Energy Use in Homes 2005

A series of reports on domestic energy use in England

Energy Efficiency

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This is one of a series of three reports on the energy characteristics of the stock as observed by the 2005 English House Condition Survey.

The reports in this series are:

1. Space and Water Heating
2. Thermal Insulation
3. Energy Efficiency

The English House Condition Survey is funded and provided courtesy of Communities and Local Government. More information about this survey can be found at www.communities.gov.uk/ehcs

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Energy Use in Homes 2005: Energy Efficiency

Executive Summary

The Standard Assessment Procedure (SAP) is the Government's recommended system for home energy rating. The SAP energy efficiency rating is based on the energy costs for space and water heating within each dwelling, representing a measure of the dwelling's energy efficiency. In the past the Energy Efficiency Update Reports have been based on the 2001 SAP Methodology. This report is based on the new 2005 SAP methodology which employs a scale of 1 to 100 for the rating, with a higher rating indicating a better level of energy efficiency.

The average SAP rating for the stock in 2005 is 48.1, representing an increase of 0.7 SAP points since 2004 and a 12 point increase since 1991. In 2005 10.2% of dwellings have a SAP rating less than 30 and 21.6% achieve a SAP rating greater than 60.

Physical characteristics of a dwelling can strongly influence SAP rating. Dwelling age is a particularly important factor. Generally, the mean SAP rating decreases as the dwelling age increases, with a lower proportion of older stock having SAP ratings greater than 60 and more having ratings less than 30 when compared to newer stock. The type of dwelling also highly influences SAP rating. Purpose built flats perform particularly well with over 60% achieving a SAP rating greater than 60 – nearly three times the proportion of any other dwelling type. However converted flats have the worst mean SAP rating at 43, five SAP points below the overall 2005 average SAP rating for the whole English housing stock. Among houses, the number of external walls is an important factor, with detached dwellings gaining the lowest average rating, and mid-terraces the best.

Other factors related to the specifications of the dwelling can determine SAP ratings. For example, the type of heating system and thermal insulation measures installed. The more effective these measures are, the more likely a higher SAP rating can be obtained. Therefore, unsurprisingly, dwellings with cavity wall insulation, the thickest loft insulation and entire dwelling double glazing have higher SAP ratings than those with lower levels or none of these insulation measures. Those dwellings with central heating tend to score higher SAP ratings than those without (i.e. those using portable and room heaters).

The social sector, which has seen significant growth in SAP rating over the last 15 years, has the highest energy efficiency rating with a mean SAP of 57 in 2005 compared to the private sector with a mean SAP rating of 46. This is related to the type of heating prevalent and lack of thermal insulation measures in the private housing stock when compared to social dwellings. Private rented stock, although still below the overall mean, has seen the largest increase in its SAP rating since 1991.

The average SAP rating also reduces as the household income increases. The lowest income quintile has the highest proportion of SAP ratings greater than 60 with 29%. This figure decreases for each successive income quintile where at the highest income quintile the value has reduced to 16%. This shows that targeting of energy efficiency measures in dwellings containing low income households has pushed the mean SAP rating of this group from being one of the lowest in the 1990's to the highest in 2005.

Energy Efficiency Update Report 2005

Summary

1. The mean SAP rating has increased steadily since 1991, with a further rise since the last update report in 2004.

2. In 2005, a greater number of dwellings have achieved a SAP of 60 or more (22%) than those with a SAP rating less than 30 (10%). This latter category represents 2.1 million English households. In 1991 the less than 30 SAP band represented over double this figure with 5.6 million.

3. The social sector, which has seen significant growth during the last 15 years, has the highest energy efficiency rating with a mean SAP of 57 in 2005 compared to the private sector with a mean SAP rating of 46. Private rented stock, although still below the overall mean, has seen the largest increase in its SAP rating since 1991.

4. The targeting of energy efficiency measures at dwellings containing low income households has pushed the mean SAP rating of this group from being one of the lowest in the 1990's to the highest in 2005.

Introduction

5. The Standard Assessment Procedure (SAP) is the Government's recommended system for home energy rating. The SAP energy efficiency rating is based on the energy costs for space and water heating within each dwelling, representing a measure of the dwelling's energy efficiency. In the past the Energy Efficiency Update Reports have been based on the 2001 SAP Methodology. This report is based on the new 2005 SAP methodology which employs a scale of 1 to 100 for the rating, with a higher rating indicating a better level of energy efficiency. The data and graphs for all years presented in this report have been derived using the 2005 SAP Methodology.

6. The calculation of the rating uses the estimated annual cost of energy required to achieve a standard temperature regime within the home, and to provide the household with appropriate supplies of hot water. The requirement for energy depends upon the size of the dwelling, so to achieve a measure of energy efficiency the energy use per square meter of floor area is used rather than the total energy requirement.

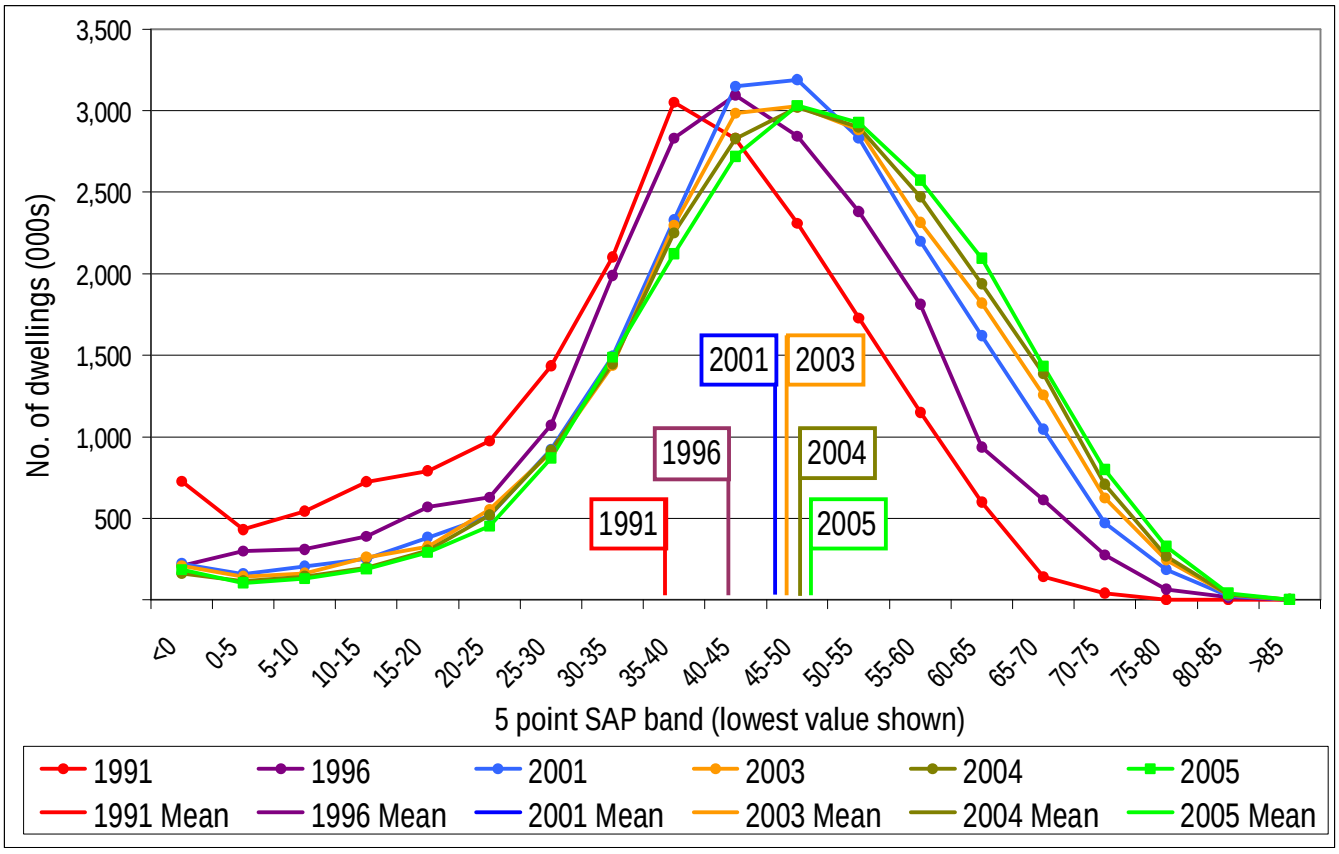

Figure 1: Distributions of 1991 to 2005 SAP ratings

7. This report examines SAP ratings as observed by the 2005 English House Condition Survey (EHCS). Since 2002 the EHCS has been in a continuous format, providing annual data which is then analysed in two-year datasets. This report presents temporal analysis based on the continuous survey and will also look at data from previous surveys conducted in 1991, 1996 and 2001.

8. Figure 1 on the previous page compares the SAP distributions of the 1991, 1996, 2001, 2003, 2004 and 2005 EHCS datasets. Over time we see several effects on this distribution, reflecting improvements in thermal insulation and heating standards. The peak of the distribution has moved by around 10 SAP points towards the higher end, along with the overall mean SAP of the stock, which has increased by 12 points in 14 years, from 36 in 1991 to 48 in 2005.

9. The distribution shift that occurs in Figure 1 towards the right from 1991 to 2005 reflects a combination of energy efficiency improvements made to dwellings and the effect of new building stock increasing each year (new build have higher SAP ratings due to stricter Building Regulations).

10. The overall shape of the distribution has become more symmetrical and more closely centred on the mean, as more low efficiency dwellings have been upgraded to conform to stricter building regulations. The following report will use EHCS data to examine typical SAP ratings categorised by distinct dwelling characteristics, whilst providing a link between household types and the energy efficiency of their dwellings. The report will then examine changes in mean SAP ratings for the total stock, and individual categories, over time.

11. The mean SAP rating will be used as a measure of relative energy efficiency throughout the report, as will a measure of the proportion of the stock falling above or below a certain rating. A SAP score of 60 is can be considered an acceptable standard under the SAP 2005 methodology for good energy efficiency.

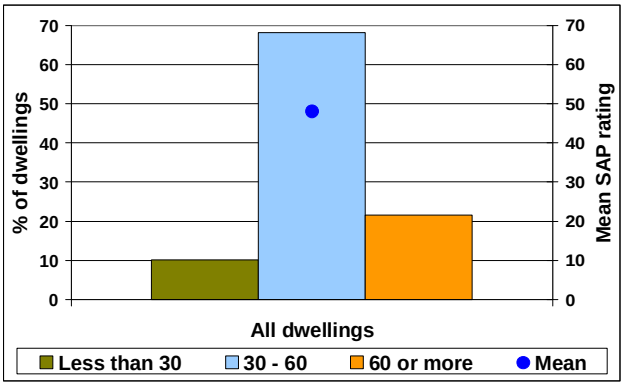

Figure 2: Spread of SAP ratings across all dwellings

12. Figure 2 shows the spread of the SAP rating across all dwellings in 2005. The largest percentage of dwellings falls in the SAP rating range 30-60 with a mean value of 48. Twenty-two percent of households have a SAP rating greater than 60, leaving a remaining 10% of dwellings with a SAP rating below 30.

13. Dwellings in the SAP band less than 30 are considered to be below minimum standard in terms of energy efficiency. In this report the key measure of energy efficiency is the balance between the 'less than 30' and 'greater than 60' bands.

Comparison Over Time

14. The average SAP rating of the housing stock has increased by 12 points between 1991 and 2005, gaining a little under a point per year until 2001 since when the increase has slowed slightly. The proportion of dwellings achieving scores above 60 has risen from just 4% in 1991 to 22% in 2005, an increase from 0.8 million dwellings to 4.7 million. The proportion of stock rated at less than 30 has fallen from 29% (5.6 million dwellings) in 1991 to 10% (2.2 million dwellings) in 2005. This left a central proportion with ratings between 30 and 60. This increased from 1991 from 67% to 74% in 1996. From 1996 this SAP band has decreased each year to 68% in 2005. This decrease from 1996 onwards occurs as the 60 or more category is increasing at a faster rate than the less than 30 category is decreasing. These figures are illustrated in Figure 3.

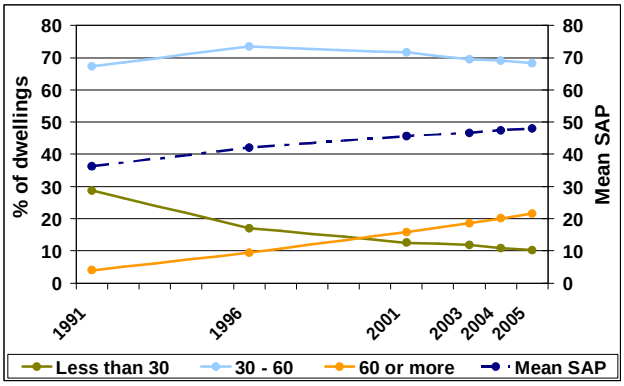

Figure 3: Timeline of SAP ratings for the total stock

Dwelling Type Analysis

Dwelling Type

15. Using the mean and high/low SAP bands to examine energy efficiency by dwelling in Figure 4, we see that no single dwelling type precisely matches the pattern shown in Figure 2. This is reflected in the range of

mean ratings, with the greatest difference being between purpose built flats and converted flats[1]. The latter have a mean of 43, which is 5 points below the stock average, whilst purpose built flats have a mean of almost 61, 15 points above the stock average.

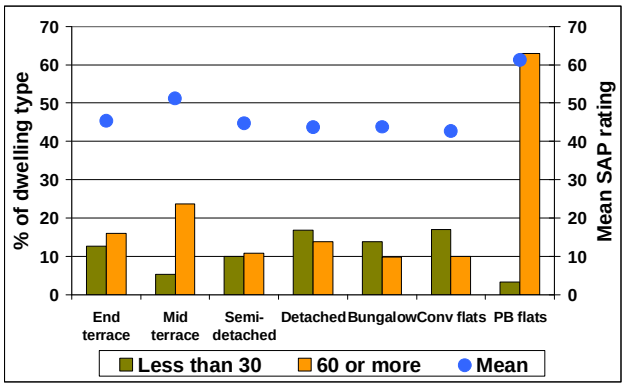

Figure 4: Comparison of highest and lowest SAP ratings by dwelling type

16. The good performance of purpose built flats is due to their typically small size and smaller area of external surfaces, giving a lower heat loss due to conduction through these surfaces. Purpose built flats are also more likely to be more recently constructed and therefore benefit from higher insulation and heating standards. The difference in types of flat is emphasised by the proportion with a SAP rating greater than 60: 63% of purpose built flats compared with only 10% of converted flats.

17. The size and shape of houses also has a close relationship with the energy efficiency rating: mid-terraced dwellings have the second highest mean SAP with 51. These are typically smaller than semi-detached and detached dwellings, and, by definition, have fewer external walls, reducing heat losses.

18. Figure 5 compares the SAP distribution of detached houses with purpose built flats for 2005. This Figure illustrates points 16 and 17, where the size and number of external walls affects the heat loss rate of the house which in turn affects the SAP rating. Detached houses are typically larger in size with a larger number of external walls, hence the second lowest mean SAP rating at 44. As mentioned in point 15, purpose built flats are typically smaller in size with fewer external walls, hence the curve for purpose built flats is distributed further to the right, with the peak of the distribution at around 61.

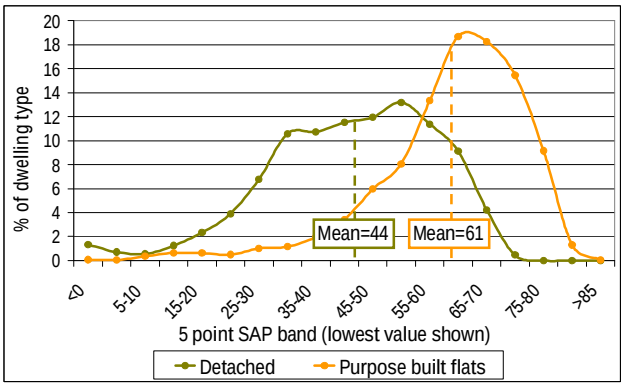

Figure 5: Distribution of SAP for detached houses and purpose built flats

19. All categories of dwelling type have seen a steady rise in mean SAP ratings between 1991 and 2005 (Figure 6), with the exception of converted flats which shows a fluctuating pattern, partially explained by the significant decrease in the numbers of this dwelling type over time. Purpose built flats show the largest total mean SAP increase, a rise of 19 points, making this the dwelling type with the highest mean in each survey since 1996.

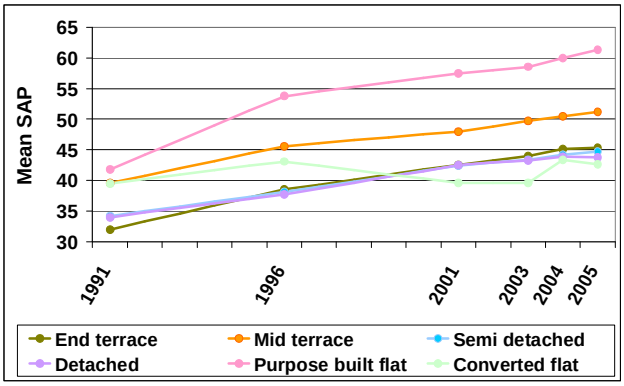

Figure 6: Timeline of mean SAP ratings by dwelling type

20. Mid-terraced houses come the closest to matching the performance of purpose built flats. The mean SAP rating for end terrace, semi-detached and detached have followed a very similar pattern from 1991 to 2005, increasing from around 32-34 in 1991 to 44-45 in 2005.

21. Figure 7 gives an alternative view of the relative improvements in energy efficiency which shows the change in the percentage of households with a SAP rating less than 30 over time, split by dwelling type.

[1] The converted flat category also includes a small number of non-residential flats.

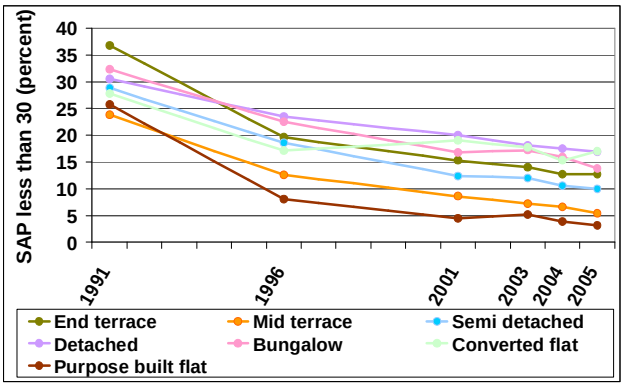

Figure 7: Timeline of percentage of SAP less than 30 by dwelling type

Dwelling Age

22. There is a distinct correlation between dwelling age and SAP rating. The SAP distribution of pre 1919 and post 1990 houses using 2005 data is shown in Figure 8. The distribution curve for post 1990 houses is much further towards the right than for pre-1919 houses. Homes built before 1919 average a SAP rating of 39 with 23% of this age group rating below 30 and only 3% achieving above 60. Dwellings built since 1990 attain far higher SAP ratings, with an average of 65. Just 1% of this category has a SAP rating less than 30, whilst 76% achieve a SAP rating greater than 60. This most recent construction date category is one of the few areas in which the majority of dwellings are found outside the central 30 – 60 SAP rating band, identified at the beginning of this section.

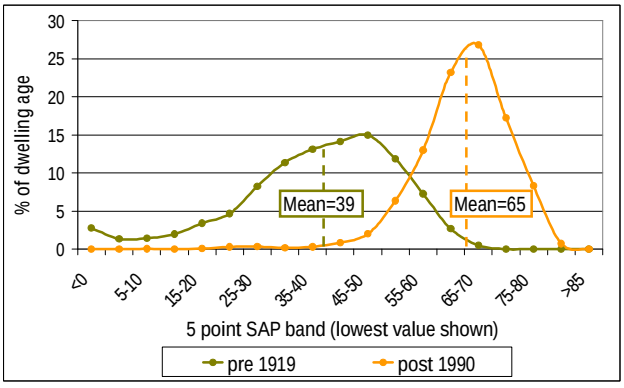

Figure 8: Distribution of SAP within the oldest and newest housing stock

23. The trend of higher SAP ratings in newer dwellings continues between 1919 and 1980 (see detailed tables), with mean SAP ratings of 43 where the construction date is between 1919 and 1944, 48 between 1945 and 1964, 51 between 1965 and 1980 and a mean of 55.9 in the 1980 to 1990 age band.

24. Examining the construction date bands by mean SAP rating we see a similar trend for each category, with the order of the age bands unchanged in each survey year (Figure 9). Between 1991 and 2005 we see each mean rising by between 8 and 12 SAP points.

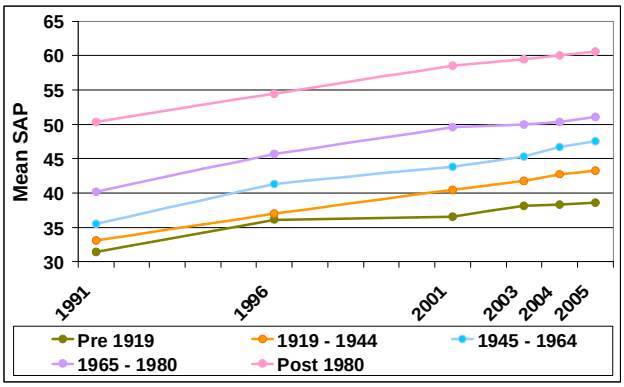

Figure 9: Timeline of mean SAP ratings by dwelling age

25. After 1996 the smallest increase has come in the oldest stock (pre-1919), suggesting a high level of stock in this category that cannot easily have its energy efficiency measures improved. This is dealt with in more detail in the Hard to Treat Homes focus report. The proportion of post 1980 dwellings with SAP values greater than 60 has increased steeply from 21% in 1991 to 64% in 2004, reflecting the standards to which new build stock has adhered to during that time.

Floor Area

26. The impact of dwelling size (here measured in total floor area) can be seen in Figure 10. The stock has been split into floor area quintiles[2] and the mean and banded SAP ratings compared. The higher average SAP ratings are found in homes with smaller floor areas and the lower average SAP ratings are found in homes with larger floor areas. The proportion of dwellings with ratings above 60 falls from 43% of the lowest floor area quintile to 12% of the highest floor area quintile, whilst the proportion of dwellings with a SAP rating less than 30 increases from 8% of the smallest floor area quintile to 16% of the largest floor area quintile.

[2] Five equal bands each representing 20% of the stock.

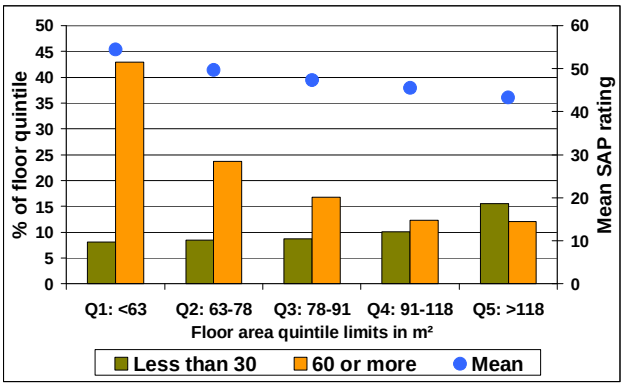

Figure 10: Comparison of highest and lowest SAP ratings by floor area quintile

27. The distribution of the SAP within the highest and lowest floor area quintile is shown in Figure 11. The largest floor area quintile is normally distributed with a mean SAP rating of 43. The smallest floor area quintile is distributed to the right of the largest with a mean SAP rating of 54. This shift towards the right can be partly attributed to a high number of energy efficient purpose built flats within the 1st quintile.

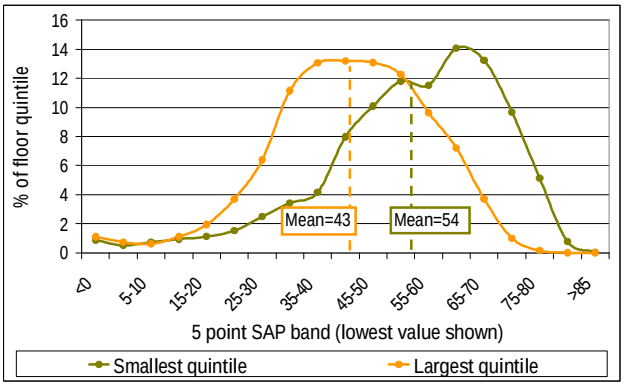

Figure 11: Distribution of SAP between the highest and lowest floor area quintile

Energy Efficiency Measures

28. The SAP rating is, of course, driven by the levels of insulation and types of heating system present in each dwelling, as well as the size and shape of the dwelling, so strong correlations between the system and the score would be expected. However, it is useful to look at the impact that such measures have on the rating, as these measures often predominate in a particular dwelling or household type with a correspondingly high or low mean SAP rating.

Heating Systems

29. A comparison of central heating systems against non-central heating is shown in Figure 12, with the latter category including all fixed and portable room heaters. A more detailed breakdown of individual heating systems is given in Table 1.

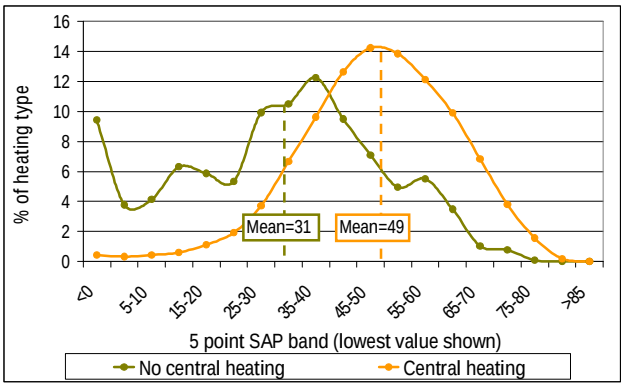

Figure 12: Comparison of SAP distribution by primary heating category

30. Dwellings using non-central heating systems have significantly lower SAP ratings, with a mean of 31, compared with 49 for centrally heated homes. Only 5% of non centrally heated dwellings have SAP ratings above 60, whilst 22% of centrally heated stock have a SAP rating greater than 60.

31. Boiler systems with radiators make up 85% of the total heating systems in the English housing stock. This category has the greatest influence on the overall mean SAP rating. As shown in Table 1 the boiler system with radiator category itself has a mean SAP of 49.0, with 7% of boiler systems with radiators having a SAP rating less than 30 and 21% with a SAP rating greater than 60. Communally heated homes make up 1.5% of the total heating systems and have the highest mean SAP rating out of the seven heating categories at 68.5. In total 82% of communal systems have a SAP rating greater than 60 and only 1% of this category has a SAP rating less than 30.

Type of Heating System	Less than 30	More than 60	Mean SAP
Boiler system with radiators	7%	21%	49.0
Storage radiators	27%	23%	42.8
Warm air system	7%	24%	49.3
Room heater	43%	6%	31.5
Other systems	56%	0%	32.0
Communal	1%	82%	68.5
Portable heaters only	94%	0%	13.7
Total	10%	22%	48.1

Table 1: Comparison of SAP ratings among heating systems

32. The high SAP rating of communally heated homes can be attributed to a large proportion (86%) being found in purpose built flats. As mentioned in paragraph 16, the good performance of purpose built flats in general is due to their typically small size with a smaller external surface area giving them a lower heat loss value.

33. Room and portable heaters (which combined make up the non-central heating category shown in Figure 10) have the two lowest mean SAP ratings out of the seven heating system categories with 31.5 and 13.7 respectively. Ninety-four percent of portable heaters have a SAP rating less than 30 and none have a SAP greater than 60. Combined, these categories only contribute towards 4.5% of the total heating systems in English housing, therefore have little influence on the overall mean SAP value. The low SAP rating of non-central heating homes is characterised by older homes predominating in their use of room heaters: 9% of pre-1919 dwellings compared with less than 1% of post-1990 stock.

Fuel Use

34. As with the heating system, the SAP rating of a dwelling depends strongly on the primary fuel used for its heating. Figure 13 shows the comparison of SAP ratings by primary heating fuel, split between gas, oil, solid fuel and electrical systems.

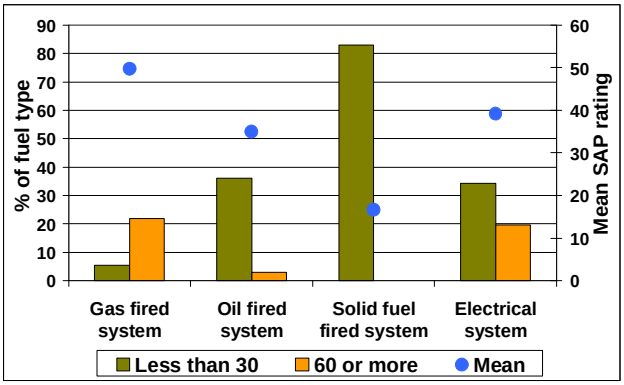

Figure 13: Comparison of SAP ratings by primary heating fuel

35. Gas is the predominant fuel (86% of the total fuel type) and therefore has the most influence on the overall mean SAP. Gas has the highest mean SAP at 50 (just above the average SAP of 49) and is also the only fuel with a higher proportion of stock rating at above 60 than below 30. Dwellings with oil, solid fuel and electric systems all have means below the stock average with 35%, 17% and 39% respectively, with no dwellings heated by solid fuel achieving a SAP rating of above 60.

36. The distribution of the heating fuel with the highest and lowest average SAP (gas and solid fuel) is shown in Figure 14. Solid fuel fired systems include coal, wood, anthracite and manufactured smokeless fuels. In total these heating systems represent 0.3 million homes (1.5% of the English housing stock) and are found in double the proportion of vacant dwellings than inhabited ones.

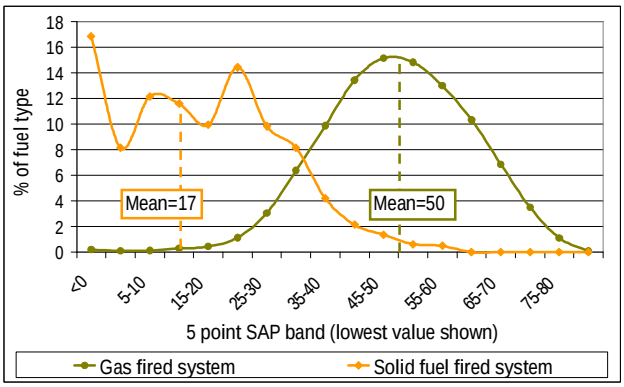

Figure 14: Comparison of SAP distribution by gas and solid fuel fired systems

Thermal Insulation

37. A further driver of the SAP rating system is thermal insulation measures within a dwelling, therefore a strong correlation between high SAP ratings and effective insulation measures is expected and this is supported by the 2005 data.

38. Figure 15 shows that dwellings with unfilled cavity walls have a higher average SAP rating (at 48) than non-cavity walled stock (41), with insulated cavity walls (56) out-performing the average SAP of those without insulation.

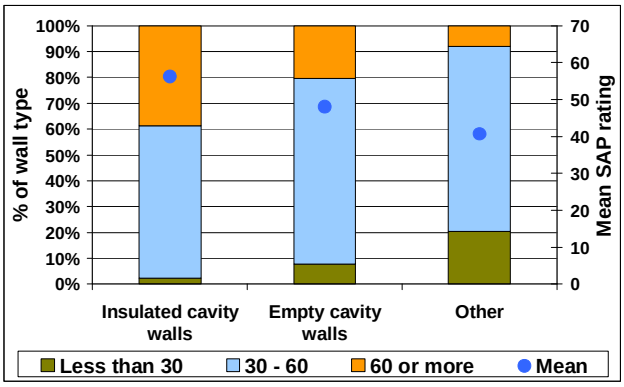

Figure 15: Comparison of SAP distribution by wall type

39. Those with filled cavities are predominantly newer dwellings with insulation fitted at the time of construction, while solid walls are found more commonly in older stock. Retrospectively fitting

insulation to a solid wall can significantly improve the SAP rating, but is often prohibitively expensive.

40. In Figure 16 we also see a pattern of higher SAP ratings with thicker levels of loft insulation. The mean SAP increases from 34 where no insulation is present to 52 where insulation is greater than 200mm. The 101 – 150mm band is where we first see more dwellings with ratings of over 60 than below 30.

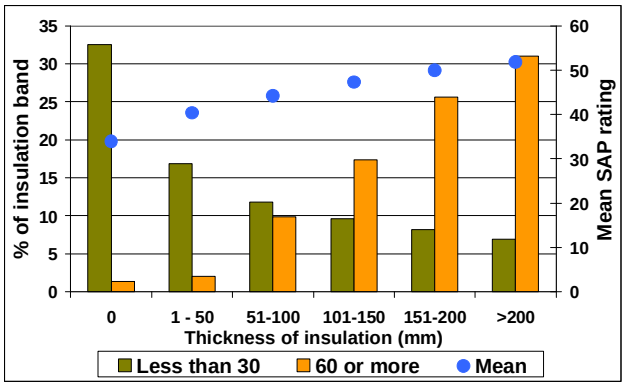

Figure 16: Comparison of highest and lowest SAP ratings by depth of loft insulation

41. The difference in the SAP distribution between households with no loft insulation and households with greater than 200mm of loft insulation is illustrated in Figure 17. The >200mm loft insulation distribution curve is shifted further towards the right than the distribution curve for households with no loft insulation.

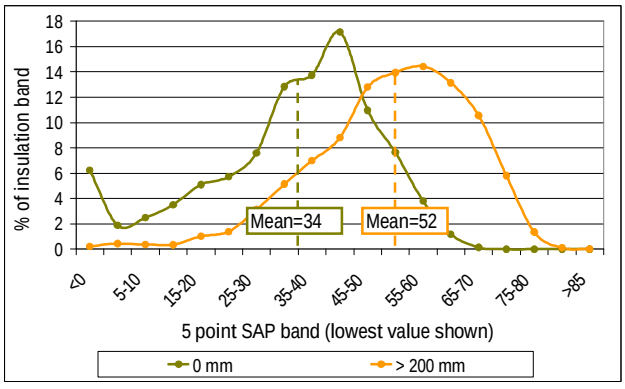

Figure 17: SAP distribution by loft insulation thickness

42. Another construction element affecting thermal insulation is the extent of double-glazing used in a dwelling. Stock which uses double-glazing in all windows has an average SAP rating of 51, whilst dwellings with little or no double-glazing typically have a SAP rating of 42. It has also been found that entirely double-glazed dwellings comprise of 74% of the 'SAP greater than 60' category and only 33% of the 'SAP less than 30' category.

43. It should be noted however, that the nine point difference observed in paragraph 42 is only partly due to the extent of double glazing. Other energy efficiency measures are more likely to be found in stock with a lot of double glazing, which will also contribute to a high SAP rating. For example, although dwellings with full double glazing make up 58% of the total stock, they account for 72% of homes with insulated cavity walls and just 41% of those with non-cavity walls. Likewise, dwellings with full double glazing account for 68% of homes with loft insulation greater than 200mm and only 38% of homes with no loft insulation.

Dwelling Location Analysis

Government Office Region (GOR)

44. Figure 18 compares the highest and lowest SAP ratings by GOR. Individual differences between each GOR exist but the mean only fluctuates by five SAP rating points between the nine GORs. London has the highest proportion of households with a SAP rating of 60 or more at 28%, the lowest proportion of households with a SAP rating of less than 30 at 6% and the highest overall mean SAP rating of 51. At the opposite end of the spectrum, the South West has the largest proportion of households with a SAP rating of less than 30 at 15% and the lowest overall mean SAP rating of 46.

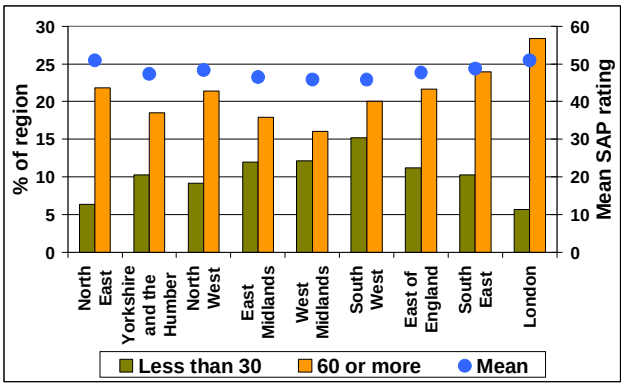

Figure 18: Comparison of highest and lowest SAP ratings by region

45. The distribution of the SAP within the London and South West GOR is shown in Figure 19. The distribution graph shows that the curve for London is slightly further to the right than the curve for the South West, which indicates that London has a slightly higher mean SAP rating than the South West.

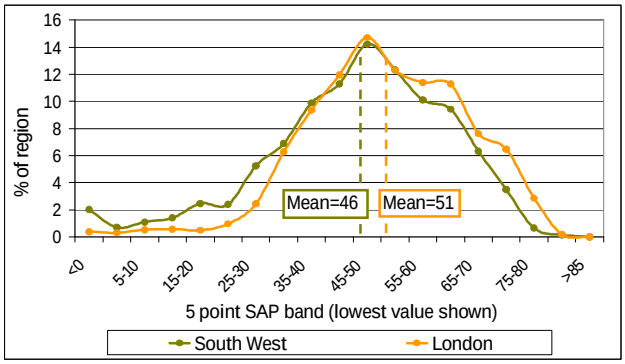

Figure 19: Distribution of SAP within the South West and London regions

46. The energy efficiency performance of the South West can be partially attributed to a relatively high proportion of stock in this region off the gas network and, as a consequence, more non-centrally heated homes, with a relatively high use of heating oil. There is also a lower than average proportion of dwellings with insulated cavity walls in the South West. The high mean SAP in London can be attributed to the very high proportion of flats found in the region, despite the greater age of this stock and relatively low incidence of cavity walls and thicker loft insulation.

47. Where, in Figure 19, SAP was investigated in groups of GORs, Table 2 displays a league table of each individual region by mean SAP, across each survey year. In all but one year London has the mean highest SAP rating out of the nine regions. The North East generally comes second in the rank, followed by the South East in third position. The North-West and Yorkshire and Humber have a mid range mean SAP rating, generally coming fourth and fifth in the rank. The mean SAP rating for the East Midlands primarily comes in seventh position, followed by the South West in eight position and the West Midlands in ninth. These last three regions have remained below the other regions due to their lower access to mains gas or low levels of cavity walls.

Region	1991	1996	2001	2003	2004	2005
London	1	1	1	2	1	1
North East	3	2	2	1	2	2
South East	2	3	3	3	3	3
North West	5	4	4	4	4	4
Eastern	4	5	5	6	5	5
Yorks and Humber	7	6	6	5	6	6
East Midlands	6	7	8	7	7	7
South West	9	8	9	8	8	8
West Midlands	8	9	7	9	9	9

Table 2: Ranking of region by mean SAP since 1991

48. A further set of comparisons can be drawn by looking at the neighbourhood surrounding a dwelling, shown in Figure 20.

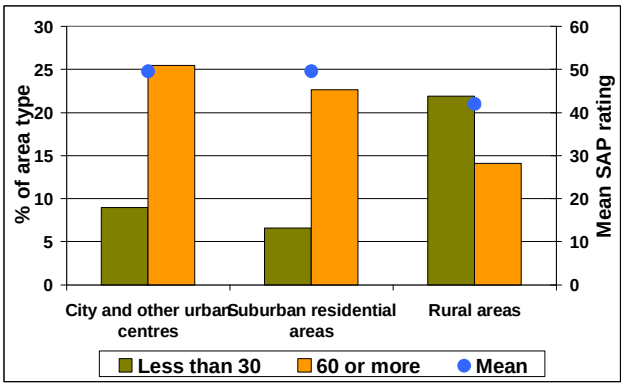

Figure 20: Comparison of SAP distribution by area category

49. Dwellings in city centre[3] and other urban centres[4] and suburban[5] locations both achieve an average SAP rating of 50, whilst dwellings located in rural areas[6] average a much lower SAP rating of 42. Twenty-one percent of rural dwellings have a SAP less than 30 compared with only 9% for city centre/urban centre dwellings and 7% for suburban residential dwellings.

50. Central heating is predominant in both rural and suburban dwellings; however the high proportion of detached dwellings found in rural stock relies on oil or solid fuels to a far greater extent than the gas powered city and suburban homes. They also have a lower incidence of the more efficient combination boilers; all effects which lead to the lower observed mean SAP rating.

Tenure Analysis

Occupancy

51. As illustrated in Figure 21 there is some difference between the mean SAP rating and the occupancy i.e. whether the dwelling is occupied or vacant. The occupied housing stock has a mean SAP of 48, one SAP point greater than the vacant housing stock at 47. This small difference in the SAP can be attributed to a higher proportion of vacant stock being reliant on non-central heating and being poorly insulated when compared to occupied dwellings.

[3] The area immediately surrounding the core of large cities.
[4] The area around the core of towns and small cities.
[5] The outer area of a town or city.
[6] Traditional villages or the heart of old villages/isolated dwellings, small hamlets.

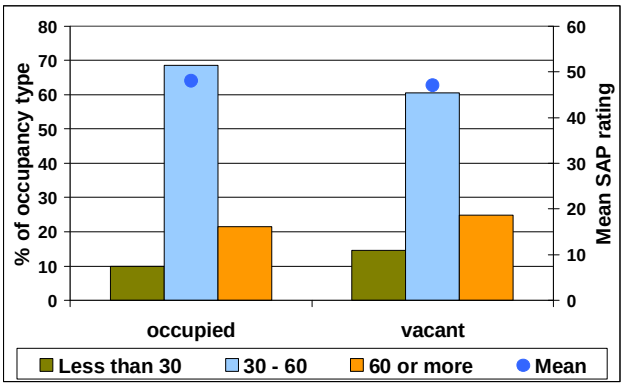

Figure 21: Comparison of SAP distribution by occupancy type

52. Occupied dwellings also have a slightly smaller proportion of the stock with a SAP rating less than 30 at 10% compared to 15% in vacant dwellings. However, 25% of vacant dwellings have a SAP rating greater than 60 compared to 21% in occupied dwellings. This is due to a relatively large number of vacant purpose built flats.

Tenure

53. As demonstrated in the accompanying Energy Use in Homes reports, varying levels of insulation and proportions of different heating systems are associated with the different tenure categories, and this is reflected in their typical SAP ratings. Figure 22 compares SAP ratings to quantify the effects of energy efficiency measures within the tenures.

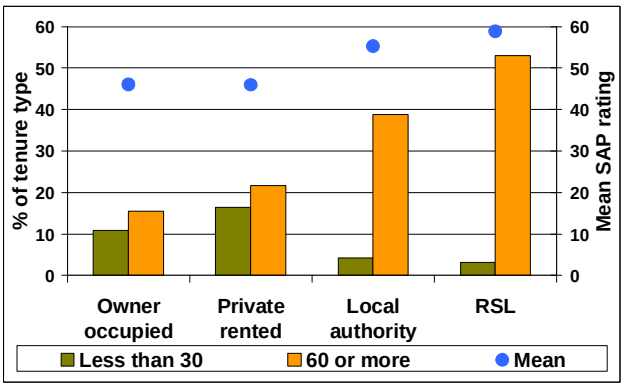

Figure 22: Comparison of SAP distribution by tenure

54. Figure 22 shows that private rented and owner occupied dwellings both have the lowest average SAP rating at 46. Sixteen percent of private rented and 11% of owner occupied fall into the 'SAP less than 30' category, with 22% and 16% respectively having a SAP greater than 60. These statistics are significantly lower than the most energy efficient tenure, the RSL sector, which averages 59, with only 3% of its stock in the lowest SAP band (less than 30) and 53% above a SAP rating of 60. Local authority dwellings reach an average SAP rating of 55, with 4% of its stock in the lowest SAP band (less than 30) and 39% above a SAP rating of 60.

55. Comparing the tenure categories to physical features (as discussed earlier under energy efficiency measures), it can be seen that a higher than average proportion of private rented dwellings use non-central heating for their primary space and water heating systems. In particular they rely on electricity as a primary fuel source. The private rented tenure also has the lowest incidence of insulated cavity walls and contains the highest proportion of solid walls as well as having a higher proportion of uninsulated lofts than other tenures. These are all contributory factors to the low energy efficiency performance in this sector.

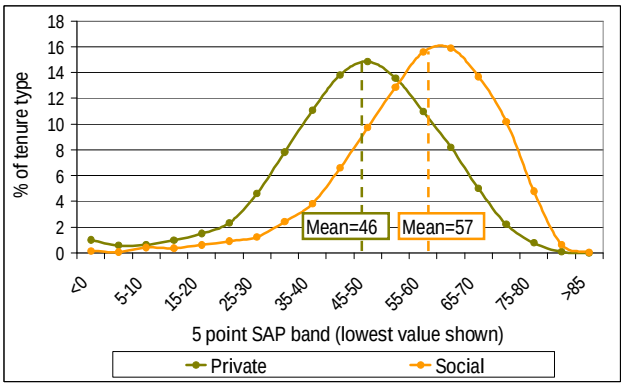

Figure 23: SAP distribution by tenure type

56. Figure 23 further demonstrates the variation in the SAP distribution ratings between the tenures by grouping private (owner occupied and private rented) and social (LA and RSL) tenures together. The private sector distribution curve displays a normal distribution curve with a mean SAP rating of 46. The social sector curve is distributed further to the right with a mean SAP rating of 57, 11 SAP points greater than the average private sector value. The social sector has 45% of the housing stock with a SAP greater than 60 compared to only 16% in the private sector, whilst the social sector has only 4% of the housing stock below a SAP of 30 compared to 12% in the private sector.

57. Figure 24 demonstrates the rise of the social tenures in terms of energy efficiency since 1991. The local authority and the registered social landlord (RSL) tenure have had the highest mean SAP rating since 1991. The RSL tenure has increased by the greatest number of SAP points from a mean of 40 in 1991 to a mean of 59 in 2005 (a 19 point increase). The owner occupied tenure has had the lowest mean SAP rating rise from 1991 to 2005, increasing by only eight SAP points. The private rented sector has gone from having the lowest mean SAP of 28 in 1991, increasing up to 46 in 2005, a value on par with the owner occupied tenure.

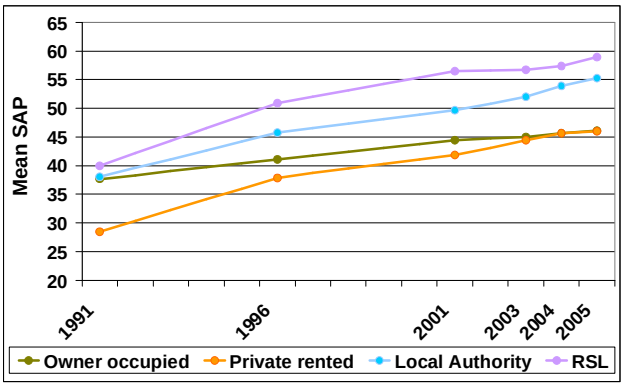

Figure 24: Timeline of mean SAP ratings by tenure

58. The change in the percentage of households with a SAP rating less than 30 over time can be seen in Figure 25. In 2005 the local authority and RSL have the lowest proportion of households with a SAP rating less than 30 with 4% and 3% respectively. The owner occupied tenure went from having the lowest proportion of households with a SAP less than 30 with 23% in 1991 to having the third highest proportion of households with a SAP less than 30 in 2005 with 11%. The private rented tenure has seen the greatest decrease in the percentage of households with a SAP less than 30, decreasing from 48% in 1991 to 16% in 2005. However, this tenure still has the greatest percentage of households with a SAP less than 30.

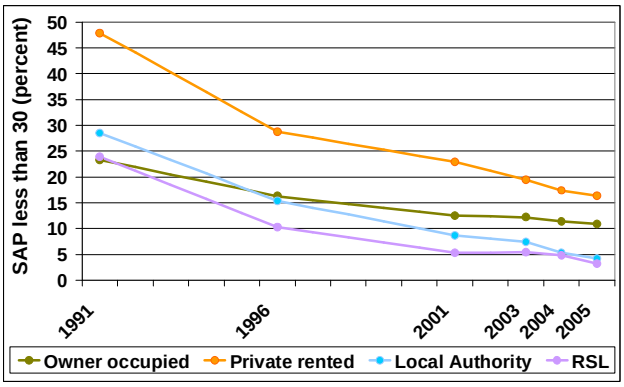

Figure 25: Timeline of percentage of SAP less than 30 by tenure

Household Analysis

Household Type

59. Household composition is split into seven categories; couple under 60, couple over 60, couple with children, lone parent with children, large adult household, one person under 60 and over person over 60. The SAP ratings vary according to the type of household, but Figure 26 groups the categories into those with similar mean SAP scores into adults only, families and single people.

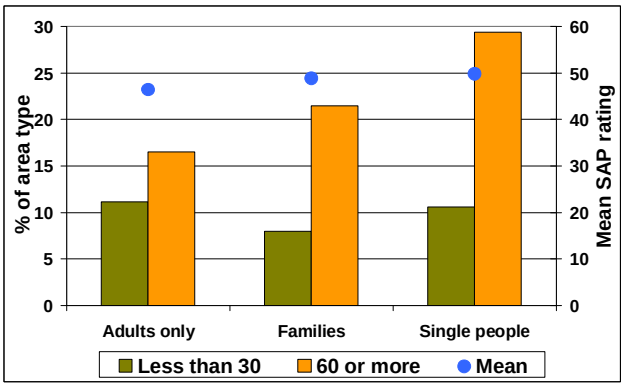

Figure 26: Comparison of SAP distribution by household type

60. The highest average rating occurs in dwellings containing single people (one person over/under 60) with a mean average SAP of 50. This reflects the high incidence of this category residing in purpose built flats. The second highest average rating occurs in dwellings consisting of families (parent(s) with dependent children) with an average SAP of 49, just one SAP point below single person households. Families are the most likely to use gas central heating systems, as well as the most likely to have a boiler and to centrally heat their water – both beneficial energy efficiency measures. Over 20% of lone parents with dependent children live in RSL dwellings, which have the highest SAP ratings. Lastly, adult only households (couples and other multi-person households) have the lowest average SAP with 46. This can be partly attributed to adult only households being the most likely to live in detached houses and the least likely to live in more modern energy efficient dwellings (post 1980).

61. Figure 27 displays the SAP distribution curve for the highest and lowest household representative category (16 to 29 and 65 and over). From this distribution graph it can be seen that older household representatives have a lower average SAP than younger household representatives. Households in which the Household Reference Person (HRP)[7] is 65 or over have an average SAP of 47, compared to 53 where the HRP is between 16 to 29. This is partly due to a relatively high proportion of younger households living in purpose built flats and a higher proportion also living in London, which has the highest regional mean SAP.

[7] The HRP is the person in whose name the dwelling is owned or rented. Where there are joint householders the person with the highest income and then highest age is the HRP.

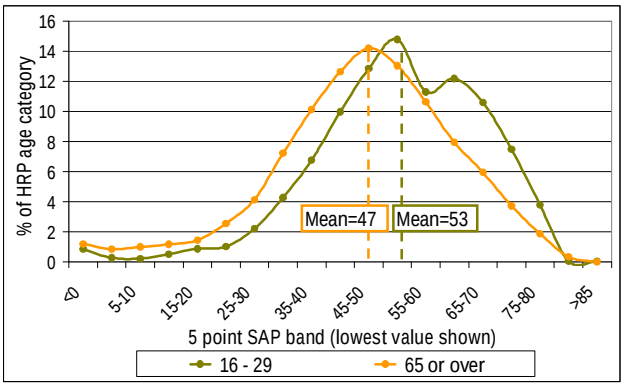

Figure 27: Comparison of SAP distribution by age of household response person

62. A timeline of change in mean SAP for the three categories of household composition (adults only, families and single people) is shown in Figure 28. The graph illustrates that all three household categories have increased in their mean SAP rating year on year from 1991 to 2005. In 1991 family households had the highest mean SAP rating with a value of 40. However, since 1991 single person households have gone from having the lowest mean SAP rating with 36 to having the highest mean SAP rating in 2005 with a value of 50. From the early 1990's onwards, adult only households have had the lowest mean SAP. In 2005 the mean SAP value for adult only households was 46.

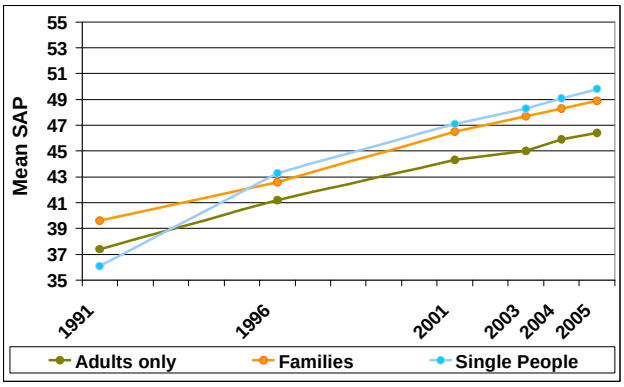

Figure 28: Timeline of mean SAP ratings by household composition

Income

63. Examining the mean energy efficiency ratings against income it can be seen (from Figure 22) that the average SAP rating reduces as the household income increase. Figure 29 separates the net income of all households into quintiles and looks at the SAP distribution within each quintile. A household in the lowest income quintile (less than £9,000) has an average SAP of 50. For the second, third and fourth income quintiles the average SAP rating is 49, 48 and 47 respectively. For the highest income quintile, (greater than £33,000) the average SAP rating is 46. There is a difference of four SAP points between the highest and lowest income quintiles.

64. Figure 29 also shows that the lowest quintile has the highest proportion of SAP ratings greater than 60 with 29%. This figure decreases for each successive income quintile where at the highest income quintile the value has reduced to 16%.

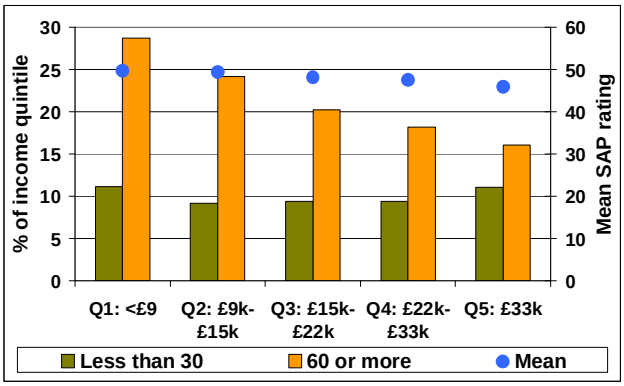

Figure 29: Comparison of highest and lowest SAP ratings by income quintile

65. One reason for this can be found in the types of dwelling that high and low income households typically live in. Forty-six percent of detached houses are occupied by households in the 5th income quintile, while 39% of purpose built flats occur in the 1st income quintile. The high income households in large detached dwellings will be able to afford energy efficiency measures, but the size of the dwelling will restrict its ability to attain a very high SAP rating. Conversely the low income households will benefit from the high average SAP rating achieved by purpose built flats and terraced dwellings,.

66. Although the lowest income households have the highest average SAP and the highest percentage of household with a SAP of 60 or more, this category also has the greatest proportion of households with a SAP rating less than 30. This may be due to the fact that the poorest households have dwellings in poor repair, reducing their energy efficiency and hence their SAP ratings, therefore increasing the numbers in the less than 30 category.

67. Figure 30 displays the timeline of the mean SAP rating by income split into five equal quintiles. In 1991 the two highest income quintiles i.e. those households in receipt of the greatest earnings had the highest mean SAP rating at 39 for quintile four and 41 for quintile five. In 1996 these two highest income quintiles became the categories with the lowest mean

SAP, both with a rating of 42. In 2005 income quintile four and five remained the quintiles with the lowest mean SAP at 47 and 46 respectively. The three lowest income quintiles have gone from having the lowest mean SAP in 1991 from between a rating of 36 to 37 to the highest three mean SAP ratings in 2005. In 2005 the lowest income quintile achieves the highest mean SAP at 50, closely followed by income quintile two at 49 and income quintile three at 48.

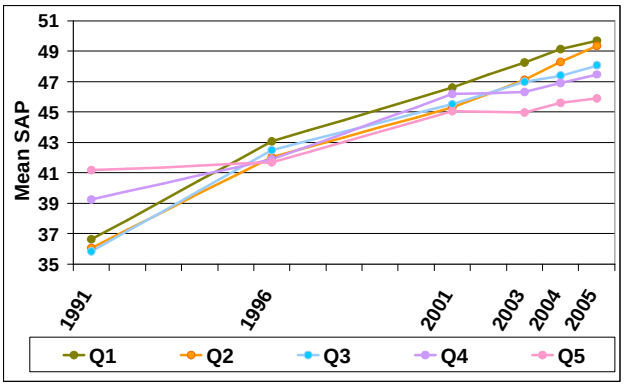

Figure 30: Timeline of mean SAP ratings by income quintile

68. This suggests that ongoing efforts to target low income households in improving the energy efficiency of their housing since 1991 have been successful and will continue to be so, with the lowest income quintiles showing strong increasing trends over the time period shown in Figure 30. The trend also reflects the tenures to which each income band belongs, with many low income households now living in the newer, more energy efficient social housing, whilst higher earners are still in the private sector – an area which has seen the smallest increase in SAP ratings.

Household Satisfaction with Heating

69. A relatively recent development in the EHCS interview survey allows us to look at householders' attitudes to their energy efficiency systems, in particular their satisfaction with water and space heating systems, their insulation effectiveness and whether they are able to keep comfortably warm in winter. Figure 31 shows the satisfaction with space heating, categorised into very, fairly, not very and not at all effective. In each survey there is a clear pattern of greater satisfaction with higher mean SAP ratings. A higher than average proportion of room and portable heaters are used by those responding 'not very effective' or 'not at all effective', with solid fuel or electricity also featuring strongly in these categories.

70. Comparing the response associated with household's satisfaction with their hot-water system over time, the larger increase in mean SAP has been in the least satisfied category. A large proportion of these have come from the private rented sector, which has itself seen a high increase in SAP ratings whilst remaining below the total stock mean.

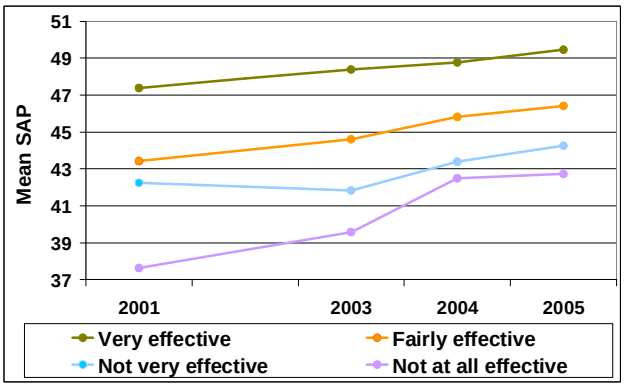

Figure 31: Timeline of mean SAP ratings by household satisfaction with space heating

71. Households who stated they were unable to keep comfortably warm in their living room during winter also have a slightly higher mean SAP (48) than those households who stated they were unable to heat their living room to a comfortable standard (mean SAP of 47).

72. The trend observed in Figure 31 is similar to attitudes associated with insulation and draught proofing i.e. the more effective households rated their insulation and draft proofing, the greater the mean SAP rating, see Figure 32.

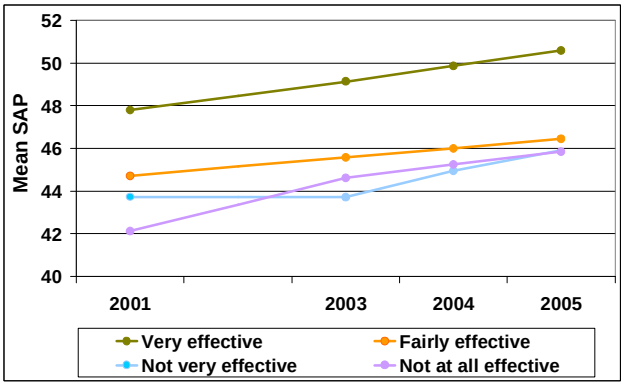

Figure 32: Timeline of mean SAP ratings by household satisfaction with their insulation

Conclusions and Future Issues

73. The overall mean SAP of the English housing stock has increased by 12 points from 1991 to 2005. The year of 2005 saw an increase in the mean SAP rating from 47.4 in 2004 to 48.1. The improvement in the SAP rating year on year reflects a combination of

energy efficient improvements made to dwellings and the effect of new, more efficient building stock increasing each year.

74. This report has identified several areas in which a historically low mean SAP rating has increased significantly, such as in private rented stock and among low income households. It has confirmed categories in which we now expect high levels of energy efficiency, for example the RSL tenure, newer dwellings and those with higher insulation levels and purpose built flats etc. It has also confirmed categories in which we now expect low levels of energy efficiency, for example in households with no central heating (particularly those that rely on portable and room heaters), older, detached and rural stock.

75. As further combined EHCS datasets are available we can more closely monitor the change in mean SAP rating, to establish whether the slower headline rate of increase seen recently will continue.

Energy Efficiency Update Tables 2005

These tables give detailed breakdowns of the banded SAP and mean SAP ratings against key variables, as an appendix to the Energy Efficiency Update Report 2005.

Index

Table 1.1 Analysis of SAP - total stock

count(000s), (column%)

SAP Band	Dwellings
Up to 30	2,220
	(10.2)
30 - 60	14,862
	(68.2)
60 or more	4,699
	(21.6)
Total	21,781
	(100.0)
Mean SAP	48.1

Base: All Dwellings

Table 1.2 Analysis of SAP - by dwelling type

count(000s), (row%), (column%)

	Less than 30	30 - 60	60 or more	Total	Mean SAP
end terrace	268	1,510	340	2,118	45.3
	(12.7)	(71.3)	(16.1)	(100.0)	
	(12.1)	(10.2)	(7.2)	(9.7)	
mid terrace	225	2,966	991	4,181	51.2
	(5.4)	(70.9)	(23.7)	(100.0)	
	(10.1)	(20.0)	(21.1)	(19.2)	
semi detached	593	4,668	636	5,897	44.7
	(10.0)	(79.2)	(10.8)	(100.0)	
	(26.7)	(31.4)	(13.5)	(27.1)	
detached	633	2,601	520	3,754	43.7
	(16.9)	(69.3)	(13.9)	(100.0)	
	(28.5)	(17.5)	(11.1)	(17.2)	
bungalow	279	1,548	199	2,026	43.8
	(13.8)	(76.4)	(9.8)	(100.0)	
	(12.6)	(10.4)	(4.2)	(9.3)	
converted flat	122	523	71	716	42.7
	(17.0)	(73.1)	(9.9)	(100.0)	
	(5.5)	(3.5)	(1.5)	(3.3)	
purpose built flat, low rise	87	940	1,754	2,780	61.5
	(3.1)	(33.8)	(63.1)	(100.0)	
	(3.9)	(6.3)	(37.3)	(12.8)	
purpose built flat, high ris	14	105	189	308	59.7
	(4.4)	(34.2)	(61.4)	(100.0)	
	(0.6)	(0.7)	(4.0)	(1.4)	
Total	2,220	14,862	4,699	21,781	48.1
	(10.2)	(68.2)	(21.6)	(100.0)	
	(100.0)	(100.0)	(100.0)	(100.0)	

Base: All Dwellings

Table 1.3 Analysis of SAP - by construction date

count(000s), (row%), (column%)

	Less than 30	30 - 60	60 or more	Total	Mean SAP
pre 1919	1,130	3,446	155	4,731	38.6
	(23.9)	(72.8)	(3.3)	(100.0)	
	(50.9)	(23.2)	(3.3)	(21.7)	
1919-44	433	3,089	285	3,808	43.3
	(11.4)	(81.1)	(7.5)	(100.0)	
	(19.5)	(20.8)	(6.1)	(17.5)	
1945-64	319	3,310	650	4,279	47.6
	(7.5)	(77.3)	(15.2)	(100.0)	
	(14.4)	(22.3)	(13.8)	(19.6)	
1965-80	286	3,348	1,294	4,928	51.1
	(5.8)	(67.9)	(26.3)	(100.0)	
	(12.9)	(22.5)	(27.5)	(22.6)	
1981-90	35	1,187	694	1,915	55.9
	(1.8)	(61.9)	(36.3)	(100.0)	
	(1.6)	(8.0)	(14.8)	(8.8)	
post 1990	18	481	1,620	2,119	64.7
	(0.8)	(22.7)	(76.4)	(100.0)	
	(0.8)	(3.2)	(34.5)	(9.7)	
Total	2,220	14,862	4,699	21,781	48.1
	(10.2)	(68.2)	(21.6)	(100.0)	
	(100.0)	(100.0)	(100.0)	(100.0)	

Base: All Dwellings

Table 1.4 Analysis of SAP - by floor area

count(000s), (row%), (column%)

	Less than 30	30 - 60	60 or more	Total	Mean SAP
Quintile 1: < 63m^2	352	2,132	1,870	4,354	54.4
	(8.1)	(49.0)	(42.9)	(100.0)	
	(15.9)	(14.3)	(39.8)	(20.0)	
Quintile 2: 63m² - 78m²	367	2,953	1,034	4,355	49.7
	(8.4)	(67.8)	(23.7)	(100.0)	
	(16.5)	(19.9)	(22.0)	(20.0)	
Quintile 3: 78m² - 91m²	379	3,242	733	4,354	47.4
	(8.7)	(74.5)	(16.8)	(100.0)	
	(17.1)	(21.8)	(15.6)	(20.0)	
Quintile 4: 91m² - 118m²	443	3,382	538	4,363	45.5
	(10.1)	(77.5)	(12.3)	(100.0)	
	(19.9)	(22.8)	(11.4)	(20.0)	
Quintile 5: > 118m²	678	3,152	525	4,356	43.3
	(15.6)	(72.4)	(12.1)	(100.0)	
	(30.6)	(21.2)	(11.2)	(20.0)	
Total	2,220	14,862	4,699	21,781	48.1
	(10.2)	(68.2)	(21.6)	(100.0)	
	(100.0)	(100.0)	(100.0)	(100.0)	

Base: All Dwellings

Table 1.5 Analysis of SAP - by tenure type

count(000s), (row%), (column%)

	Less than 30	30 - 60	60 or more	Total	Mean SAP
owner occupied	1,665	11,305	2,361	15,331	46.1
	(10.9)	(73.7)	(15.4)	(100.0)	
	(75.0)	(76.1)	(50.2)	(70.4)	
private rented	405	1,527	535	2,467	46.0
	(16.4)	(61.9)	(21.7)	(100.0)	
	(18.3)	(10.3)	(11.4)	(11.3)	
local authority	91	1,235	839	2,166	55.3
	(4.2)	(57.0)	(38.8)	(100.0)	
	(4.1)	(8.3)	(17.9)	(9.9)	
RSL	58	795	964	1,817	58.9
	(3.2)	(43.8)	(53.1)	(100.0)	
	(2.6)	(5.3)	(20.5)	(8.3)	
Total	2,220	14,862	4,699	21,781	48.1
	(10.2)	(68.2)	(21.6)	(100.0)	
	(100.0)	(100.0)	(100.0)	(100.0)	

Base: All Dwellings

Table 1.6 Analysis of SAP - by household type

count(000s), (row%), (column%)

	Less than 30	30 - 60	60 or more	Total	Mean SAP
Couple under 60	422	2,822	703	3,948	46.9
	(10.7)	(71.5)	(17.8)	(100.0)	
	(20.1)	(19.6)	(15.6)	(18.8)	
Couple 60 or over	438	2,596	467	3,501	45.2
	(12.5)	(74.1)	(13.3)	(100.0)	
	(20.9)	(18.1)	(10.4)	(16.7)	
Couple with children	417	3,701	941	5,059	48.0
	(8.2)	(73.2)	(18.6)	(100.0)	
	(19.9)	(25.8)	(20.9)	(24.1)	
Lone parent with children	108	950	474	1,532	51.7
	(7.0)	(62.0)	(30.9)	(100.0)	
	(5.1)	(6.6)	(10.5)	(7.3)	
Large adult household	132	1,001	296	1,429	48.1
	(9.2)	(70.1)	(20.7)	(100.0)	
	(6.3)	(7.0)	(6.6)	(6.8)	
One person under 60	250	1,457	790	2,497	50.7
	(10.0)	(58.4)	(31.6)	(100.0)	
	(11.9)	(10.1)	(17.6)	(11.9)	
One person 60 or over	333	1,835	824	2,992	49.1
	(11.1)	(61.3)	(27.6)	(100.0)	
	(15.9)	(12.8)	(18.3)	(14.3)	
Total	2,099	14,363	4,495	20,957	48.1
	(10.0)	(68.5)	(21.4)	(100.0)	
	(100.0)	(100.0)	(100.0)	(100.0)	

Base: All Dwellings

Table 1.7 Analysis of SAP - by age of household representative

count(000s), (row%), (column%)

	Less than 30	30 - 60	60 or more	Total	Mean SAP
16 - 29	106	1,063	608	1,777	52.8
	(6.0)	(59.8)	(34.2)	(100.0)	
	(5.0)	(7.4)	(13.5)	(8.5)	
30 - 44	494	4,326	1,478	6,298	49.4
	(7.8)	(68.7)	(23.5)	(100.0)	
	(23.5)	(30.1)	(32.9)	(30.1)	
45 - 64	829	5,290	1,333	7,452	46.8
	(11.1)	(71.0)	(17.9)	(100.0)	
	(39.5)	(36.8)	(29.7)	(35.6)	
65 or over	670	3,684	1,076	5,431	46.9
	(12.3)	(67.8)	(19.8)	(100.0)	
	(31.9)	(25.7)	(23.9)	(25.9)	
Total	2,099	14,363	4,495	20,957	48.1
	(10.0)	(68.5)	(21.4)	(100.0)	
	(100.0)	(100.0)	(100.0)	(100.0)	

Base: All Dwellings

Table 1.8 Analysis of SAP - by household income

count(000s), (row%), (column%)

	Less than 30	30 - 60	60 or more	Total	Mean SAP
Quintile 1: < £9k	466	2,518	1,201	4,185	49.7
	(11.1)	(60.2)	(28.7)	(100.0)	
	(22.2)	(17.5)	(26.7)	(20.0)	
Quintile 2: £9k - £15k	385	2,793	1,011	4,190	49.4
	(9.2)	(66.7)	(24.1)	(100.0)	
	(18.4)	(19.4)	(22.5)	(20.0)	
Quintile 3: £15k - £21k	392	2,951	846	4,190	48.1
	(9.4)	(70.4)	(20.2)	(100.0)	
	(18.7)	(20.5)	(18.8)	(20.0)	
Quintile 4: £21k - £32k	392	3,033	761	4,186	47.5
	(9.4)	(72.5)	(18.2)	(100.0)	
	(18.7)	(21.1)	(16.9)	(20.0)	
Quintile 5: > £32k	464	3,068	675	4,206	45.9
	(11.0)	(72.9)	(16.0)	(100.0)	
	(22.1)	(21.4)	(15.0)	(20.1)	
Total	2,099	14,363	4,495	20,957	48.1
	(10.0)	(68.5)	(21.4)	(100.0)	
	(100.0)	(100.0)	(100.0)	(100.0)	

Base: All Households