

Greater and greener homes

More homes, ready for net zero

James Cullimore

 bright blue

Greater and greener homes

More homes, ready for net zero

James Cullimore

The moral right of the author has been asserted. All rights reserved. Without limiting the rights under copyright reserved above, no part of this publication may be reproduced, stored or introduced into a retrieval system, or transmitted, in any form or by any means (electronic, mechanical, photocopying, recording, or otherwise), without the prior written permission of both the copyright owner and the publisher of this book.

Bright Blue is an independent think tank and pressure group for liberal conservatism. Bright Blue takes complete responsibility for the views expressed in this publication, and these do not necessarily reflect the views of the sponsor.

Chief Executive: Ryan Shorthouse

Members of the board: Diane Banks, Philip Clarke, Alexandra Jezeph, Richard Mabey

Design: Chris Solomons

First published in Great Britain in 2022

by Bright Blue Campaign

ISBN: 978-1-911128-59-5

www.brightblue.org.uk

Copyright © Bright Blue Campaign, 2023

Contents

	About the author	2
	Acknowledgements	3
	Greater and greener development	4
	Executive summary	6
1	Introduction	9
2	Recent government policies to build more homes	24
3	Existing government policies to ensure new homes will be net zero compliant	34
4	Policy recommendations	52

About the author

James Cullimore is a Senior Programme Manager at the Conservative Environment Network (CEN). James joined CEN from the Electoral Commission where he was a political analyst. He has previous experience working for an MEP in the European Parliament and as a staff writer. James has a Masters in Politics and Contemporary History.

Acknowledgements

This report is part of Bright Blue's project on greater and greener development, which is kindly supported by the European Climate Foundation. The ideas expressed in this publication do not necessarily reflect the views of the sponsor.

I would like to thank all of those who have kindly offered ideas and feedback throughout. Sam Hall, Jack Richardson, Juliet Philips, Dave Sowden, Jane MacBean, Samuel Hughes, and Ben Southwood all offered invaluable policy advice. I am particularly indebted to Nicholas Boys Smith and his team at Create Streets, who are working with Chesham Town Council on their new Neighbourhood Development Orders, and the team at the UK Green Building Council, whose work on net zero building standards and whole-life carbon this report has drawn extensively from.

I am especially grateful to Ryan Shorthouse and Bartek Staniszewski for their edits and thoughtful comments during the progress of this report.

All remaining errors and all judgements are the author's responsibility. The views in this report are those of the author and do not necessarily reflect the views of Bright Blue.

Greater and greener development

This report is part of Bright Blue's project to create and argue for a programme of reforms to the English planning system, which reconciles two key sometimes conflicting objectives in housing and infrastructure policy: the socioeconomic (such as more and affordable homes for young people, and more secure and affordable energy) and the environmental (such as reducing greenhouse gas emissions and improving biodiversity). Ultimately, we want to present sensible solutions to the politically contentious planning system to enable both greater and greener development.

Bright Blue has commissioned independent experts to provide original analysis and policy recommendations in three key areas.

First, this paper examines how to secure more homes, ready for net zero. This paper will consider how the English planning system can encourage more housing development which helps to achieve net zero by 2050, including both improvements to the construction process and ensuring that all homes are energy efficient and utilise latest technologies to integrate them with the aims of the Government's *Net Zero Strategy*.

Second, a paper on building resilient neighbourhoods, prepared for climate risks. This paper will consider how the English planning system can support development which accounts for the increasing amount of adverse weather events, reducing the risk of and impacts from coastal and fluvial flooding in particular, going beyond the measures in the

National Flood and Coastal Erosion Risk Management Strategy.

Third, a paper on building resilient neighbourhoods, powered by low-carbon energy. This paper will consider how the English planning system can incentivise the construction, maintenance and expansion of low-carbon energy infrastructure, especially onshore wind, going beyond the recommendations outlined in the *Net Zero Strategy*.

Executive summary

Building more homes and delivering net zero are both monumental public policy challenges. Our complex, discretionary planning system makes it harder to create dense, sustainable settlements. Meanwhile, we continue to build new homes that are emissions-intensive and will require costly retrofitting in the future.

Housing policy reform should seek to make it easier to densify towns and neighbourhoods and ensure new homes are energy efficient and low carbon. But determining where we build homes, in what quantity, and to what standard is fraught with political challenges. This report identifies the following five principles as being critical to doing this in a politically durable way:

1. Environmental regulations should not prevent homes being built affordably or more quickly and efficiently.
2. New development should be consistent with net zero and biodiversity governmental targets.
3. The lifestyles that people lead in new homes are as important for net zero as the fabric of the home.
4. Planning policy and building standards should incentivise communities to accept new homes in their neighbourhoods.
5. Planning reform should ensure that communities can shape development in their area to facilitate local democracy.

The recommendations are grouped into two core policy objectives. First, to speed up the delivery of new homes where development is most sustainable, such as near workplaces, shops, and sustainable transport links. Second, to ensure new homes are compliant with reaching net zero greenhouse gas emissions by 2050.

Delivering more homes close to workplaces, shops and sustainable transport links

Recommendation one: Government should create and fund a *Neighbourhood Development Order Pathfinder Programme to bring forward homes in urban neighbourhoods.

Recommendation two: Set a requirement in the National Planning Framework (NPPF) for Local Planning Authorities (LPAs) to create Local Development Orders (LDOs) for small- and medium-sized sites to meet a proportion of their housing requirement.

Ensuring new homes are compliant with reaching net zero greenhouse gas emissions by 2050

Recommendation three: New National Development Management Policies (NDMP) should include a hierarchy of options to set higher environmental standards for more ambitious local authorities.

Recommendation four: Include targets for energy use intensity (EUI) and thermal energy demand limit (TED) for all new homes in the Future Homes Standard from 2025 onwards.

Recommendation five: Introduce through the Future Homes Standard a new testing requirement for all new homes, and reform Energy Performance Certificates (EPCs) so they test in-use energy performance.

Recommendation six: Ensure the energy performance targets for new homes in building regulations incentivise solar PV and energy storage in the Future Homes Standard from 2025.

Recommendation seven: Include appropriate reporting requirements for the whole-life carbon emissions of new homes by developers in the Future Homes Standard from 2025, with a timeline for introducing limits on embodied carbon in the future.

Recommendation eight: Strengthen minimum water efficiency standards in the Future Homes Standard.

Recommendation nine: Expand green infrastructure requirements in the National Planning Policy Framework (NPPF).

Recommendation ten: Ensure heat pump training courses can access future waves of Skills Bootcamps, and provide appropriate governmental financial support to those undertaking them, to ensure there are sufficient installers for the introduction of the Future Homes Standard in 2025.

Chapter one: Introduction

The twentieth century model of housing development is in crisis. Medium- and low-density urban sprawl and new towns are land hungry, car-dependent, and politically unpopular. Meeting the UK government's net zero and biodiversity targets while increasing the supply of new homes will require a new approach.

Residential and transport emissions together accounted for 40% of all UK greenhouse gas emissions in 2020.¹ Planning policy and building regulations have a major role to play in reducing these emissions to achieve net zero. The Climate Change Committee (CCC) has consistently recommended that planning policy and building regulations be brought into alignment with net zero.²

The UK has also lost more of its biodiversity than any other G7 country,³ almost half of our species are in long-term decline.⁴ The delivery of new homes will have to be reconciled with new governmental targets to halt species decline and protect more areas

1. Department for Business, Energy and Industrial Strategy (BEIS), "2020 UK greenhouse gas emissions – statistical summary", https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1051407/2020-final-emissions-statistics-one-page-summary.pdf (2022).

2. Climate Change Committee (CCC), "Progress in reducing emissions: 2022 report to Parliament", <https://www.theccc.org.uk/wp-content/uploads/2022/06/Progress-in-reducing-emissions-2022-Report-to-Parliament.pdf> (2022), 9.

3. RSPB and Natural History Museum, "The UK's global rank for levels of biodiversity loss", <https://www.rspb.org.uk/globalassets/downloads/projects/48398rspb-biodiversity-intactness-index-summary-report-v5-1-1.pdf> (2021).

4. State of Nature, "State of Nature Report", <https://nbn.org.uk/wp-content/uploads/2019/09/State-of-Nature-2019-UK-full-report.pdf> (2019), 6.

for nature this decade.⁵

We have a housing shortage in some parts of the country, which is contributing to low productivity and economic stagnation. Our planning system makes it difficult to build new homes where they are needed most. Speeding up the delivery of new homes is one of the surest ways to raise our trend rate of economic growth. This is essential to maintain investment in public services while reducing the tax burden, which is now at its highest sustained level in almost 80 years.⁶

This report will outline how we can make progress on both achieving net zero and tackling the decline in homeownership by delivering greater and greener housing.

The housing shortage

The supply of new homes has not kept pace with demand in some parts of the country, contributing to the significant increase in house prices in recent decades. London house prices are up by 612% since September 1988 and by 510% for the rest of England.⁷ In comparison, the CPI inflation index increased by 152% during this period.⁸ This gulf between house price inflation and price rises across the rest of the economy reflects in part the shortage of housing. Research has found that the average new-build house price across seven major British cities is 130% higher than the average cost of construction,⁹ a margin also in large part driven by the imbalance between supply and demand.

5. Department for Environment, Food and Rural Affairs (DEFRA), "Landmark Environment Bill strengthened to halt biodiversity loss by 2030", <https://www.gov.uk/government/news/landmark-environment-bill-strengthened-to-halt-biodiversity-loss-by-2030> (2021); GOV.UK, "PM commits to protect 30% of UK land in boost for biodiversity", <https://www.gov.uk/government/news/pm-commits-to-protect-30-of-uk-land-in-boost-for-biodiversity> (2020).

6. Office for Budget Responsibility, "Overview of the November 2022 economic and fiscal outlook", <https://obr.uk/overview-of-the-november-2022-economic-and-fiscal-outlook/> (2022).

7. UK House Price Index, "House Price Statistics", <https://landregistry.data.gov.uk/app/ukhpi> (2021).

8. Office for National Statistics, "CPI INDEX", <https://www.ons.gov.uk/economy/inflationandpriceindices/timeseries/d7bt/mm23> (2022).

9. Isla MacFarlane, "Revealed: The UK's most profitable new build markets", <https://www.showhouse.co.uk/news/revealed-the-uks-most-profitable-new-build-markets/> (2021).

Indeed, house prices have risen much faster than average incomes in recent decades. In 2021, the median house price in England was around nine times higher than the median annual earnings of a full-time worker, and this gap is even wider in London. Twenty years ago, it was only around five times higher.¹⁰

As a result, home ownership has become increasingly out of reach for a generation of young people. Given the choice, 86% of people across Britain would want to own their home.¹¹ But only two thirds of English households are homeowners, down from 71% in 2003. The decline in home ownership has been most pronounced in younger age groups, with the number of 25-34 and 35-44-year-old homeowners down by almost a fifth over the past 20 years. Meanwhile, the private rented sector has swollen to almost a fifth of all households.¹²

The reasons behind our failure to build enough homes in the right places were outlined in the government white paper on zonal planning in 2020, *Planning for the Future*.¹³ Our complex, discretionary planning system creates too much risk and uncertainty. Planning consent is granted by local planning officers on a case-by-case basis, rather than being granted upfront in local plans on the condition that developers comply with a clear set of rules on where and what to build. Analysis by the Centre for Cities has shown that this rationing of land for homes prevents supply from responding to demand in local areas, leading to a crisis in affordable housing in certain parts of the country.¹⁴ It also creates uncertainty, delay, and additional cost, leaving in its wake a concentrated market dominated

10. Wendy Wilson and Cassie Barton, "What is affordable housing?", <https://researchbriefings.files.parliament.uk/documents/CBP-7747/CBP-7747.pdf> (2022), 21.

11. Alisomn Park, Elizabeth Clery, John Curtice, Miranda Phillips and David Utting (eds.), *British Social Attitudes: the 28th Report*, (London: NatCen Social Research, 2011), 123.

12. Wendy Wilson, Hannah Cromarty, Antony Seely and Cassie Barton, "Extending home ownership: Government initiatives", <https://researchbriefings.files.parliament.uk/documents/SNO3668/SNO3668.pdf> (2021), 5.

13. Department for Levelling Up, Housing and Communities (DLUHC), "Planning for the future", https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/958420/MHCLG-Planning-Consultation.pdf (2020), 10-14.

14. Anthony Breach, "Planning for the future How flexible zoning will end the housing crisis", <https://www.centreforcities.org/wp-content/uploads/2020/06/Planning-for-the-future-how-flexible-zoning-will-end-the-housing-crisis-final-online.pdf> (2020), 12-22.

by a small number of big developers who can afford to navigate the process.¹⁵ Meanwhile, poor design and sustainability provide limited incentives for people to accept new homes in their area.

Our discretionary planning system is internationally anomalous.¹⁶ A comparative analysis by Create Streets suggests it is the primary reason for house prices rising faster in the UK than other comparable nations.¹⁷ Real house prices in the UK increased by more than any other OECD country between 1970 and 2015.¹⁸

The failure of the planning system to deliver enough homes is also a consequence of opposition to new development among local residents. Only 37% of people support building new homes in their local area.¹⁹ The people who could be negatively affected by any new development, such as from added pressure on public services or lost amenity value, are concentrated locally, whereas those that benefit from the marginal improvement in housing affordability are dispersed. This means there is a greater political incentive for local authorities to limit the number of new homes in response to local opposition than to increase supply in line with national objectives.²⁰

Local opposition is exacerbated by the failure of the planning system to encourage attractive design, as the Building Better, Building Beautiful commission report found.²¹ Unquestionably, reforming the planning system to expedite consent for new homes is unlikely to be politically durable if it does not also improve the incentives for communities to accept them.

15. Nicholas Boys Smith and David Milner, "Where will Thomas and Rebecca live? Direct planning: how to build more and better homes faster", https://www.createstreets.com/wp-content/uploads/2020/09/Where-will-Thomas-and-Rebecca-live_v3.pdf (2020), 8-10.

16. *Ibid.*, 10.

17. Nicholas Boys Smith and David Milner, "Where will Thomas and Rebecca live?", 4-7.

18. *Ibid.*, 4.

19. Ben Ansell, "The UK's Political Housing Crisis", <https://benansell.substack.com/p/the-uks-political-housing-crisis> (2022).

20. Alex Morton and Samuel Hughes, "Giving Back Control: How to empower communities within the planning system", https://cps.org.uk/wp-content/uploads/2022/11/Giving-Back-Control_-_Final.pdf (2022), 1-2.

21. Building Better, Building Beautiful Commission, "Living with Beauty: Promoting health, well-being and sustainable growth", https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/861832/Living_with_beauty_BBBBC_report.pdf (2020).

Housing and climate change

It is not just that we build too few homes; we continue to build homes that have a substantial carbon footprint. Housing contributes to climate change in two main ways: first, through energy consumption — mainly heating and cooking — commonly referred to as ‘operational carbon.’ Second, through the construction, maintenance, retrofitting, and demolition of homes, referred to as ‘embodied carbon.’

First, on energy consumption. The residential sector was responsible for 16% of UK greenhouse gas emissions in 2020. CO₂ accounts for 97% of residential emissions. Of these residential emissions, the primary source is the use of natural gas for heating and cooking.²² Emissions from electricity consumption in homes are included under the power sector in official statistics. Residential electricity use contributes a further 4% of total UK greenhouse gas emissions, according to the CCC.²³

Residential emissions fell by just 17% between 1990 and 2020, although there is considerable variation year to year as the consumption of fossil fuels for heating is affected by the weather.²⁴ Hitting our net zero target will require almost the complete decarbonisation of buildings by 2050,²⁵ meaning the residential sector needs to deliver a further 83% reduction in emissions over the next three decades compared with 1990 levels. This ought to be achieved primarily through the phasing out of fossil fuel heating. New homes must be built with low-carbon heating appliances and around 29 million existing UK homes will need to have low-carbon heating installed.²⁶

22. BEIS, “2020 UK greenhouse gas emissions: Final figures”, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1051408/2020-final-greenhouse-gas-emissions-statistical-release.pdf (2022), 20.

23. CCC, “UK housing: Fit for the future?”, <https://www.theccc.org.uk/wp-content/uploads/2019/02/UK-housing-Fit-for-the-future-CCC-2019.pdf> (2019), 27.

24. BEIS, “2020 UK greenhouse gas emissions”, 20.

25. CCC, “Net zero: The UK’s contribution to stopping global warming”, <https://www.theccc.org.uk/wp-content/uploads/2019/05/NetZero-The-UKs-contribution-to-stopping-global-warming.pdf> (2019), 34.

26. Green Finance Institute and Bankers for Net Zero, “Tooling up the Green Homes Industry”, https://volans.com/wp-content/uploads/2021/09/Tooling-up-the-Green-Homes-Industry_FINAL.pdf (2021), 3.

Given more than 80% of the projected housing stock in 2050 already exists today,²⁷ retrofitting existing homes will be the primary route to decarbonisation of the residential sector. However, new homes should also be net-zero-ready, such that they are not adding to the number of home retrofits.

Building regulations set the legal standards for new homes, covering health, safety, and environmental performance. Approved Documents provide guidance on how to comply with the 16 technical requirements in building regulations and are labelled from A to S. Part L of building regulations sets the minimum standards for energy performance that any new homes built in England must comply with. The Part L standard was strengthened in 2021 and will be improved again in 2025, as set out below in Box 1.1.

27. UKGBC, "Climate change", <https://www.ukgbc.org/climate-change-2/>.

BOX 1.1. Part L Fabric and heating standards in building regulations²⁸

The table below shows the notional building specification for the past, present and future edition of Part L. The notional building is used as a benchmark for compliance with building regulations.

	2013 Part L standard	2021 Part L standard	Indicative Future Homes Standard from 2025 onwards ²⁹
Floor U-value (W/m ² .K)	0.13	0.13	0.11
External wall U-value (W/m ² .K)	0.18	0.18	0.15
Roof U-value (W/m ² .K)	0.13	0.11	0.11
Window U-value (W/m ² .K)	1.4	1.2	0.8
Door U-value (W/m ² .K)	1.0 – opaque 1.2 – semi	1.0	1.0
Air permeability at 50 Pa	5.0 m ³ /(h.m ²)	5.0 m ³ /(h.m ²)	5.0 m ³ /(h.m ²)
Heating appliance	Gas boiler	Gas boiler	Low-carbon heating
Heat Emitter type	Regular radiators	Low temperature heating	Low temperature heating
PV	None	40% ground floor area	None
Wastewater heat recovery	No	Yes	No
Carbon (kgCO ₂ /m ² /yr) for a typical semi-detached home	16.0	11.0	3.6

28. MHCLG, “Future Homes Standard consultation: government response”, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/956094/Government_response_to_Future_Homes_Standard_consultation.pdf (2021),18.

29. The Future Homes Standard is explained in greater detail in Chapter Three.

U-values are a measure of heat loss in a building element such as a roof or window. The higher the U-value, the greater the heat loss and, therefore, the less well insulated the home. The table above shows the U-values for the floor, roof, external wall, windows.

Air permeability measures the volume of air lost through cracks or leaks in the fabric of a home: what is commonly referred to as draught. Ensuring air tightness standards are met reduces heat loss, thereby improving energy efficiency. All new homes in England must undergo an air tightness test to demonstrate compliance with Part L of building regulations. It is measured by calculating the air leakage rate per hour per square metre of fabric area at a test pressure differential of 50 Pascal (Pa). The higher the air permeability, the more draughty the building. The maximum air permeability permitted in England is $10 \text{ m}^3 / (\text{h} \cdot \text{m}^2)$ but new homes should aim for an air permeability of $5 \text{ m}^3 / (\text{h} \cdot \text{m}^2)$ to meet energy performance standards in Part L. Making a home too airtight can lead to condensation and mould.

Heating appliance refers to the technology used for space and water heating.

Heat Emitter type refers to technology used to transfer heat to a room, such as radiators and underfloor heaters. Part L 2021 requires heating systems to achieve a flow temperature, which refers to the temperature water is heated to before being distributed to the radiators, of 55°C , compared with 80°C under the 2013 edition of Part L. This is known as low temperature heating.

Wastewater heat recovery extracts the heat from hot water removed by drains, usually from the shower and bath, and transfers it to incoming mains water. This reduces the amount of energy required for hot water, thereby improving energy efficiency.

Carbon refers to the emissions from the home, measured in kilograms of carbon per square metre per year.

As Box 1.1 above shows, homes built to the 2021 Part L standard are not net-zero-ready. This is because developers can comply with the standard in the building regulations through a combination of solar

PV and higher levels of fabric efficiency, without the need to install low-carbon heating systems, such as heat pumps. These new homes are therefore still reliant on fossil fuel heating, and so will need to be retrofitted with low-carbon heating in the future. However, from 2025 onwards when the Future Homes Standard is introduced, low-carbon heating will be required in all new homes to comply with Part L standards, as shown in Box 1.1. These homes will be compliant with net zero.

It is not just low-carbon heating that is important for net zero homes; maximising energy efficiency is also essential. Since deeper decarbonisation of homes will place a greater strain on the power supply in order to operate electric heating systems and electric vehicle chargers, improving the energy efficiency of homes will ensure the power grid can meet demand. A zero-carbon home that is energy inefficient should not be considered compatible with our economy-wide net zero target.

In 2020, the energy demand of UK homes was about 450 Terawatt hours (TWh), with space and water heating accounting for 79% of this.³⁰ The National Grid Electricity System Operator's (ESO) net zero scenarios envisage between a three- and four-times increase in electricity demand for heating between now and 2050.³¹ In addition, it is estimated that there will be 15 million electric vehicles on the road by 2030.³² Electric vehicles will increase electricity demand by approximately 30 TWh in 2030 and 65-100 TWh in 2050, accounting for around 10% of the overall demand.³³ Consequently, new homes urgently need to become more energy efficient to alleviate pressure on the electricity grid.

Achieving net zero cost-effectively will also require homes to consume energy flexibly in response to higher electricity demand peaks by shifting their energy consumption to off-peak times. According to the

30. National Grid ESO, "Future Energy Scenarios", <https://www.nationalgrideso.com/document/263951/download> (2022), 54.

31. National Grid ESO, "Future Energy Scenarios", 57.

32. BEIS and Ofgem, "Transitioning to a net zero energy system: Smart Systems and Flexibility Plan 2021", https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1003778/smart-systems-and-flexibility-plan-2021.pdf (2021), 19.

33. *Ibid.*, 30.

National Grid ESO, peak electricity demand could increase from around 60 GW today to potentially more than 110 GW in 2050.³⁴ Government analysis suggests it could increase by more than 10% by the end of this decade and more than double by 2050 if the levels of heat, transport and industrial electrification across the economy are high.³⁵ This cannot be met cost-effectively simply by ramping up clean electricity generation; flexible energy consumption and storage, including in homes, will be required to help keep energy demand in balance with supply.³⁶

The availability of electricity will also be more variable in future, due to the fluctuating levels of wind and solar power generation, which continues to increase as a proportion of the UK's overall energy source. When weather conditions are more favourable, electricity production could have to be curtailed to match supply with demand — curtailment is when some power generators are asked to switch off, as supply is significantly in excess of demand. The National Grid ESO's *Future Energy Scenarios* states that demand-side flexibility, which homes can provide by shifting their energy consumption to periods of abundant renewable power, can help to reduce curtailment,³⁷ and ensure we maximise the amount of renewable electricity used to power the grid.

Next, we examine the contribution of embodied carbon to the emissions of the residential sector. The construction, maintenance, retrofitting, and demolition of homes are significant sources of emissions. In particular, building materials such as concrete, steel, and cement are carbon intensive to produce. Embodied carbon emissions account for more emissions than aviation and shipping combined.³⁸

While operational emissions account for the bulk of housing's carbon

34. National Grid ESO, "Future Energy Scenarios", 194.

35. BEIS, "Heat and Buildings Strategy", https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1044598/6.7408_BEIS_Clean_Heat_Heat_Buildings_Strategy_Stage_2_v5_WEB.pdf (2021), 117.

36. *Ibid.*, 118

37. National Grid ESO, "Future Energy Scenarios", 221.

38. Environmental Audit Committee, "Building to net zero: costing carbon in construction", <https://committees.parliament.uk/publications/22427/documents/165446/default/> (2022), 5.

footprint, its share is gradually falling due to the decarbonisation of the energy grid and the tightening of energy efficiency standards in new homes. Meanwhile, embodied carbon accounts for 19% of built environment emissions – which includes residential and nonresidential buildings as well as infrastructure – and this will grow as operational emissions fall.³⁹ On current trajectories, embodied carbon will form over half of all built environment emissions by 2035.⁴⁰ Current building regulations do not require developers to measure or reduce the embodied carbon of new homes, despite the fact it accounts for up to half of life-cycle carbon emissions for a new home built to higher energy-efficiency standards.⁴¹

This means regulation in the construction sector is not driving demand for low-carbon construction products, from recycled steel to domestic timber and biomaterials, which are essential for net zero. It also means there is not a level playing field across the construction sector, or a standard method for all developers and local authorities to use. Embodied carbon regulation would standardise the methodology, making assessment cheaper and quicker for developers to carry out.⁴²

39. UK Green Building Council (UKGBC), “Net zero whole life carbon roadmap: Summary for policymakers”, <https://ukgbc.s3.eu-west-2.amazonaws.com/wp-content/uploads/2021/11/28194152/UKGBC-Whole-Life-Carbon-Roadmap-Summary-for-Policy-Makers.pdf> (2021), 9.

40. *Ibid.*, 9.

41. UKGBC, “New homes policy playbook”, <https://ukgbc.s3.eu-west-2.amazonaws.com/wp-content/uploads/2021/01/05144257/New-Homes-Policy-PlaybookJanuary-2021.pdf> (2021), 26.

42. Environmental Audit Committee, “Building to net zero”, 15.

BOX 1.2. Net-zero lifestyles

Above and beyond operational emissions, the lifestyles that people lead in new places is also fundamental to reaching net zero. A zero-carbon home that you can only access by car still drives environmental harm. As such, limiting car dependency through access to public transport and walkable streets can reduce transport emissions; the UK's most-emitting sector, which amounts to a quarter of the UK's total greenhouse gas footprint.⁴³

Homes in urban centres and the suburbs are closer to workplaces, shops, schools, and leisure facilities, making it easier for residents to choose active or public modes of travel. For example, Transport for New Homes' analysis of 20 new housing developments in England found that greenfield sites were dominated by the car, while urban developments were better oriented towards sustainable modes of travel.⁴⁴ Urban intensification includes several types of development: infill development, residential conversions, and the redevelopment or extension of existing buildings. Increasing housing density in town and city centres and their suburbs could help to ensure new housing development is compliant with net zero.

However, Transport for New Homes has found a trend toward remote, out-of-town development rather than urban intensification.⁴⁵ In addition, research by the Centre for Cities found that there had been no new homes built in more than a fifth of suburban neighbourhoods between 2011-2019, while half had built less than one home per year.⁴⁶ Research by CPRE shows that brownfield redevelopment has been in decline too, while building on greenfield sites has increased.⁴⁷

43. BEIS, "2020 UK greenhouse gas emissions: Final figures – statistical summary", https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1051407/2020-final-emissions-statistics-one-page-summary.pdf (2022).

44. Transport for New Homes, "Building Car Dependency: The tarmac suburbs of the future", https://www.transportfornewhomes.org.uk/wp-content/uploads/2022/02/Building-Car-Dependency-2022.pdf?utm_source=TfNH_website&utm_medium=website_pdf&utm_campaign=report_launch (2022), 8.

45. Transport for New Homes, "Project summary and recommendations", <https://www.transportfornewhomes.org.uk/wp-content/uploads/2018/07/transport-for-new-homes-summary-web.pdf> (2018), 5.

46. Anthony Breach and Elena Magrini, "Sleepy suburbs: The role of the suburbs in solving the housing crisis", <https://www.centreforcities.org/wp-content/uploads/2020/03/Sleepy-Suburbs.pdf> (2020), 3.

47. CPRE: The countryside charity, "Recycling our land: state of brownfield 2021" https://www.cpre.org.uk/wp-content/uploads/2021/11/Nov-2021_CPRES_Recycling-our-land_brownfields-report.pdf (2021), 3.

If every suburban neighbourhood – defined as the remaining parts of a city outside of the city centre – had added just four homes per year on average since 2011, there would have been 446,000 more homes in cities in 2019, an analysis by Centre for Cities has found. Building this additional 56,000 homes per year in suburban neighbourhoods could almost close the gap between the current rates of annual housing supply and the government's long-standing 300,000 per annum target.⁴⁸

Building within settlements is challenging because brownfield sites can come with a remediation cost, there may be competing commercial uses for the land,⁴⁹ and land ownership in towns is more fragmented than in the countryside where developers need only purchase from one farmer or landowner.⁵⁰ But, dishearteningly, the incentives created by the planning system also support the creation of new settlements rather than densifying existing ones. Housing extensions, infill development, and brownfield regeneration are subject to the same uncertain planning process as large-scale development. The risk and uncertainty in securing planning approval discourages developers from bringing forward intensification projects, which tend to yield fewer homes per application than larger, out-of-town sites, that are often greenfields. This equally applies to LPAs under resource and time pressure.⁵¹

Research by Transport for New Homes suggests that the trend toward out-of-town development has also been driven by local planning authorities. Planners have used large urban extensions and greenfield estates to meet the requirement in the *National Planning Policy Framework* (NPPF), which sets the planning rules for England, to maintain a supply of deliverable sites sufficient to meet the local housing requirement for the next five years – known as the ‘five year housing land supply’.⁵² These sites can deliver large numbers of homes with fewer potential barriers in planning, such as neighbourhood opposition or costly site remediation.

48. Anthony Breach and Elena Magrini, “Sleepy suburbs”, 33.

49. Alex Morton and Samuel Hughes, “Giving Back Control”, 5.

50. *Ibid.*, 30.

51. Anthony Breach and Elena Magrini, “Sleepy suburbs”, 30.

52. Transport for New Homes, “Project summary and recommendations”, 5.

In contrast, delivering homes through intensification is higher risk and lower reward in terms of the number of homes, making it a less attractive option for planning authorities under pressure to increase the supply of homes. Sites not allocated by planning authorities in their five-year supply must progress as ‘windfall sites’, which can be less likely to secure planning consent.⁵³

Mandatory housing targets and land supply registers have helped to increase house building in recent years,⁵⁴ although the Government has recently brought forward proposals to clarify that these targets are advisory and subject to local supply constraints in response to political opposition.⁵⁵ A net-zero-aligned planning system would encourage more homes through urban intensification to help meet said targets; this can be incentivised alongside well-connected greenfield development.

Focus of this report

This report will propose how to tackle two key challenges: building more homes and reducing the carbon footprint of homes.

The key research questions are:

1. How does housing contribute to climate change?
2. How does the planning system help or hinder the delivery and sustainability of housing in the UK?
3. How effective are existing policies in ensuring new homes will be built to a net zero standard?
4. What reforms will be needed to the regulations around the design and construction of new homes to ensure they are compliant with zero carbon emissions?
5. How can we bring forward new homes in the places where development is most sustainable and homes are in most demand?

53. Anthony Breach and Elena Magrini, “Sleepy suburbs”, 28.

54. Alex Morton and Samuel Hughes, “Giving Back Control”, 1-3.

55. DLUHC, “Open consultation, Levelling-up and Regeneration Bill: reforms to national planning policy”, <https://www.gov.uk/government/consultations/levelling-up-and-regeneration-bill-reforms-to-national-planning-policy/levelling-up-and-regeneration-bill-reforms-to-national-planning-policy> (2022).

The report is structured as follows:

- **Chapter Two** analyses attempts by Conservative-led Governments to build more homes since 2010.
- **Chapter Three** examines changes in government policy since 2010 to reduce carbon emissions from new homes and ensure they will be net zero compliant.
- **Chapter Four** offers new policy recommendations to bring forward new homes in towns and suburbs and ensure new housing is compliant with reaching net zero greenhouse gas emissions by 2050.

Chapter two:

Recent government policies to build more homes

Having established in the previous chapter the challenges with achieving both greater and greener homes, this chapter will outline and critique the major public policy reforms that successive Conservative-led Governments have implemented since 2010 to try and boost the number of new homes in the UK.

Broadly, Conservative-led Governments since 2010 have sought to limit complexity, improve certainty, and reduce delay in the planning system. However, planning consent mostly remains discretionary rather than rules-based and community opposition to development remains a persistent problem.

Since 2010, there have been a number of changes to the planning system affecting the supply of new homes. The most significant policies are summarised in Box 2.1 below.

BOX 2.1. Planning for new homes: significant policy developments since 2010

Provisions for neighbourhood planning introduced by the Localism Act 2011. The Act introduces a new right for communities, through a local parish council or neighbourhood forum, to draw up a 'neighbourhood plan' or 'development order' to determine the location and appearance of new homes. 'Neighbourhood plans' identify places where residents will accept new homes, helping to bring forward new

development. 'Development orders' can grant full or outline permission for certain types of development upfront, removing the need for a subsequent planning application to speed up the delivery of new homes with local support. Local people vote to approve neighbourhood plans or development orders in a local referendum. Moreover, Local Planning Authorities (LPAs) are required to provide technical advice and support for neighbourhood plan development. Secondary legislation to implement neighbourhood planning came into force in April 2012.

The National Planning Policy Framework (NPPF) introduced in 2012. This requires every LPA in England to have an up-to-date 'local plan' for development. 'Local plans' set the planning policies for the whole local authority area, whereas 'neighbourhood plans' are developed voluntarily by parishes or neighbourhood forums within the local authority, and are used to determine planning decisions. They must be consistent with the policies in the NPPF, based on an objectively assessed housing need for the local area, and reflect the residents' preferences for development in their area. The NPPF was updated in 2018, 2019, and 2021.

The new temporary Permitted Development Order passed in 2013 to allow for office-to-residential conversions. This permitted development right (PDR) allows for an office building to become residential without the need to go through the usual planning approval process. In 2015, the Government passed the Town and Country Planning (General Permitted Development) (England) Order 2015 to consolidate all existing PDRs. The office-to-residential PDR was made permanent in 2016 and the Government has expanded PDRs to allow for other changes in building use. PDRs have also been introduced to create new homes through upward extensions, and the demolition and rebuild of vacant buildings.

Standard method for assessing housing need included in the 2018 update to the NPPF. This was introduced to ensure local plans deliver sufficient homes in their area. The standard method calculation is

based on the 2014 Household Projections, an uplift for affordability, and a cap on the number of new homes in any one local authority. In December 2020, the formula was updated to include a 35% increase in housing numbers in the 20 largest cities to encourage urban development. The housing need figure is supposed to provide the basis for local planning policy and the allocation of land for development, but is not a housing target.

Planning for the Future white paper published in 2020. The proposed reforms of the planning system included a zoning system to allocate land for development. New development which complied with local plans and ‘design codes’, which allow communities to set rules for new development including the building materials and sustainability standards, would be permitted upfront in ‘Growth Zones’ and fast-tracked in ‘Renewal Areas.’ The zonal planning reforms have not been taken forward by Government.

Levelling up and Regeneration Bill published in 2021 with provisions to streamline planning. The Bill includes changes to ‘Compulsory Purchase Orders’, which give local authorities the power to acquire land, to make it easier for local authorities to assemble brownfield land for redevelopment, a requirement for planning authorities to develop a design code for their area, a new ‘National Development Management Policies’ to determine planning policy at the national level on issues of national importance such as reducing carbon emissions, and provisions to allow streets to grant permission for development through a referendum.

National Planning Policy Framework (NPPF)

The NPPF, explained in Box 2.1 above, consolidated planning policy, which previously spanned 200 documents and 7,000 pages, into a single document of less than 100 pages.⁵⁶ The NPPF includes a presumption

56. Jack Airey and Chris Doughty, “Rethinking the Planning System for the 21st Century”, <https://policyexchange.org.uk/wp-content/uploads/Rethinking-the-Planning-System-for-the-21st-Century.pdf> (2020), 93.

in favour of sustainable development while enabling local people to shape development in their area. Local Planning Authorities (LPAs) are required to have up-to-date local plans in place to guide housing development in their area.

The NPPF also includes housing targets to increase the supply of new homes. LPAs are required to calculate their housing need using a standard method introduced, explained in Box 2.1 above. The calculated housing need is used by LPAs to determine their local housing requirement or housing target, which is the number of new homes the LPA plans to build in their area. This takes into account any constraints on the number of homes the area can deliver. If the local housing requirement figure is less than the figure for housing need, the local constraints must be justified by the LPA to the national Planning Inspectorate.

LPAs must maintain a supply of deliverable sites to meet at least five years' worth of their local housing requirement. Where a local plan is out of date, the local housing need figure rather than the local housing requirement figure is used automatically to determine the five-year housing land supply.

Local housing targets informed by the standard method have been controversial, with critics arguing that it has forced LPAs to approve inappropriate development to meet their target.⁵⁷ The current Conservative Government is now consulting on changes to local housing targets to address this concern. The changes would retain the standard method for calculating housing need and the five-year housing land supply, but provide more clarity on the local supply constraints, such as maintaining the boundaries of the Green Belt,⁵⁸ that will be accepted by the Planning Inspectorate if LPAs cannot meet their calculated housing need.⁵⁹

57. Theresa Villiers MP, "The new Government must honour its promise to scrap housing targets that are set in Whitehall", <https://conservativehome.com/2022/11/07/theresa-villiers-the-new-government-must-honour-its-promise-to-scrap-housing-targets-that-are-set-in-whitehall/> (2022).

58. DLUHC, "National Planning Policy Framework: draft text for consultation", https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1126647/NPPF_July_2021_-_showing_proposed_changes.pdf (2022), 42.

59. DLUHC, "Levelling-up and Regeneration Bill: reforms to national planning policy", <https://www.gov.uk/government/consultations/levelling-up-and-regeneration-bill-reforms-to-national-planning-policy/levelling-up-and-regeneration-bill-reforms-to-national-planning-policy#chapter-4-planning-for-housing> (2022).

We await to see the consequences of these changes for house building if they are taken forward. The current Government argues they could in fact help to increase housing supply, since one of the barriers to updating local plans has been uncertainty among LPAs about the circumstances in which they can bring forward plans which do not meet their calculated housing need. Clarifying this could accelerate plan making. Evidence shows that areas with up-to-date local plans deliver more homes than those without.⁶⁰

However, it is likely that supply will fall in the short-term if LPAs delay allocating land for development while awaiting confirmation of government changes. Longer-term, the impact on housing supply, compared with the status quo, will depend on whether it leads to more local authorities getting approval for local plans that allocate fewer sites than their assessed need.

Annual housing supply reached a trough in 2012-13 when the NPPF was introduced, but has since recovered to exceed the rate before the financial crisis in 2008.⁶¹ In fact, the number of new homes created reached its highest level in three decades in 2019-20.⁶² However, this was still almost 60,000 homes short of the Conservative Government's 300,000 homes per annum target.

Furthermore, only 42% of the LPAs have up-to-date local plans.⁶³ Preparation of local plans takes seven years on average,⁶⁴ as they have become long, complex documents, and the local plans in place only provide for 62% of the Conservative Government's annual target of 300,000 new homes.⁶⁵ Plans in place still underpin a discretionary planning process; they do not permit homes upfront, as in other

60. Ibid.

61. DLUHC, "Live tables on housing supply: net additional dwellings", <https://www.gov.uk/government/statistical-data-sets/live-tables-on-net-supply-of-housing> (2022).

62. MHCLG, "Most homes delivered in 33 years", <https://www.gov.uk/government/news/most-homes-delivered-in-33-years> (2020).

63. Rachel Clements, "Ten years of the NPPF: What do we have to show for a decade of plan making?", <https://lichfields.uk/blog/2022/may/4/ten-years-of-the-nppf-what-do-we-have-to-show-for-a-decade-of-plan-making/> (2022).

64. DLUHC, "Planning for the future", 12,

65. Ibid., 14.

countries, such as Japan, the Netherlands, and Germany.⁶⁶

Ultimately, the Government will struggle to build the volume of homes required until new incentives are created for people to accept development in their area. Housing targets can help to ensure local authorities are planning for a sufficient volume of homes, but they will continue to generate resentment and resistance unless new development has local support.

Permitted development rights

To speed up housing delivery, the Government has expanded permitted development rights (PDRs) since 2013, as explained earlier in Box 2.1. PDRs have been created to allow change in the use of certain building types to residential. Their purpose is to create more homes in towns and city centres through more predictable planning consent.

PDRs have helped to deliver some more new homes, but have not been successful in garnering local support for new development. More than 10,000 new dwellings have been delivered every year since 2015 under permitted development rights, peaking in 2016-17 at almost 19,000. Indeed, last year, PDRs contributed almost 5% of new homes.⁶⁷ That being said, it is not possible to know how many of these homes were built specifically because of PDRs, since developers could still have brought forward these developments through the usual planning process.⁶⁸

The House of Commons Housing, Communities and Local Government Select Committee report into PDRs in 2021 collated evidence to suggest that, while they have delivered some new homes, PDRs bypassed local communities and development plans, delivered poorer quality housing than homes delivered through the full planning process, and were largely exempt from Section 106

66. *Ibid.*, 26.

67. DLUHC, "Live tables on housing supply: net additional dwellings".

68. Housing, Communities and Local Government (HCLG) committee, "Permitted Development Rights", <https://committees.parliament.uk/publications/6896/documents/72563/default/> (2021), 27-28.

Agreements, through which LPAs secure affordable housing provision and contributions toward infrastructure improvements, and the Community Infrastructure Levy, which can also be used to secure payments for infrastructure.⁶⁹

In addition, the prior approval process for PDRs, which requires developers to apply for consent from LPAs to ensure the developments meet specified criteria, has become increasingly extensive. Prior approval allows local authorities to object to development. This has made PDRs less distinguishable from the usual planning process, reducing the advantage of speed and certainty for developers.⁷⁰ Since 2020, PDRs have allowed upward extensions, but these led to just 697 new homes in 2020-21 and 131 new homes last year.⁷¹ This suggests the potential to deliver urban intensification through further expansion of PDRs is limited.

Recent reforms to the planning system

In 2020, the Conservative Government attempted to overhaul the planning system. The *Planning for the Future* white paper proposed a zonal plan system to fast-track new development, as explained earlier in Box 2.1. Permission in principle was to be granted in new ‘Growth Zones’ for development that complied with local plans and design codes. The intention was to bring public consultation forward to the plan making stage and introduce more certainty and predictability to the planning system. In principle, these changes could have expanded the supply of homes, but the reforms were quashed by opposition in parliament. Published alongside a new algorithm for setting local housing targets, the white paper generated fear among the Government’s own backbench MPs that it would lead to many new homes in the South East, which their constituents would not have the

69. *Ibid.*, 10-20, 27-36.

70. *Ibid.*, 15-17.

71. DLUHC, “Live tables on housing supply”.

power to stop.⁷²

Then, last autumn, the Government once again triggered a debate on planning reform. The proposal for investment zones, where planning rules would be relaxed, triggered a strong reaction from nature conservation groups, including the National Trust, who feared it would mean a weakening of environmental protections.⁷³

The lessons from these attempts at zonal planning are that supply-side reform must uphold local democracy, improve incentives for people to accept new homes in their neighbourhoods, and seek better environmental outcomes alongside faster planning consent in order to be politically durable.

Through the current Levelling up and Regeneration Bill, the Conservative Government is taking forward more limited improvements to the planning system to encourage sustainable development and intensification. This includes changes to Compulsory Purchase Orders, which give local authorities the power to acquire land for development to make it easier for local authorities to compile brownfield land for regeneration. The purpose of this is to reduce the pressure on greenfield sites and enable denser settlements.

The Levelling up and Regeneration Bill also contains a new ‘street votes’ mechanism to give residents the right to vote to create a development order for their street. This would permit new development which complies with terms of the development order without applying for additional planning permission. This could potentially lead to more homes being built on existing residential streets through extensions and infill development, reducing pressure to build on greenfield sites, and providing more housing close to public transport links, workplaces, and shops. Residents would benefit from the land value uplift accrued

72. Hansard, House of Commons debate, Volume 681, 8 October 2020, “Planning and housebuilding”, <https://hansard.parliament.uk/commons/2020-10-08/debates/2496DD54-7CE6-4393-B8E0-477A7084D8FD/PlanningAndHouseBuilding>.

73. The National Trust, “Statement on recent Government proposals and the importance of environmental protections”, <https://www.nationaltrust.org.uk/services/media/statement-on-recent-government-proposals-and-the-importance-of-environmental-protections> (2022).

through planning consent, creating a financial incentive for residents to support more homes on their street. In addition, design rules would be agreed and voted on by residents, giving them confidence that new homes will be attractive and sympathetic to the character of the local area.

If successfully implemented, street votes could be an effective tool for encouraging more dense, sustainable development in England. The policy has attracted support from a cross-section of planning and environmental groups, suggesting it could overcome some of the usual opposition to new development.⁷⁴

The Levelling up and Regeneration Bill will also see local design codes, which specify the aesthetic and sustainability standards new homes must meet, become mandatory. These are intended to be developed in consultation with the local community to give residents more power to shape development in their area. They will set clear design guidance for developers, providing greater certainty on what development will be permitted. To deliver greener housing, it will be important to ensure that design codes include requirements to enhance biodiversity and improve the sustainability and climate resilience of new homes. These considerations are set out in the government's *National Model Design Code*, which provides detailed guidance for LPAs on the production and content of design codes.⁷⁵

Finally, the Levelling up and Regeneration Bill stipulates that the government will set some planning policies nationally, rather than in local plans, through the new National Development Management Policies (NDMPs) which will have full weight in local planning decisions. This means local plans should only contain policies for idiosyncratic local issues. Government has not yet consulted on the NDMPs, but have suggested they will deal with common issues across the country such as conserving heritage assets, protecting the Green Belt, and preventing development on areas of high flood risk. NDMPs could also

74. YIMBY Alliance, "Street Votes", <https://yimbyalliance.org/street-votes/>.

75. DLUHC, "Guidance: National Model Design Code", <https://www.gov.uk/government/publications/national-model-design-code> (2021).

set a preference for housing densification or set policies for reducing emissions from new homes.⁷⁶ Setting planning policies nationally will make plans faster to write and easier for developers to navigate. The NDMPs could also ensure the planning system contributes to net zero; in the Government's recent *Net Zero Strategy*, there was a commitment to update planning policy to ensure it fully contributes to climate change mitigation and adaptation.⁷⁷

Where there is conflict between local and national policies, the latter will take precedence. While this could help to improve speed and predictability, the supremacy of NDMPs could prevent local authorities from setting more ambitious environmental standards to meet their local targets. For example, some local authorities have a more ambitious net zero target than the national 2050 goal; there are 108 councils signed up to UK100's Net Zero Pledge, committing to reach net zero as soon as possible and by 2045 at the latest.⁷⁸ Ensuring NDMPs do not conflict with local climate ambitions will be addressed in the final chapter of this report.

Overall, the policies in the Levelling up and Regeneration Bill described above should help to speed up the supply of new homes and deliver better aesthetic and sustainability outcomes. However, there are further steps that the Government could and should take to encourage more rules-based planning consent where new housing has local support. This can be achieved using the existing tools of development orders and design codes, as we propose in Chapter Four. Through this, it is possible to give local people a greater say over development in their area and provide more predictability and certainty for developers in securing planning approval.

We desperately need to build many more homes in certain parts of the country. Though gradually increasing over the past decade, the rates

76. DLUHC, "Levelling-up and Regeneration Bill: reforms to national planning policy".

77. BEIS, "Net Zero Strategy: Build back greener", https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1033990/net-zero-strategy-beis.pdf (2021), 252.

78. UK100, "Membership Pledge", <https://www.uk100.org/membership>.

of house building are still well below the annual rates of the post-war era. But, in the face of climate change, we also need to build greener homes. The next chapter explores and examines how public policy has tried to do this in the past decade or so.

Chapter three: Existing government policies to ensure new homes will be net zero compliant

Having explored in the last chapter the effectiveness of public policy since 2010 to incentivise house-building, this chapter will analyse policies since 2010 to decarbonise new homes, both in terms of operational carbon and embodied carbon.

Decarbonising even the existing housing stock is a colossal infrastructure challenge. The Committee for Climate Change (CCC) has estimated that an investment of about £250 billion will be needed to fully decarbonise all existing homes in the UK.⁷⁹ It is a harder sector to decarbonise than other major polluters such as transport. This is because it requires costly and intrusive retrofits in addition to technological and behavioural change.

It is a particular challenge in the UK, which has one of the leakiest housing stocks in Europe.⁸⁰ Government has a target for all homes to meet Energy Performance Certificate (EPC) Band C and to phase out

79. CCC, "The Sixth Carbon Budget: The UK's path to Net Zero", <https://www.theccc.org.uk/wp-content/uploads/2020/12/The-Sixth-Carbon-Budget-The-UKs-path-to-Net-Zero.pdf> (2020), 120.

80. Madeleine Cuff, "Draughty British homes lose heat more quickly than those in Europe", <https://inews.co.uk/news/environment/britain-energy-draughty-fuel-leakiest-homes-400292> (2020).

the installation of new gas boilers by 2035.⁸¹ There are an estimated 24 million homes in England,⁸² but only 46% are rated EPC C or above and 88% still have gas fired heating.⁸³ That means around 13 million homes in England will need to be made more energy efficient and many more will need to change to low-carbon heating. The average cost of upgrading a home to band C from band D to G in 2020 was £7,737, meaning the Government's 2035 energy efficiency target alone could cost around £100 billion at 2020 prices.⁸⁴

The focus of this report, however, is on new homes. Ensuring we have net zero new homes will be a significant and necessary challenge, but also an opportunity. Building new homes to net zero standards can upskill the construction workforce, improve consumer confidence in low-carbon heating appliances, and help to drive down the cost of technologies such as heat pumps through innovation and economies of scale. Indeed, the Government's recent *Heat and Buildings Strategy* sets an aim of 600,000 heat pump installations per year by 2028, at least one third of which will be in new homes.⁸⁵

Under Conservative-led Governments since 2010, there have been a number of policies that have been introduced and also then abandoned to try and reduce the carbon footprint of new homes. The most significant policies are summarised in Box 3.1 below.

81. BEIS, "Net Zero Strategy", 135-136.

82. DLUHC, "English Housing Survey Headline Report, 2020-21", https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1060141/2020-21_EHS_Headline_Report_revised.pdf (2021), 4.

83. DLUHC, "English Housing Survey Energy Report, 2020-21", https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1091144/Energy_Report_2020_revised.pdf (2021), 4, 14.

84. *Ibid.*, 5.

85. BEIS, "Heat and Buildings Strategy", https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1044598/6.7408_BEIS_Clean_Heat_Heat_Buildings_Strategy_Stage_2_v5_WEB.pdf (2021), 22.

BOX 3.1. Reducing the carbon footprint of new homes: significant policy developments since 2010

Part L of building regulations 2013 changes implemented in April 2014. The energy efficiency and carbon emissions of new homes is regulated through Part L of building regulations. This was updated in 2013 to require new homes to achieve a 6% reduction in carbon emissions relative to the 2010 standard.⁸⁶

Zero Carbon Homes Standard scrapped in 2015. The Government's productivity strategy, *Fixing the Foundations*,⁸⁷ announced that it would not proceed with the plan to require new homes to be carbon neutral from 2016, which was originally advocated by the last Labour Government and officially introduced by the Coalition Government in the 2010s.

Future Homes Standard consultation published in 2020.⁸⁸ The Government set out its proposals to reduce carbon emissions in new homes by 75-80% compared with the 2013 Part L edition and ensure all new homes after this date are net-zero-ready with high standards of fabric efficiency and low-carbon heating. The consultation proposed a phased approach, with an interim standard requiring a 31% reduction in carbon emissions compared with the 2013 standard. The Government's response to the consultation in 2021 confirmed it would introduce the interim standard from 2022 and the Future Homes Standard from 2025.⁸⁹

Heat and Buildings Strategy published in 2021.⁹⁰ This outlined the actions the Government will take to decarbonise buildings by 2050. The Government committed to scaling low-carbon heating solutions, which will be a requirement in new homes from 2025. It includes

86. DLUHC, "Conservation of fuel and power: Approved Document L1A", <https://www.gov.uk/government/publications/conservation-of-fuel-and-power-approved-document-l> (2013).

87. HM Treasury, "Fixing the foundations: Creating a more prosperous nation", https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/443898/Productivity_Plan_web.pdf (2015), 46.

88. MHCLG, "Future Homes Standard consultation", https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/852605/Future_Homes_Standard_2019_Consultation.pdf (2020).

89. MHCLG, "Future Homes Standard consultation: government response", 28, 13.

90. BEIS, "Heat and Buildings Strategy".

the installation of 600,000 heat pumps per year by 2028, taking key decisions on the role of hydrogen in heat decarbonisation by 2026, and increasing the deployment of low-carbon heat networks.⁹¹

Part L 2021 changes implemented in June 2022. The interim standard in building regulations requires new homes to reduce carbon emissions by 31% compared with those built to the 2013 standard.

As outlined in Chapter One, there are two principal ways that new homes contribute to climate change. First, through operational carbon, which means the emissions from energy consumption, mainly heating and cooking. Second, through embodied carbon, meaning emissions from the construction, maintenance, retrofitting and demolition of homes. Now we describe and assess in detail how public policy since 2010 has been trying to reduce both embodied and operational carbon.

Operational carbon

Energy use in homes is influenced by three main factors: energy demand, flexible energy consumption, and sources of heating. Public policy has targeted each of these factors. First, building standards regulate the energy performance of new homes to limit carbon emissions from energy consumption. Second, household flexibility technologies shift energy consumption to times when there is abundant renewable electricity available on the grid. Finally, low-carbon technologies are an alternative to fossil fuels for space heating and hot water in homes.

Building standards

The UK continues to build new homes to standards that are not net zero compliant, as outlined in the first chapter. In 2015, the Government cancelled the Zero Carbon Homes Standard, as described in detail in

91. BEIS, "Heat and Buildings Strategy", 12-14.

Box 3.2, which would have required new homes to be carbon neutral.

Since then, there have been more than a million new builds,⁹² most of which will need to be retrofitted with low-carbon heating for net zero. By the time the Future Homes Standard is introduced in 2025, which – as Box 1.1 described – will require new homes to have both low-carbon heating such as heat pumps and high levels of energy efficiency such as triple glazed windows, we will have lost nine years in which further progress could have been made in reducing residential emissions and cutting energy bills for the owners of new homes.

BOX 3.2. Zero Carbon Homes Standard

In 2006, the Labour Government published a consultation setting out plans to move towards zero carbon new homes.⁹³ This included a voluntary set of standards for assessing new homes with six levels of ambition, the highest of which was zero carbon, called the Code for Sustainable Homes.⁹⁴ The intention was to integrate these standards into building regulations to require new homes to be zero carbon from 2016.

The Coalition Government published *The Carbon Plan* in 2011, which included the 2016 zero carbon homes commitment.⁹⁵ In 2013, the Government consulted on its plan to deliver zero carbon new homes,⁹⁶ and introduced powers to implement its proposals in the Infrastructure Act 2015. Under this plan, house builders would be required to reduce operational carbon emissions from energy consumption that falls within the scope of building regulations to net zero. This included fixed heating,

92. DLUHC, “Live tables on housing supply”, <https://www.gov.uk/government/statistical-data-sets/live-tables-on-net-supply-of-housing> (2022).

93. Department for Communities and Local Government (CLG), “Building A Greener Future: Towards Zero Carbon Development”, <https://webarchive.nationalarchives.gov.uk/ukgwa/20120919132719/http://www.communities.gov.uk/documents/planningandbuilding/pdf/153125.pdf> (2006).

94. CLG, “Code for Sustainable Homes: A step-change in sustainable home building practice”, https://webarchive.nationalarchives.gov.uk/ukgwa/20150612123823/http://www.planningportal.gov.uk/uploads/code_for_sust_homes.pdf (2006).

95. HM Government, “The Carbon Plan: Delivering our low carbon future”, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/47613/3702-the-carbon-plan-delivering-our-low-carbon-future.pdf (2011), 34.

96. CLG, “Next steps to zero carbon homes – Allowable Solutions”, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/226610/130731_ALLOWABLE_SOLUTIONS_CONDOC_FOR_PUBLISHING.pdf (2013).

hot water and lighting, but not appliances like refrigerators or washing machines. The new building regulations would require a 20% improvement in energy efficiency, which was equivalent to the energy standards in level four of the Code for Sustainable Homes. Developers would be required to offset the remaining emissions by supporting off-site schemes that reduce carbon emissions, called Allowable Solutions.

However, in 2015, the Government announced it would not implement the Zero Carbon Homes Standard.⁹⁷

New policy eventually came five years later. The Future Homes Standard was consulted on by the Conservative Government in 2020. Homes built to this standard are to produce between 75 and 80% less carbon emissions than those built to the 2013 edition of Part L, as shown in Box 1.1 much earlier.⁹⁸ The Government is due to consult on a full technical specification for the new standard in 2023.

In the meantime, the interim Part L 2021 standard of building regulations, requiring a 31% reduction in carbon emissions from new homes,⁹⁹ came into force in June 2022. This is intended to help developers adjust to higher standards – by upskilling workers and growing supply chains – before the Future Homes Standard comes into force in 2025.

However, according to the CCC, Part L 2021 will not achieve its stated objectives as it is insufficiently ambitious.¹⁰⁰ It is possible for developers to comply with the standard while installing fossil fuel heating, so it will not scale the heat pump supply chain, and the energy efficiency standards are insufficient to drive an improvement in skills.¹⁰¹ The CCC analysis suggests the interim standard alone will not prepare the industry for the Future Homes Standard in two years' time.

Homes built to the Future Homes Standard from 2025 onwards

97. HM Treasury, "Fixing the foundations", 46.

98. MHCLG, "Future Homes Standard consultation: government response", 13.

99. DLUHC, "Conservation of fuel and power: Approved Document L", <https://www.gov.uk/government/publications/conservation-of-fuel-and-power-approved-document-l> (2022).

100. CCC, "Independent assessment of the UK Heat and Buildings Strategy", <https://www.theccc.org.uk/publication/independent-assessment-the-uks-heat-and-buildings-strategy/>, (2021), 41-42.

101. *Ibid.*, 41-42

will be net-zero-ready, meaning they will not require retrofitting in the future with energy efficiency upgrades or low-carbon heating. Importantly, these homes will produce fewer carbon emissions than those under the Zero Carbon Homes Standard. This is because the Future Homes Standard delivers more emission reductions on-site, through energy efficiency and low-carbon heating, than the Zero Carbon Homes Standard, which was reliant on carbon offsetting.

However, the CCC recommends the Future Homes Standard from 2025 require higher, ultra-high energy efficiency standards, defined as a space heat demand of 15 kWh/m²/yr.¹⁰² The Future Homes Standard currently does not commit to this level of thermal performance, which would limit the amount of energy required to heat new homes. This would relieve pressure on the electricity grid and reduce energy bills.¹⁰³

The performance gap

Generally, the CCC has highlighted the performance gap between the intended levels of energy efficiency at the design stage – set by the building standards described above – and the actual energy performance of new homes.

The CCC estimates that newly built homes lose on average 50% more heat than intended and have recommended that the Standard Assessment Procedure (SAP) – the methodology for assessing energy performance – be reformed to reflect real-world performance, in addition to better enforcement of building standards.¹⁰⁴ They estimated in 2019 that closing the performance gap in new homes could save up to £260 on energy per household each year.¹⁰⁵ In fact, this saving would be even greater at today's higher energy prices.

In addition, the minimum energy performance standard for new homes, known as the Primary Energy Target, only accounts for

102. *Ibid.*, 41.

103. *Ibid.*, 41.

104. CCC, "UK housing: Fit for the future?", <https://www.theccc.org.uk/publication/uk-housing-fit-for-the-future/> (2019), 115; 12.

105. *Ibid.*, 115.

regulated energy: that is, heating, hot water, ventilation, and lighting. Unregulated energy – which includes appliances such as electric vehicle (EV) chargers, refrigerators, and cookers – falls outside building regulations. Unregulated energy can constitute half of total operational energy,¹⁰⁶ and is growing as a proportion while regulated energy falls. Its omission further exacerbates the discrepancy between estimated and actual energy consumption in new homes.

Household flexibility technologies

As outlined in Chapter One, new homes need to support a smart, flexible electricity grid. Government predicts that achieving a smarter, more flexible grid will reduce balancing costs – which accrue when the National Grid has to purchase additional electricity from generators to balance supply and demand – and the amount of new energy infrastructure required to meet periods of high demand. This will save around £10 billion a year in energy system costs by the middle of the century, which will reduce costs for consumers.¹⁰⁷

New homes are currently not being built with good household flexibility technologies, detailed in Box 3.3 below, such as smart heating or energy storage. The CCC recommended in 2019 that government explore options for addressing this through amended building regulations.¹⁰⁸ These technologies – commonly called household demand-side response (DSR) – have the potential to reduce peak electricity demand by up to 23%¹⁰⁹ and will cut energy bills as power is cheaper during off-peak times.

106. London Energy Transformation Initiative (LETI), “Climate Emergency Design Guide”, https://www.leti.uk/_files/ugd/252d09_3b0f2acf2bb24c019f5ed9173fc5d9f4.pdf (2020), 41.

107. BEIS and Ofgem, “Transitioning to a net zero energy system: Smart Systems and Flexibility Plan”, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1003778/smart-systems-and-flexibility-plan-2021.pdf (2021), 10.

108. CCC, “UK housing”, 18.

109. National Grid ESO, “Domestic flexibility could reduce peak electricity demand by up to 23%, new study shows”, <https://www.nationalgrideso.com/news/domestic-flexibility-could-reduce-peak-electricity-demand-23-new-study-shows>, (2022).

BOX 3.3. Household flexibility technologies

Pre-heating and thermal storage. Energy efficient homes can be heated ahead of peak demand. Homes can also use hot water tanks and phase change-based materials to store heat.

Batteries. Homes with solar PV can store excess energy for use during peak periods or sell unrequired power to the electricity grid.

Smart meters and time-of-use tariffs. Smart meters automatically send meter readings to the supplier to provide data on energy demand. The in-home digital display shows the occupant how much gas and electricity they're using, as well as its cost. This encourages occupants to reduce their demand and use energy more efficiently. Smart metres also enable households to take advantage of time-of-use tariffs – which provide cheaper energy during periods of low demand or increased supply from renewables. This will encourage households to shift their consumption to off-peak times.

Smart appliances. Smart appliances can be programmed to operate during times when energy is cheaper. For example, heat pumps with smart controls can respond to changes in energy availability.

Smart electric vehicle charging and vehicle-to-grid technology. Smart electric vehicle chargers operate during off-peak periods to ensure demand for charging does not overwhelm the power grid. Electric vehicle batteries could also export electricity back to the grid during periods of high demand, known as vehicle-to-grid. In the National Grid ESO's more optimistic future scenarios, where consumer engagement is higher, a combination of smart charging and vehicle-to-grid ensures electricity demand to charge EVs during periods of peak demand is net negative from the mid-2030s, as more energy is being transferred back to the grid from EV batteries than is being extracted to charge them.¹¹⁰

110. National Grid ESO, "Future Energy Scenarios", 208.

The 2021 Government's *Heat and Buildings Strategy* emphasised the importance of ensuring homes are equipped with smart technologies and energy storage.¹¹¹ Indeed, the Government committed in its *Energy Security Strategy* to ensure all new homes are smart meter ready by 2024.¹¹² Building regulations now also require EV charge points in all new homes, following a campaign by the Conservative Environment Network led by Felicity Buchan MP.¹¹³ Last year, the Government legislated to require all private charge points to have smart capability.¹¹⁴

The Government's *Smart Systems and Flexibility Plan 2021* committed to collaborate with industry to build flexibility and smart technologies into the SAP, which – as aforementioned – assesses the energy performance of new homes, and explore the creation of a 'smart readiness indicator' to assess the preparedness of homes for these technologies.¹¹⁵ This plan also committed to consider smart technologies and energy storage as part of the development of the Future Homes Standard from 2025 onwards.¹¹⁶ To ensure future homes are net zero compliant, the new version of the SAP (SAP11) must assess the ability of new homes to consume energy flexibly, and this ought to become a requirement in building regulations in 2025.

Some homes will be needed to increase the supply of electricity too, by generating renewable power onsite. According to the National Grid ESO, up to 41 GW of solar capacity could be required on domestic buildings by 2050.¹¹⁷ This will reduce demand on the electricity grid. The installation of solar PV in new homes is becoming commonplace to meet the 2021 Part L standards, as explained in Box 1.1. However, once low-carbon heating is required in 2025, developers may stop installing solar PV, even where

111. BEIS, "Heat and Buildings Strategy", 88-94.

112. BEIS, "British energy security strategy", <https://www.gov.uk/government/publications/british-energy-security-strategy/british-energy-security-strategy#networks-storage-and-flexibility> (2022).

113. DLUHC, "Infrastructure for charging electric vehicles: Approved Document S", <https://www.gov.uk/government/publications/infrastructure-for-charging-electric-vehicles-approved-document-s> (2021), 3.

114. BEIS, "Regulations: electric vehicle smart charge points", <https://www.gov.uk/guidance/regulations-electric-vehicle-smart-charge-points> (2022).

115. BEIS and Ofgem, "Transitioning to a net zero energy system", 29.

116. *Ibid.*, 29.

117. National Grid ESO, "Future Energy Scenarios", 66.

it is economically feasible. This is because the indicative Future Homes Standard can be met without onsite renewable energy generation.¹¹⁸

Low-carbon heating

The Future Homes Standard that will come into force from 2025 will require housebuilders to install low-carbon heating. Government expects heat pumps to be the primary technology to meet the higher standard.¹¹⁹ In most cases, evidence suggests that heat pumps work best either in individual homes or via heat networks,¹²⁰ explained in Box 3.4 below, but there could be a role for hydrogen boilers near industrial clusters with a ready supply of hydrogen. The Government will take key strategic decisions on the role of hydrogen in home heating in 2026 following feasibility studies and pilot projects.¹²¹

BOX 3.4. Key low-carbon heat technologies

Heat pumps. A domestic heat pump draws heat from the air or ground to warm homes. It is a proven, ultra-efficient technology, and is powered by electricity, so it does not produce carbon emissions at the point of use.

Government expects heat pumps to be the primary heating appliance for new homes, with 200,000 installed in new homes per annum by 2028. For that purpose, the *Heat and Buildings Strategy* set out policies to develop the heat pump supply chain. This includes phasing out the installation of new fossil fuel heating in homes off the gas grid from 2026, providing grants for households to install heat pumps through the Boiler Upgrade Scheme, developing a market-mechanism to scale the heat pump market, and rebalancing consumer gas and electricity prices to incentivise households to install electric heat pumps.¹²²

118. MHCLG, "Future Homes Standard consultation: government response", 18.

119. MHCLG, "Future Homes Standard consultation", 16.

120. Jan Rosenow, "Is heating homes with hydrogen all but a pipe dream? An evidence review", *Joule* (2022), 2225-2228.

121. BEIS, "Heat and Building Strategy", 13.

122. BEIS, "Heat and Buildings Strategy", 20-22.

Heat networks. Sometimes called district heating, these take heat from a central source and distribute it to a cluster of homes.

The CCC estimates that around 18% of UK heat will need to come from heat networks by 2050.¹²³ The Government has made clear that they regard heat networks as part of the solution to heat decarbonisation and is providing funding for them through The Heat Networks Delivery Unit and the Green Heat Network Fund.¹²⁴

The Energy Bill will create provisions to designate heat network zones that new homes within the zone will be required to connect to. Ofgem will regulate heat networks, after Bright Blue advocated for this in their 2019 report, *Pressure in the pipeline*.¹²⁵

Hydrogen boilers. A potential lower-carbon alternative to natural gas boilers. Hydrogen gas could potentially be distributed to homes using the existing gas network. Low-carbon hydrogen can be produced using natural gas with carbon capture and storage (CCS), which is known as 'blue hydrogen.' Alternatively, it can be produced via electrolysis, which is known as 'green hydrogen.' This uses electricity to break water down into hydrogen and oxygen. Government is pursuing both production methods to meet demand for low-carbon hydrogen.

The extent to which hydrogen will be used for home heating will be determined by the Government in 2026, following technical research and consumer trials to assess its safety, costs, and benefits.¹²⁶

Since most new homes will install electric heat pumps, this report will focus on public policy to prepare the heat pump market and installer base for the Future Homes Standard from 2025 onwards.

Government measures will be important to scale the heat pump supply chain and achieve price parity with gas boilers by 2030, as the

123. CCC, "The Sixth Carbon Budget: Buildings", <https://www.theccc.org.uk/wp-content/uploads/2020/12/Sector-summary-Buildings.pdf> (2020), 17.

124. BEIS, "Heat networks", <https://www.gov.uk/government/collections/heat-networks#available-support> (2016).

125. Wilf Lytton and Ryan Shorthouse, "Pressure in the pipeline Decarbonising the UK's gas", <https://brightblue.org.uk/wp-content/uploads/2019/02/Pressure-in-the-pipelines.pdf> (2019).

126. BEIS, "Heat and Buildings Strategy", 24.

Heat and Buildings Strategy envisages.¹²⁷ Bringing down costs through economies of scale and cheaper electricity will make heat pumps more affordable to install and run in new homes.

However, the CCC has warned there is a risk the heat pump market is not able to deliver the 200,000 heat pumps in new builds annually from 2028, unless further action is taken to underpin skills and supply chains.¹²⁸ Other than the Boiler Upgrade Scheme, the Government has not yet actually implemented the policies to develop the heat pump supply chain outlined in Box 3.4.

Furthermore, another significant risk to the delivery of the Future Homes Standard is the skills deficit. At the moment, there are fewer than 3,000 qualified heat pump installers.¹²⁹ As such, there currently is no sufficient qualified installer base to ensure that all new homes can be equipped with operationally efficient, clean heating. The Heat Pump Association (HPA) estimates we will need 12,400 by 2025, meaning we need to train at least 10,000 over the next two years.¹³⁰ Indeed, the *Heat and Buildings Strategy* identified the need to train up to 7,500 installers annually up to 2025 and reach a peak of 15,000 new installers per year before 2030 to meet installation targets.¹³¹

It takes at least three years to become a qualified heat pump installer for new entrants without previous experience as a heat engineer, but around one working week for an existing engineer.¹³² That means the initial upsurge in installers will need to come from the more than 130,000 registered gas engineers.¹³³

However, there is currently little incentive for engineers to retrain while demand for heat pump installations and maintenance remains

127. BEIS, "Heat and Buildings Strategy", 12.

128. CCC, "Progress in reducing emissions 2022", 193.

129. Nesta, "How to scale a highly skilled heat pump industry", <https://www.nesta.org.uk/report/how-to-scale-a-highly-skilled-heat-pump-industry/> (2022), 4.

130. HPA, "Building the installer base for net zero heating", https://www.heatpumps.org.uk/wp-content/uploads/2020/06/Building-the-Installer-Base-for-Net-Zero-Heating_02.06.pdf (2020), 7.

131. BEIS, "Heat and Buildings Strategy", 53.

132. BEIS, "Heat and Buildings Strategy", 52.

133. Juliet Philips, Colm Britchfield, and Pedro Guertler, "The Home Energy Security Strategy", https://e3g.wpenginepowered.com/wp-content/uploads/The-home-energy-security-strategy-a-permanent-solution-for-lower-bills_E3G-report-1.pdf (2022), 10.

low before 2025. Along with the cost of the training course and the loss of a week's income for sole traders, this is proving to be a barrier to upskilling the workforce. Providing a financial incentive to entice them to retrain is, therefore, essential. The HPA has called for a £300 training voucher to cover the training costs of the first 5,000 installers.¹³⁴

In fairness, the Home Decarbonisation Skills Training competition delivered by the Department for Business, Energy and Industrial Strategy (BEIS) is providing £9.2 million in funding for 8,900 training courses across England in heat pump installations, insulation upgrades, and retrofit assessments.¹³⁵ In 2021 BEIS provided £6 million for 7,000 training opportunities under this scheme. It is intended to support the delivery of government retrofit grants, which are available to households wanting to improve the efficiency of their homes, by expanding and upskilling the retrofit workforce. The courses are free or heavily subsidised.

However, the funding only runs until March of this year, giving industry very little time to deliver the training. Not all the training courses will provide heat pump qualifications, as the funding is spread across three different retrofit services, so it will not deliver the 10,000 additional installers required to meet the HPA's market assessment for 2025, which is when the Future Homes Standard comes into force.¹³⁶

Other government training schemes have not been effective at closing the skills gap in low-carbon heating. Skills Bootcamps, explained in Box 3.5 below, have not been well suited to upskilling the existing heating and plumbing workforce to install heat pumps. This is because the 16-week courses are longer than the required training for those already in the home heating sector, but too short for those with no experience in the industry.¹³⁷

134. Heat Pump Association, "Building the installer base for net zero heating", https://www.heatpumps.org.uk/wp-content/uploads/2020/06/Building-the-Installer-Base-for-Net-Zero-Heating_02.06.pdf (2020), 15.

135. BEIS, "Training for thousands to take advantage of green job opportunities", <https://www.gov.uk/government/news/training-for-thousands-to-take-advantage-of-green-job-opportunities> (2022).

136. HPA, "Building the installer base for net zero heating", 7.

137. Electrify Heat and Trade Union Congress, "The role of heat pumps in building a high skill, high wage economy: A race to the top for standards and jobs", <https://electrifyheat.uk/wp-content/uploads/2022/06/The-role-of-heat-pumps-in-building-a-high-skill-high-wage-economy11.pdf>, (2022), 7.

BOX 3.5. Skills Bootcamps

Skills Bootcamps provide free training courses of up to 16 weeks for adults over 19 years old. They intend to equip people with the skills that are in demand across key sectors. Adults who complete a Skills Bootcamp are guaranteed a job interview at the end of it. The scheme is funded through the government's National Skills Fund. The 2021 Spending Review committed a further £550 million over three years to deliver Skills Bootcamps.¹³⁸

In addition, free training courses could be an insufficient incentive for sole traders to retrain without an additional payment to compensate for the income forgone. Failure to train enough installers could mean there is an insufficient pool of trained engineers for the introduction of the Future Homes Standard in 2025, and would put the Government's target of installing 600,000 heat pumps a year by 2028 at risk.

Embodied carbon

There currently exists no government regulation concerning the embodied carbon of homes. The CCC has recommended government make whole-life carbon assessments of new homes mandatory from 2025.¹³⁹ This would provide the data to set limits on embodied carbon in the future. Indeed, some planning authorities already require house builders to assess and reduce whole-life carbon emissions, such as Greater London for developments over 150 units.¹⁴⁰ France has also introduced whole-life carbon assessments,

138. Department for Education, "National Skills Fund: consultation response", https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1065705/National_Skills_Fund_consultation_response.pdf (2022), 9-10.

139. CCC, "Progress in reducing emissions 2022", 554.

140. Greater London Authority, "The London Plan 2021", https://www.london.gov.uk/sites/default/files/the_london_plan_2021.pdf (2021), 343.

including incremental reductions from 2025.¹⁴¹

The exclusion of embodied carbon from the proposed Future Homes Standard is a glaring omission in government plans. That said, the Department for Levelling Up, Housing and Communities will run an embodied carbon consultation in 2023 on its approach to measuring and reducing embodied carbon in the built environment generally.¹⁴² Whole-life carbon assessments and embodied carbon limits should be incorporated into building regulations.

141. ATIBT, "A look back at the new guidelines of the French Environmental Regulation", <https://www.atibt.org/en/news/12902/a-look-back-at-the-new-guidelines-of-the-french-environmental-regulation-re-2020> (2020).

142. Environmental Audit Committee, "Building to net zero: costing carbon in construction: Government Response to the Committee's First Report", <https://committees.parliament.uk/publications/30124/documents/174271/default/> (2022), 4.

BOX 3.6. The climate resilience of new homes

Finally, another gap within current public policy is the absence of climate resilience measures for new homes.

One in six English properties are at risk of flooding and 20% of homes in England already suffer from overheating.¹⁴³ The Environment Agency (EA) and National Infrastructure Commission (NIC) have warned that climate change could lead to water shortages in the UK and that reducing demand is essential to mitigate this risk.¹⁴⁴ The CCC's climate change risk assessment also placed risks to human health from overheating in buildings as one of the eight highest priority areas for the government.¹⁴⁵

The Government, admittedly, has introduced a new requirement to reduce overheating risk in new homes through building regulations (Part O) in June 2022.¹⁴⁶ Sustainable drainage systems (SuDs) will also become mandatory in new properties from 2024, subject to further consultation.¹⁴⁷

SuDS seek to reduce surface water flooding and runoff by mimicking natural drainage. This includes installing permeable surfaces to allow surface water to infiltrate the soil and slowing the flow of stormwater to reduce runoff. The integration of natural habitats and green spaces into developments through SuDS, commonly referred to as 'green infrastructure', can enhance biodiversity and place-making. Following a review, Government will commence Schedule 3 of the Flood and Water Management Act 2010 to require SuDS in new developments and set national design standards.¹⁴⁸

143. Policy Connect, "Bricks & Water: Building resilience for England's homes", <https://www.policyconnect.org.uk/research/bricks-water-building-resilience-englands-homes> (2020), 20; CCC, "UK Climate Change Risk Assessment: Evidence Report. Chapter 5: People and the Built Environment", <https://www.theccc.org.uk/wp-content/uploads/2016/07/UK-CCRA-2017-Chapter-5-People-and-the-built-environment.pdf> (2017), 4.

144. Sir James Bevan, "Drought risk in the Anthropocene: from the Jaws of Death to the Waters of Life", <https://www.gov.uk/government/speeches/drought-risk-in-the-anthropocene-from-the-jaws-of-death-to-the-waters-of-life>, (2021); National Infrastructure Commission (NIC, "Preparing for a drier future", <https://nic.org.uk/app/uploads/NIC-Preparing-for-a-Drier-Future-26-April-2018.pdf> (2018), 76-77.

145. CCC, "Independent Assessment of UK Climate Risk", <https://www.theccc.org.uk/wp-content/uploads/2021/07/IndependentAssessment-of-UK-Climate-Risk-Advice-to-Govt-for-CCRA3-CCC.pdf>, (2021), 134-135.

146. DLUHC, "Overheating: Approved Document O", <https://www.gov.uk/government/publications/overheating-approved-document-o> (2021).

147. Department for Environment, Food and Rural Affairs, "The review for implementation of Schedule 3 to The Flood and Water Management Act 2010", https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1128073/The_review_for_implementation_of_Schedule_3_to_The_Flood_and_Water_Management_Act_2010.pdf (2023), 5.

148. *Ibid.*, 5.

Part G of building regulations currently limits water demand in new homes to a maximum of 125 litres per person per day.¹⁴⁹ Local authorities have been encouraged to adopt a more ambitious target of 110 litres per person per day where there is pressure on water supplies.¹⁵⁰ However, minimum water efficiency standards need to be tightened if we are to meet future demand and sustain resilience levels in a changing climate. The former Environment Secretary, George Eustice MP, committed to exploring stricter water efficiency standards in building regulations.¹⁵¹ This should be included as part of the Future Homes Standard from 2025 onwards.

As with low-carbon heating and energy efficiency, installing climate resilience measures at the construction phase is cheaper than retrofitting later. According to the CCC, installing a package of water efficiency measures, such as dual flush toilets, efficient showers, taps, dishwashers and washing machines, and water butts is more than ten times cheaper at the construction stage than retrofitting to the same standard.¹⁵²

This chapter has detailed and evaluated the leading public policies since 2010 to increase the number of greener new homes, both in terms of operational and embodied carbon, as well as climate resilience. Though there has been progress on greater and greener homes over the past decade or so, much more desperately needs to be done, for socioeconomic and environmental reasons. That is the focus of the next chapter.

149. DLUHC, "Sanitation, hot water safety and water efficiency: Approved Document G", <https://www.gov.uk/government/publications/sanitation-hot-water-safety-and-water-efficiency-approved-document-g> (2010), 36.

150. George Eustice MP, "Reducing demand for water", <https://questions-statements.parliament.uk/written-statements/detail/2021-07-01/hcws140> (2021).

151. *Ibid.*

152. CCC, "UK housing", 42.

Chapter four: Policy recommendations

So far, this report has identified that, despite the implementation of different policies by Conservative-led Governments since 2010, the UK is failing to build enough homes which are net-zero compliant, leading to suboptimal socioeconomic and environmental outcomes. In this chapter, we propose new policies to help change this.

It is worth stressing that if planning reform and net zero policies are done without public consultation, there is a risk of a political backlash. There are many solutions to the housing and climate crises that would work in theory but would be undeliverable in practice due to political constraints. As such, to ensure political durability, the policy recommendations in this chapter flow from the following principles:

1. New development should be consistent with net zero and biodiversity governmental targets.
2. Environmental regulations should not prevent homes being built affordably or more quickly and efficiently.
3. The lifestyles that people lead in new homes are as important for net zero as the fabric of the home.
4. Planning policy and building standards should incentivise communities to accept new homes in their neighbourhoods.
5. Planning reform should ensure that communities can shape development in their area to facilitate local democracy.

Our recommendations are grouped into two core policy objectives to achieve both greater and greener homes. First, to speed up the delivery of new homes where development is most sustainable, such as close to workplaces, shops, and sustainable transport links. Second, to ensure new homes are compliant with reaching net zero greenhouse gas emissions by 2050.

Bringing forward new homes where development is most sustainable, close to workplaces, shops, and sustainable transport links

Recommendation one: Government should create and fund a *Neighbourhood Development Order Pathfinder Programme to bring forward homes in urban neighbourhoods.

Planning risk is a common barrier to intensification. Developers must invest time and resources into writing planning applications with no certainty of approval. Urban infill and brownfield sites are usually small so deliver fewer homes per planning application. For local authorities, permitting building extensions, infill, and brownfield redevelopment has traditionally been fraught with political risk due to hostility to new housing from existing residents.

Yet, densification of existing settlements is the most environmentally sustainable way of increasing housing supply, as explained in Chapter One. The CCC argues existing towns and cities should be prioritised for new development.¹⁵³

To ensure intensification can make a greater contribution toward meeting housing targets, we need to remove the need for house builders to submit a planning application where development can be shown to have local support. This can be done using Neighbourhood Development Orders (NDOs), described in Box 4.1 below. NDOs give parishes and neighbourhood groups a chance to bring forward the development they

153. CCC, "UK housing", 103.

want to see in their areas, rather than waiting for developers to come forward with their own proposal. NDOs need to set clear rules on the type, design, and density of homes, and are approved by residents in a referendum. This could unlock a large number of homes spread across a number of different sites in the town or neighbourhood.

BOX 4.1. *Neighbourhood Development Orders (NDOs)

NDOs are a tool for community-led planning created by the Localism Act 2011. They provide planning permission for specific developments. This could be specified changes of use and building alterations, or the granting of planning permission on allocated sites. NDOs are developed by a civil parish (such as town councils) or a neighbourhood forum designated by the LPA. They must be subject to an independent examination and a community referendum before coming into force.

Four urban NDOs are being developed in the commuter town of Chesham, situated 28 miles north-west of London at the end of the Metropolitan Line. As the third largest town in Buckinghamshire, it is facing growing pressure to build more homes. However, it is surrounded by the Chilterns Area of Outstanding Natural Beauty and Green Belt land. Extension of the town into the Green Belt has been deemed as undesirable by the local community who fear this would be detrimental to its unique setting, but the town needs to grow to thrive.

To deliver the much-needed new housing, the Town Council is developing the Chesham Neighbourhood Plan (CNP) to encourage 'gentle densification' of the town centre and selected existing land parcels. This involves working with Create Streets to develop four NDOs.

If approved by the local community, these will facilitate planning permission for new homes on nineteen brownfield sites which have been identified as having strong potential for development. The sites are a mix of vacant plots, car parks, and commercial buildings. The design code is being developed in consultation with the community and other key public and private stakeholders to emulate and complement existing building design, whilst recognising local sensitivities and preferences.

There has been strong community engagement, including 2,847 responses to an online survey on building preferences.¹⁵⁴ The code will inform detailed site plans for the NDOs.

Residents are involved throughout the process and will be the final arbiters when the CNP and the NDOs are brought forward at a local referendum scheduled for 2024, following consultation with the LPA, Buckinghamshire Council, and scrutiny by an independent examiner.

However, there has been limited use of NDOs. To gain local support, NDOs must provide communities with complete confidence that the homes permitted will be attractive and supported by the necessary infrastructure. This can be resource- and time-intensive, in particular developing the urban design and housing types with community input, as in Chesham. The current funding to deliver NDOs is limited, so achieving good design at a meaningful scale, such as a whole neighbourhood or area in a town, is challenging.

In addition, the process for permitting infill and brownfield redevelopment through an NDO remains ambiguous. So, in some circumstances, is the granting of consent for homes subsequent to the NDO's approval. Perhaps above all, they are simply little known. If approved, the urban NDOs in Chesham will be a trailblazer, pre-permitting locally acceptable gentle intensification of sites in a town with a clear housing need.

To make NDOs an established solution to community-led intensification, the Government needs to kickstart a programme of NDO creation in towns and suburbs which already have a local design code in place. These codes, explained in Chapter Two, specify the local design preferences and other requirements which residents want new homes to meet. This will allow the neighbourhood planning group to move swiftly to public consultation. Box 4.2 below outlines existing government grants for neighbourhood planning.

154. Data provided to the author by Create Streets.

BOX 4.2. Government grants for Neighbourhood Plans and Neighbourhood Development Orders (NDOs)

Grant funding is available for neighbourhood planning groups preparing a Neighbourhood Plan or NDO. All groups are eligible to apply for up to £10,000 in basic grant funding. Groups which meet certain eligibility criteria are able to apply for an additional grant of up to £8,000.¹⁵⁵

Funding is also available for Local Planning Authorities (LPAs) to support neighbourhood planning groups in their area. They can claim £5,000 for the first five neighbourhood areas and forums they designate, and £20,000 to support NDOs for each neighbourhood planning area per year.¹⁵⁶

Government has also established two new funding pots to encourage more neighbourhood planning.¹⁵⁷ This is in response to a lack of take up in urban and deprived areas and declining numbers of new groups being established in England as a whole.

The Simpler Neighbourhood Planning pilot has provided up to £45,000 to seven LPAs for schemes that enable communities to set out their priorities for development without having to undertake a full Neighbourhood Plan. The Bidding Fund for LPAs in Underrepresented Areas has provided up to £50,000 to four local planning authorities to provide additional support to residents in urban and deprived areas to produce a Neighbourhood Plan. Less than 7% of existing Neighbourhood Plans are in the most deprived areas and only 5% are in urban areas.¹⁵⁸

A new NDO Pathfinder Programme should be created to dovetail with the Government's Design Code Pathfinder Programme, which has provided £3 million of funding for 21 LPAs and four neighbourhood planning groups to produce local design codes.

155. Locality, "Neighbourhood Planning – Grant Support", <https://neighbourhoodplanning.org/about/grant-funding/>.

156. DLUHC, "Update on financial support for neighbourhood planning in 2022/23", https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1087202/Letter_from_the_Chief_Planner_Neighbourhood_Planning_Grant_Update.pdf (2022).

157. DLUHC, "Two funds to support the uptake of neighbourhood planning", <https://www.gov.uk/government/publications/neighbourhood-planning-two-funds-to-support-greater-uptake/two-funds-to-support-the-uptake-of-neighbourhood-planning> (2021).

158. DLUHC, "Urban and deprived areas among those chosen for planning pilots", <https://www.gov.uk/government/news/areas-selected-for-planning-pilots-for-deprived-communities> (2022).

The NDO Pathfinder would provide funding and technical support for communities to bring forward development once a design code is in place for their area. The programme would be open to applications from existing neighbourhood planning groups, providing them with a financial incentive to create an NDO, or LPAs seeking to promote and support the creation of NDOs in their area to meet their local housing target. The programme could be administered by the new Office for Place, which has been set up by government to support LPAs with the development of their design codes.

Where local design codes are already in place, neighbourhood planning groups can focus their resources on navigating the legal mechanisms for gaining approval for the NDO. The process for establishing an NDO is outlined in Box 4.3 below. Successful NDO pathfinders will provide a precedent for other planning groups to follow. Further guidance may be necessary on best practice ‘sign-off’ for new homes subsequent to the creation of an NDO, which should be as simple, predictable, and ‘tick box’ as possible. It is imperative to de-risk development which complies with the locally approved framework provided by the NDO.

BOX 4.3. Process for creating a Neighbourhood Development Order (NDO)

1. Parish, town council, or neighbourhood forum submits neighbourhood areas for designation by the local planning authority.
2. Community consultation and engagement is undertaken to establish what the NDO should permit.
3. The types of development to be permitted are identified and the planning conditions are drafted.
4. The draft NDO is subject to a public consultation.
5. The draft NDO is then reviewed and finalised before being submitted to the local planning authority for their consultation process.
6. The NDO is assessed by an independent examiner.
7. If approved by the examiner, the planning authority puts the NDO forward for approval at a local referendum.
8. If approved by residents, the NDO comes into force shortly afterwards.

The purpose of the NDO Pathfinder is to develop an attractive tool for bringing forward popular and locally-approved building extensions, urban infill, and brownfield redevelopment. They could become an established mechanism for local councils and communities looking to hit their local housing requirement and maintain their five-year housing land supply while minimising unpopular urban sprawl, as in Chesham. The Levelling Up and Regeneration Bill will require all LPAs to prepare a local design code, as explained in Chapter Two. A successful pathfinder programme could help to make NDOs the logical next step to bring forward new homes that are acceptable to the local community.

Like permitted development rights (PDRs) set by central government, as explained in Chapter Two, NDOs provide greater speed and certainty for developers because they do not need to submit a planning application.

However, unlike PDRs, NDOs are community-led and democratically approved. This means they have a greater chance of overcoming the second systemic barrier to intensification identified in this report, namely local opposition to new homes. While the design code may increase construction costs, this will be baked into the land price when the viability of development is assessed.

That being said, community engagement, popular design, and democratic approval will not be sufficient if residents still feel like new development will negatively affect their lives. Where possible, house builders should contribute to local infrastructure upgrades for homes permitted through an NDO. This will require small sites to be subject to the new Infrastructure Levy — a locally-set charge for securing developer contributions, which is being introduced in the Levelling Up and Regeneration Bill — where this would not make the development economically unviable. As explained in Chapter Two, PDRs have effectively been exempt from Section 106 Agreements and the Community Infrastructure Levy, which has contributed to their unpopularity.

Where parish councils and neighbourhood forums have created NDOs, these should count toward a new requirement for small- and medium-sized

sites in the NPPF, which we are proposing below. This would provide LPAs with an incentive to actively promote NDO creation in their area. They could do this by encouraging parish councils and neighbourhood forums to create an NDO, or providing additional funding for neighbourhood planning in their area so more neighbourhood forums are established.

Landowners will also need an incentive to support NDOs. If land included in an NDO becomes more valuable because it has planning permission, this should make them popular with landowners. Homeowners may also benefit from an uplift in land value if the NDO permits extensions or rebuilds in their area. An NDO could be an opportunity for landowners to secure consent for higher density development than the conventional planning process if they can achieve community support for this through popular design. Where communities insist on a lower density than the landowner would like, the landowner may still support an NDO if it unlocks housing more quickly than a protracted planning battle with the LPA.

Importantly, encouraging locally-led intensification via more NDOs would support our net zero target. Building new homes in towns and suburbs will reduce the number of vehicle journeys, since the homes are more likely to be within walking distance of public transport, such as the Metropolitan Line in Chesham, and closer to offices and shops. Denser settlements allow for more frequent public transport services to serve the higher demand. In addition, developer contributions via the new Infrastructure Levy can support investment in public transit and active travel infrastructure. Finally, design codes can require new homes to enhance biodiversity, facilitate active travel, use materials with a lower embodied carbon, and be resilient to flooding and overheating.

Recommendation two: Set a requirement in the National Planning Framework (NPPF) for Local Planning Authorities (LPAs) to create Local Development Orders (LDOs) for small- and medium-sized sites to meet a proportion of their housing requirement.

Local Development Orders (LDOs), in contrast to NDOs, are created

by the LPA rather than a parish council or neighbourhood forum. They serve the same purpose of granting planning permission upfront for specified development without the need for house builders to submit a planning application. To encourage intensification, we need to make the use of both LDOs and NDOs more common across the country.

Government should amend paragraph 69 of the 2021 NPPF,¹⁵⁹ which currently states that LPAs should:

- a. use brownfield registers and development plans to identify small- and medium-sized sites (no larger than one hectare) to meet at least 10% of their housing requirement, unless they can show this is not achievable;
- b. use tools such as area-wide design assessments and Local Development Orders to help bring small and medium sized sites forward.

While there is a requirement to allocate enough small and medium sites to accommodate 10% of the local housing requirement, there is no specific target for using LDOs to bring forward housing on small and medium sites. Government should consult on a target for the use of LDOs to drive uptake. LDOs can be particularly effective for catalysing regeneration of areas, particularly where development has stalled or been unforthcoming.

The creation of local design codes will help to expedite the creation of LDOs. This is because much of the design work will already be done if the codes are detailed, specific, and based on extensive community engagement, as intended. LPAs will be required to develop a design code for their area following the passage of the Levelling Up and Regeneration Bill. These can be used to inform the housing types permitted through an LDO. That being said, LPAs will still be required to consult residents on the draft LDO; this should provide a meaningful opportunity for community input, so that the new homes have local consent.

159. DLUHC, "National Planning Policy Framework", https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1005759/NPPF_July_2021.pdf (2021), 19.

LPA that prepare LDOs can recoup some of the costs from the house builders.¹⁶⁰ This should address concerns about resourcing, although additional funding from HM Treasury may be required.

Ensuring new homes are compliant with reaching net zero greenhouse gas emissions by 2050.

Recommendation three: New National Development Management Policies (NDMP) should include a hierarchy of options to set higher environmental standards for more ambitious local authorities.

NDMPs will set the planning rules for issues of national salience, rather than local plans, as explained in Chapter Two. This could include common considerations such as protecting the Green Belt, as well as other national priorities like reducing carbon emissions.

However, setting development policies nationally could lead to worse environmental outcomes in some areas. This is because some local authorities have more ambitious environmental targets, such as to reach net zero locally before the UK-wide 2050 target. For example, the West Midlands has a net zero target for 2041, Greater Manchester 2038, and London 2030.¹⁶¹

To alleviate this, local authorities should be able to continue to set more ambitious planning requirements than the national minimum on issues such as reducing carbon emissions and providing green infrastructure in developments.

There has already been confusion over whether local authorities can set higher energy efficiency standards than the minimum requirements

160. Planning Advisory Service, "Local Development Orders: Guidance for councils on preparing local development orders", <https://www.local.gov.uk/sites/default/files/documents/LDO%20Guidance%20Document%20March%202019.pdf> (2018), 17.

161. West Midlands Combined Authority, "Environment and Energy", <https://www.wmca.org.uk/what-we-do/environment-and-energy/>; Mayor of London, "Zero carbon London" <https://www.london.gov.uk/programmes-strategies/environment-and-climate-change/climate-change/zero-carbon-london>; Greater Manchester Mayoral Combined Authority, "Five-Year Environment Plan", <https://www.greatermanchester-ca.gov.uk/what-we-do/environment/five-year-environment-plan/>.

in building regulations since 2015, when the Government amended the 2008 Planning and Energy Act to stop local authorities using planning policy to this end. This amendment was never actually implemented. The Government has since clarified that local authorities can continue to set higher standards for now.¹⁶²

To provide stronger clarification, where policies included in the new NDMPs or standards in building regulations conflict with local policies on the environment, central government should set a hierarchy of more ambitious standards that local authorities can choose to adopt. This would prevent a plethora of different requirements springing up across the country while respecting the wishes of communities to insist on more sustainable development in their area.

This hierarchy could also be a tool for ensuring more homes are net zero compliant prior to 2025 when the Future Homes Standard will finally be introduced, reducing the need for retrofits in the future. The CCC criticised the interim building standards that came into force in June 2022 (Part L 2021), as described in detail in Chapter Three, for being insufficiently ambitious, as the standards can be met without low-carbon heat.¹⁶³ The CCC has recommended that LPAs be free to set more stringent or earlier performance targets for new homes.¹⁶⁴

Recommendation four: Include targets for energy use intensity (EUI) and thermal energy demand limit (TED) for all new homes in the Future Homes Standard from 2025 onwards.

Since greener homes will place a greater strain on power supplies to operate electric heating systems and electric vehicle chargers, the Future Homes Standard needs to set the highest energy efficiency standards possible.

162. DLUHC, "Future Homes Standard consultation: Government response", https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/956094/Government_response_to_Future_Homes_Standard_consultation.pdf (2021), 19-21.

163. CCC, "Progress in reducing emissions 2022", 193.

164. CCC, "Letter: Future Homes Standard and proposals for tightening Part L in 2020", <https://www.theccc.org.uk/publication/letter-future-homes-standard-and-proposals-for-tightening-part-l-in-2020/>.

Government currently argues new homes built to Future Homes Standard will not require costly retrofitting for net zero. However, the Future Homes Standard could commit to higher energy efficiency standards to minimise energy demand. This will not just minimise energy system costs, as described in Chapter 3, it will also help to ensure new homes are not delayed; a lack of grid capacity has already put the building of new homes in West London at risk.¹⁶⁵

The Future Homes Standard should set more ambitious performance targets based on the actual energy performance of new homes, including both regulated and unregulated energy, as described earlier in Chapter 3.

Achieving ultra-high energy efficiency standards could cut the annual demand associated with air source heat pumps in new homes by four terawatt-hours in 2050.¹⁶⁶ To ensure the Future Homes Standard delivers homes that are ultra-efficient, government should include targets for EUI and TED for all new homes.

EUI measures the total amount of energy (regulated and unregulated) used in a building in a year divided by its floor area. This provides the basis for driving improvements to the in-use performance of new homes, ensuring that the energy demand from the built environment is aligned with the energy supply from the grid. The Royal Institute of British Architects (RIBA) suggests a target of <70 kWh/m²/year for 2025 and 35 kWh/m²/year for 2030.¹⁶⁷ The UK Green Building Council (UKGBC) Whole Life Carbon Road Map recommends a design target of 35-40 kWh/m²/yr from 2025.¹⁶⁸

TED, on the other hand, measures space heating requirements and is an established metric for energy efficiency. The CCC recommends a space heating design limit of 15 kWh/m²/year.¹⁶⁹ Achieving this

165. Matt Oliver, "No new homes in West London as electricity grid runs out of capacity", *The Telegraph*, 28 July, 2022.

166. CCC, "UK housing", <https://www.theccc.org.uk/publication/uk-housing-fit-for-the-future/> (2019), 64.

167. Royal Institute of British Architects (RIBA), "2030 Climate Challenge", <https://www.architecture.com/about/policy/climate-action/2030-climate-challenge> (2021).

168. UKGBC, "Net zero whole-life carbon roadmap", <https://ukgbc.s3.eu-west-2.amazonaws.com/wp-content/uploads/2021/11/28194152/UKGBC-Whole-Life-Carbon-Roadmap-A-Pathway-to-Net-Zero.pdf> (2021), 41.

169. CCC, "Independent assessment of the UK Heat and Buildings Strategy", 41.

standard would ensure new homes are warm, cheap to run, and suitable for low-carbon heating technologies.

Energy efficient homes can be more cost-effective for the developer as well as the occupier. Building to achieve a space heating demand limit of 15 kWh/m² is more cost-effective than a lower standard of 20-30 kWh/m²/yr, according to calculations by the CCC. This is because the developer saves up to £3,300 on the capital cost of the radiators and heating distribution system, which offsets some of the additional costs from higher fabric efficiency requirements.¹⁷⁰

It is also more than five times cheaper to deliver ultra-high energy efficiency standards and heat pumps at the construction phase than retrofitting later the same home later.¹⁷¹ Retrofitting to this standard later on would cost in excess of £20,000.¹⁷² This means that, unless new houses are built to ultra-high energy efficiency standards, they will not become a reality at scale in England, with all the added energy costs and grid pressures that this would bring.

Recommendation five: Introduce through the Future Homes Standard a new testing requirement for all new homes, and reform Energy Performance Certificates (EPCs) so they test in-use energy performance.

Lower energy demand saves households money on their bills; the pay-back time for energy efficiency measures and heat pump installations has shrunk as energy prices have increased since 2021. Even in 2019, the CCC estimated that the combination of heat pumps and ultra-high energy efficiency standards would save households £85 a year.¹⁷³ There are also health benefits for the occupants of warmer homes, which can reduce pressure on the NHS during the winter months. As such, high

170. CCC, "The costs and benefits of tighter standards for new buildings", <https://www.theccc.org.uk/wp-content/uploads/2019/07/The-costs-and-benefits-of-tighter-standards-for-new-buildings-Currie-Brown-and-AECOM.pdf> (2019), 77.

171. CCC, "UK housing", 42.

172. *Ibid.*, 65.

173. *Ibid.*, 14.

standards of energy performance are fundamental to building truly affordable homes.

To that end, the Government should introduce in the Future Homes Standard a requirement through building regulations for developers to test the standard of construction to ensure it matches the design quality. Building regulations already require air tightness testing; this could be extended to include assessments of thermal and ventilation performance, helping to improve the enforcement of building standards.

Moreover, the Government's Energy Performance Certificate (EPC) Action Plan recognises the need to reform EPC ratings to reflect the actual energy consumption of occupied homes, known as in-use performance.¹⁷⁴ Currently, the efficiency rating of a home is based on its design, such as its fabric and heating system. As explained in Chapter Three, there is often a discrepancy between the energy performance of new homes as intended at design, and their actual performance once built. EPCs use the government's Standard Assessment Procedure (SAP) methodology to calculate the home's energy use, its energy efficiency based on fuel cost, and its estimated carbon emissions; the latter two scores are displayed on the EPC using a scale from A (highest) to G (lowest). In future, additional data on the performance of a home once it has been built should be included in the EPC calculations to ensure developers close the gap between the expected and actual performance of new homes.¹⁷⁵

Some Local Plans already require developers to monitor and report on in-use performance, such as in London and Milton Keynes.¹⁷⁶ The 'Be Seen' energy monitoring guidance explains how to monitor and

174. BEIS and DLUHC, "Energy performance certificates for buildings: Action plan", https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/922660/EPC_Action_Plan.pdf (2020), 6.

175. *Ibid.*, 6.

176. Greater London Authority, "The London Plan: The Spatial Development Strategy for Greater London", https://www.london.gov.uk/sites/default/files/the_london_plan_2021.pdf (2021), 342; Milton Keynes Council, "Plan: MK 2016 – 2031", <https://www.milton-keynes.gov.uk/sites/default/files/2022-05/PlanMK%20Adoption%20Version%20%28March%202019%29.pdf> (2019), 222.

report on actual performance to comply with London Plan Policy SI 2.¹⁷⁷ Government could consult on including this in the new NDMPs. It would be very important, however, that reporting requirements distinguish building performance from occupant behaviour.

Recommendation six: Ensure the energy performance targets for new homes in building regulations incentivise solar PV and energy storage in the Future Homes Standard from 2025.

The decarbonisation of heat and transport could double electricity demand by the mid-century.¹⁷⁸ As outlined in Chapter Three, building homes that consume energy flexibly allows us to manage demand peaks and variability in renewable power generation, improving efficiency and reducing the overall energy system costs.

The carbon intensity and availability of electricity varies throughout the day and time of year, depending on demand and the proportion of electricity being generated by fossil fuels compared with renewables. Moving demand for electricity away from peak times can reduce the emissions from household energy consumption and reduce pressure on the grid. But this benefit is not reflected in current static energy performance targets in building regulations.

Moreover, there are currently no requirements for developers to install smart technologies and energy storage solutions. This is because the carbon and primary energy factors used to calculate the energy performance of new homes through building regulations are an annual average. Consequently, homes designed to shift energy consumption to periods of lower demand do not score better than those which do not.

Indeed, industry modelling also suggests it will be possible to comply with the Future Homes Standard without measures such as solar PV

177. Greater London Authority, "Be seen' energy monitoring guidance", <https://www.london.gov.uk/programmes-strategies/planning/implementing-london-plan/london-plan-guidance/be-seen-energy-monitoring-guidance> (2021).

178. BEIS, "Energy white paper", https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/945899/201216_BEIS_EWP_Command_Paper_Accessible.pdf (2010), 42.

and wastewater heat recovery systems.¹⁷⁹ This is because low-carbon heating and higher fabric efficiency standards will be enough to meet the performance targets in building regulations for new homes.

The Government should consult to include options to improve the energy performance targets for new homes to reward load shifting – the process of moving electricity consumption away from peak times to periods when there is an abundance of renewable power – in the Future Homes Standard. Indeed, industry initiatives such as the Net Zero Carbon Building Standard are exploring how energy performance targets could require flexible energy consumption in new homes.¹⁸⁰ The Government should also ensure the energy performance targets in the Future Homes Standard incentivise the uptake of onsite renewable energy generation, such as solar PV, where it makes economic sense.

Admittedly, developing new energy performance targets is complex and may take longer than 2025, when the Future Homes Standard is due to be implemented. Government understandably prefers using energy performance targets in building regulations rather than prescribing specific technologies, so that developers can find the most cost-effective way of reaching the desired outcomes. However, if updated energy performance targets are not included in the Future Homes Standard for 2023 to reward flexible energy consumption, an alternative would be undoubtedly required.

In this instance, Government could require solar PV and energy storage technologies in new homes through building regulations. Although this would be challenging, as the capacity for energy generation and storage will vary across homes, Section 3 of Part L guidance in building regulations already requires developers to assess and document the technical, environmental, and economic feasibility of including high-efficiency alternative systems, such as solar PV. This

179. UKGBC, “Five key tests”, <https://ukgbc.s3.eu-west-2.amazonaws.com/wp-content/uploads/2022/11/08092138/UKGBC-5-Key-Tests-for-Future-Homes-Standard-Oct-2022.pdf> (2022), 5.

180. UK Net Zero Carbon Buildings Standard, “UK Net Zero Carbon Buildings Standard: Call for evidence guide”, <https://www.nzcbuildings.co.uk/> (2022).

could be strengthened to require developers to install solar PV and energy storage where they are viable. For example, developments with a south-east or south-west facing roof could be required to install solar panels, as recommended in UKGBC's *New Homes Policy Playbook*.¹⁸¹

While designing homes to provide demand flexibility adds marginally to the cost of construction, it makes the energy system cheaper to operate and saves households money. Grid flexibility measures have the potential to bring electricity system costs down by up to £8 billion a year by the end of this decade and up to £16 billion annually by 2050.¹⁸² In the CCC's balanced net zero pathway, changes in how households consume energy can save around £0.4 billion a year by 2050, and there is potential for higher savings.¹⁸³ For example, insulated homes with heat pumps can be preheated ahead of peak times. In a highly electrified scenario, this would save an estimated £2 billion a year if all homes with heat pumps behaved this way.¹⁸⁴ This is because households could access cheaper tariffs at this time, reflecting the lower off-peak network costs.

Recommendation seven: Include appropriate reporting requirements for whole-life carbon emissions of new homes by developers in the Future Homes Standard from 2025 onwards, with a timeline for introducing limits on embodied carbon in the future.

The Government should introduce mandatory whole-life carbon reporting in building regulations from 2025 as part of the Future Homes Standard. As explained in Chapter One, buildings produce both operational carbon emissions, from energy consumption, and embodied carbon emissions, from construction, maintenance, retrofitting, and demolition. While operational carbon is regulated, embodied carbon is not.

181. UKGBC, "New Homes Policy Playbook", <https://ukgbc.s3.eu-west-2.amazonaws.com/wp-content/uploads/2021/01/05144257/New-Homes-Policy-Playbook-january-2021.pdf> (2021), 32.

182. CCC, "UK housing", 74.

183. CCC, "The Sixth Carbon Budget: Buildings", <https://www.theccc.org.uk/wp-content/uploads/2020/12/Sector-summary-Buildings.pdf> (2020), 9.

184. *Ibid.*, 9.

Mandatory whole-life carbon assessment from 2025 would provide the data to set limits on embodied carbon in future, which can be tightened incrementally on the route to net zero. Initially, limits should be set for upfront embodied carbon – emissions from the materials and construction – for which data is most readily available. In the future, however, regulations should be extended to include embodied carbon throughout the life of the building, as argued by UKGBC.¹⁸⁵ This is aligned with the chronology set out in Jerome Mayhew MP’s Carbon Emissions (Buildings) Bill. Embodied carbon regulation on developers would drive investment in low-carbon concrete and steel, as well as sustainable timber, boosting UK industry.

That said, it will be important to ensure that embodied carbon regulations are not prohibitively expensive for smaller housebuilders. Evidence provided to the House of Commons Environmental Audit Committee (EAC) highlighted that reducing embodied carbon should not cost more than conventional construction methods, and with an established methodology for calculating whole-life carbon the cost of assessments should fall.¹⁸⁶ Enabling measures such as a consistent methodology, guidance, assessment tools, and eventually embodied carbon labelling on materials should also be developed to reduce the assessment costs for developers. Moreover, dwellings below a certain size and projects below a certain number of units could be exempt, especially in the initial years of the requirement.

If integrating whole-life carbon reporting into building regulations from 2025 is not found to be feasible, the Government could use the new NDMPs to require large development projects (defined by buildings over a certain size and projects above a number of dwellings) to assess and take steps to reduce whole-life carbon. This would require a standard methodology to be approved for use across the industry, such

185. UKGBC, “Five key tests”, <https://ukgbc.s3.eu-west-2.amazonaws.com/wp-content/uploads/2022/11/08092138/UKGBC-5-Key-Tests-for-Future-Homes-Standard-Oct-2022.pdf> (2022), 9.

186. Environmental Audit Committee, “Building to net zero: costing carbon in construction” <https://committees.parliament.uk/publications/22427/documents/165446/default/> (2022), 13-15.

as the RICS (Royal Institution of Chartered Surveyors) Professional Statement on whole-life carbon assessments.¹⁸⁷ This would build the evidence base for incorporating embodied carbon into building regulations in the future.

Recommendation eight: Strengthen minimum water efficiency standards in the Future Homes Standard.

Climate change could reduce water availability in England due to drier summers and more erratic rainfall.¹⁸⁸ This will require households to consume water more efficiently.

Part G of the building regulations currently requires water consumption standards of 125 litres per person per day and local authorities in water stressed areas can require up to 110 litres. The CCC has said these standards need to be strengthened.¹⁸⁹ Indeed the RIBA 2030 Climate Challenge suggests reaching 95 litres per person per day from 2025.¹⁹⁰

Research by the CCC found that improving water efficiency can also cut energy consumption and carbon emissions, and lower household utility bills.¹⁹¹

Recommendation nine: Expand green infrastructure requirements in the National Planning Policy Framework (NPPF).

Green infrastructure refers to natural and semi-natural environmental features incorporated into urban design to deliver beneficial services, such as flood management. Government is consulting on how planning policy

187. Royal Institution of Chartered Surveyors (RICS), "Whole life carbon assessment for the built environment", <https://www.rics.org/globalassets/rics-website/media/news/whole-life-carbon-assessment-for-the-built-environment-november-2017.pdf> (2017).

188. Sir James Bevan, "Drought risk in the Anthropocene: from the Jaws of Death to the Waters of Life", <https://www.gov.uk/government/speeches/drought-risk-in-the-anthropocene-from-the-jaws-of-death-to-the-waters-of-life> (2021).

189. CCC, "UK housing", 81.

190. RIBA, "2030 Climate Challenge", <https://www.architecture.com/about/policy/climate-action/2030-climate-challenge> (2021), 6.

191. CCC, "UK housing", 77.

can support climate change adaptation, in particular through nature-based solutions as these can also improve biodiversity and amenity.¹⁹²

In 2021, the NPPF was updated to require all new streets to be tree lined.¹⁹³ This could be expanded to include green or brown flat roofs in urban areas, water recycling, and minimum levels of greenery and vegetation, such as hedgerows or rain gardens in large developments.

These interventions will not be cost-effective or viable in all new builds, and so are difficult to include in building regulations. However, planning policy can favour developments which include nature-based solutions to local priorities such as flooding and overheating. These requirements could be included under planning conditions where appropriate.

Recommendation ten: Ensure heat pump training courses can access future waves of Skills Bootcamps, and provide appropriate governmental financial support to those undertaking them, to ensure there are sufficient installers for the introduction of the Future Homes Standard in 2025.

The Government expects heat pumps to be the primary low-carbon heating solution for new homes and intends for new builds to help develop the supply chain for heat pumps, as outlined in Chapter Three. The CCC said that there will need to be a focus on skills to ensure that there are enough installers for the roll-out of low-carbon heat.¹⁹⁴ However, without a skills base, new homes could be delayed when the Future Homes Standard is introduced in 2025. Furthermore, substandard installations could undermine consumer confidence in the technology.

Closing the skills gap in low-carbon heating will require government to attract and train a generation of talented and highly skilled engineers to deliver the clean heat transition. This is particularly important given

192. DLUHC, "Levelling-up and Regeneration Bill: reforms to national planning policy".

193. DLUHC, "National Planning Policy Framework", 39.

194. CCC, "Independent assessment of the UK's Heat and Buildings Strategy", 66-67.

the plumbing and heating workforce is declining and ageing.¹⁹⁵ However, training as a heat engineer takes at least three years, so readying for the Future Homes Standard in 2025 will predominantly require the retraining of existing heating engineers and plumbers.¹⁹⁶

To reach the 12,400 heat pump installers required by 2025 according to the Heat Pump Association, we need to train almost 10,000 more (there are currently around 3,000 qualified installers).¹⁹⁷ As mentioned in Chapter Three, gas boiler engineers currently lack a sufficient incentive to retrain. The industry is predominantly made up of sole traders¹⁹⁸ who do not have the training budgets of large companies to prepare themselves. As such, there is a need for government support to upskill the workforce ahead of the Future Homes Standard.

As explained in Chapter Three, the Heat Decarbonisation Skills Training competition does not provide long-term funding or sufficient training opportunities to build the installer base for the Future Homes Standard, and the Skills Bootcamps have not been well-tailored for heat pump installation courses.

Therefore, to ensure there is consistent provision of free heat pump installation training for heating engineers during the remainder of this parliament, the Government should ensure future waves of Skills Bootcamps can be accessed by heat pump training providers.

This will require a review of the minimum number of 'guided hours' required to access the funding, which currently stands at 60. According to one training provider, this is around three times the number of hours required to train a heating engineer to install an air source heat

195. PHAM News, "Plumbing and heating engineers in decline", <https://www.phamnews.co.uk/plumbing-and-heating-engineers-in-decline/> (2021); Gas Safe Register, "Decade Review", <https://www.gassaferegister.co.uk/media/2490/decade-review.pdf> (2017), 9.

196. CCC, "Independent assessment of the UK's Heat and Buildings Strategy", 67.

197. HPA, "Building the installer base for net zero heating", https://www.heatpumps.org.uk/wp-content/uploads/2020/06/Building-the-Installer-Base-for-Net-Zero-Heating_02.06.pdf (2020), 7; Nesta, "How to scale a highly skilled heat pump industry", https://media.nesta.org.uk/documents/How_to_scale_a_highly_skilled_heat_pump_industry_v4.pdf (2022), 4.

198. Electrify Heat and Trade Union Congress, "The role of heat pumps in building a high skill, high wage economy: A race to the top for standards and jobs", <https://electrifyheat.uk/wp-content/uploads/2022/06/The-role-of-heat-pumps-in-building-a-high-skill-high-wage-economy11.pdf> (2022), 6.

pump.¹⁹⁹ Adding a low-temperature heating course to the technology specific course – as with the one-week HPA training scheme – would still not equate to 60 hours. To ensure installation courses can access the funding, the Government should consult with industry and training providers to set an optimum number of teaching hours that delivers a high standard of competence. The Government has already used Skills Bootcamps to train 11,000 HGV drivers,²⁰⁰ demonstrating that there is precedent for using this model to plug urgent skills shortages.

To further incentivise heating engineers to upskill while the demand for heat pumps remains relatively low, the Government should consider an additional payment to compensate sole traders for their time. The average cost of a four-to-five-day course, according to the Heat Pump Association, is £300, and compensation for this time, based on the average earnings for a gas boiler installer, would be around £900,²⁰¹ taking the total cost for the government to £12 million to train and compensate 10,000 heat pump installers.

The Government will also need to ensure the necessary skills are in place across the construction sector to deliver the higher fabric efficiency standards and other elements of low-carbon design from 2025, but a full suite of policy proposals for green skills is beyond the scope of this report.

Conclusion

The UK is facing both a housing and climate crisis. We are not building enough homes. And the houses we do build are not green enough to support this country's transition to a net-zero economy. Bolder public policy is needed to support both greater and greener homes.

199. Griff Thomas, "Skills bootcamp a missed opportunity?", <https://www.heatingandventilating.net/skills-bootcamp-a-missed-opportunity> (2022).

200. Department for Education, "The National Skills Fund: Government consultation response", https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1065705/National_Skills_Fund_consultation_response.pdf (2022), 12.

201. Juliet Philips, Colm Britchfield and Pedro Guertler, "The Home Energy Security Strategy", https://e3g.wpenginepowered.com/wp-content/uploads/The-home-energy-security-strategy-a-permanent-solution-for-lower-bills_E3G-report-1.pdf (2022), 11.

The policy recommendations outlined in this report are necessarily exhaustive, given the scale and urgency of the challenge. However, they remain within the realm of political possibility by adhering to five principles.

1. New development should be consistent with net zero and biodiversity governmental targets.
2. Environmental regulations should not prevent homes being built affordably or more quickly and efficiently.
3. The lifestyles that people lead in new homes are as important for net zero as the fabric of the home.
4. Planning policy and building standards should incentivise communities to accept new homes in their neighbourhoods.
5. Planning reform should ensure that communities can shape development in their area to facilitate local democracy.

Our policies have two core objectives. First, to speed up the delivery of new homes where development is most sustainable, such as close to workplaces, shops, and sustainable transport links. Second, to ensure new homes are compliant with reaching net zero greenhouse gas emissions by 2050.

Together, we believe our policies will help bring forward sustainable housing development, by moving from discretionary to rules-based decision-making for brownfield redevelopment and intensification. Second, our policies will help deliver net zero efficiently, by incentivising the building of ultra-efficient, flexible, low carbon, climate resilient homes. Finally, they will help support economic growth, by building more homes where the demand is highest, increasing demand for clean technologies and industry, and helping workers to retrain for the green economy.

The scale of the challenge of achieving greater and greener homes, combined with heightened political sensitivity surrounding planning reform, means we urgently need bold but deliverable policy ideas. The recommendations in this report are just that.

The UK is facing both a housing and climate crisis. We are not building enough homes. And the houses we do build are not green enough to support this country's transition to a net-zero economy. Bolder public policy is needed to support both greater and greener homes.

This report outlines and examines the key changes in government policy since 2010 to increase housing supply and reduce carbon emissions from new homes, before proposing new policies to achieve two core policy objectives. First, to speed up the delivery of new homes where development is most sustainable, such as near workplaces, shops, and sustainable transport links. Second, to ensure new homes are compliant with reaching net zero greenhouse gas emissions by 2050.

Bright Blue Campaign
brightblue.org.uk

ISBN: 978-1-911128-59-5