulation identified by the surveyor are included with those that do have evidence of insulation.

Combining these two categories provides the most reliable estimate of the total number of homes with cavity wall insulation because, although there will be some post 1990 dwellings without cavity wall insulation, there will also be some dwellings built with insulated cavity walls in the 1980s but where there is no visible evidence of this. Further details of the difficulties in providing an estimate are given in chapter 5 of the Technical Report, Annex 6.

1.29. The EHS estimates that in 2013 around 16 million homes had cavity walls. Some 9.6 million dwellings had clear evidence of insulated cavity walls and a further 1.3 million were constructed post-1990, so many of these will have ’as built‘ insulation installed (see Box 1.2). Overall therefore, under the assumption that this entire group had insulation, in 2013 around 68% of dwellings with cavity walls were insulated, Annex Table 1.9.

1.30. Private rented homes were the least likely to have this insulation (55%). There is some evidence to suggest that private sector landlords have less incentive to undertake cavity wall insulation, where it does not exist[6]. In contrast, housing association homes, which were generally newer, were the most likely group to have this insulation (73%). The prevalence of cavity wall insulation was similar for local authority and owner occupied homes (69-70%).

1.31. Only 27% of the oldest homes built before 1919 had insulated cavities in 2013. Just over half (52%) of London homes with cavity walls had insulation, far lower than the proportion found for the rest of England (69%). London homes performed less well in this respect owing to the capital having a higher proportion of flats and older cavity walled homes, which tend not be insulated.

Households living in homes with cavity walls

1.32. As with boiler provision there were some variations in the incidence of cavity wall insulation in homes occupied by different types of households. Overall, some 68% of occupied homes with cavity walls were insulated. This proportion was higher for households where the HRP was aged 60 years or more (74%) and for households where someone had a long term illness or disability (73%), Figure 1.8. These groups have been targeted by Government schemes, such as Warm Front[7], CERT[8] and CESP[9], and the increased prevalence of this measure may reflect this.

1.33. Ethnic minority HRP households were notably less likely to have insulated cavity walls (56%) in their homes than their white counterparts (70%).This is partly because a higher proportion of ethnic minority HRP households lived in flats, and these were less likely to have insulated cavity walls (60%) than houses or bungalows (70%), Figure 1.8 and Annex Table 1.9.

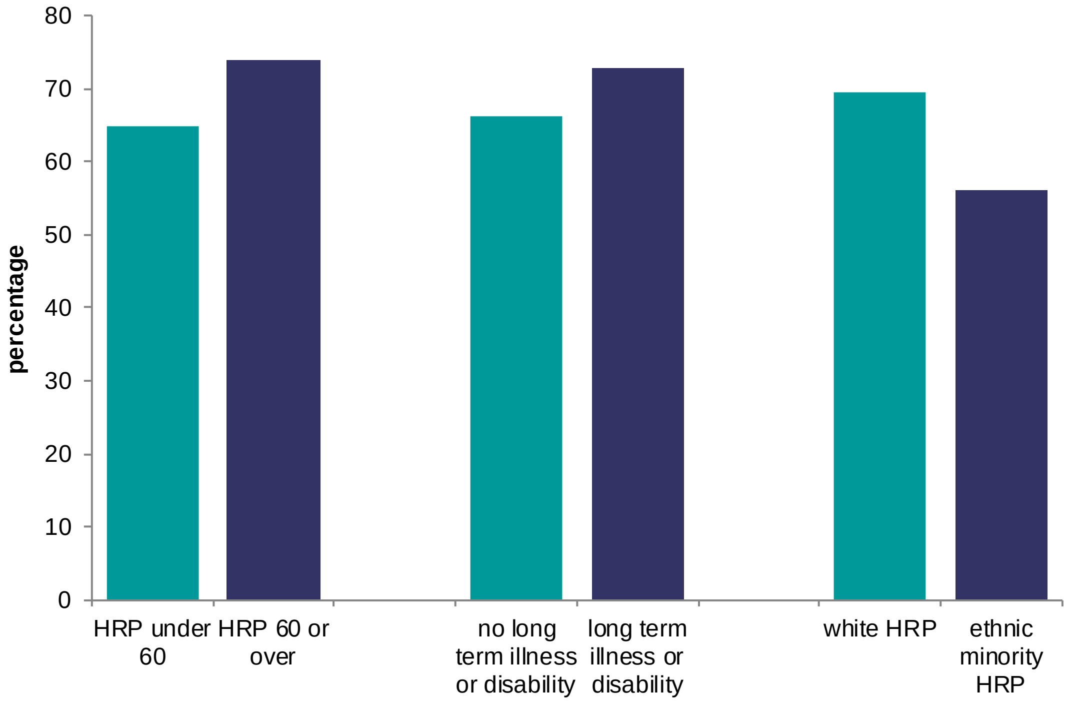
[6] For further discussion see DECC's research report *Green Deal and the Private Rented Sector* available from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/43019/3506-green-deal-consumer-research-prs.pdf

[7] The Warm Front scheme operated from 2000 to 2013. It was a programme designed to help vulnerable households, including those in fuel poverty, to benefit from energy efficiency improvements such as home heating and loft insulation measures.

[8] The Carbon Emissions Reduction Target (CERT) ran between 1 April 2008 and 31 December 2012. CERT required certain gas and electricity suppliers to achieve targets for reducing carbon emissions within domestic properties.

[9] The Community Energy Saving Programme (CESP) obligation period ran from 1 October 2009 to 31 December 2012. CESP was designed to promote a 'whole house' approach and to treat as many properties as possible in defined geographical areas.

Figure 1.8: Percentages of insulated cavity walls by household type, 2013

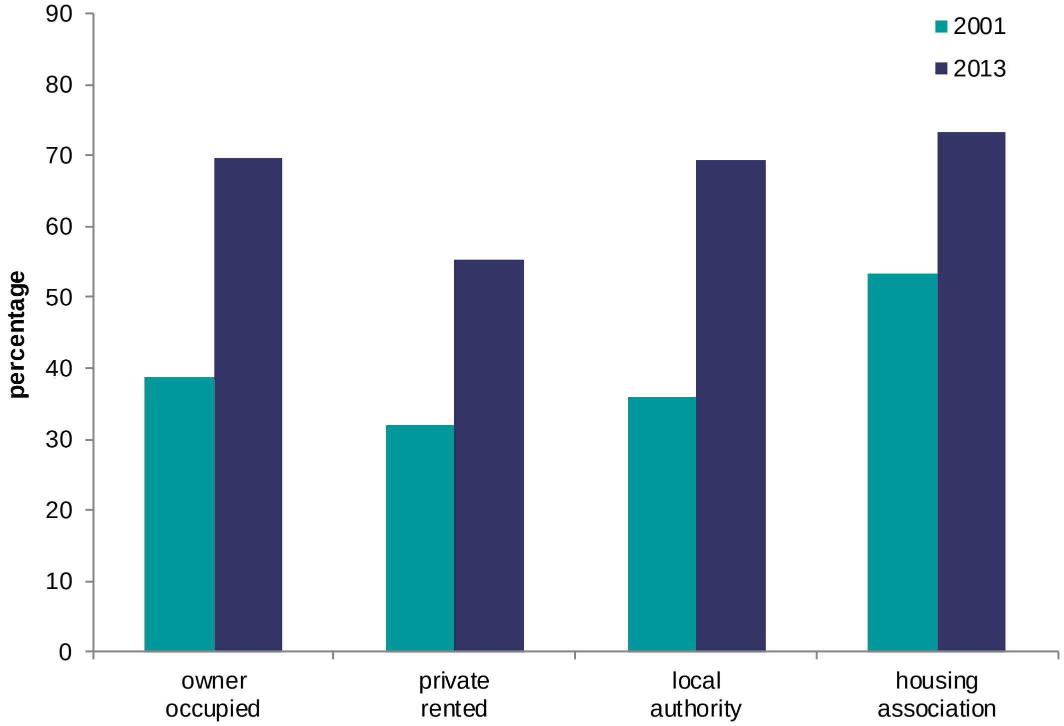


Base: all occupied homes with cavity walls
Note: underlying data are presented in Annex Table 1.10
Source: English Housing Survey, household sub-sample

Cavity wall insulation over time – all dwellings

1.34. There has been a marked increase in the number and proportion of homes with insulated cavity walls over time, from around 5.8 million (39% of all cavity wall dwellings) in 2001 to 10.8 million (68%) in 2013. This growth was particularly evident among local authority and owner occupied homes (up from 36% to 69% and from 39% to 70% respectively). Growth was less marked for housing association homes, but these homes had the highest proportion of insulated cavity walls in 2001, Figure 1.9.

Figure 1.9: Percentage of homes with insulated cavity walls by tenure, 2001 and 2013



Base: all dwellings with cavity walls
Note: underlying data are presented in Annex Tables 1.9 & 1.11
Sources:
2001: English House Condition Survey, dwelling sample
2013: English Housing Survey, dwelling sample

Solid wall insulation

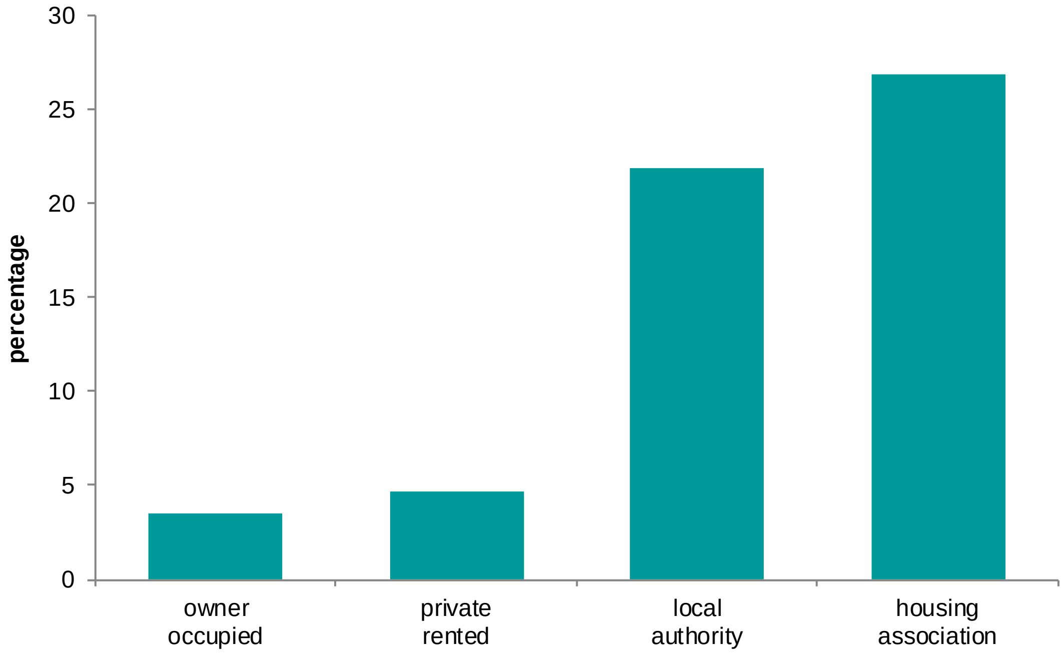
Box 1.3: Solid wall insulation

One common method of insulating solid walls is the application of external insulation. This involves fixing insulation boards or material to the outside walls and rendering over the top. Consequently, this means that the presence of projections such as bays or conservatories will affect the complexity and cost of the work as will the type and condition of the existing wall finish at the dwelling. There are additional factors which are likely to increase the costs and technical complexity of installation and these are explored in greater detail in Chapter 3 of this report.

Internal insulation can be added in a similar way using insulated plasterboard and a standard plaster finish or by constructing a timber frame inside the existing wall and filling this with mineral wool insulation, with a plasterboard and plaster finish. See Box 2 of Chapter 3 of this report for more details.

1.35. There were 6.8 million homes with solid walls in 2013, of which 450,000 (7%) had either internal or external insulation applied to the majority of their outer walls. Both housing association and local authority homes with solid walls were far more likely to have insulation (27% and 22% respectively) compared with private rented (5%) and owner occupied homes (4%), Figure 1.10.

Figure 1.10: Percentages of dwellings with solid walls that had insulation, by tenure, 2013



Base: all dwellings with solid walls
Note: underlying data are presented in Annex Tables 1.12
Source: English Housing Survey, dwelling sample

1.36. In London there were around 2 million homes with solid walls, and around 6% of these had some form of internal or external insulation. The proportion of insulated solid walls was similar for the rest of England (7%), Annex Table 1.12

1.37. The proportion of key household groups, who lived in homes with insulated solid walls varied considerably by tenure and within the social sector. In the private sector, only 4%-5% of these household groups, who lived in homes with solid walls, had solid wall insulation. For those living in solid walled social sector homes, the percentage with solid wall insulation varied from 17% of ethnic minority HRP households, to 30% of households with an HRP aged 60 years or more and those with someone with a long term illness, Annex Table 1.13.

Double glazing[10]

1.38. In 2013, the vast majority (80%) of homes were fully double glazed and a further 10% had more than half of their windows doubled glazed. Only a small proportion (6%) had no double glazing. Housing association and local authority homes were more likely to be fully double glazed (91% and 89% respectively), compared with owner occupied (79%) and private rented homes (74%). These differences reflect the energy improvements in the social sector undertaken as part of the Decent Homes programme and highlight the large scope for improvement in the private sector, Annex Table 1.14.

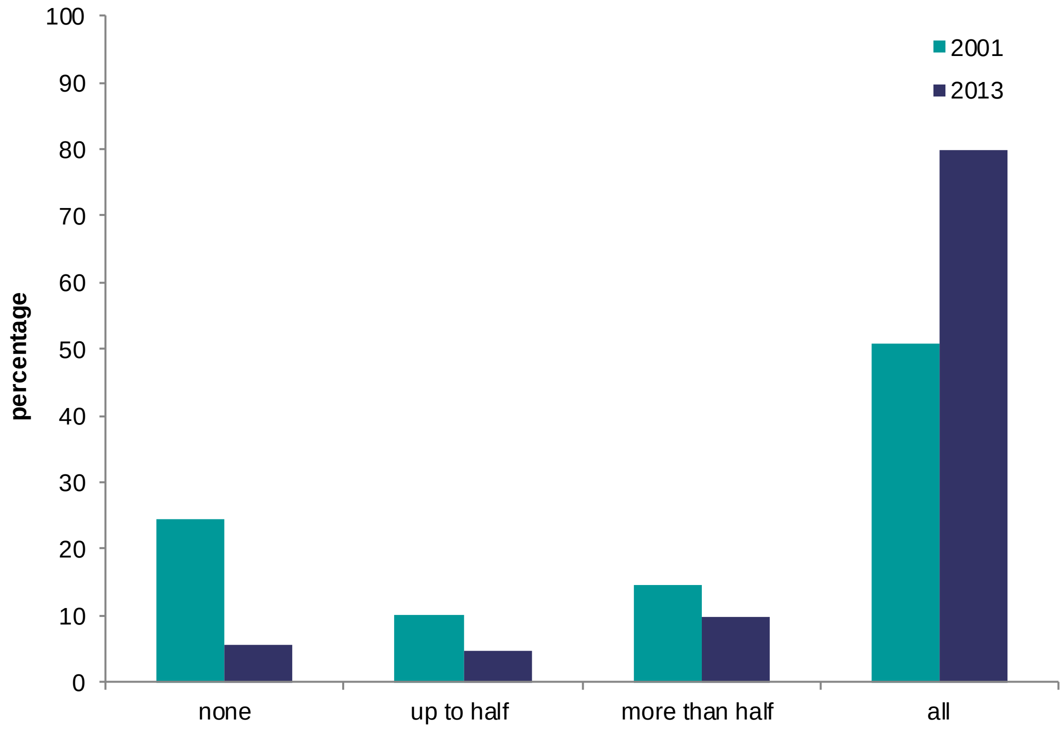
1.39. Overall, levels of double glazing were fairly similar for all types of households, and there were no notable differences among potentially vulnerable household groups, Annex Table 1.15

Double glazing over time – all dwellings

1.40. The proportion of homes that were fully double glazed increased markedly from 51% in 2001 to 80% 2013. Similarly, the proportion of homes with no double glazing fell from a quarter (25%) in 2001 to just 6% in 2013. This is mainly because, since 2006, Building Regulations have stipulated that all windows in new dwellings and most of those that are replaced in older dwellings should be double glazed, Figure 1.11.

[10] this covers factory made sealed window units only; see Glossary for further details

Figure 1.11: Degree of double glazing, 2001 and 2013



Base: dwellings
Note: underlying data are presented in Annex Table 1.16
Sources:
2001: English House Condition Survey, dwelling sample
2013: English Housing Survey, dwelling sample

Loft insulation

1.41. Current Building Regulations require new dwellings to have around 270mm of mineral wool loft insulation (or equivalent). It was not always possible in the survey to collect information on loft insulation, for example where the loft hatch was inaccessible or where the roof had a very shallow pitch with no access point. In addition, some homes have flat roofs which do not have a loft space. These cases together comprised 9% of all houses and top floor flats (roughly 1.8 million homes) in 2013[11], Annex Table 1.19. Details of the difficulties of installing or upgrading loft insulation are provided in Chapter 3 of this report.

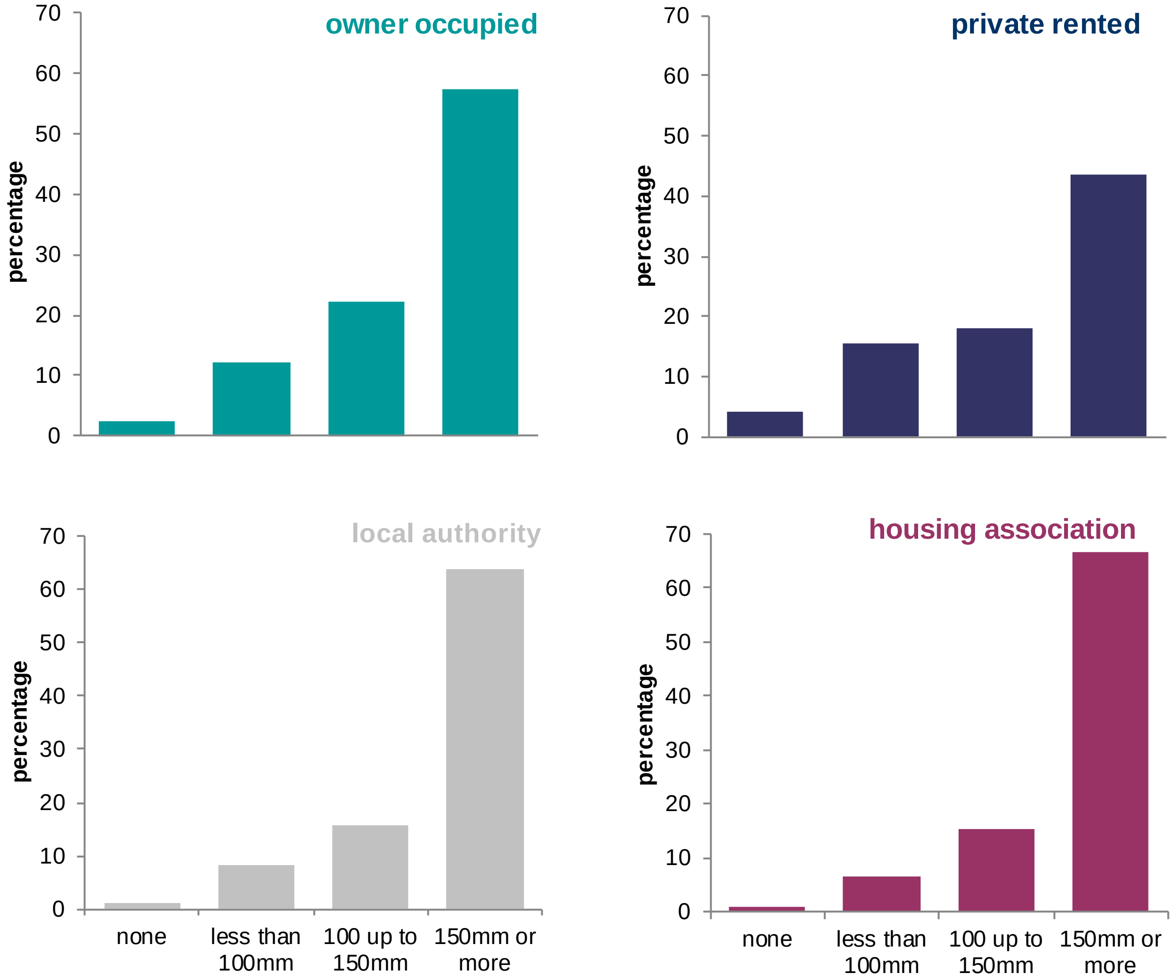
1.42. In 2013, 56% of dwellings with a loft space above had at least 150mm of insulation, but this varied by tenure. Although the private rented sector seemed to perform least well with 44% of homes with loft space having this level of insulation, Figure 1.12, we need to bear in mind that a further 19% of such homes had flat roofs or the information on loft space was not known,

[11] approximately 1.2 million homes had unknown levels of loft insulation, roughly 6% of all homes with a loft space

making it difficult to ascertain the potential for improvement, Annex Table 1.17.

1.43. Homes in the social sector were more likely to have insulation of 150mm or more: 67% of housing association homes and 64% of local authority homes had this level of loft insulation, Figure 1.12.

Figure 1.12: Percentage of dwellings with different amounts of loft insulation by tenure, 2013



Base: all houses and top floor flats
Note: underlying data are presented in Annex Table 1.17
Source: English Housing Survey, dwelling sample

Loft insulation – households

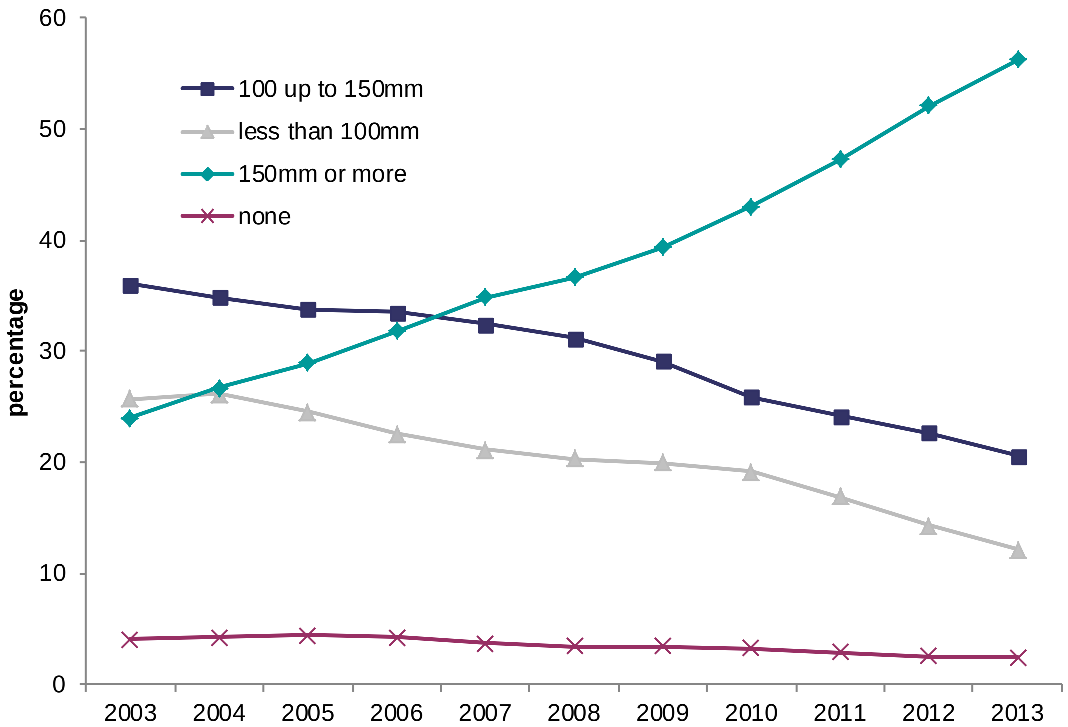
1.44. Of those occupied homes with loft space above, 57% had at least150mm of insulation. Households where the HRP was aged 60 years or over were more likely than households where the HRP was under this age to live in homes with this level of insulation, 62% compared with 53%. However, 10% of these households where the HRP was under 60 years of age lived in homes with either a flat roof or where insulation levels were unknown, Annex Table 1.18.

1.45. White HRP households were also more likely to have this higher level of insulation (57%) compared with ethnic minority HRP households (51%).

Loft insulation over time – all dwellings

1.46. Between 2003[12] and 2013, there was a marked increase in the proportion of homes with 150mm or more of loft insulation, from 24% to 56%. Conversely, the proportion of homes with less than 100mm of insulation halved from 26% to 13%. The proportion of homes with no insulation also fell steadily (from 4% to 2%), Figure 1.13.

Figure 1.13: Percentage of dwellings with different amounts of loft insulation, 2003-2013



Base: all houses and top floor flats
Note: underlying data are presented in Annex Table 1.19
Sources:
2003- 2007: English House Condition Survey, dwelling sample
2008 onwards: English Housing Survey, dwelling sample

1.47. Homes where the roof had a very shallow pitch with no access point and those that had flat roofs which did not have a loft space formed a consistent

[12] it is not possible to give equivalent 2001 figures for loft insulation as the English House Condition Survey only surveyed lofts in houses built before 1980 in this year

8%-10% of dwellings over the 2003 to 2013 period[13], Annex Table 1.19. These homes are analysed further in Chapter 2 of this report which focuses on the potential for improving energy efficiency.

Renewable energy

Box 1.4: The EHS and renewable energy

The EHS began collecting data on the presence of solar panels for hot water in 2008, and solar photovoltaic panels or domestic wind turbines for electricity production in 2009. Longer term monitoring of the presence of these items will be required before any definite trends can be discerned. Sample sizes for wind turbines are too small to provide robust estimates.

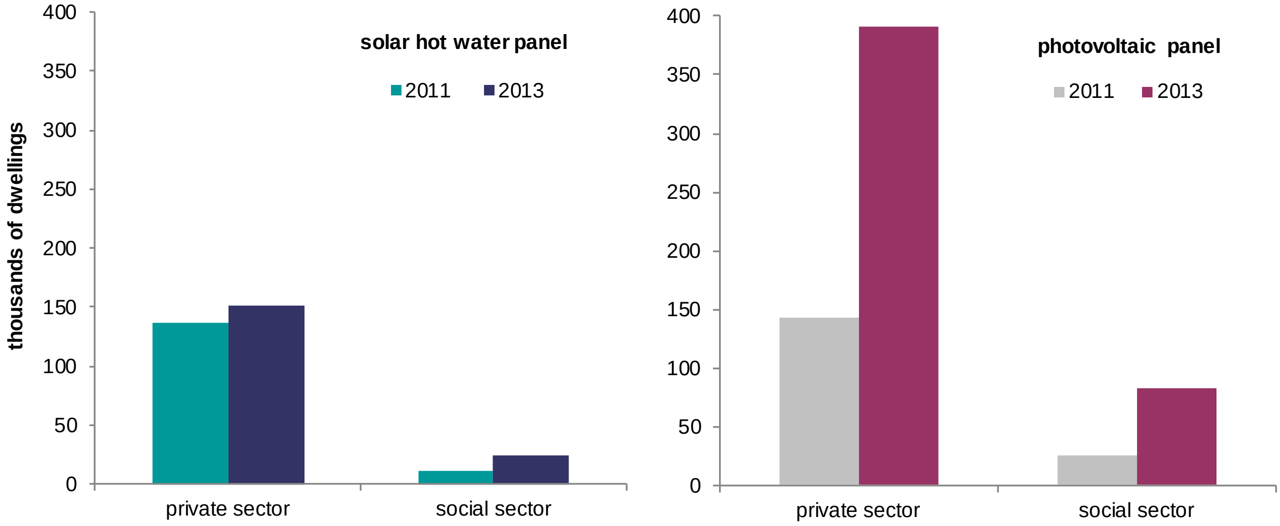
1.48. In 2013 there were an estimated 474,000 homes with photovoltaic panels and 176,000 with solar panels for hot water. The majority of these homes were in the private sector (83% and 86% respectively). Overall some 602,000 homes had some form of solar panel(s) for renewable energy, Annex Table 1.20.

1.49. There was a rise in the number of homes with these renewable energy measures from 2011 when around 295,000 had some form of solar panel. This increase may be partly due to the Feed-in Tariffs (FITs) scheme introduced in 2010, which rewarded investment in low-carbon technology.

1.50. The majority of these new installations were photovoltaic panels. Although the vast majority were in the private sector, the social sector has seen the highest proportional increase since 2011, Figure 1.14.

[13] like dwellings with flat roofs, these homes may be suitable for some roof insulation by either fitting insulated board below the current ceiling or lifting the roof cover and fitting insulation between the timbers

Figure 1.14: Number of renewable energy measures by type and tenure, 2011 and 2013



Base: dwellings with a renewable energy measure
Notes:
1) some dwellings had both types of measure
2) underlying data are presented in Annex Table 1.20
Sources: 2011 and 2013 English Housing Survey, dwelling sample

Appendix 1 SAP09 and SAP12 methodologies

1.51. The 2010, 2011 and 2012 EHS reports used the SAP09 methodology for energy efficiency comparisons, but this report uses the updated SAP12 methodology. The majority of the raw EHS data collected and used in the calculation are the same so the difference between the two sets of figures is due to different assumptions and values used in SAP12. Box 1.5 summarises the main differences between the two methods:

Box 1.5: Key differences between SAP09 and SAP12

In SAP12:

- climatic data has been extended to allow calculations using regional weather
- an allowance for height above sea level is incorporated into external temperature data
- CO_2 emission factors have been extensively revised
- fuel price and primary energy factors have been revised
- the options for heat losses from primary pipework have been extended

1.52. The 2012 changes in the SAP methodology are less far reaching than those which occurred following the transition from SAP05 to SAP09 in 2010. Differences in SAP ratings calculated under SAP2009 and SAP2012 mainly occur for dwellings using solid fuel; for further details see The Government's Standard Assessment Procedure for Energy Rating of Dwellings 2012 edition (SAP worksheet Table 15 p.231), (http://www.bre.co.uk/filelibrary/SAP/2012/SAP-2012_9-92.pdf).