



SUSTAINABLE RETROFITS

POST-WAR RESIDENTIAL TOWERS IN BRITAIN

ASTERIOS AGKATHIDIS AND ROSA URBANO GUTIÉRREZ

Sustainable Retrofits

Presenting the state-of-the-art in sustainable retrofits in post-war residential towers, *Sustainable Retrofits* captures and re-informs the current intense refurbishing process that is taking place in Britain, which is part of a global phenomenon happening all over the world, as cities upgrade their building stock in an attempt to comply with governmental emission reduction targets. The authors present inspections of 20 sustainably retrofitted social housing towers, analysing their aesthetic and technical modifications, as well as the shifts occurring in their social structure. The authors use over 200 full colour plans, elevations, photographs, maps and illustrations to beautifully support the statistical and analytical information collected. Finally, they include interviews with some of the architects who designed the retrofits, residents and key stakeholders to inform the conclusions.

Asterios Agkathidis is an architect (ARB) and lecturer in digital architecture at the University of Liverpool, UK, where he is currently leading the MA in Architecture. He studied architecture in Thessaloniki and the RWTH Aachen, and completed his postgraduate studies in Advanced Architectural Design at the Städelschule Architecture Class in Frankfurt. His built work has been published, awarded and exhibited internationally. His seventh book, *Biomorphic Structures*, was published in 2017.

Rosa Urbano Gutiérrez is a Senior Lecturer at the Liverpool School of Architecture, UK, and founding director of the Environmental Ceramics for Architecture Laboratory (ECAlab). She is a registered architect, who studied and worked at the Massachusetts Institute of Technology, Harvard University, and the School of Architecture of Madrid. Her research revolves around documenting, analysing and pursuing the invention and implementation of pioneering sustainable materials and technologies for architecture.



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Post-War Residential Towers in Britain

Asterios Agkathidis and
Rosa Urbano Gutiérrez

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Introduction

This book is the report on our RIBA-funded research project presenting the state of the art of sustainable retrofits in post-war residential towers in Britain. The main aim in writing this book is to capture and re-inform the current intense refurbishing process that is taking place in this country, which is part of a global phenomenon happening all over Europe and the world, as cities are upgrading their building stock in an attempt to comply with governmental emission reduction targets. In the UK, greenhouse gas emissions must be drastically reduced by 80 per cent of the 1990 levels by 2050. High-rise concrete tower blocks offer some of the best candidates for an energy-efficient upgrade, presenting structural vulnerability to cold, draughts and damp, becoming unaffordable to heat, unattractive to view and undesirable to occupy.

Due to the magnitude of such a study, we will focus on two main regions: Northwest England and the Greater London areas, where we believe most representative samples can be found. The key objective is the compilation, analysis and categorization of intervention data for a paradigmatic selection of retrofitted social high-rise housing in these two areas. We have inspected 89 sustainably retrofitted social housing towers, analysing their aesthetic and technical modifications, as well as the shifts occurring in their social structure. The book includes a brief historical review of the towers; an evaluation of the socio-cultural and environmental context of their refurbishment for both the 'before' and 'after' situations; the analysis of the towers through drawings, photographs, maps and statistics in reference to the different types of refurbishing interventions; and interviews with some of the architects and developers who designed the retrofits. The final section reveals our conclusions and outlook, including a reflective criticism of fire regulations and safety, based on the tragic aftermath of the Lakanl House and Grenfell Tower disasters.

Chapter 1

Public high-rise blocks in Britain

A brief review of their historic context

The origins of public housing and high-rise estates

The post-war period represented a very distinctive situation in the history of public housing in Europe. Obviously, the Second World War had left the continent devastated, with many cities bombed or in ruins, involving a massive destruction of all kinds of buildings. There was indeed an overwhelming demand for buildings, and most urgently, people needed homes. How the reconstruction of Europe would take shape in those years was very much affected by different trends, some of them had in fact started their trajectory decades before.

An important part of this process is based upon one overarching concept – modernity – which was profoundly focused on the pursuit of health, well-being and progress of society. Important theoretical movements across Europe underpinned this positive thinking. The provision of decent homes for the low-income population was fundamentally connected to these currents of thought: the moral crusade to improve the extremely poor living standard conditions of the working class brought about by industrialisation was very much led by the urgent need to eradicate the epidemics that still haunted Europe at the turn of the twentieth century.

The pursuit of health and well-being consolidated new lines of experimentation. These years would see significant investigations into comfort and the environmental control of buildings that led to important developments, particularly in Britain and France. Numerous designs for walls, floors and ceilings emerged, as multi-layered assemblies with cavities that housed innovative heating, cooling and ventilation equipment of all kinds. The invention or optimisation of new non-porous, easy-to-clean materials (glass, concrete and steel), together with new construction techniques was critical for envisioning the modern *urbanscape*, with large expanses of smooth non-ornate surfaces. The pursuit of health would also bring new building typologies (e.g. sanatoria, spas) or new ideas about how to approach old ones (e.g. the open-air school movement). This line of thought was also influential in theories of the planning of cities, establishing a new relationship with nature in terms of ventilation, sun exposure, views and landscape, while firmly based on a new understanding of civilisation as closely related to technology. These principles, the essence of the Modern Movement, were vastly promoted through the seminal works of Le Corbusier (*Ville Radieuse*, 1929), or Lewis Mumford (*Technics and*

Civilization, 1934), which were highly influential in the following years.¹ In relation to housing in particular, modernity encouraged the generation of new social arrangements, proposing the concept of collective social housing and communal living, which is deeply rooted in the development of a critical concept: the modern welfare state.

The welfare state, as the proposal for an increasingly stronger role of governments in social matters, would definitely be a determining factor in the initiation of social housing. The industrialisation process that had taken place in the nineteenth century had attracted masses of people to the main cities, which were flourishing as industries were concentrated, beginning a depopulation of rural areas. Cities were ill suited to effectively absorb this massive and rapid growth, lacking not only the physical infrastructure to accommodate these huge flows of migrants, but also the regulatory and planning framework. There is abundant literature illustrating the extreme misery affecting the poor newcomers, stuck in overcrowded housing in tenements that could not cater to their hygiene and health needs, generating a breeding ground for the emergence and expansion of contagious diseases. The demand for housing was first of all provided by private initiatives in the form of high-density small dwellings for rent, that often failed to meet thermal and sanitary standards. Aggravating this situation, the commonest practice, as the quickest and cheapest solution for the poorest families, was to subdivide the existing conventional houses into 'rooms'. Later initiatives to improve these conditions were also privately managed by companies, factory owners and philanthropists (following the concepts of model villages, utopian communities, and garden cities), who felt compelled to cater for the accommodation and education of the urban poor all over Europe. Nonetheless very few of the urban poor actually benefitted from these early forms of social housing, which represented a very small percentage of the existing stock, with the majority still left to live in precarious conditions.

A combination of factors paved the way towards engaging civil authorities in the creation of public housing. Primarily, the threat to health and safety: cities were not only dirty and unhealthy, they were also hotbeds for social unrest. The fear of riots, epidemics, and loss of economic profit due to debilitated labour provided the conditions for the generation of Housing Acts in all the European countries. By 1914, the crucial principles and instruments of the regulatory housing policy had been basically established in nearly all the European countries, with the aim of offering a combination of private and public initiatives to solve the housing problem. Housing became a key element in British politics: the building of homes through public agencies was a clear objective, and the civil authorities were the only ones in a position strong enough to assume responsibility for tackling the problem in a comprehensive way.

Despite the provision of a legislative framework, results would not be substantial until after the First World War; in Britain, the effect would not be visible until 1919. To create the space for the implementation of a comprehensive rebuilding programme, the eradication of tenements, cellars and back-to-back terraces had to be conclusive,² and this meant a clear trend towards massive slum clearance. Despite the extensive governmental support, by 1931, there was still evidence of both housing shortage and excessive overcrowding



◀ **Figure 1.1**

Slum in Glasgow, Lanarkshire,
1868

(Figure 1.1). Over those years, the number of areas labelled as slums and potentially to be cleared kept rising, prioritising the quick production of new dwellings over quality and well-planned strategies to optimise the use of the available land.^{3, 4} Of all the housing construction between 1919 and 1939 (nearly four million dwellings), over one million dwellings were supplied from public initiative (30 per cent of all new dwellings), and many of the rest had also benefitted from state subsidies.^{5, 6} On the whole, basing the strategy on slum clearance generated problems of social imbalance, not only because it privileged those who lived in the designated areas, ignoring others who might be in equal or worse conditions, but also because the massive destruction and rehousing did not take into account an understanding of and protection of the existing communities.

This negligence would unfortunately continue in future interventions, and had a disastrous critical impact, as we will see in later discussions.

Regarding housing types, until 1930, both the public and the private sectors predominantly followed traditional typologies. In the British context, the government adopted the 'cottage' model in garden suburbs as the ideal home for the working class. However, after 1930, a new philosophy emerged, strongly promoting the ascendant progression in the design evolution of flats. Supporting this process, there was not only the pressing need to densely rehouse the slum population, but also, in some cities, the convenience of keeping the workers in the city centres. A critical influence in the creation of flats was the arrival of the new model of collective rental housing for workers promoted by the Modern Movement's ideology. Multi-storey flats seemed the immediate answer to house large numbers of slum dwellers following the new sanitary standards.⁷ In 1930, the freestanding high-rise block was promoted at the third CIAM Congress⁸ as the typology that would incarnate the Modernist building principles of the functionalist, standardised mass-produced city. In line with these principles, in the Housing Act of 1930, subsidies were related to the numbers of people rehoused rather than the dwellings supplied, giving an extra allowance to developments taking the shape of blocks of flats. Both the European modern vision and the economic affluence helped to establish the modern flat as an acceptable family home.

London, Liverpool, Leeds, Sheffield and Manchester presented the largest clearance programmes in the country. Two of these cities, Liverpool and the various London authorities, would be the only ones to build central flats as their primary strategy to rehouse the working classes. London's reasons for doing this were evident. The outer low-cost land was simply too far away to offer an affordable solution for these families, and in the case of the boroughs, they could not build outside their own boundaries. These reasons were not critical in the case of the main provincial cities, where the leading trend was to accommodate the slum families cheaply and comfortably in suburban cottage developments. The flats were effectively the opportunity for local politicians to experiment with modern European principles and the positive social value associated with this typology through the development of large central buildings, publicising a progressive approach to rehousing that would grant these municipalities (particularly exceptional in Liverpool and on a minor scale in Manchester, Sheffield and Leeds) and their architects a unique reputation.⁹

Rehousing in the original inner-city slum areas, where sites were small and highly priced, meant similar densities were achieved while allowing for the provision of open space and social amenities. Until 1935, the courtyard type of layout was the most successful in Britain, as a design that provided the highest and most economical density. The enclosing rings also provided a public front and a private more domestic back towards the courtyard, typical of most English houses.¹⁰

An early pioneering project was Ossulston Estate¹¹ between Euston and St. Pancras stations, built by the London County Council (LCC) between 1927 and 1931¹² (Figure 1.2). Other initiatives to explore the new typology followed, such as the experimental schemes developed for the Metropolitan Borough of



◀ **Figure 1.2**
View of Ossulston Estate,
London, 1927–31

Stepney between 1925–37,¹³ or the project for Bethnal Green and East London Housing Association flats at Brunswick Street, Hackney, from 1936 (Figure 1.3). Outside London, Liverpool’s Central Redevelopment Area started with St. Andrew’s Gardens, designed by John Hughes (1932–35), and followed by Gerard Gardens (1935–39), Myrtle Gardens (1936–37) (Figure 1.4), Caryl Gardens (1936–37), Warwick Gardens (1938), Sir Thomas White Gardens (1938–40) and the Corlett Street flats (1938–39). Quarry Hill, designed by Richard Alfred Hardwick Livett (1934–41), is another, although isolated, eminent example of the European vision in Leeds.

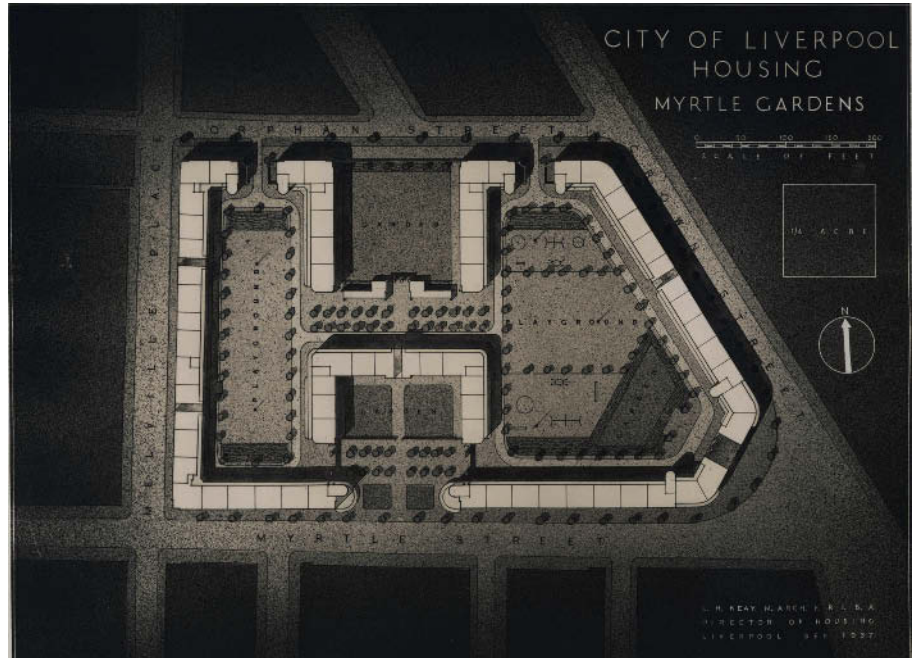
During 1935, the *Zeilenbau* layout, already tried in most European countries, started to appear in Britain. The German development was based on the optimisation of sunlight exposure for each flat, by arranging them in long strips running north to south and giving most habitable rooms a westward outlook receiving sunshine for the non-working part of the day. This arrangement was mostly thought suitable for suburban areas due to space and orientation demands, coupled with inferior capability to deliver high density. Therefore, the concept would not substantially develop until after 1945. Heights were still limited to five or six storeys in most of the cases because lifts were too expensive, but the schemes benefitted from generous floor areas, social communal amenities and some technical novelties, such as the provision of bathrooms and electric lighting. With the exception of London, the private sector showed little interest in building schemes of flats during the 1930s. Two



▲ **Figure 1.3**
View of the terraced balconies
in Bethnal Green and East
London Housing Association flats
at Brunswick Street, Hackney,
July 1936

► **Figure 1.4**

Myrtle Gardens, Liverpool, 1937.
(a) Planned layout; (b) view of the central courtyard facing Myrtle Street; (c) view of one of the internal courtyards showing the children's playground





of the most renowned Modernist examples of that period emerging from private initiative are Highpoint One flats in Highgate (seven storeys), built by Berthold Lubetkin and Ove Arup between 1933 and 1935, and the Isokon Building on Lawn Road (five storeys) designed by Wells Coates, which opened in 1934.

1945–68: The ascent of high-rise social housing

After the Second World War, definite circumstances made the Modernist vision of the functionalist residential tower block a reality. During the 1950s, its production was still mostly characterised by low-rise blocks of flats (three to five storeys tall), and the construction of high-rise blocks would only reach relevant numbers between 1958 and 1968. Their emergence was obviously related to the urgent need to solve the long-standing problem of housing shortages, but this time it would be accompanied by the necessity to use new construction techniques to support cheaper and quicker production.¹⁴ This necessity would offer the opportunity to explore this typology as a laboratory to finally provide 'homes for a fairer society', whose ultimate goal was to improve the overall quality of life, both in comfort and convenience terms. The post-war period is in fact regarded as providing the grounds for the emergence of the modern welfare state, social housing being a crucial instrument in local and national welfare policies.¹⁵

In that sense, the image of the new social housing had to be effectively new in every way: offering spacious rooms with high quality standards (maximising ceiling heights and window areas to optimise natural light and air ingress), in combination with the implementation of innovative technologies and social and leisure visions. Layouts and planning were driven by modern life in the flats: acknowledging new functions (e.g. the bathroom), but also new types of households, allowing for the first time flexible use of the spaces. The concept of the estate would take full meaning in these years, comprising communal functions such as playgrounds, shops, clubs, nurseries or schools, and new family-oriented uses such as a car parking space, or a garden that was no longer considered a means to provide food to the family, but an environment for leisure (Figures 1.5, 1.6, 1.7).

As in the past, high-rise blocks were not the preferred typology: the cottage model (the three-bedroom family house) was still the most favoured form of public housing, accounting for 64 per cent of the total output between 1945 and 1979 (Figure 1.8). But to all intents and purposes, high-rise blocks embodied the ideals of modernity, bringing the opportunity to create landmarks that represented the progressive attitude of cities. All the actors involved in the provision of social housing competed to offer their symbolic buildings. In the British context, this typology would receive the greatest subsidies from public housing programmes, including the much-needed 1946 lifts subsidy, which would allow higher flats to be built. It was centrally determined that subsidies would increase with height (more than six storeys),¹⁶ which was particularly useful in inner city or landlocked areas where expanding the boundaries proved impossible. High density housing seemed the only effective way to deal with a housing problem that showed even worse conditions than in 1919, and factors such as the advances in prefabrication building techniques, or the introduction of the tower crane in the building construction process presented a more feasible way of meeting the targets.

► **Figure 1.5**

View of internal courtyard of Park Hill, Sheffield 1957–61, designed by Sheffield Corporation City Architect's Department, John Lewis Womersley





◀ **Figure 1.6**

Great Arthur House, Golden Lane Estate, Finsbury, London, 1957: detail of the roof terrace of the tower block

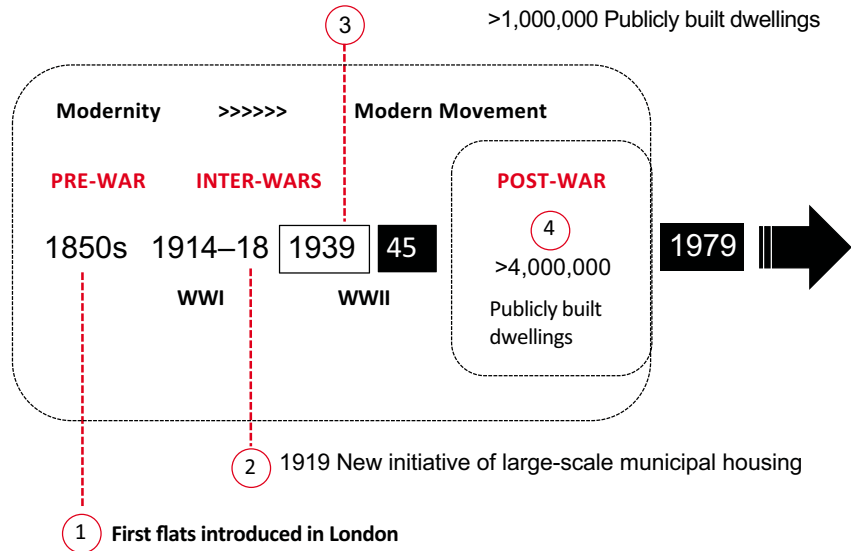


◀ **Figure 1.7**

Barbican Estate, City of London, 1961: full-scale mock-up of kitchen, built in the architect's studios

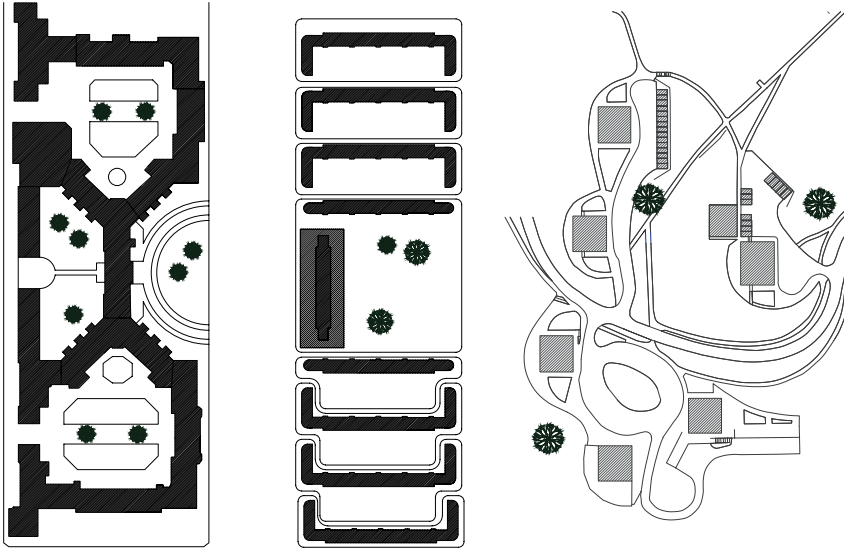
► **Figure 1.8**

Public high-rise housing construction between 1850 and 1945



All the progressive architects wanted to work for the local authorities and their active housing programmes, contributing to the general idealism of a better future for all. A good example of this is the LCC Architects Department, which by the end of the 1950s had more than 3,000 staff, including 503 qualified architects.¹⁷ Central government established the National Building Agency in 1963 to support the local authorities design teams to embrace the emergent construction systems. These technologies were imported from more experienced countries, particularly from Scandinavia, in a variety of methods. The early developments using slab blocks and their scientific *Zeilenbau* arrangement soon gave way to other formal explorations, in search of the 'aesthetics of height'. Since the early 1950s, mixed heights, for instance, through the use of maisonnettes and point blocks, would firmly define a new design trend, forming different configurations complemented by explorations in deck accesses, bridges, *piloti* and other topographical landscapes. Local housing policies also favoured point blocks over slabs, encouraging the production of progressively taller towers, which by the mid-1960s vertiginously increased to over 20 or even 30 storeys¹⁸ (Figure 1.9).

All the countries in Europe launched programmes to meet symbolic production figures (typically one million dwellings), and all the legal processes were speeded up for that to happen. In many areas, the demolition of pre-war dwellings was a product of deliberate eradication of slums rather than the need to tackle war damage¹⁹ (Figures 1.10 (a) and (b) and 1.11). Some countries envisioned the new typology as a 'modern village in which all classes would live in harmony'.²⁰ That certainly happened in all the Eastern European countries, and that aim was also included in the British Housing Act of 1949. Estates of flats remained of no interest to the private sector, and their construction was left in the hands of municipal authorities, as part of their target to build four-fifths of all new housing.²¹ Despite extensive support, flats in blocks above six



◀ **Figure 1.9**

Evolution of the social high-rise housing typology in England according to three layouts: enclosed courtyards (left), Zeilenbau slabs (centre) and point blocks (right)



◀ **Figure 1.10**

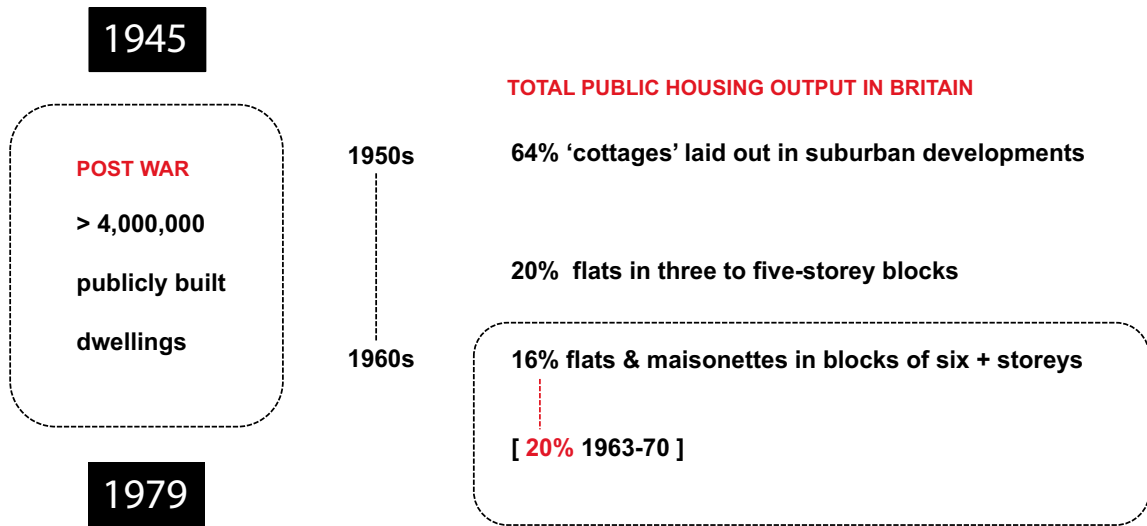
(a) and (b) Two views showing the emergence of high-rise housing blocks in slum clearance areas, East End, London in the 1960s. (a) Odds against tomorrow. (b) Another gloomy Sunday.



► **Figure 1.11 (a–c)**

Three views of the emergence of the Netherthorpe Estate in slum clearance areas of Sheffield, 1952–57





storeys represented a minor proportion: just accounting for over 2 per cent of all council housing in 1991^{22, 23} (Figure 1.12).

In spite of the low numbers, high-rise estates were very visible. It was easier to produce them in cleared areas that needed redevelopment, or in greenfield sites in the peripheries of cities to allow tower cranes to systematise their erection following parallel rows to minimise cost and maximise sun exposure, which led to highly concentrated areas of tower blocks. Nationally, some regions accumulated the highest concentrations of high-rise flats, nearly 80 per cent of the total production in those years: Greater London and the North West again led this trend, this time also followed by the West Midlands and Glasgow.²⁴ Some developments effectively became real landmarks, in some cases even achieving protected status years later. Examples of these prominent estates are Golden Lane Estate, designed by Chamberlin Powell & Bon in 1957; the Trellick Tower, designed by Ernő Goldfinger in 1972; Robin Hood Gardens, designed by Alison and Peter Smithson in 1972; or Park Hill, designed by Jack Lynn and Ivor Smith in 1957. But the image that remains for the majority of the population is that of the hundreds of massive 'anonymous' interventions (designed by the municipal Housing Departments), which colonised the peripheral landscape of these cities: of the 6,544 post-war blocks built in the UK, 2,789 were built in Greater London, 458 in Birmingham, 692 in the North West, and 863 in Scotland (261 in Glasgow alone).²⁵

▲ **Figure 1.12**

Public high-rise housing construction between 1945 and 1979

1968 to the 1980s: The decline of high-rise housing

By the end of the 1960s, the perception of tower blocks, and their optimistic modernist connection to technology as a vehicle for social change, had shifted dramatically. Apart from a sudden general scepticism regarding the Modern Movement ideology by architects and planners, different realistic facts became

apparent at that time, in relation to technical, social and financial issues, with a major impact on young families with children:

- The management of these big estates was a new responsibility for the municipal authorities, and proved to be very challenging, lacking a continuous approach in the provision of services (e.g. maintenance), and in many cases counting on insufficient resources, which seriously affected the estate's viability.
- Estates turned out to be technically dysfunctional for different reasons: deficient in acoustic and weather insulation, inefficient lifts (or even absence of them), structural problems connected with the use of new techniques, low quality materials, and inadequate building services equipment.
- Social and spatial problems in the environments outside and inside the blocks: lack of security, failure to favour communication between neighbours, lack of privacy, traffic and noise pollution, and a poor location (developments far from local facilities, aggravated when social and leisure amenities were not provided within the estate).
- Statistics showed that building high was actually more expensive,²⁶ running the estate involved high maintenance and large losses, and that actually people preferred to live at ground level.²⁷
- Socio-economic issues related to the wider context: high unemployment, poverty, poor schooling, and new problems in relation to drug consumption and anti-social behaviour.²⁸



▲ **Figure 1.13**

Linda Marshall on the balcony of her new home on the 19th floor flat of Ferrier Point in Canning Town, after being evacuated from Ronan Point

All these factors, together with the withdrawal of subsidies in 1967 and the fatal partial collapse of Ronan Point in 1968, marked the decline of the high-rise block venture in Britain. Major concerns about safety, along with the high operating costs, predisposed local authorities to support the development of structural surveys of the blocks, which soon would lead to decisions to demolish many of them, in some cases after only 18 years of existence. The first demolitions took place in Birkenhead in Merseyside in 1979: two 11-storey high-rise blocks. The actual Ronan Point would be demolished in 1984 together with another eight almost identical blocks, and many others came after them following reports commissioned by the Ministry of Housing²⁹ (Figure 1.13).

The advice to authorities was to appraise all their

blocks over six-storeys in height which were built of large pre-cast concrete panels to form load-bearing walls or floors or both in order to carry out dynamic and fire tests, and assess whether they were susceptible to progressive collapse.

Some of these studies led to interventions to strengthen the buildings; in other cases, to demolitions. In Liverpool, two-thirds of their 67 tower blocks were approved for demolition. The debate as to whether it is more appropriate to demolish or to refurbish these buildings is still current today across Europe



◀ **Figure 1.14**

Demolition of AAB Afdeling 43 in Copenhagen. Photograph taken from the 11th floor of the opposite block within the estate, 13 May 2012.

(Figure 1.14). The high cost of demolitions in combination with a change of vision in the welfare activities of states since the mid-1980s changed attitudes towards this typology once more.

High-rise blocks: new visions

The Right-to-Buy law passed in the Housing Act of 1980 allowed council tenants in the UK to buy their properties for the first time, the majority of sales being of family houses (cottages) and with flats only accounting for 10 per cent of the sold high rise stock.³⁰ As a result, now most public housing in the UK is flats. The increasing demand for social housing, together with the fact that some of the flats are privately owned and that some of these buildings have been listed by Historic England, make many of these blocks unsuitable for demolition. These circumstances and evidence from surveys performed between 1980 and 1990s of the positive views of tenants^{31, 32} (who in many cases have been living in their flats for 30 years), have moved this part of the council housing stock back into the category of assets.

In these years, the initiative for intervention and management remained with the municipal housing authorities, and some started to develop refurbishment strategies for their high-rise stock. In the 1990s and the early 2000s many local authorities put their housing stock in the hands of housing associations through Large Scale Voluntary Transfers, as a way to provide managers with access to raise private funding to enable the modernisation of their properties. In 2001, local authorities owned 2.8 million homes (13 per cent of the housing stock), which by 2010 had decreased to 1.8 million (8 per cent of the stock). Over the same period, the number of housing association homes has increased from 1.4 million to 2 million.³³

Refurbishment not only offers opportunities for technical upgrades, but also for social rearrangements to improve the social imbalance that occurred

over the different periods, while providing for the new social demands. Social housing was not only an instrument to deliver accommodation to the working classes in the aftermath of the two wars; in some countries it was also an instrument for municipal authorities to 'organise' the poor (including 'persons considered unable to behave decently in a normal house'³⁴) in a selective and controlled way.³⁵ In the past, working families with young children able to pay their rents and take care of their tenancies received the highest priority, but rehousing from slum clearance involved a diversity of social compositions, and in some cases this organisation could lead to blocks entirely accommodating 'residual' populations with extreme conditions of unemployment or poverty. When social conflict became palpable, those tenants with more options left, and high-rise blocks were occupied by those tenants with least choice: migrants, single people, and 'problem families'.³⁶

Local strategies to regenerate the blocks during the 1990s included the specialisation of some blocks into 'sheltered housing' to accommodate the increasing numbers of older and ill people, as well as blocks for single people and students. Some of these blocks were comprehensively refurbished with successful results, although in limited numbers, and that has become the general practice nowadays. The current social profile of tower blocks varies according to locations and circumstances, as explained above. Where gentrification has not happened, the typical profile presents high proportions of retired or unemployed tenants, tenants whose income is at the level of state benefits, and households containing persons with a long-term illness. The latest demographic analysis of the English high-rise housing stock reveals that:

- only 7 per cent of owner-occupier households with people aged 60 years old or over live in flats compared with 20 per cent of such households in the private rented sector, and 45 per cent in the social rented sector;
- a high proportion of households in poverty³⁷ (52 per cent) rent flats from social landlords;
- ethnic minority households are much more likely to live in flats.³⁸

The central government has not devised specific strategies to target the regeneration of the high-rise stock in particular. Although the typology could benefit from global refurbishment programmes, this route offers limited resources and hard competition from other models of housing.³⁹

New trends support the refurbishment of high-rise housing as a demanded alternative for new urban lifestyles, which is attracting the interest of both the public and private sectors:

- Many of the towers are now considered 'well located' for populations and cities that keep growing, becoming in some cases (mostly in London) listed buildings in which their historic features are favourably appreciated, going not only through processes of specialisation (young/single population) but even of gentrification (liberal professionals).
- They are well suited to the increasing number of smaller and childless households.⁴⁰

- Retrofitting and reusing buildings also suit the environmental sensitivities of our contemporary society.

In the most up-to-date survey, the English Housing Survey: HOMES 2010, out of the 22.4 million dwellings in England (21.4 million occupied), 66 per cent were owner-occupied and the rest were rented, split evenly between the private rented sector (17 per cent) and the social rented sector (17 per cent). As regards the high-rise stock numbers, 46 per cent of local authority homes were flats, 9 per cent of these in high-rise blocks (390,000 dwellings).⁴¹

In particular, according to a report from 2012,⁴² there were still around 3,500 council housing high-rise blocks in Britain taller than ten storeys. Whether these buildings are a worthy legacy to be kept is still controversial. Tower blocks keep being demolished every year all over the country. Since 2006, 25 per cent of Glasgow's high-rise housing has been demolished, to make way for new housing developments. In London, the Heygate Estate was only demolished in 2014; in the North, two 15-storey tower blocks from Seaforth, Merseyside, and the remaining three 17-storey tower blocks of Queens Park flats in Blackpool, were only demolished in April and July of 2016 respectively. In addition to approved plans, the UK government's declarations in January 2016 elicited new debates about the demolition-refurbishment issue, when plans to either bulldoze or refurbish 100 sink estates were confirmed.

The assessment of the towers involves high levels of complexity, where numerous quantitative (measurable) and qualitative (subjective) aspects have to be taken into consideration, and the weight of these measures normally depends on whether the evaluation is undertaken from a public or private perspective. In a similar way, the different proposals to retrofit the successfully retained high-rise blocks present diverse approaches in the consideration of those variables. The framework in which these retrofits are happening and the analysis of those approaches will be the focus of the following chapters.

Notes

1 Lewis Mumford, *Technics and Civilization* (New York: Harcourt, Brace & World, 1934); Le Corbusier, *La Ville Radieuse* (Paris: Vincent, Fréal & Cie, 1933).

2 See Lionel Esher, *A Broken Wave: The Rebuilding of England 1940–1980* (London: Penguin Books, 1981), p. 70: quoting the *DIA Yearbook of 1929–30*:

Our slums are a disgrace. Everyone has said so for 50 years . . . why then do we not demolish them and build healthy flats instead! Amsterdam, Hamburg and Vienna are not afraid of the problem. But in this country we build suburbs . . . too far from work to attract the slum-dwellers.

3 *Ibid.* For instance, this practice doubled the built up area of London for only an increase in population of one-fifth.

- 4 Simon Pepper and Peter Richmond, 'Homes unfit for heroes: the slum problem in London and Neville Chamberlain's Unhealthy Areas Committee, 1919–21', *Town Planning Review*, 80(2) (2009): 143–171.
- 5 *Ibid.*, p. 27: nearly one-seventh of the remainder.
- 6 Miles Glendinning and Stefan Muthesius, *Tower Block: Modern Public Housing in England, Scotland, Wales and Northern Ireland* (New Haven, CT: Yale University Press, pp. 1–2: These overall totals were rather unevenly distributed across the UK. Between the wars, public housing accounted for 28 per cent of all new dwellings in England and Wales, only 15 per cent in Northern Ireland, but as much as 67 per cent in Scotland (Glasgow had 71 per cent).
- 7 See Florian Urban, *Tower and Slab: Histories of Global Mass Housing* (London: Routledge, 2012), pp. 10–13.
- 8 Congrès International d'Architecture Moderne, created in 1928 to set the principles of the Modern Movement.
- 9 Frank Newbery, 'Liverpool's flats 1919–1939: policy and design of central area redevelopment by the Liverpool Housing Department', B.Arch. dissertation, Liverpool School of Architecture, 1980, p. 102.
- 10 *Ibid.*, pp. 89–90.
- 11 The term 'estate' appears for the first time in 1920: both the word and concept appear in the December 1920 issue of the official journal *Housing*, which was circulated free to local authorities when they were beginning to implement the 1919 Housing Act. See Alison Ravetz, *Council Housing and Culture: The History of a Social Experiment* (London: Routledge, 2001), p. 67.
- 12 Simon Pepper, 'Ossulston Street: early LCC experiments in high-rise housing, 1925–29', *The London Journal*, 7(1) (1981): 45–64.
- 13 Simon Pepper and Peter Richmond, 'Stepney and the politics of high-rise housing: Limehouse Fields to John Scurr House, 1925–1937', *The London Journal*, 34(1) (2009): 33–54; and Simon Pepper and Peter Richmond, 'Upward or outward? Politics, planning and council flats, 1919–1939', *The Journal of Architecture*, 13(1) (2008): 53–90.
- 14 Building high was not actually demonstrated to be cheaper. See Alison Ravetz, *Council Housing*, p. 105.
- 15 Mark Swenarton, Tom Avermaete and Dirk van den Heuvel (eds), *Architecture and the Welfare State* (London: Routledge, 2015).
- 16 'Flats in 6-storey blocks would get more than twice the subsidy on houses, and flats in 15-storey blocks nearly three times as much' (*ibid.*, p. 106).
- 17 Simon Pepper, 'High-rise housing in London c1940–1970', in Peter Guillery and David Kroll (eds), *Mobilising Housing Histories* (London: RIBA Publishing, 2017), p. 124.
- 18 *Ibid.*, p. 131.
- 19 Pepper, 'High-rise housing', p. 129.
- 20 Implemented by Aneurin Bevan in the Housing Act of 1949.
- 21 Ravetz, *Council Housing*, p. 96.
- 22 Glendinning and Muthesius, *Tower Block*, p. 2.
- 23 Richard Turkington, "Britain. High-rise Housing as a 'Doubtful Guest'". In Richard Turkington, Ronald van Kempen, and Frank Wassenberg, (eds.)

High-Rise Housing in Europe: Current Trends and Future Prospects (Delft: DUP Science, 2004), pp. 147–164: regarding the situation at the end 1990s–early 2000s:

The numbers of high-rise dwellings (6 storeys and above) rose from 6,000 in 1956 to 17,000 in 1961, 35,000 in 1964 and 44,000 in 1966. Within the high-rise category there was a marked trend towards increasingly tall blocks. Blocks of 10–14 storeys expanded from 0.7% of public housing in 1955 to 8.4% in 1963. Blocks of 15–19 storeys expanded from 0.1% in 1955 to 8.3% in 1964.

24 For instance, Hutchesontown Gorbals in Glasgow, by 1971, had 208 towers comprising nearly 21,000 homes. Birmingham created 458 high blocks in its suburbs. See Ravetz, *Council Housing*, p. 105. Data in relation to Greater London: 25 per cent of all new council dwellings between 1945–79, 50 per cent of all new council dwellings in 1965–68; Glasgow: 75 per cent of all new council dwellings from 1961–68. See Glendinning and Muthesius, *Tower Block*, p. 4.

25 *Ibid.*, Table 3, p. 333.

26 Official report *Flats and Houses* (Ministry of Housing and Local Government, London: HMSO, 1958).

27 See Patrick Dunleavy, *The Politics of Mass Housing in Britain 1945–75: A Study of Corporate Power and Professional Influence in the Welfare State* (Oxford: Clarendon Press, 1981), p. 280:

[In Greater London] seventy per cent of their applicants preferred a house and a garden, although at this period only nine per cent of the authority's housing output was in this form, while sixty-five per cent was in high flats.

See Ministry of Housing and Local Government. *Families Living at High Density: A Study of Estates in Leeds, Liverpool and London* (London: HMSO, 1970). p. 151.

28 Richard Turkington, Ronald van Kempen and Frank Wassenberg (eds), *High-Rise Housing in Europe: Current Trends and Future Prospects* (Delft: DUP Science, 2004), p. 12.

29 From conversation with Sam Webb, consultant at British Research Establishment, who developed reports for the Ministry of Housing between 1968 and the end of the 1980s, for instance: 'The structure of Ronan Point and other Taylor Woodrow buildings' (1985), 'Large panel system dwellings: preliminary information on ownership and condition' (1986), and 'The structural adequacy and durability of large panel system dwellings' (1987).

30 Turkington, 'Britain. High-rise', p. 152.

31 *Ibid.*

32 The National Tower Block Network was created in 1987 for the active involvement of tenants in blocks issues, having their own bulletin nationwide. Nowadays tenants are sought to engage through consultation in any refurbishment process.

- 33 Department for Communities and Local Government), *English Housing Survey: HOMES 2010* (London: TSO, 5 July 2012), p. 9.
- 34 Francis G. Castles, et al. *The Oxford Handbook of the Welfare State*. Oxford Handbooks Online (Oxford: Oxford University Press, 2010). pp. 67–80. See especially Chapters 5 and 6: ‘The Emergence of the Welfare State’ by Stein Kuhne and Anne Sander, and ‘Post-War Welfare State Development’ by Frank Nullmeier and Franz-Xaver Kaufmann.
- 35 See the idea of a new order for the poor, expressed by Jeremy Till in his article ‘Modernity and order: architecture and the welfare state’, available at: https://jeremytill.s3.amazonaws.com/uploads/post/attachment/35/2006_Modernity_and_Order.pdf, p. 19:

There is a symbiotic relationship; both the welfare state and architectural modernism are reliant on their need for order. Within the welfare estate, the poor need to be reclassified as non-poor if progress is to be announced. They need to be reordered into another system, lifting them from poverty in an attempt to throw off the Victorian associations with dirt and immorality. Importantly, it needs to be seen that the poor have been reordered, and it is here that architectural modernism comes in as a signifier of order, cleanliness and progress. And architecture is all too willing to collaborate, not just because the welfare agenda fits so well with architecture’s own agenda of ordering and cleanliness (with beauty in there as an associated given), but also because architects can feel good about it. The architecture of the welfare state provides a perfect vehicle for architectural notions of social progress being affected by architectural input.

- 36 Turkington, ‘Britain: High-rise’, p. 157.
- 37 Department for Communities and Local Government, *English Housing Survey*, p. 24: ‘Households in poverty are defined as households whose equivalised income is less than 60% of the median value.’
- 38 Ibid.
- 39 See Chapter 2.
- 40 Department for Communities and Local Government, *English Housing Survey*, p. 12: In 2010 of the 22.4 million dwellings existing in England, 21.4 million were occupied; the vast majority (97 per cent) were occupied by a single household or person.
- 41 Ibid., p. 14.
- 42 Katie Bates, Laura Lane and Anne Power, ‘High rise hope: the social implications of energy efficiency retrofit in large multi-storey tower blocks’, LSE Housing and Communities, *CASE Report 75* (2012): 1.

Chapter 2

Carbon emissions reduction

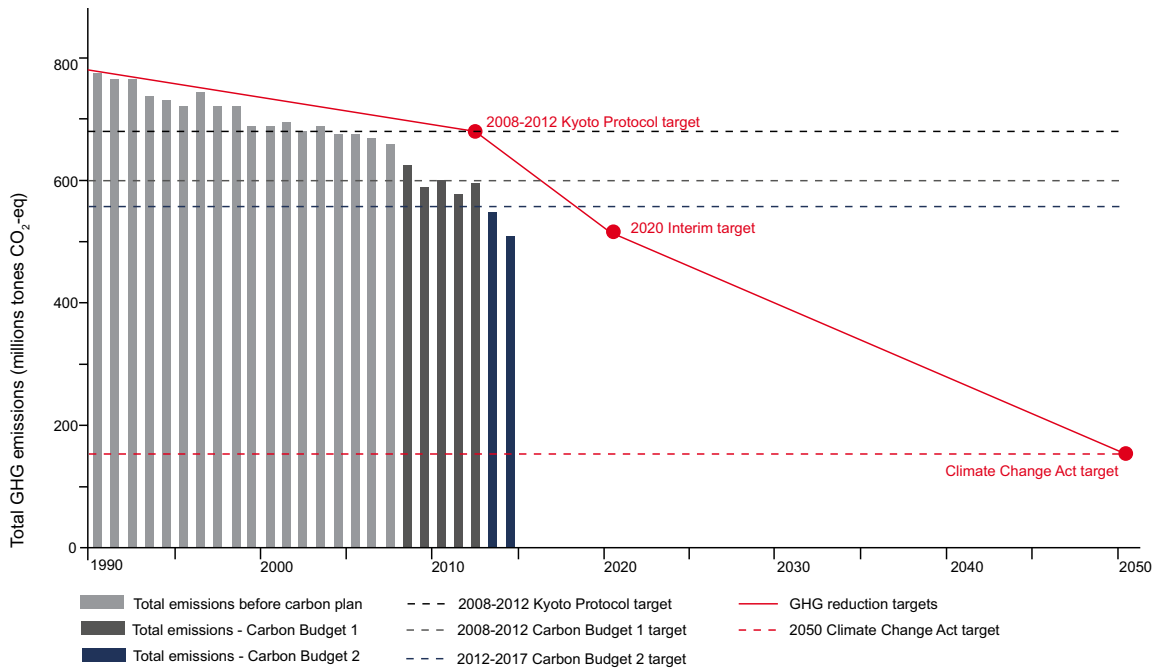
The need for sustainable retrofits

Environmental context

The British government, through the UK Carbon Plan,¹ published in the Climate Change Act of 2008, made a long-term commitment towards a substantial decarbonisation of Britain, establishing the world's first legally binding climate change target. According to this law, the aim is to reduce the UK's greenhouse gas emissions by at least 38 per cent by 2020, and by 80 per cent by 2050, from the 1990 baseline.

This strategy is of critical relevance to the built environment. Statistics from 2009, right after the Carbon Plan was published, show that buildings were responsible for 37 per cent of the total greenhouse emissions in the UK, being higher than any other use (i.e. transportation or industry).² At present, at the beginning of 2017, it is still obvious that decarbonising space and water heating is one of the biggest challenges for carbon budgets, since 17 per cent of UK emissions are still produced from heating and powering homes and buildings.³ By 2050, all buildings will need to have an emissions footprint close to zero, which mostly means that they will need to become better insulated, use more energy-efficient products and obtain their heating from low carbon sources. Currently, the use of low-carbon heat is minor, representing less than 2 per cent of buildings' heat demands.⁴ Regarding the domestic sector in particular, in 2015, it consumed 29 per cent of the total final energy (leading to 24 per cent of the total emissions), and accounted for 66 per cent of the building emissions in Britain.⁵ A similar situation can be seen in Europe, where in 2014 housing represented 25 per cent of all energy used in the European Union, occupying the largest amount of floor area (70–75 per cent),⁶ despite the majority of the EU-28 population (41.5 per cent, four out of every ten persons) living in flats.⁷

Measures created to ensure carbon reductions are having a great impact on the design of present and future buildings, but are particularly critical as a catalyst for the regeneration of existing buildings. This is true not only because refurbishing rather than building new saves more carbon, but also because the UK's housing stock is among the most inefficient in Europe, and most importantly, the renewal rate of the stock is very slow, at least 80 per cent of the homes that will be standing in 2050 have already been built.⁸ According to this figure, only 20 per cent of the stock will be at least at the energy-efficiency level required by current regulations for newly built housing. Improving the energy



UK greenhouse gas emissions compared to targets

▲ **Figure 2.1**

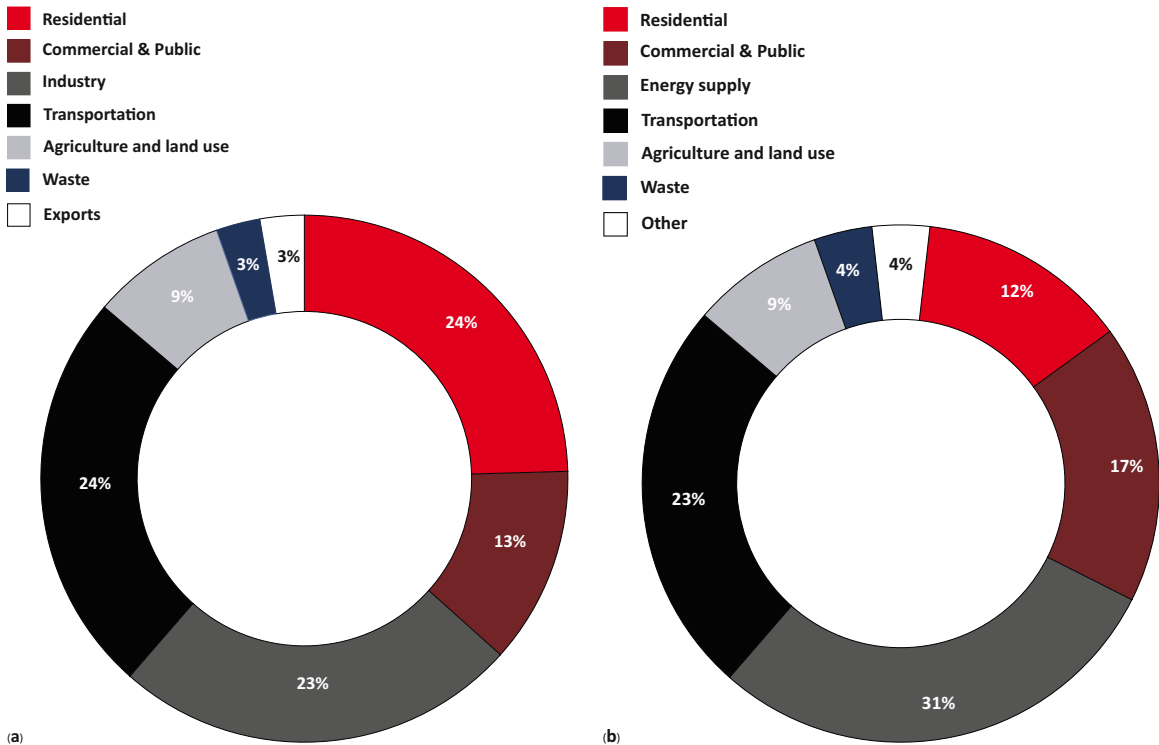
UK GHG emissions compared to targets

Source: Department of Energy and Climate Change (31 March 2016).

efficiency of existing homes will, therefore, play a significant role in ensuring the UK's 2050 climate change targets are met (Figure 2.1).

A recent report shows that densely populated British cities have lower greenhouse emissions and energy consumption per capita than less dense cities, due to a reduced dependency on car travel.⁹ The sustainable growth of cities requires compactness and diversity of use in all its areas, allowing for well-connected and car-independent communities. Sustainability also implies making the most of existing infrastructure and resources, taking advantage of the energy and capital that were invested in them. As part of this strategy, it is essential to maximise the value of the existing residential building stock.

Inspecting and appraising the existing stock are crucial to this process, not only because buildings present a variety of physical problems, but also because most of them were built at a time when energy efficiency and sustainability regulation standards were non-existent or much less demanding than today. About 70 per cent of the existing residential buildings in the UK were actually built before the oil crisis of 1973, that is, before design intentionally incorporated ecological concerns: 23 per cent were built before 1919; 17 per cent were built between 1919 and 1945, and 30 per cent were built between 1946 and 1973.¹⁰ In the existing residential buildings, over 410,000 homes are social high-rise flats (390,000 in England, and 18,146 in Scotland;¹¹ there is no available surveyed data for high rise flats in Wales and Northern Ireland). Given that the oldest stock tends to consume more energy, it also offers the highest potential to improve its energy performance by resorting to retrofitting.



Since the 1990s, most of the British dwellings have gone through consecutive processes of modernisation and adaptation, aiming to improve their technical and energy efficiency performance (Figure 2.2). In 2013, the average energy efficiency rating (SAP09) for the English stock (80 per cent of the UK stock) was 60 (band D; 5.1 tonnes of CO₂ per dwelling per year), whereas in the social sector, the global rating was 64.6 (3.2 tonnes of CO₂ per dwelling per year), and for high-rise flats, in particular, the rating was 67.8 (top of band D; 2.9 tonnes of CO₂ per dwelling per year).¹² Only 6 per cent of homes (1.5 million) in England achieved the worst energy efficiency rating bands F and G (4 per cent of these homes were in the social sector), whereas in 1996 this proportion was 29 per cent of the total housing stock.¹³ In a similar upgrading process, the SAP rating for the Scottish housing stock successively improved up to 66 (top of band D) in 2013.¹⁴

However, the scale of this challenge became clear in a report released by the UK government in 2013. It was estimated that an average of one home would need to be retrofitted every minute between then and 2050 if the UK was to meet its carbon reduction targets.¹⁵ Looking at the UK residential stock, public housing represents the highest share of the housing stock developed without any energy performance considerations, and within it, high-rise concrete tower blocks offer great potential in this endeavour to lower our environmental footprint, since they already contribute to higher density and compactness, and provide economies of scale difficult to achieve in private properties. The majority of these blocks already have well-organised communities, with well-established

▲ **Figure 2.2**

(a) and (b) UK GHG emissions by sectors in 2009 and 2014

Source: Department of Energy & Climate Change (31 March 2016).

systems to support communication among tenants. Another advantage is that there is normally one freeholder, a local authority or registered social landlord, which are easier to engage. Having just one freeholder also means that it is easier to refurbish the whole estate (in many cases over 700 dwellings) in one single comprehensive programme, where a number of practicalities can be arranged more easily too: from installing scaffoldings or acquiring building materials and labour, to granting consistency of intervention criteria for the entire block in terms of aesthetics and performance goals. An integral refurbishment permits a full treatment of the different issues of the building envelope (thermal and acoustic insulation, fabric repair, installation of renewables, etc.), rather than inefficient partial interventions detrimental to the building's performance.

The post-war residential tower blocks used experimental construction systems that were poorly insulated, and in many instances, they were not properly managed and maintained throughout their life, which have left them in even poorer technical condition: structural vulnerability to cold, draughts and damp, becoming unaffordable to heat, unattractive to view and undesirable to occupy. The ecological retrofit offers not only the instrument to update their energy and technical performance, but also to eliminate social stigmas, increase their attractiveness, and provide a positive sense of well-being and safety for tenants and landlords.

The main goals of the retrofits are:

- To deliver an ecological upgrade, leading to reductions in energy consumption, greenhouse gas emissions and energy costs. This is mainly achieved through the implementation of thermal insulation, and renewable and energy-efficient systems.
- To address the physical problems of the estate caused by poor maintenance, low construction standards and inefficient or outdated design solutions. This work implies external and internal repairs of the building fabric (cladding and structure), the definition of a new layout according to contemporary uses and types of households, implementing new and more efficient building services (lighting, heating, ventilation, electrical systems, water, waste management, passenger lifts), and cleaning (painting).
- To provide a positive environmental image for the estate and its neighbourhood. This work entails improvements to the landscape within and around the high-rise blocks, and on their communal facilities for social interaction (green areas, playgrounds, allotments, sports areas, community centres, etc.). The ultimate goal is to remove any negative social connotations and offer a safe, sustainable, pleasant and welcoming environment.

Government energy-efficiency retrofit programmes

For over twenty years, the government has launched a series of environmental schemes to incentivise the ecological upgrade of the British housing stock, by engaging dwelling owners to undertake retrofit work. Improving the current energy-inefficient housing stock offers enormous opportunities for the UK, in both

economic and environmental terms. Some studies indicate that renovating homes would not only generate investment and jobs, but could also help to avoid costly investments in additional energy infrastructure: more efficient houses present a lower energy demand, which can be minimised or even zero in those cases that incorporate power generation and resource-efficiency systems (photovoltaic cells, wind turbines, geothermal energy, water reuse, waste recycling, etc.), which can make the property completely independent from the energy networks. Apart from the obvious global carbon reductions and economic benefits already discussed, retrofitting also brings lower bills and increased well-being for residents. However, encouraging energy-efficiency improvements, despite the offered support and highly subsidised prices (often for free), turned out to be a difficult task, and take-up by households has tended to be surprisingly slow and low.¹⁶

Successive environmental programmes have been created to support the different stages of the decarbonisation process, in correspondence with statistical performance data supplied by regular reports commissioned by independent bodies, such as the Climate Change Committee and the British Research Establishment, who provide advice and recommendations to the UK government. A timeline in Figure 2.3 shows the different programmes chronologically ordered, and they are also explained in more detail in this section.

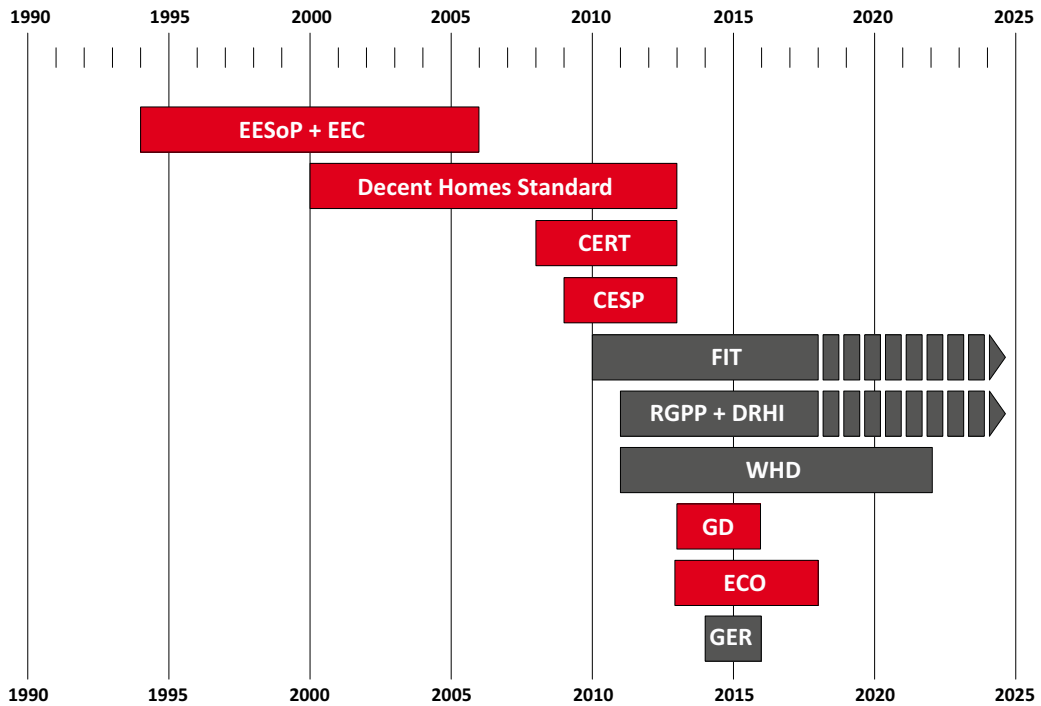
Energy Efficiency Standards of Performance (EESoP) and Energy Efficiency Commitment (EEF) (1994–2005)

The Energy Efficiency Standards of Performance (EESoP) and the Energy Efficiency Commitment (EEC) schemes were established with social and environmental goals. The EESoP, in its three consecutive stages, ran from 1994 to 2002; after that, the EEC ran from 2002 to 2008 in two consecutive stages. They were set to deliver energy-efficiency measures to the most vulnerable homes, mainly focused on insulation, lighting, heating and appliances, although thermal insulation was at the centre of the strategy as the most important resource to deliver comfort while saving residents money on their fuel bills.¹⁷ These schemes were open to all types of housing, and despite their benefits and successful outcomes, they would not have as great an impact on public residential tower blocks as the Decent Homes Standard, also created at that time.

Decent Homes Standard (2000–2012)

The Decent Homes Standard¹⁸ was a technical standard specific to public housing, introduced to improve the quality of the stock to ensure that all social housing was of a decent standard (achieves minimum quality conditions) within ten years. The target was set in 2000, using the policy as a vehicle

[to] promote social cohesion, well-being and self-dependence, and ensure that all social housing meets set standards of decency by 2010, by reducing the number of households living in social



- Energy-efficiency measures
- Energy use/Renewable energy use measures

EESoP: Energy Efficiency Standards of Performance; EEC: Energy Efficiency Commitment; CERT: Carbon Emission Reduction Target; CESP: Community Energy Saving Programme; FIT: Feed-in Tariffs; RGPP: Renewable Heat Premium Payment; DRHI: Domestic Renewable Heat Incentive; WHD: Warm Home Discount; GD: Green Deal Policy; ECO: Energy Company Obligation; GER: Government Electricity Rebate.

▲ **Figure 2.3**
UK decarbonisation incentives timeline

housing that does not meet these standards by a third between 2001 and 2004, with most of the improvement taking place in the most deprived local authority areas.¹⁹

This policy required all local councils to set out a programme to evaluate the entirety of their housing stock and undertake modifications and replacements when the conditions laid out in the standard were not met. Some of them found out that an extensive proportion of their stock was actually in need of an upgrade, with works that required major regeneration and long time frames. Putting in place the operational logistics to undertake the different jobs that would meet their maintenance obligations (from assessing to tackling extensive repairing, but also enabling the financial resources to fund the different interventions) was a demanding task for many local authorities, considering their inability to generate private capital. The policy was flexible enough to allow them to delegate part or the totality of their housing stock to registered social landlords, who could seek funding under the Private Finance Initiative to undertake the scheduled interventions. They could resort to three strategies: (1) private finance

initiative (PFI) already mentioned; (2) the arm's-length management organisations (ALMOs); and (3) stock transfer.

- ALMOs were first established in 2002 and currently, manage over 500,000 council homes in 40 local authorities.²⁰ They were created to ensure high-quality management, effective investment, and the increased involvement of tenants while maintaining the ownership of the housing stock in council control. They provide the opportunity for tenants to be well represented, since one-third of members on the board are council tenants, with the remaining positions occupied by serving councillors and independent members with relevant business and housing experience. Since tenants keep local authorities as their legal landlords, they also keep the same rights: rights to buy, repair and manage.
- PFI has been in effect since 1998, and its foremost aim was to enable the involvement of the private sector (private capital) in public sector projects, by creating public-private partnerships. Through PFI, the private sector handles the up-front costs, and offers an instrument for increasing efficiency to public spending, bringing a wide range of skills to the provision of public services.
- Many local councils decided to transfer some or all of their housing stock to a housing association, as another way of bringing private investment to the public sector, to better repair and maintain the stock. Housing associations can focus on management and development that can be funded by private loans, working in close collaboration with tenants, who have a greater say in the services and improvements provided. This solution permits local authorities to reduce their debts, use their funding to finance other projects and concentrate on housing strategy and planning rather than management and development.

The implementation of the Decent Homes Standard was regarded by many of the involved stakeholders as highly successful, resulting in many tower blocks being improved, with new kitchens, bathrooms, heating systems, insulation and windows.²¹

Halfway the upgrade process it became clear that the target of 100 per cent decency was unlikely to be met, but nonetheless, the 47.5 per cent non-decency homes reported in 2001 dramatically declined to 14.5 per cent in 2010.²² Some interventions went beyond the thermal efficiency requirements, which were seen to be low, running their own Decent Homes Plus schemes with additional energy-efficiency measures. The Decent Homes Standard is actually a minimum standard, and, as in 2001 nearly half of the public housing stock was below that standard, gives stark evidence of the precarious conditions presented by a very high proportion of the stock. This fact makes the case for going beyond the standard to keep delivering improvements in living quality, which together with the critical new goals of reducing carbon dioxide emissions set in the Carbon Plan of 2008, of clear relevance in the social sector, suggested the need for new governmental incentives.

According to government reports, having massively invested in the social sector during that decade implied underinvestment in the private sector

programme, and therefore the new incentives would need to be more inclusive, despite being aware of the fact that a significant backlog of works remained. For this reason, the Energy Act 2011 required the UK government to introduce regulations to improve the energy efficiency of buildings (Minimum Energy Efficiency Standards) in the private rented sector no later than 1 April 2018. From this moment, 'it will be unlawful to rent out a residential or business premises that does not reach a minimum energy performance rating of E' on their Energy Performance Certificate (EPC).²³ That is, this policy will come into force for new lets and renewals of tenancies with effect from 1 April 2018, and for all existing tenancies on 1 April 2020, requiring private landlords to update their stock, as they have access to the government's incentives, such as the Green Deal and Energy Company Obligation (described below), therefore expanding competition for these schemes.

First Carbon Plan Instruments (2008–2012): the Carbon Emission Reduction Target (CERT) and the Community Energy Saving Programme (CESP)

In the following years, two new policies supported the delivery of energy--efficiency measures to domestic premises: the Carbon Emission Reduction Target (CERT), which ran from 2008 to 2012 to assist the general decarbonisation, and the Community Energy Saving Programme (CESP), which ran from 2009 to 2012, and was specially focused on geographic areas with fuel-poor and vulnerable households.²⁴ Both programmes required an active contribution from energy (gas and electricity) suppliers and generators, who had to implement different carbon-saving measures. At first, carbon savings were planned to be accomplished through lighting optimisation, and nearly 304 million compact fluorescent lamps were replaced in 25 million households. Since 2010, the focus was on achieving targets related to thermal insulation, leading to more than 4 million lofts being insulated as well as 2.5 million cavity walls and almost 150,000 solid walls. Both schemes were considered successful in fulfilling their goals: energy companies were required to achieve an overall target of 19.25 Mt CO₂ saving by 31 December 2012, and they actually achieved a saving of 16.31 Mt CO₂, almost 85 per cent of the overall target.²⁵

According to an independent study, by the end of these two programmes in 2012, it was estimated that 5 million lofts still remained to be properly insulated, as well as 4–5 million unfilled cavity walls and the majority of the UK's 7–8 million inefficient solid walls.²⁶

The Green Deal (2013–2015)

The next programme was the Green Deal, offering the opportunity to finance the installation of a wide range of energy-efficiency measures to householders between January 2013 and July 2015. This scheme specifically worked on an individual basis, so it inherently presented barriers to individual tower block

properties, given the lack of benefit in punctual thermal-control retrofit interventions (insulation and double glazing), unless the whole block agreed to the retrofit. On the other hand, tower blocks could take advantage of it for small-scale interventions, such as energy-efficient lighting and water management measures (LED lighting, and water-efficient taps).²⁷ To ensure the engagement of local authorities with the programme, the government additionally contributed £13 million between October 2012 and May 2013 to the creation of eight Green Deal Low Carbon Cities (Birmingham, Bristol, Leeds, Liverpool, Manchester, Newcastle, Nottingham and Sheffield).²⁸

The Department of Energy and Climate Change launched this scheme, together with the Energy Company Obligation, the characteristics of which would particularly fit the high-rise housing estates needs, and therefore better benefit retrofits in these buildings, leading to a poor take-up of the Green Deal. Statistics revealed that the total number of measures installed financed by the Green Deal was 20,347 up to the end of October 2015: most of them boilers (31 per cent), followed by photovoltaics (29 per cent) and solid wall insulation (15 per cent).²⁹

Recent retrofit schemes

There are several recent retrofit schemes, some of them currently in operation:

- Energy Company Obligation (ECO) (2013–2017);
- Government Electricity Rebate (Autumns 2014 and 2015);
- Warm Home Discount (current);
- Feed-in Tariffs (current);
- Renewable Heat Premium Payment and Domestic Renewable Heat Incentive (current).

The Energy Company Obligation (ECO) (2013–2017), was structured in two obligation periods, ECO1 from January 2013–March 2015, and ECO2, launched on 1 April 2015 and effective until 31 March 2017. This scheme was devised again to require energy suppliers to deliver energy-efficiency measures to domestic properties, at no up-front cost to the consumer. Improvements were focused on hard-to-treat cavity wall insulation and solid wall insulation (internal or external), with low-income geographical areas qualifying to benefit from further benefits, such as loft insulation and gas boilers. The policy also regarded additional subsidies for those with certain benefits who live in a private property, such as boiler repairs or replacements.

According to a recent study, ECO provides the best framework for funding large-scale tower block retrofits ‘with the potential to support a more holistic set of retrofit measures than CERT, which was targeted at insulation’, making all tower blocks stakeholders predominantly interested in this programme.³⁰ Apart from the obvious benefits to residents in getting more comfortable homes with lower energy bills, the opportunity to refurbish a high number of premises in one go is particularly advantageous to the energy companies, as a cost-effective