CRACKING THE CODE

How design codes can contribute to net-zero and nature's recovery

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giving nature a home

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The Royal Town Planning Institute (RTPI)

The RTPI champions the power of planning in creating prosperous places and vibrant communities. We have over 27,000 members in the private, public, academic and voluntary sectors.

Using our expertise and research we bring evidence and thought leadership to shape planning policies and thinking, putting the profession at the heart of society's big debates. We set the standards of planning education and professional behaviour that give our members, wherever they work in the world, a unique ability to meet complex economic, social and environmental challenges. We are the only body in the United Kingdom that confers Chartered status to planners, the highest professional qualification sought after by employers in both private and public sectors.

About this paper

This paper considers the role of design codes in responding to the climate and ecological emergencies. It is accompanied by two illustrative design codes.

Project team

Front and back cover image

Photo credit: North West Cambridge, **LDA Design** have worked with Skanska as the landscape architects on the design of Phase 1 Public Realm.

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Foreword

This is a crucial time for our planet. While the case for the reality and voracity of global warming is made, we still have a massive responsibility to halt it and reverse biodiversity collapse. Now is the time to make plans and act on them across all the sectors of our economy and society.

The task can seem overwhelming. So, the guidance and illustrative codes in this report are intended to inspire and help everyone, and planners in England in particular, working to make places more resilient to climate risks and reduce and mitigate greenhouse gas emissions. They show why we need to plan both strategically at scale and locally with communities. They demonstrate how it can be done, so that our places work for people, nature, and the planet.

For professional planners, the guidance supports best practice. Landscape-led development provides for nature recovery and renewable energy alongside local distinctiveness. It locates development for easy access to local goods, services and social infrastructure on foot, bicycle or shared mobility. But we want this guidance to reach not only professionals but also local communities, so that they can demand more from the development industry.

Investment in green and blue infrastructure generates multiple benefits and demands a higher profile, especially when we consider the risks and losses from not making that investment. The power of nature-based solutions, and their cost effectiveness, is central to this report and accompanying codes. Working with nature we can make a difference, one development at a time.

Nature is at the heart of our being, investments in nature are investments in ourselves. Planned investments secure multiple benefits for all in terms of physical and mental wellbeing and tackling the deep inequalities in our societies. The natural world, of which human life is an intrinsic and indivisible part, nourishes the soul and reconnects us to our true nature. If we harm nature we harm ourselves and the act of good stewardship has reciprocal benefits for those who act for nature.

We also create a fairer society by investing in compact neighbourhoods, green space, contact with the natural world and reduced climate risks, because of their enormous benefits for health and wellbeing and for life chances.

Nature and nature-based solutions must form a key part of the Levelling Up agenda. The opportunities for good growth that is inclusive and diverse lie in part in healing our relationship to the planet addressing the climate and biodiversity crisis that we face. It is the work of us all to make space for nature in our places and hearts. It is essential that we not only plan for new nature opportunities, but also ensure that existing places benefit from nature recovery.

Planners are the conductors of the built environment orchestra; they bring the various disciplines together to create a harmonious composition. At the RTPI, we help planners to understand their role, to meet the professional challenges of what's being put in front of them and to ultimately succeed in making the world a better place.

Having attended COP26, I found this an energising, terrifying, inspiring, and stimulating experience that gave me much food for thought. In future years I would like to see planning more central to the debates and identified as a key part of the solution.

The RTPI is delighted to present this report and accompanying codes, which we hope will be of assistance to all stakeholders in the built and natural environment. We are pleased to have worked in partnership with the RSPB on this project and our thanks go to LDA Design, City Science and BSG Ecology for delivering it. Finally, a huge thanks to all of those who supported us on this project by attending workshops and inputting on draft versions.

For the love of all beings, we must act now.

Timothy David Crawshaw MRTPI FRSA, RTPI President 2022

Nature is in crisis, and after years of continuing decline this is the critical decade within which we must reverse its fortunes. So much depends upon it. Nature provides us with essentials such as air and water, it provides our food, it underpins our economies, and is essential to our on-going health and wellbeing. In short it is our life support system.

So how serious is the problem? The most recent State of Nature Report highlights that within the UK of 8,431 species 15% are now at risk of extinction. 41% of species have seen their populations decline since 1970. The very latest Birds of Conservation Concern Report has seen 11 species red-listed for the first time. The crisis is serious and accelerating as good habitats become scarcer, smaller, less well connected, and impacted by the ever-growing effects of climate change.

Yet the COVID-19 pandemic has shown just how critical nature is to our health and wellbeing, and there is strong public demand for change. A recent survey for the RSPB found almost nine in ten people think that more accessible greenspace will improve general health, and that it was advantageous to live closer to spaces rich in wildlife and nature. 84% want government to increase the number of accessible nature-rich areas in the UK.

It is clear then that not only is a healthy natural world critical to our on-going survival and economic prosperity, but it should also be central to place-making and the creation of the localities that we call home. But this won't happen by accident. It is the result of good and deliberate design, and this can be achieved through the careful and proper use of design codes and guidance.

The RSPB has therefore welcomed the opportunity to collaborate with the RTPI and commends the guidance and advice set out within this report and accompanying design codes. We are living in unprecedented times, and we need to find new approaches to tackle the scale of the nature and climate emergency that we are in. We need a culture change in our approach to place-making – one that sees green and blue infrastructure as a first principle from which we design our new communities, and not something to be 'slotted in' only after the location of buildings upon the site has been chosen.

The benefits of such an integrated approach are multiple. Getting the location of development right in the first place is paramount in protecting valuable places for nature and enabling networks of connected habitat where wildlife can recover and thrive. On-site nature-based solutions can help communities to adapt to a changing climate, including through providing natural cooling and managing the consequences of extreme rain events. Simultaneously they provide homes for nature, contribute towards the connectivity of habitats, and provide a welcome resource and joy for local residents, supporting their health and wellbeing.

Is this a pipe dream? We know that creating nature-friendly new developments is possible. Through our partnership with Barratt Developments Plc we have designed and showcased it at Kingsbrook, Aylesbury. This award-winning development will comprise 2,450 new homes with a range of community infrastructure, all designed with a nature-friendly ethos. Not only has it proved to be practically possible, it is also proving highly popular with purchasers and residents who are enjoying natural beauty and a growing range of species on their doorstep.

So, in a nature and climate emergency, the need has never been greater. This research shows how to build upon the foundations of the National Model Design Code to truly harness design codes and guides that drive the creation of new developments that rise to the urgent challenge of delivering net zero and nature recovery. It can be done – now is the time to do it.

I hope that you will find this research invaluable in doing so.

Emma Marsh MAPM FRSA, Director RSPB England

Executive Summary

The UK Government's target is to reach net zero by 2050. To hit this target, much rests with local authorities and their plans to reduce emissions and environmental pollution, as well as improving health and wellbeing, tackling rising inequality and increasing the abundance of species.

This report will help local authorities, communities, and developers to put net zero and nature recovery at the heart of the design and placemaking process, and in so doing make a meaningful contribution to tackling inequality, through using design codes to establish a set of critical success factors and a baseline understanding of what 'good' looks like.

The research project builds upon the National Design Guide (published in 2019) and the National Model Design Code (published in 2021) and provides further guidance of how we can design for net zero and nature recovery. It shows that a multi-disciplinary approach is needed for design, but for this to happen, there needs to be a culture change in the mindset of designers and development managers.

A recipe for good growth

Design codes are not a new idea. Some of our most cherished developments, from the Georgian period through to the Garden Villages and New Towns, were based on adopted codes[1]. But addressing the twin crises of climate breakdown and nature loss does give design codes a new significance and urgency.

Design codes have a key role to play in developing and delivering on ambitious visions for where we live and how we live. In 2021, the National Planning Policy Framework was revised to make design codes a more important planning tool in shaping places, for local planning authorities, applicants and local communities. However, design codes are often introduced towards the end of the development process, setting standards for building heights, typologies and urban design. But what if they are introduced much earlier in the planning process, with an ambitious environmental vision? What then?

Decisions about growth should be governed by the impact on carbon emissions, and on habitats, biodiversity and green and blue infrastructure, and equally how those decisions influence and facilitate active lifestyles and infrastructure such as public transport, to support more equitable access to jobs and services. A March 2022 IPCC report[2] stresses that the climate crisis hits the poor, vulnerable and excluded in society the most, including within the UK, and that addressing inequality is an essential part of tackling global heating. RSPB research has evidenced that access to nature-rich accessible greenspace is highly inequitable too[3].

The relationship between inequality and climate action underpins these design codes. Introducing them earlier and focusing on net zero and nature recovery, design codes provide an opportunity to start addressing inequalities in access to green space. With all design codes strengthened, and the

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[1] Commission for Architecture and the Built Environment, **The use of urban design codes: Building sustainable communities**

[2] IPCC Sixth Assessment Report (2022) **Climate Change 2022: Impacts, Adaptation and Vulnerability**

[3] RSPB (2020), **Recovering together: A report of public opinion on the role and importance of nature during and in our recovery from the Coronavirus crisis in England**

possibility of weak ones reduced, we can begin to tackle other areas of inequality. With design principles aiming to deliver on the local community's vision for the place, everyone can become more confident about the long-term outcomes from development.

This report sets out how design codes can drive the change that we need to see by underpinning decisions about where and how growth happens, and the green and blue infrastructure needed to support it. Design codes should be a strategic exercise at every scale, from a district level right down to individual sites. They need to be landscape-led in order to include a wider set of design characteristics. This will strengthen their capacity to direct and facilitate climate mitigation and adaptation, resource efficiency and ecological recovery. Design codes can steer place-making to make it easier for people to live low carbon lives.

The report found that the new generation of design codes also needs to become far more evidence-based. Frontloading design at the start of the planning and development process with a range of analysing tools such as carbon modelling and high quality environmental and ecological data will ensure energy and changes in land use and natural systems are given proper weight.

Design codes in practice

For design codes to work well and be valued they need to be simple, concise and illustrated, with specific, detailed parameters for physical development.

Drawing on the typologies created as part of the RTPI's research into net zero transport[4], illustrative codes for district-wide and site-specific development underpin this research. Both provide practical guidance for those preparing their own codes, showing how to base them in the vision for the kind of place communities want; for example, with design principles that enable people to engage with nature on an everyday basis.

The illustrative codes include the key design principles that set the big moves and include critical success factors with targets and timescales. They show what each landscape type looks like, down to plant typologies, and show which areas need protection, joining up, or are of strategic importance.

Key moves

The report identifies key moves needed for design codes to become transformative tools in the planning process.

Climate, smart energy and nature underpin all aspects of planning and design, and need equal weight with housing, transport and economic growth in national policy. Design codes can integrate spatial planning and enable local planning authorities to set targets which go beyond national standards.

There needs to be more emphasis on climate and nature in the National Model Design Code (NMDC). Provide clearer guidance and templates on the relationship between different design characteristics, their impact on carbon and nature, and how these should be addressed through good design at the local level.

Methodological definitions and scope must be improved. A more robust framework for carbon

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[4] RTPI (2021) **Net Zero Transport: the role of spatial planning and place-based solutions**

assessment would ensure that those impacts are considered throughout the design and development process.

Design codes need to allow for outcomes that might best be delivered through innovations that are not yet fully understood. This requires a radical shift in ambition and approach including the transition to digital approaches to design.

Culture change is critical. Design codes can enable planning, design and development professionals to work more closely together in climate and nature positive ways. The process of design coding should provide a focus for shared learning between planners, communities and other stakeholders. Citizen assemblies can be involved to improve understanding and transparency in how we respond to the climate and ecological emergencies.

About the authors

The project, commissioned by the RTPI in partnership with the RSPB, was led by planners at independent consultancy LDA Design and supported by data, climate and transport specialists, City Science, and ecologists, BSG Ecology. The research drew on a literature review and multidisciplinary stakeholder workshops held with planners, developers, ecologists, architects, designers and transport and energy experts in 2021.

1. Aligning planning and design with net zero and nature recovery

The world is in danger of significantly exceeding the targets in the Paris Agreement which was 'adopted' at COP21 in December 2015 and entered into force in November 2016[5].

193 Parties (192 countries plus the European Union) have joined the Paris Agreement. The agreement includes long term goals to guide all nations "*to substantially reduce global greenhouse gas emissions to limit the global temperature increase in this century to 2 degrees Celsius while pursuing efforts to limit the increase even further to 1.5 degrees*"[6].

Based on the current policies and short-term goals of countries committed to the agreement, global temperatures will continue to rise to levels that would lead to dangerous climate breakdown.[7] The Committee on Climate Change has noted that following the COP26 Climate Summit in Glasgow in 2021, "*The UK's climate goals have been substantially reset, so the focus moves to delivery and implementation*[8]".

Planning and development have a significant effect on carbon emissions, which are generated through construction and locked in through poor design that generates demand for power, heating and transport from future occupiers[9]. The RTPI and TCPA joint climate change guide[10] highlights ways that local authorities and communities can make a real difference in tackling the climate crisis. Plan the World We Need[11] is an RTPI campaign aiming to raise awareness of the vital role planners have in every aspect of the recovery to revive the economy, tackle inequality and meet net-zero targets by 2050.

The Town and Country Planning Association (TCPA) and Centre for Sustainable Energy (CSE) note that "*At its best, planning can shape the most cost-effective policy choices for carbon reduction and do that as part of a wider democratic conversation with the local community*", and that "*Planning is fundamental to successfully delivering new renewable energy systems, to minimising the carbon emissions of what we build, of finding the right sustainable locations and of designing places that support healthy and zero carbon transport options*"[12].

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[5] United Nations **The Paris Agreement**
[6] United Nations **The Paris Agreement**
[7] The Guardian (2021) **Cop26: world on track for disastrous heating of more than 2.4C, says key report**
[8] Climate Change Committee (2022) **Doubling down on climate delivery in 2022**
[9] UK Green Building Council (UKGBC) **Vision for a sustainable built environment is one that mitigates and adapts to climate change**
[10] RTPI and TCPA (2021) **The Climate Crisis: A guide for local authorities on planning for climate change**
[11] **Plan the World We Need**
[12] Town and Country Planning Association & Centre for Sustainable Energy (2020) **Why the Planning System needs to be at the heart of delivering the UK's Climate Change targets**

In October 2021, the UK government published its Net Zero Strategy[13] to describe the overarching plan for achieving net zero emissions by 2050. The strategy directly addresses the role of the planning system in achieving net-zero emissions, and includes:

- Recognition of "the importance of the planning system to common challenges like combatting climate change and supporting sustainable growth".

- A commitment to ensure that future planning reform helps bring greenhouse gas emissions to net zero by 2050, including via a full review of the NPPF to ensure it "contributes to climate change mitigation and adaptation as fully as possible".

- A commitment to update the energy National Policy Statements to provide clarity on the need and urgency for low carbon infrastructure, and to streamline the Nationally Significant Infrastructure Projects (NSIP) consenting regime.

- A commitment to "embed transport decarbonisation principles in spatial planning and across transport policy making", addressing a key recommendation in the RTPI's 2021 research on Net Zero Transport[14].

- Recognition that "land use change must be designed in a systemic, geographically targeted way…which consider the complex range of interacting social, economic and demographic factors", and a commitment to develop a Net Zero Systems Tool to enable effective analysis of policy trade-offs.

- Recognition of the role of the National Model Design Code in providing practical guidance on energy efficiency, carbon reduction and circular economy principles, and in helping local authorities to produce their own codes for environmentally responsive and sustainable places. This research is necessary because of a need to further explore exactly how design codes can meet these objectives.

These planning provisions are important in the context of the legal duty on local planning authorities set out in the 2004 Planning and Compulsory Purchase Act, as amended by the 2008 Planning Act, to ensure that planning policy contributes to the mitigation of, and adaptation to, climate change. At the same time as the planning system is having to adapt to the imperative of net zero, it must also act to arrest an unprecedented decline in nature. The global Living Planet Index reports an average 68% decrease in the population size of mammals, birds, amphibians, reptiles and fish between 1970 and 2016[15]. The Index cites global changes in land use arising from unsustainable residential and commercial development as amongst the biggest threats to biodiversity, alongside climate breakdown.

The UK is amongst the most nature-depleted countries in the world, and the ways in which we have developed, and managed land historically has been one factor of many that has contributed to habitat loss and degradation. The RSPB's most recent State of Nature Report demonstrated that the decline of nature overall has continued over the last decade[16]. 15% of 'red list species' are

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[13] Department for Business, Energy and Industrial Strategy (2021), **Net Zero Strategy: Build Back Greener**
[14] RTPI and LDA Design (2021), **Net Zero Transport: The role of place based solutions** - Discussion Paper
[15] WWF (Eds., Almond, R.E.A, Grooten M and Peterson, T), **Living Planet Report 2020 – Bending the curve of biodiversity loss** (WWF, Gland, Switzerland, 2020), pp. 16 – 20.
[16] RSPB (2019), **State of Nature Report**

now at risk of extinction from Great Britain, and 2% are already extinct. Official data shows the UK failed to meet 14 of the 20 commitments it has previously made on halting biodiversity loss,[17] and broader analysis by the RSPB indicates the country may have met just 3 of these commitments, while going backwards on others[18].

Since publication of the 25 Year Environment Plan in 2018[19], environmental restoration and reversing biodiversity loss has been a central tenet of environmental policy in England. This includes commitments to a national Nature Recovery Network which entails restoring 75% of one million hectares of terrestrial and freshwater protected sites, and to creating or restoring 500,000 hectares of wildlife-rich habitat outside that network. The plan commits to sustainable soil management and increasing woodland cover, seeks high quality natural spaces close to where people live and work, particularly in urban areas, and encourages more people to spend time in them.

The Environment Act became law in November 2021, setting the new legal framework for environmental policy and regulation post-Brexit and strengthening many of the commitments in the "25 Year Plan. For the first time, there is a statutory requirement for most new development in England to deliver a minimum 10% net gain in biodiversity, for all local authorities to produce Local Nature Recovery Strategies, and for specific targets on species abundance. This is a major shift in how we have previously planned and delivered development. Successful planning should mitigate the impacts of development and ensure development delivers broad socio-economic and environmental value.

Local authority corporate decision making

Many local authorities have already recognised the intrinsically interconnected threats posed by climate change and biodiversity loss. 84% of all local authorities have declared climate emergencies,[20] and Bristol became the first of a growing number to declare an ecological emergency in 2020[21]. Local planning policies have been used to encourage low carbon development and net gains in biodiversity. Design coding for zero carbon and nature recovery can be part of the move from recognition to action through a fit for purpose action response. Local authority housebuilding could set the benchmark[22].

However, between 2018 and 2019 the average decrease nationally of carbon emissions was just 4%[23]. Analysis by City Science of the Tyndall Centre's 'Carbon Targeter for Local Authorities' tool[24] indicates that most local authorities in the UK need to reduce carbon emissions in their areas by an average of 12-14% each year to achieve a local carbon budget aligned to Paris Agreement commitments on limiting global temperature rises.

[17] HM Government (2019), **Sixth National Report to the United Nations Convention on Biological Diversity: United Kingdom of Great Britain and Northern Ireland: V2**
[18] RSPB (2020), **A lost decade for nature**
[19] Department for Environment, Food & Rural Affairs (2018), **A Green Future: Our 25 Year Plan to Improve the Environment**
[20] **https://councilclimatescorecards.uk/**
[21] Bristol City Council, **Bristol's ecological emergency**
[22] RTPI (2019), Practice Advice Note **Local Authority Direct Delivery of Housing**
[23] BEIS (June 2021), **UK local authority carbon dioxide emissions estimates 2019**, p. 12.
[24] **Tyndall Centre for Climate Change Research Local Authority Carbon Targeter**

Recognition that nature is in crisis is often followed by a lack of sufficient action to reverse its decline, or consideration of how nature-based solutions in planning and design can help nature and the climate. Of local authorities who have declared a climate emergency, 84 do not have climate action plans, while 139 have yet to commit to reaching net zero emissions by a specific date[25].

This slow pace of carbon reduction, and the continuing decline of biodiversity, points to the need for us to go further and faster in reducing emissions, halting biodiversity loss and reversing nature's decline. An ambitious, design-led planning system can help to ensure that development maximises its contribution to achieving these aims.

[25] The Guardian (2022), **One in five UK councils have no climate action plan, campaigners say**

2. The role of design codes

2.1 The National Design Guide and Model Design Code

"To provide maximum clarity about design expectations at an early stage, all local planning authorities [in England] should prepare design guides or codes consistent with the principles set out in the National Design Guide and National Model Design Code, and which reflect local character and design preferences"

National Planning Policy Framework (NPPF), paragraph 128

The National Design Guide (NDG) was published in 2019 and amended to align with the National Model Design Code (NMDC) and Guidance Notes for Design Codes that were published in 2021. The National Design Guide sets out 10 characteristics of good design to consider in the planning and design of new development[26].
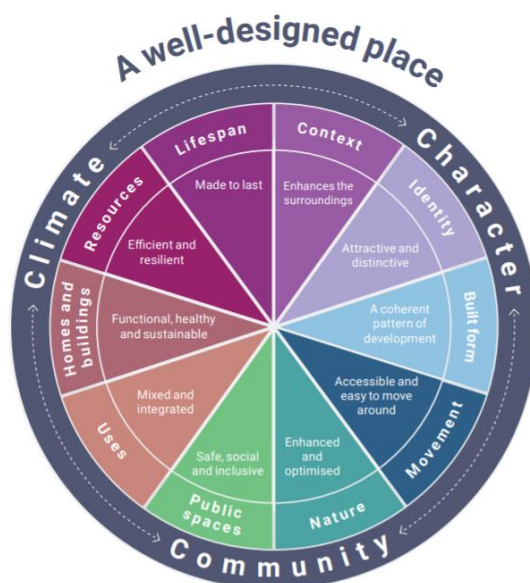
The NMDC is intended to provide a further layer of detailed guidance on the production of local design codes, guides and policies to promote successful design[27]. It makes clear that coding should be seen as a strategic exercise and that codes could apply to all scales and places, from the district-wide level down to large development sites and individual building plots. It also sets out a seven-stage coding process, based on the characteristics of good design in the NDG.

The NPPF advises that *"these national documents should be used to guide decisions on applications in the absence of locally produced design guides or design codes*[28].

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[26] MHCLG (2019), **National Design Guide**
[27] MHCLG (2021), **National Model Design Code**
[28] **Paragraph 129 of the NPPF states:** "Whoever prepares them, all guides and codes should be based on effective community engagement and reflect local aspirations for the development of their area, taking into account the guidance contained in the National Design Guide and the National Model Design Code. These

2.2 How design codes need to change

The NMDC is a valuable resource for all those involved in the design coding process, however there is insufficient emphasis on the need to place the zero carbon / ecological emergency at the heart of the coding process. Climate change and biodiversity decline are the defining planning issues of our time, and the response needs to be a set of robust, innovative design codes that underpin every decision about where and how we develop and manage land.

Design codes should have a critical role to play in planning for the future of places and ensuring that opportunities to maximise development's contribution to net zero and nature recovery are locked in from the outset, through strong spatial development frameworks and strategic design requirements. Codes can outline ways for developments to combine net zero and nature recovery with place making and encourage unique and innovative approaches to green and blue infrastructure and the role of landscape.

To be effective, design codes need:

- **An ambitious vision and outcomes for the quality of environment local communities wish to see.** Only then can we consider how this vision can be realised and the role of individual design characteristics in achieving desired outcomes.

- **To be grounded in cross-boundary spatial planning and reflect the fact that virtually all aspects of design, construction and end-user activities have a role to play in achieving net zero and nature recovery.** This means they need to consider the most basic design decisions on where to develop, not just how to develop.

- **To cut across multiple policy areas and provide a framework for the delivery of great places that use design to unlock the broadest possible set of public goods.** This means breaking out of professional siloes and looking beyond individual design characteristics. The focus should instead be on the relationship between characteristics and how design responses can contribute to the delivery of net-zero, nature recovery and wider policy objectives.

For example, a design code might identify how to meet the key objectives from strategies considering the environment, health and wellbeing, travel and decarbonisation. To help deliver Local Nature Recovery Strategies (LNRS), Green Infrastructure Strategies in addition to health and wellbeing initiatives, codes might set out principles for the type, location and design of green and blue infrastructure. The RTPI have an alternative proposal to LNRS called Local Environment Improvement Plans [29].

To help deliver Local Transport Plans, Cycling and Walking Investment Plans (LCWIPS) and Decarbonisation Strategies, design codes might ensure that decisions about mobility, street design and the location of development are driven by the need to reduce the need to travel and minimise whole life carbon emissions. They could also set design principles and requirements to foster more active lifestyles and ensure equitable access to jobs, services, energy and education through accessible 20-minute neighbourhoods and active and public transport.

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national documents should be used to guide decisions on applications in the absence of locally produced design guides or design codes".
[29] RTPI (2021) **Local Environment Improvement Plans**

In short, design codes should become an essential tool for policy integration and the leading lines from which the future of place is drawn, with outcomes on net-zero and nature recovery at their heart. This builds on the NMDC's requirement for codes to be a strategic exercise and broadens the scope of codes to consider a wider set of carbon and nature-related objectives upfront, with clear principles to deliver on these.

Section five of this report sets out some of the significant challenges that need to be overcome to meet statutory targets and ensure that development is genuinely sustainable. These challenges transcend the planning, design, ecology, transport, civil engineering and energy professions. They require greater collaborative action from all disciplines to better understand the environmental impact of material sourcing in a globalised supply chain, to nudge people into adopting more sustainable behaviours and lifestyles, and to establish more comprehensive and universal methodologies for assessing and reporting carbon and biodiversity impacts on a global scale.

By disciplines working collaboratively, a cross-cutting approach to design coding can help to foster a shared understanding of these issues and facilitate an open discussion on where codes can add most value, and where they are limited by gaps in knowledge, capability and science.

These discussions will become increasingly important to avoid tensions emerging between local support for action, and the practical implications of climate-conscious design and loss of biodiversity on people's everyday lives. Citizen assemblies have demonstrated the value of open discussion in understanding these trade-offs and building policy legitimacy and accountability in relation to the nature and climate emergency[30]. A similar approach adopted for a cross-cutting approach to design coding could generate mutual trust and understanding between planning professionals, communities, and delivery partners. This could help to foster a sense of stewardship over the future success of the place. It would also involve communities in the process of how the outcomes sought by design codes can be embedded into sometimes opaque delivery processes, such as infrastructure delivery plans, section 106 agreements, Community Infrastructure Levy (CIL) payments and through direct delivery.

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[30] European Climate Foundation (2021), **The growing traction of climate citizens assemblies**

3. Putting it into practice: illustrative design codes

This report is accompanied by two illustrative design codes to demonstrate how opportunities to maximise contributions to net zero and nature recovery can be central to codes at the scale of a district and strategic development site. The illustrative codes are intended as a one of several resources a practitioner can use when developing their own codes for districts or individual development sites in England. Some of the design principles may have relevance in the other nations of the UK that have similar approaches to planning.

They do not scope in every characteristic of good design within the NMDC but provide further detailed guidance on the specific topics net zero and nature recovery. The focus is on the ways in which a cross-cutting approach to design coding can deliver a framework for the delivery of great places that put outcomes in relation to net-zero and nature recovery at the heart of design codes.

The codes build on the approach set out in the NMDC, starting with a scoping exercise and baseline analysis, and identifying the key characteristics and challenges, before progressing to develop a vision and arrive at a set of simple development parameters, principles and requirements. However, they seek to raise the level of ambition in relation to net zero and nature recovery and are underpinned by some core assumptions.

Design Codes should be an integral part of the plan-making process

A cross-cutting approach to design coding requires a robust understanding of baseline conditions and the ways in which these influence development planning that supports net-zero and nature recovery. This includes understanding the spatial context, existing sources of carbon emissions, the distribution and condition of habitats and infrastructure, and the specific challenges that design codes need to address.

Crucially, comprehensive baseline analysis must be undertaken at the start of the plan-making process, with the design coding process used to inform 'where' development comes forward, not just 'how', and fully reflecting the mitigation hierarchy.

Detailed data sets would need to be collected through the call for sites process, giving policy makers a robust understanding of baseline conditions and the ways in which these influence net zero and nature recovery in different parts of the district. Having access to this data upfront would enable a more evidence-based approach to site selection.

This points to the need for district design codes to be used as part of criteria-based assessment for site selection. Codes will be most effective when integrated with the local plan process and co-designed with broad community expertise harnessed from the bottom up to achieve 'buy in'.

Design codes should lead with a vision

Design codes need to be based on a vision for the kind of place communities want, backed by ambitious critical success factors that capture desired outcomes and clearly articulate what successful delivery of the vision looks like. This could include not just the need for places to maximise their contribution to net-zero and nature recovery targets within defined timescales, but direction on how this could be achieved, for example through integration of land-use and infrastructure by adopting nature-based design principles that enable people to engage with nature on an everyday basis. These should act as a reference point when interpreting baseline analysis to identify where growth should be located, and when creating development parameters, principles and requirements critical to the delivery of net zero and nature recovery. To ensure they reach their full potential as an integrative planning tool, design codes will need to support delivery of existing strategies and set out design-led development principles for topics such as green and blue infrastructure, energy, transport, carbon and land use. This will need to be underpinned by fostering change amongst local communities and political representatives, whose support will be vital in creating ambitious codes and living sustainably in the places that result from them.

Design codes should focus on delivery of long-term outcomes

Design codes should set a durable, agile framework for delivery of outcomes consistent with net-zero and nature recovery objectives and that can withstand changes to policy and guidance. This means they should set a balance between prescriptiveness and a flexible design-led approach. The rapid pace of change in our understanding of net-zero and nature recovery, and the technological and practice-based responses used to get there, means that too much prescription could lead to codes becoming quickly obsolete.

Design codes can therefore add most value by building consensus around the route map and set clear expectations on design parameters, principles and required outcomes. They can also set expectations around standardised assessment methodologies and delivery mechanisms, such as establishing clear benchmarks on advanced scope whole life carbon assessments and nature recovery metrics. To ensure that design codes have local legitimacy and are deliverable in practice, it is vital that the coding process involves sustained engagement with communities, landowners, development partners and wider stakeholders. Technical specialists in topics scoped into the code should also be engaged in the process. These discussions should focus not only on the setting of desired outcomes, but on ensuring delivery through infrastructure delivery plans and planning mechanisms that provide strong protection against possible viability challenges later in the planning process.

The illustrative codes recognise that data and knowledge is still developing in the sphere of decarbonisation and nature recovery, which present significant challenges to delivery. Therefore, each stage of the illustrative codes provides a 'key learning' box with practical guidance on the methodological steps to be taken and links to further resources. Local codes are likely to require period review and amendment to ensure that the level of ambition keeps pace with new knowledge and capabilities over time.

4. Design and technology in the 21st century

The acceleration of computing power and digital connectivity over the last decade has resulted in digital technologies now influencing almost every aspect of modern living. The critical role of digital connectivity across the economy has been demonstrated during the COVID-19 pandemic, with a significant rise in the number of people working from home or in a more flexible manner and ordering essential goods and services online for home delivery. Access to digital technology in the home and community has become a vital component of social inclusion, and its absence can impact on the educational, employment, financial and health outcomes of individuals and families.

The application of ever more sophisticated digital technologies presents an opportunity for a paradigm shift in how to approach sustainable design and development. This includes exploring how technology can help tackle the climate and nature crises through reducing the need to travel, driving efficiencies in energy generation, consumption and storage, and expanding opportunities to monitor energy consumption, soils and water quality to provide bigger and better data sets to support change. The pace of innovation has been dubbed by some as the fourth industrial revolution[31] because of the potential importance of these emerging technologies to the economy and a sustainable transition.

Digital first approach

It is beyond the scope of this project to accurately predict future advances in technology, and the fast pace of technological change means it is impossible to articulate how application of digital solutions will affect design in its fullest definition. We must also be mindful that for all its positive potential, technological innovation does not guarantee success in the fight against climate change and can itself generate substantial carbon emissions – for example from the resources needed to manufacture, distribute and power an ever-increasing quantity of digital devices, and the energy needed to power and cool the servers that are the foundation of the internet and cloud computing. Technology is also no substitute for the simple need to protect, restore, expand and create habitats that have existed for hundreds or thousands of years.

However, many places have already started using data and emerging technology to address common local challenges in areas such as transport, connectivity and air quality. The terms Smart Places[32] or Smart Cities[33] are becoming well established in describing places where digital interactions between live real time data are observed by ubiquitous connected sensors in homes and the public realm, interpreted by increasing powerful data processing capability.

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[31] PWC (2017) **Fourth Industrial Revolution for the Earth: Harnessing the 4th Industrial Revolution for Sustainable Emerging Cities**

[32] Connecting Cambridgeshire **Using data and emerging technology to address common local challenges**

[33] European Commission, **Smart cities: Cities using technological solutions to improve the management and efficiency of the urban environment.**

Design codes will be most effective when they use a digital first approach. This means they should allow for the fact that the best way of delivering some required outcomes might, in the longer term, be through innovations that are not yet fully understood. While it was not possible in the scope of this project, local codes should be available in html web format as well as PDFs, to maximise their accessibility and make it easier to update codes as and when required.

Future innovations

We have noted some of the key technological areas that may need to be taken into consideration in the preparation and delivery of design codes. These are not specific to planning and their development and application will largely be driven by other sectors, but they all have potential to profoundly impact on how we live, and consequently, how we respond to the climate and ecological emergency. It is important to acknowledge that this list is not exhaustive, and there will be other emerging areas which will continually require integrating:

5G and small cells

Under current plans, most of the UK population will have access to next generation 5G wireless communication technology by 2027. 5G will provide access to ultra-fast download speeds and enable devices to access large amounts of data at the same time, with expected applications in health care, automated manufacturing, transport and traffic management.[34]

DCMS has already published guidance on how local planning authorities can support the rollout of fixed and mobile networks, with Local Plans expected to play a key role in supporting mobile connectivity and the rollout of small cells for 5G through adopting policies on the location and integration of infrastructure in the urban realm[35].

There is a potentially significant role for 5G in terms of both net zero and also climate mitigation innovation. For example, '5G Art of the Possible'[36], a joint project between the National Grid and Digital Catapult is assessing the benefits of 5G within the Electricity & Gas Transmission networks to deliver net zero.

Integrated data

Bigger and better data sets combined with integrated public transport systems, demand responsive transport (DRT) and intelligent traffic management will play a crucial role in optimising provision of mobility services to match demand, and enabling more effective management of air quality and congestion[37]. The role of energy data is another important consideration as highlighted by the Energy Data Taskforce which outlined recommendations to deliver a modern, digitalised energy system'[38].

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[34] **Gigabit-broadband in the UK: Government targets and policy**
[35] Department for Digital, Culture, Media & Sport (2018) **Guidance for the local planning authority: How can the local planning authority support the rollout of fixed and mobile networks at the local level?**
[36] National Grid (2021) **National Grid and Digital Catapult partner to explore 5G benefits to deliver net zero**
[37] BBC Minds, Francesca Baker (2018), **The technology that could end traffic jams**
[38] Catapult Energy Systems **Energy Data Taskforce: A Strategy for a Modern Digitalised Energy System**

Building Information Modelling (BIM)

BIM[39] is a collaborative way of working, underpinned by the digital technologies which unlock more efficient methods of designing, creating and maintaining our assets. BIM embeds key product and asset data and a 3-dimensional computer model that can be used for effective management of information throughout a project lifecycle – from earliest concept through to operation. It is likely to play a significant role in later stages of the planning and design process when considering how required building outcomes set by design codes are delivered on the ground.

Virtual reality - uses in creating design codes

The COVID-19 pandemic has demonstrated the potential for virtual meetings and remote working to reduce the need to travel and revitalise towns and villages that previously struggled with high levels of out commuting. This trend in hybrid working, facilitated by advances in audio-visual technology are likely to continue. Virtual, augmented, and mixed reality will also play a much greater role in planning and design processes, helping communities to visualise how a place might look and feel, and facilitating a more immersive and engaging approach to co-design.

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[39] HM Government (2012): Industrial strategy: government and industry in partnership: **Building Information Modelling**

5. Overcoming delivery challenges

Discussions with stakeholders have identified several barriers that could frustrate the creation of local design codes that are consistent with delivering on urgent decarbonisation and nature recovery targets.

The response to these challenges should be addressed at a national level through the next stage of planning reform and the wider UK net-zero strategy.

A more integrated approach to legislation and policy related to planning, net zero and nature recovery

The legislative and policy framework governing the transition to net zero and nature recovery is becoming progressively stronger. However, environmental policy has been in flux since the UK's departure from the European Union and further regulations and guidance are still required to implement the key statutory provisions around biodiversity net gain and local nature recovery strategies in the Environment Act 2021.

This uncertainty has created challenges for local authorities which want to respond quickly in accordance with the spirt of the legislation, but lack the legal underpinning or resources required to proceed with confidence. Uncertainty also surrounds proposals for future planning reform.

Whatever proposals emerge, design codes have a key role as an integrative tool in the plan-making process, ensuring that decisions about where to grow and how to grow are underpinned by a design-led strategy for minimising negative impacts and maximising contributions to net zero and nature recovery.

Recommendation: Smart energy[40] , climate change and nature recovery should have equal status with the provision of housing, transport and economic growth in national policy, and enable local planning authorities to take appropriate action, including by setting targets which go beyond national standards[41]. Policy should set clear metrics for carbon assessment, monitoring and reporting by Local Plans.

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[40] RTPI (2019) **Planning for a Smart Energy Future**
[41] RTPI (2020) **RTPI calls for £500m boost to England's planning system in CSR response**

A greater emphasis on climate and nature in the NMDC

There is insufficient emphasis on the importance of designing for net zero and nature recovery in the NMDC. For example, a cross-cutting approach to design coding would recognise the interrelationships between different aspects of spatial planning. This includes spatially planning for surface transport and energy to support carbon reduction and advising on the impact of different locational and design choices in reaching net-zero. The NMDC does not fully address these relationships or provide sufficient guidance on how nature-based solutions and landscape-scale habitat restoration and creation can be facilitated through the development process.

Recommendation: The NMDC should provide clearer guidance and templates on the systemic relationship between different aspects of spatial planning and sustainable design characteristics such as energy, transport and Green Infrastructure, their impact on carbon and nature, and how they should be addressed through good design at the local level.

Better understanding and consistency in methodological definitions and scope

More clarity is required on the meaning of technical terminology. Measures to help the natural environment need to start with a strategic assessment and robust understanding of ecological sites, habitats, species and nature networks at a local and regional level. Yet the meaning and design implications of statutory concepts such as 'biodiversity net gain' and 'nature recovery networks' need to become better understood amongst planners, designers, developers and communities, so that they can be of key consideration in design coding from the outset.

Uncertainty about the practical scope, reach, ownership of resolution and wider opportunities of net-zero in a development context is also hampering efforts to devise effective strategies, with no clear national guidance in this area. For example, a key measure to determine the carbon impact of development is to undertake a Whole Life Carbon Assessment, but the scope varies according to the stage of the development life cycle. The Future Homes Standard, due to take effect in updated building regulations from 2025, only assesses operational 'Regulated' carbon emissions from a single building, while standard Whole Life Carbon Assessments only include those regulated operational carbon emissions alongside embodied carbon and carbon from the decommissioning. Analysis from City Science indicates that people's collective emissions from consumption and transport over the lifetime of a development are likely to be 4-6x larger than the Whole Life Carbon impacts of the development itself. Therefore, current approaches exclude some of the biggest sources of embodied and operational carbon across the lifetime of a development. This includes emissions from surface transport, now the largest emitting sector in the UK.

Some current approaches also ignore how consumption in the UK affects habitats and biodiversity elsewhere due to the global nature of our supply chains. For example, while it's accepted that reducing steel and concrete is important to reducing embodied carbon within buildings, a large-scale switch to timber – often cited as a more sustainable alternative – could have severe consequences for global forests at a time when we rapidly need to halt biodiversity loss. This points to the complexity in material choices and the challenge of finding ways to account for impacts on carbon and nature at a national and international scale. The London Energy Transformation Initiative and Royal Institute of Chartered Surveyors (RICS) are notable exceptions

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to current approaches; their research has highlighted the role of embodied carbon[42].

Blue and-Green Infrastructure also plays a key role in the carbon cycle not just in the ability of grassland, woodland and wetlands to sequester carbon, but also in features such as greenroof substrates and where nutrient poor substrates are used to replicate brownfield in landscapes. Research[43] has found brownfields are very good at carbon capture. There is need for an on-going system of environmental assessment that is fit for purpose for the nature and climate emergency.

> Recommendation: Provide clarity in the planning system on which carbon assessment methodologies should be used in the plan-making and development management process, taking account of the need to include the broadest possible scope of emissions and opportunities to consider wider environmental gains.

A change of culture to encourage and embed climate-positive behaviours

The process of design coding should provide a focus for shared learning and ambition between planners, communities and other stakeholders. However, the greatest barrier to integrating net zero and nature recovery within local codes is the culture change needed to place the two issues at the heart of design processes. This culture change will need to occur amongst two groups of people. Firstly, amongst all those involved in the production of design codes and in the planning, design, promotion, and delivery of development. Professions will need to break out of their siloes to develop a better understanding of the issues we face, and to work together to find common solutions that help deliver net-zero and nature recovery and make these the catalyst for wider benefits such as healthier, more resilient and equitable communities[44].

Secondly, we need to foster change amongst local communities and political representatives, whose support will be vital in creating ambitious codes and living sustainably in the places that result from them. Analysis produced by the Climate Change Committee has demonstrated that nearly 60% of the activity which can deliver the UK's net zero target requires societal or behavioural changes[45]. 81% of the public says it is concerned about climate change[46], but our research has found that entrenched attitudes and market preferences, for example in relation to private car use and patterns of consumption, can be a barrier to delivering radically different design approaches. Furthermore, data from the Global Footprint Network shows that the ecological footprint per person in the UK significantly exceeds the country's biocapacity to support them[47]. Design codes are an important tool in raising the level of ambition and encouraging the behavioural changes needed to live more sustainably.

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[42] London Energy Transformation Initiative (2021), **Climate Emergency Guide: How new buildings can meet UK climate change targets**
Royal Institute of Chartered Surveyors (2017) **Whole life carbon assessment for the built environment**
[43] Engineering & Technology (2016) **Brownfield sites 'incredibly efficient' in capturing atmospheric CO2**
[44] RTPI (2021) **Net Zero Transport: the role of spatial planning and place-based solutions**
[45] Louise Marix Evans, **Local Authorities and the Sixth Carbon Budget** (Climate Change Committee, December 2020), p. 43.
[46] BEIS (June 2020). **Public Attitudes Tracker**
[47] **Global Footprint Network website**

> Recommendation: Promote more integrated, climate and ecologically conscious working cultures amongst planning and design professionals based on RTPI research into Place-Based Approaches to Climate Change[48]. Facilitate more citizen assemblies in the design coding process to generate greater understanding, transparency and accountability in how we respond to the climate and ecological emergencies.

Further reading

- Action for Swifts (2019) **Guidance for including bird boxes in residential development**
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- Alan Turing Institute **Quantitative Urban ANalyTics (QUANT):** A land use transportation model simulating the location of employment, population and transport interactions
- British Standards Institute (2022) BS42021:2022 **Integral nestboxes – Selection and installation for new developments – Specification**
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- Building with Nature (2021) **Standards Framework (BwN 2.0)**
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- Department for Transport and CIHT (forthcoming) **Manual for Streets**
- Graham, A. et al, RSPB/WWT (2012) **Sustainable drainage systems: Maximising the potential for people and wildlife.**
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- Nordregio (2018) **Stockholm Biochar Project** Conversion of garden and municipal green waste into soil conditioner and energy generation for the city's heating.
- Urban Green-Blue Grids, **Hammarby Sjöstad, Stockholm, Sweden**

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[48] RTPI (2021) **Place-Based Approaches to Climate Change: Opportunities for collaboration in Local Authorities**

- Natural England (2011) **Horizon-scanning for invasive non-native plants in Great Britain (NECR053)**
- **Wildlife and Countryside Act 1981**
- The Landscape Institute (2021), **Landscape for 2030: How landscape practice can respond to the climate crisis**
- The Landscape Institute Library Case Study Library: **https://my.landscapeinstitute.org/case-studies#list**
- The Landscape Institute, **Technical resources for Street and Town Centre professionals**
- **Living Roofs and Walls**
- Kukadia, J. et al. Urban Design London (2018) **Designing rain gardens: A Practical guide**
- Michael Batty and Wei Yang, Digital Task Force for Planning (2022), **A Digital Future for Planning: Spatial Planning Reimagined**
- RSPB, RTPI, CIEEM (2013) **Planning Naturally**
- RTPI (2019) Practice Advice Note **Biodiversity in Planning**
- RTPI (2021) **Green Growth Boards**
- RTPI (2020) **Plan the World We Need: The contribution of planning to a sustainable, resilient and inclusive recovery**
- Tree pits – **GreenBlue Urban** and **Stockholm tree pits**
- **Swift conservation**; and **Action for swifts**
- Levitt Bernstein, Elementa, Passivhaus Trust and Etude commissioned by West Oxfordshire, Cotswold and Forest of Dean District Councils, funded by the LGA Housing Advisers Programme (2021) This Net Zero Carbon Toolkit is licensed under Creative Commons Licence 4.0 International (CC BY-NC-SA 4.0). Licence Deed: https://creativecommons.org/licenses/by-nc-sa/4.0/legalcode
  - **Net Zero Carbon Toolkit**
- UKGBC (2021), **Net Zero Whole Life Carbon Roadmap for the Built Environment**
- UKGBC, **New Homes Playbook - Driving sustainability in new homes - a resource for local authorities. Version 2.1**
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- Natural England, **Green Infrastructure Framework - Principles and Standards for England**
- The Wildlife Trusts (2020), **Nature Recovery Network Handbook: Version 1**

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