

Households and living space



Demographics have a major impact on the prospects for reducing residential emissions – not only how many people will be living in the UK by 2050, but how many live in each household, what ages they are, how much space they occupy and where the households are located. The number of households is one of the driving forces behind the growth in residential energy consumption. Whilst not easily amenable to policy, it is important to understand the population trends and projections in order to develop a reliable estimate of future energy demand and consequent carbon emissions. Assumptions about household numbers and amount of living space have implications for space heating and cooling, water heating and the number, size and usage of appliances, which raise important policy considerations. Likely trends in population, household numbers and household size (both in terms of number of people and living space) to 2050 are summarised here, along with the assumptions made under the 40% House scenario.

3.1 Population

Population projections are based on census figures, extrapolated to the present and then projected into the future on the basis of three factors: fertility, life expectancy and net migration.

3.1.1 Net migration

Net migration is the most difficult factor to predict and accounts for around 60% of projected increases. A net migration gain of 130,000 each year between 2004 and 2031 is assumed by the Office of National Statistics (NS 2004e) – this is somewhat lower than estimates for the past five years of between 151,000 and 172,000 (NS 2004g) and any changes to these figures could have a significant impact on current projections.

3.1.2 Fertility

Post-war fertility peaked in 1964 with a total fertility rate of 2.95 children per woman, falling to 1.71 in 2003. While actual births each year will

continue to fluctuate, the overall trend since the baby boom has been downward (NS 2004f). The birth rate is unlikely to rise significantly in the foreseeable future and it is assumed that the number of children born to women born after 1985 will level off at 1.74, close to the current level (NS 2004e).

3.1.3 Population age structure

Life expectancy at birth is projected to rise from 76.2 years in 2003 to 81.0 in 2031 for men and from 80.6 to 84.9 for women (NS 2004e). The latest projections for the UK show that the total population of pensionable age (over 65 years) will increase from 10.9 million in 2002 to 12.7 million by 2021 and 15 million by 2031, peaking at over 17 million in the 2060s (Shaw 2004). This represents almost a quarter of all residents and an increase in the potentially vulnerable population. Homes will be needed that allow for as much self-sufficiency as possible in old age. In March 2004, the ODPM committed itself to reviewing Part M of the Building Regulations (access and facilities for disabled people) in order to incorporate Lifetime Home Standards, so that homes can easily be adapted to different stages of life and to chronic illness or disability.

3.1.4 Population assumptions

The current UK population is approximately 60 million. Projections of population size, and also the size and year of the 'peak' population, have risen considerably over the last decade. The range of predicted figures widens as the time horizon lengthens into the future and it is extremely difficult to give an accurate projection of the population in 2050 – the Government Actuary's Department figures range from 62.5 million to 72 million (Shaw 2004). A mid-range projection of 66.8 million for 2050 has been adopted for use in the 40% House scenario (Table 3.1) since this is thought likely to be the period of peak population. This figure was felt to be more realistic than the 2050 population figure of 55 million assumed under the Local Stewardship scenario.



By 2050, a quarter of the population will be over 65

3.2 Household size and numbers

The number of households, each with its own lighting and set of appliances, will be a key factor in future energy consumption. Communal space and water heating are unlikely to spread beyond 20% of dwellings – a large majority of households will still have their own systems. The actual number of households is dependent on the total population and the average number of people per dwelling (household size).

3.2.1 Trends in household size

There has been a downward progression in household size for some time to the current figure of 2.3 people per dwelling. Only 7% of households in Great Britain contained more than four people in 2002 – half the figure for 1971 – whilst the proportion of one-person households rose from 18% to 29% over the same period (NS 2004b). Traditional families make up a decreasing proportion of the population: for example, Scottish projections are for a drop in households with two or more adults with children from 21% of the total in 2002 to only 15% in 2016 (Scottish Executive 2004).

Table 3.1: UK population projections used in the 40% House scenario (thousands)

Year end	2003	2011	2021	2031	2051
England	49,856	51,595	53,954	55,885	
Wales	2,938	3,020	3,106	3,153	
Scotland	5,057	5,034	4,963	4,825	
Northern Ireland	1,703	1,753	1,811	1,840	
United Kingdom	59,554	61,401	63,835	65,700	66,800

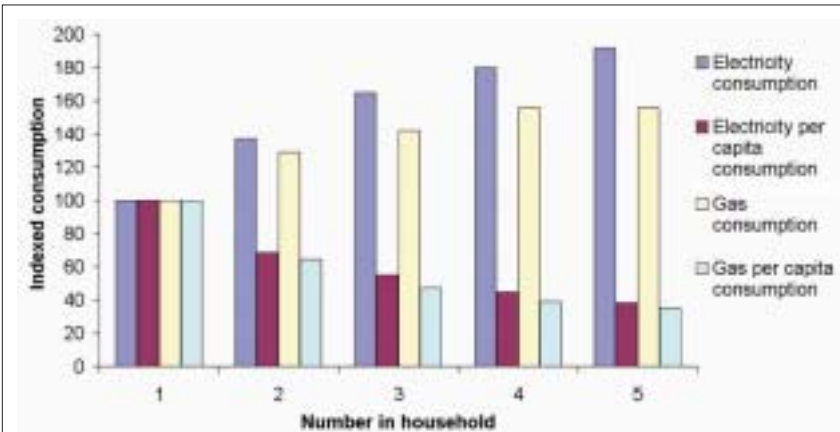
Source: Shaw (2004)

Almost 70% of the expected rise in household numbers in England between 1996-2016 is attributed to single-person households (Holmans 2001), nearly half of which currently contain pensioners (NS 2004d). The Treasury report on future housing needs anticipates a continuation of this trend, with approximately 9 million single-person households by 2021 (Barker 2004). However, it is possible that this is actually coming to an end: *'over the last five years there have been no statistically significant changes in the overall proportion of adults living in one-person households, and among people aged 65 and over, the proportion living alone has remained relatively stable since the mid-1980s'* (NS 2002).

Household size in the future will depend on a number of socioeconomic factors that shape people's preferences. For example, the downward trend in extended families living together could change given house price trends, increased life expectancy, pension under-funding and increased costs of residential care. It was recently estimated that the number of three-generation families could rise from 75,000 to 200,000 over the next 20 years (Skipton Building Society 2004).

3.2.2 Regional issues

Government projections show increases in household numbers for all four countries of the UK, although some population decline is expected in Scotland and in North-East and North-West England (ODPM live tables). Projected household growth in the English regions is highest in the South East, South West, East and the East Midlands and lowest in the North East, North West and the West Midlands. These figures mirror existing and expected trends in employment – there is momentum towards growth in the parts of the country that are most economically active and current policy is to adapt to this: 'predict and provide'. The East of England Regional Assembly is likely to ratify plans for 500,000 new homes in the region – an increase of 20% in the number of households, in a region that is already experiencing water shortages. The planned



3.2.3 Household size and energy demand

Per capita consumption plummets when people live in larger households, with a particularly marked difference between one- and two-person households. Figure 3.1 illustrates how, in theory, 60% energy savings could be achieved for all one-person households simply by moving them into five-person households, although this is unlikely in reality.

3.2.4 Household size assumptions

Household size is not easily amenable to policy intervention as it results from a complex mixture of factors such as income, house prices and availability, employment opportunities, social provision for children and the elderly, and the age at which young people move into their own homes. It was therefore important not to base the modelling on household size assumptions that might be over-optimistic in terms of the impact on carbon emissions.

The lowest European figure for household size is for Sweden, with 1.9 persons per household in 2002 (Eurostat 2004). If household size in the UK were to drop to this level, there would be a 47% increase in the number of households by the middle of the century, assuming a population of 66.8 million. If household size were to hold steady

Figure 3.1: Effects of household size on energy use

Note: One-person household = 100
 Source: Fawcett et al (2000), based on analysis of EHCS 1996 data

Thames Gateway development is the biggest co-ordinated building programme for more than 50 years, with 120,000 new homes planned (ODPM 2004f). The House Builders Federation claim that 47% of projected growth in England between 2001 and 2021 is likely to be in London and the South East, with three quarters of the total in these two regions plus the East and South West (HBF 2003). Hence the highest growth in household numbers is expected in the warmest regions of the country.

Table 3.2: Projected UK household numbers, 2050

Year	Household size (people)	Population (000)	Household numbers (000)	% Change in household numbers, 1996-2050
1996	2.43	58,139	23,926	–
2002	2.31	59,232	25,641	–
2050 (household size falls to current Swedish level)	1.9	66,800	35,158	46.9
2050 (household size stabilises at current level)	2.31	66,800	28,918	20.1
2050 (40% House scenario)	2.1	66,800	31,810	33.0
2050 (Local Stewardship scenario)	2.6	55,000	21,154	-11.6

Sources: population figures – NS (2004a); household size estimates – NS (2004b); LS scenario - UKCIP (2000)

Table 3.3: Average floor space by household size and category, England, 2001 (m²/person)

	<i>1 person</i>	<i>2 people</i>	<i>3 people</i>	<i>4 people</i>	<i>5+people</i>	<i>All</i>
Owner-occupied	77	48	33	27	21	46
RSL*	54	31	24	19	15	36
Couple + dependent child(ren)	–	–	31	26	20	26
Couple aged 60 +	–	48	34	27	20	46
1 person under 60	65	–	–	–	–	65
1 person aged 60+	71	–	–	–	–	71
All	69	44	31	25	20	44

* Registered Social Landlord

Source: ODPM (2003a)

at its current level of around 2.3, this would represent a 20% rise in household numbers by 2050 (Table 3.2). The Local Stewardship scenario assumes an average household size that stabilises at 2.6 by the 2020s (UKCIP 2000), giving 21.2 million households by 2050. Although this was the average household size in the UK as recently as 1985 (GHS 2002), it was thought unlikely that there will be a return to this level. A conservative approach was adopted for the 40% House scenario, stabilising household size at 2.1 by 2020. This allows for some continuation of the downward trend but stops short of the Swedish figure.

Under the 40% House scenario there is a substantial increase of 33% in the number of dwellings needed, over and above the number in 1996, which would give rise to a 33% increase in carbon emissions, all other things being equal. The table also demonstrates the huge difference in projected housing demands between the Local Stewardship and 40% House scenarios: the latter has an additional 10.7m homes, accommodating 11.8m more people, living in households with 0.5 fewer inhabitants on average.

The relationship between new households, replacements, new construction and house prices is complex, particularly when regional issues are included. Currently, most new housing is for new household formation; very little replaces old

stock. The recent Treasury review of housing proposes 242,000 new starts per year in England in order to reduce annual house price inflation from 2.4% to 1.8%, whilst building extra social housing and meeting the backlog of need, although no time horizon is given (Barker 2004). Building on this scale has occurred before – the peak was in 1968, when over 425,000 new homes were built in the UK (ODPM live table 241). This is considerably higher than the figures proposed under the 40% House scenario.

3.3 Living space

The amount of living space has implications for the energy required to heat (or cool) the space and the number and size of appliances that can fit into the dwelling. On average, personal living space has risen primarily because of dwindling numbers of people per household – from 38 m² per person in 1991 to 43 m² in 1996 and 44 m² in 2001 (ODPM 2003a). Table 3.3 indicates the range of personal living space, from single retired people to those in large households.

When they can afford to, people tend to buy themselves more living space: among single people in the private sector who moved house between 1996 and 2001, the highest earners bought or rented accommodation that was 17 m² larger on average than that for the lowest

earners. For households of four or more, the difference was still 11 m² per person (ODPM 2003a). This supports the contention that *'demand for small dwellings will generally be restricted to those on low incomes, including many first-time buyers ... and the elderly trading down from a family home'* (HBF 2003).

3.3.1 Under-occupancy and fuel poverty

Much of the current housing stock is able to accommodate larger households (ie more people) than it does at present, because of under-occupation. It is estimated that 36% of all English households (45% of owner-occupiers) have two or more rooms above the 'bedroom standard' (ODPM 2004d). Under-occupancy is of course not necessarily a problem for individuals, although it does drive up the demand for space and space heating per person. However, it is a factor in causing and compounding fuel poverty.

Approximately 29% of fuel poor households in England surveyed for the 1996 EHCS were under-occupying by two or more bedrooms above the standard, while 65% (4.5m) were under-occupying by one or more bedrooms above standard. They consisted predominantly of single householders over 60, couples over 60 and single adults under 60 (Houghton and Bown 2003). There would seem to be a clear case for building more attractive, efficient and relatively small-scale housing, to provide a range of alternatives for those who are in fuel poverty living in large properties (often a family home that they are reluctant to leave).

The median floor area of those in severe fuel poverty was 102 m² in 1998, whereas the majority of the population spending 10% or less of their income on fuel – those free from fuel poverty – had the use of 82 m² per household (DTI 2002b). Households in the lowest income quintile can normally only stay out of fuel poverty if they live in the smallest and most energy-efficient housing – under 63 m² with a SAP of 60+ (DETR 2000). Larger homes need a higher SAP in order to provide affordable warmth.

Where should standards be set, in order to be spacious enough to appeal to elderly people and small enough to heat effectively on a pension? The Housing Corporation gives 40-45m² as 'typical' for a new 1-bedroom dwelling and 72.5 m² for a '2.5-bedroom' dwelling (HC 2002). The former may be too small to appeal to most elderly people (Appleton 2002). An average living space of 74m² (35.2 m² per person) is assumed for the 40% House scenario for all dwellings built between now and 2050.

3.3.2 Overcrowding

The ODPM estimate that 2.4% of the English housing stock is overcrowded (ODPM, 2004d) – around 492,000 dwellings – with the highest percentage in London (6.1%). As with homelessness (Section 3.4.1), the problem relates to social and economic factors such as high rents and employment opportunities.

3.3.3 Teleworking and home-working

Home-working could potentially increase the demand for space, with a requirement for a home office, as well as resulting in higher use and ownership of home office and other equipment. The number of teleworkers has been rising rapidly in recent years, being estimated in 2001 at 2.2 million, of whom approximately one-third work part-time (Hotopp 2002). However, the estimated extra consumption was not thought significant enough to include in the model.

3.4 Number of dwellings

The number of dwellings in the UK exceeds the number of households by around 3% because of the existence of second homes and long-term vacant dwellings. This is balanced out to some extent by the fact that around 1.5% of the population live in communal establishments.

3.4.1 Homelessness and vacant dwellings

Homelessness is a social, economic and location issue, rather than one of actual housing space. In 2004 there were approximately 300,000 homes



Of the 31.8 million households in 2050, 10 million of them will be new

in England that had been vacant for six months or more – roughly 1.5% of the housing stock – and around three times as many as the (rising) number of homeless households being accommodated temporarily by local authorities (ODPM 2004e).

The Housing Act of 2004 allows councils to apply to make Empty Homes Management Orders on long-term empty properties. The owner retains legal ownership and will be entitled to rental income generated by letting the property, after deduction of relevant costs such as renovation (UK Government 2004). This provides an opportunity to reduce homelessness and improve energy efficiency, in a housing stock where between a quarter and a third of homes are estimated to be ‘non-decent’ – that is, they are not wind and weather-tight, warm and with modern facilities (ODPM 2004b).

3.4.2 Second homes

UK household statistics – and references to household data used in this report – relate to *occupied dwellings* unless otherwise stated. The

figure for English households with a second home in Great Britain (not counting those held as an investment and rented out) has risen by 37,000 since 1993-94 to 228,000 (ODPM 2004d). The figure for the UK is therefore around 1% of the total housing stock, giving a total for vacant and second homes of 2.5%. This has implications in terms of duplication of appliances and heating systems, and how much they are in use when a dwelling is unoccupied. The impact of second homes in the UK on residential energy use is not great at present – and is not modelled – but the trend needs watching.

3.5 Conclusions

Population and household size are important factors in determining residential energy demand. Other important policy considerations relate to an ageing population, under-occupancy and regional planning. By exploring the current and projected trends, the following assumptions have been made for the 40% House scenario:

- A population projection of 66.8 million by 2050. This represents a mid-range estimate.
- An average household size of 2.1, giving 31.8 million households by 2050. This assumes a slight trend downward, but does not go as low as the lowest figures for some European countries today.
- An average living space of 74m² per dwelling in these new homes by 2050.
- Almost 70% of the expected rise in household numbers in England between 1996-2016 is attributed to single-person households, half of whom are likely to be pensioners.
- By 2060, Government projections give a figure of 17 million pensioners, making up 25% of the population and potentially a much higher proportion of households.