The Implications of Housing Density

Graham Towers

Introduction

The need to increase the density of urban development is becoming widely recognised - a recognition stimulated by two areas of concern. The first is the growing demand for new housing in developed countries. This is partly due to increasing wealth and partly to the growth in small households. In Britain it is estimated that an additional 3.8 million homes will be needed in the first twenty years of this century. Such growth presents a huge challenge and an *Urban Task Force*, chaired by leading architect Richard Rogers, was appointed to consider the implications. The task force examined current development patterns, which largely comprised low-density developments on ex-urban 'greenfield' sites. If this pattern were allowed to continue the required new housing would result in the loss of enormous swathes of open land, and create serious problems of transport and servicing. Instead, the task force recommended a new emphasis on developing derelict urban sites (Department of the Environment, Transport and the Regions, 1999). This has now been recognised in government policy with a target of building 60 percent of new housing on urban 'brownfield' sites and new planning guidelines for the development of high density housing (DETR, 2000).

The second concern was the problem of global warming and the need to reduce the emission of greenhouse gases. This has now been enshrined in the Kyoto protocol with the commitment of participating countries to reduce their energy consumption. In housing, this objective is often interpreted in purely technical terms. Energy consumption would be reduced by better insulation and greater efficiency in use by such innovations and combined heat and power (CHP); by the use of low energy materials and increased recycling; and by exploiting renewably energy sources using technology such a Photo-Voltaic (PV) cells. But housing density is an issue as well. Research in the USA has shown that a family living in a very energy efficient house will, if it is in a low-density location, be highly dependent on car transport. Because of these transport needs, their overall energy consumption may be greater than a similar family living in a wholly un-insulated traditional house in the inner city (Smith *et al*., 1998: *41*).

Moving to higher density living has distinct advantages. It can conserve land by reducing the loss of open countryside, and it can offer reductions in

energy consumption through more effective transport and easier servicing of urban areas. For many though, high density has negative connotations both historically and in contemporary experience. If the benefits are to be realised, the implications of building at higher densities need to be better understood.

The Historical Context

The nineteenth century in Britain was characterised by rapid industrialisation and urbanisation. The new industrial cities attracted large numbers of people who packed into poorly adapted existing buildings or inadequately built new ones. Many of the buildings leaked, and lacked ventilation or adequate sanitation. Such conditions created a breeding ground for diseases and the high levels of overcrowding meant that infection spread rapidly. There were outbreaks of cholera and typhoid in many large cities, and housing and health became inextricably linked. Bad health was largely the product of poor standards and severe overcrowding, and since it quickly became associated with the densely populated areas of large cities, housing density also becoming an issue.

There were two responses. One was to clear away the areas of bad housing and rebuild. Slum clearance began in Liverpool and Glasgow in the 1860s and was promoted nation-wide by legislation of 1875. Significant slum clearance schemes took place in London, but though the new housing was well built, its design was dictated by the requirement to re-house as many people as had been displaced. Some of the densest purpose-built housing was put up under these schemas – intensive developments of five-storey tenements packed cheek by jowl. These tenements, built and managed by philanthropic societies, were regarded as grim and barrack-like. Tenements of social housing, even in later less dense developments, never lost this poor reputation.

The other response was to flee the overcrowded, polluted and unsanitary cities. Early on the wealthy began to build their houses in the cleaner air of the countryside. Facilitated by the growth of the railways, developers soon began to build new suburbs. Meanwhile, social reformers advocated lower densities as the solution to urban problems for all classes. Various model towns had been built on such lines and, by the end of the nineteenth century such ideals became focussed in the Garden City movement. These principles were enshrined in the Tudor Walters report on the design of new housing (1918), which set the pattern for social housing development after the First World War. This recommended the relief of urban problems through decentralisation and the development of new housing estates outside urban areas at densities as low as 12 houses to the acre (30 per ha.). In the inter-war period over a million houses for rent were built on this pattern, and these were accompanied by 3 million houses for sale in similarly low density suburbs.

In the new planning system introduced after the Second World War there was an attempt to impose a new order. A series of plans were produced for the development of large cities. Particularly influential was Patrick Abercrombie's plan for London. This proposed a hierarchy of densities for new housing development: 200 persons per acre (ppa) at the centre, 136 in the inner areas descending through 100 and 75 ppa to 50 ppa at the periphery. The twin priorities of urban planning were preserved – relatively high densities in the slum clearance areas with the low densities of the Garden City movement in the suburbs. The results of these post-war plans did little to counter the traditional hostility to high density. Most redevelopment in the inner areas comprised estates of multi-storey housing in which, increasingly, low-income families with children were housed. The result has been an accumulation of social problems that have caused many multi-storey estates to become foci of crime and deprivation. Such degeneration has reinforced the negative image of high density living (Towers, 2000).

The Definition of Density

The measurement of housing density is a complex matter, which prohibits easy comparison of one form of development against another. Essentially, density is a measure of the number of people living on a given area of land. In Britain, the land area was traditionally measured in acres. With metrication it is now necessary to convert to hectares (ha) with a factor of 2.48 acres/ha. But this is only the start of the confusion. No less than four separate measures of size of the resident population have been used in the past:

- *Dwellings per ha/acre* - the numbers of houses or flats. Early definitions of density used this measure and it is still in use to denote basic standards. However, it can be a misleading measure due to the considerable variation in the sizes of dwellings.
- *Persons per ha/acre* - the number of people. This has been generally used to define density standards for planning purposes. To be a useful measure though, it needs to be converted into numbers of dwellings. The usual means of conversion is to measure ***bedspaces per ha/acre***. This measure can be used to convert a persons' per ha/acre standard into a range of dwelling mixes. At one time ***habitable rooms per ha/acre*** was used as a conversion measure but this is now regarded as less useful than bedspaces since it is more variable and, therefore, more confusing. In some European countries ***housing floorspace per ha/acre*** is also used as a measure of density.

Further complication is added by the use of at least two measures for the area of land to be considered:

- *Net residential density* measures the area of a housing site up to the surrounding roads include facilities for the immediate benefit of the housing, such as small areas of open space, community centres, a few shops and so on.
- *Gross residential density* measures a residential area and includes - in addition to housing - parks, schools, the road and transport network and other mixed uses. It does not normally include large commercial or industrial areas.

Net residential density is a fairly tightly defined measure that allows quite accurate comparison between developments. Gross residential density is more variable depending on the extent of non-residential land use included. This makes density values more variable and comparisons less accurate, particularly when dealing with large urban areas or whole cities.

The various methods of measuring housing density can be illustrated by drawing on a study carried out by Rudlin and Falk (2000: 219) on the redevelopment scheme for the Hume estate in Manchester. Net and gross densities were calculated using different systems of measurement (see Table 1). First, the numbers of dwellings was set down, and then the numbers of bedspaces, using a ratio of four per dwelling. This is equivalent to the standard measure of persons per acre. However, it was considered that with modern housing standards it was unlikely that, in any development, all bedspaces would be fully occupied. A further calculation was done using a ratio of 2.4 persons per household, which was felt to give a better indication of the likely population at any given density.

Table 1 Net and gross density calculations

	per hectare	per acre
Net Density		
dwellings	62	25
bedspaces	247	100
population	148	60
Gross Density		
dwellings	27	11
bedspaces	108	44
population	65	26

Source: Rudlin and Falk, 2000: 219

All the figures in the table are based around a standard of 100 persons per acre (248 ppha), which is generally felt to be the minimum necessary to achieve the benefits of efficient transport and servicing. However, it is apparent that to achieve an actual net density of 100 persons per acres a higher notional density must be planned to allow for lower levels of occupancy in contemporary urban communities

Density and the Built Form

'High density' is commonly confused with 'high rise', the multi-storey estates built in British cities during the 1950s and 60s that have become the focus of serious social problems. Having often been seen as the epitome of high density housing, they have been thought of as a form of living to be avoided in future developments. In fact, all multi-storey estates were built to zoned density standards. In London some estates were built at a net residential density of 200 ppa (494 ppha), but many were built at 136 ppa (336 ppha) and quite a few at 100 ppa (247 ppha). In Glasgow, which has a great many high rise estates, the maximum zoned density was 120 ppa (296 ppha).

Many of these estates consisted of tall blocks set in large areas of open space. Their density was no higher, and often lower than, the traditional housing which surrounded them. As early as 1946 Trystan Edwards demonstrated that individual houses built in narrow-fronted terraces could be built at densities up to 275 ppa (679 ppha) (Edwards cited in Owens, 1987). A more recent study by architect Harley Sherlock showed that three- or four-storey terraces of flats and maisonettes could be built to densities of 155-160 ppa (385-400 ppha) (Sherlock, 1991). This means that many traditional terraced streets, which, in London, are commonly 3 storeys and higher, achieve densities considerably in excess of many multi-storey housing estates.

A range of British housing, planning and transport bodies sponsored a very recent study as part of the debate about increasing the densities of new housing development. In it, architect Llewelyn-Davies identifies a range of types of housing form and the approximate densities they could achieve (see Table 2). They went on to apply different mixtures of these types to a series of case studies, which examined several options and considered qualitative as well as quantitative issues (Llewelyn-Davies, 2000).

Table 2 Densities achieved by different types of housing form

Type		Dwellings per ha	Dwellings per acre	Bedspaces per ha	Bedspaces per acre
A1	Detached houses	10	4	40	16
A2	Semi-detached houses on street	16	6.5	64	26
A3	Semi-detached houses on cul-de-sac	31	12.5	124	50
B1	Terraced houses - medium frontage	53	21	212	84
B2	Terraced houses - wide frontage	44	18	176	72
C1	Flats - 4 storey perimeter blocks	155	62.5	620	250
C2	Flats - 4 storey cluster blocks	67	27	268	108
C3	Flats - 6-10 storey perimeter blocks	423	170	1692	680
D1	Mixed houses and flats	140	56.5	560	226

Source: Llewelyn-Davies, 2000

Density and Sustainability

The critical contribution higher densities can make to reducing energy consumption is in lowering the cost of servicing urban areas. As development density increases the per capita cost of providing services such as water, gas, electricity and waste disposal reduces. The cost of transporting materials and goods also declines. As the costs go down so does the consumption of energy. Of most significance is the cost of personal transport, which diminishes rapidly as density increases. At low densities people are dependent on private cars for personal transport. As density increases public transport becomes increasingly necessary and viable. At high densities fast, frequent and reliable public transport systems become fully effective with dramatic reductions in energy costs. More and more trips can also be made on foot or by bicycle eliminating fuel consumption and pollution altogether. In overall terms people in low density areas travel more than twice as far each week as people in more compact cities.

Two Australian environmental scientists, Peter Newman and Jeffrey Kenworthy, have carried out wide-ranging studies of the relationship between transport and urban form. They suggest there is a threshold density above which diverse, less automobile-based personal transport systems become viable. This threshold coincides with the density of a group of European cities such as Paris, Stockholm, Hamburg, Frankfurt and Amsterdam, all of which provide a high quality urban environment coupled with diverse and effective transport systems. These cities proved to have personal transport costs (measured in fuel consumption) that were less than one third of those in low density, North American cites (Newman and Kenworthy, 1987: *127ff*).

Energy efficiency is a necessary goal but the sustainable city can be most effectively achieved by increasing densities. Energy savings can certainly be made by better insulation and fuel economies in buildings. In the high density city these savings are reinforced by the effective use of mass transport and by the greater concentration of activities, which reduces transport needs altogether. To realise these benefits it is not necessary to move to very high densities. Research has shown that relatively modest increases in density can produce disproportionate savings in land take. Similarly, it is generally considered that the reduced cost of servicing, and the efficient use of public transport begin to take effect at densities as low as 100 ppa (248ppha) or 62 dwellings per hectare.

Urban densities vary widely. In parts of Hong Kong densities rise as high as 1,250 dwellings per hectare (Rudlin and Falk, 1999: 191). This is exceptional, but even in Europe there are considerable variations. In overall terms the population density of Paris is twice that of London. In the inner areas the ratio is even higher, with central Paris housing almost three times as many people in the same land area (Sherlock, 1991: *216*). Barcelona is a city widely admired for its heritage and its recent achievements in regeneration. Its population density of 400 dwellings per hectare is more than double that of even the most heavily populated part of inner London such as Islington (DETR, 1999: 59) whose densities are rarely matched elsewhere in Britain. Most urban areas have densities that are much lower than inner London. Good models of relatively high density cities can be found in continental Europe. Many European cities are not only efficient but also attractive and enjoyable places to live.

Achieving higher densities must be accepted as a necessity, but there are also positive benefits. One reason why European cities are widely admired is because their higher density creates more vitality and diversity. Bigger concentrations of people stimulate and support the provision of more services and facilities making possible a wider choice of restaurants, theatres, cinemas and other recreational opportunities. They support specialist centres and services for minorities, which are not possible where such minorities are dispersed in low density sprawl. All this stimulates interdependent economic development that creates new employment opportunities and greater choice of employment. Above all, in higher density urban areas, all this diversity is within easy reach of where most people live. Ease of access is a key factor, which has critical implications for a sustainable quality of urban life.

Bibliography

Department of the Environment, Transport and the Regions (DETR) (1999), *Towards an Urban Renaissance - Final report of the Urban Task Force*, chaired by Lord Rogers of Riverside London, HMSO/E & F Spon.

Department of the Environment, Transport and the Regions (DETR) (2000), *Planning Policy Guidance Note No.3: Housing.*

Owens, G. R. (1987), *Mixed Development in Local Authority Housing in England and Wales 1945-1970*, PhD Thesis, University College, University of London, London.

Llewelyn-Davies (2000), *Sustainable Residential Quality - Exploring the Housing Potential of Large Sites*, London Planning Advisory Committee, London.

Newman, P. and Kenworthy, J. (1989), *Cities and Automobile Dependence: A Sourcebook* Aldershot, Hants and Brookfield. Vermont. Gower Publishing Company Ltd.

Rudlin, D. and Falk, N (2000), *Building the 21st Century Home – The Sustainable Urban Neighbourhood*, Architectural Press, Oxford.

Sherlock, H. (1991), *Cities Are Good For Us - The Case For Close-knit Communities, Local Shops and Public Transport*, Paladin, London.

Smith, M., Whitelegg, J. and Williams, N. (1998), *Greening the Built Environment*, Earthscan Publications Ltd., London.

Towers, G. (2000), *Shelter Is Not Enough – Transforming Multi-Storey Housing*, The Policy Press, Bristol.