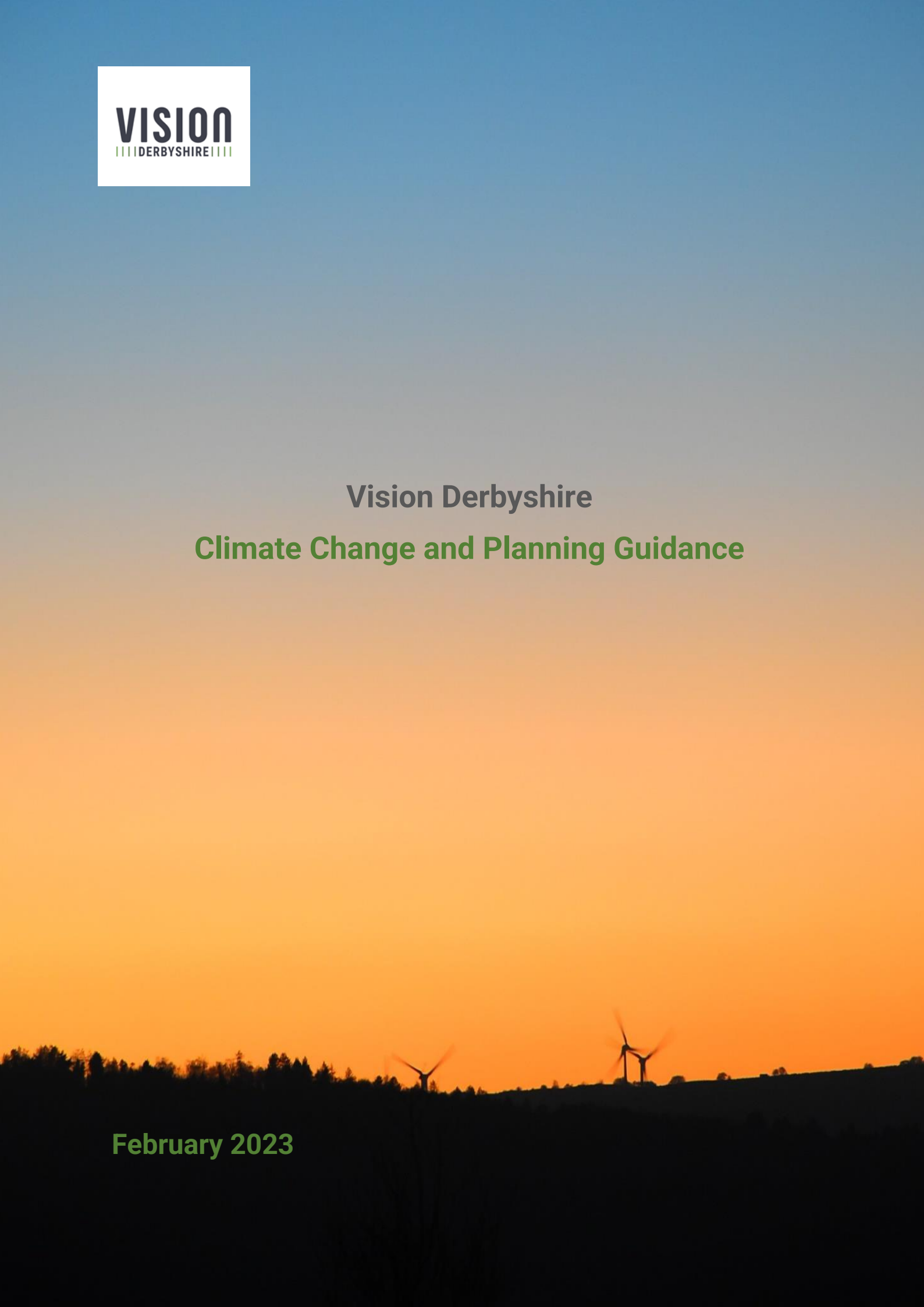
Vision Derbyshire

Climate Change and Planning Guidance



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Front cover, wind turbines at Carsington Pastures/Griffe Grange, Derbyshire.

Introduction: Background to climate change science and evidence

"It is unequivocal that human influence has warmed the atmosphere, ocean and land. Widespread and rapid changes in the atmosphere, ocean, cryosphere and biosphere have occurred.
Many changes due to past and future greenhouse gas emissions are irreversible for centuries to millennia, especially changes in the ocean, ice sheets and global sea level."

Intergovernmental Panel on Climate Change, Sixth Assessment Report
9 August 2021

1. The Intergovernmental Panel on Climate Change (IPCC) published its 6th Assessment Report on 9 August 2021 and an Impacts, Adaptation and Vulnerability Report in March 2022. It contains a damning assessment of the current state of action on climate change and states that strong, rapid and sustained reductions in greenhouse gas emissions along with limiting cumulative carbon dioxide (CO_2) emissions, reaching at least net zero by 2050, are required to keep climate change to between 1.5°C and 2.0°C this century. The report concludes that there is now a small window of opportunity when significant action by society and governments can reduce the worst effects of climate change to within our ability to adapt.

2. Climate science is not new, the impacts of atmospheric CO_2 concentrations were first identified by Fourier in 1820s[1] and linked to climate by Tyndall in 1850s[2]. It was not until the second half of the 20th century that the scale of human influences on CO_2 levels was recognised, and the term 'Greenhouse' applied to the effect on

[1] General remarks on the temperature of the globe. J Fourier, 1824
[2] Proceedings of the Royal Institution of Great Britain. J Tyndall, 1859

climate, and to the gases responsible, principally carbon dioxide, methane, nitrous oxide and fluorinated gases. As concentrations of these gases increase, the world warms, the sea levels rise, and the atmosphere becomes more turbulent and able to hold more moisture. In the UK this will mean warmer, wetter winters with less snowfall and fewer frosts. Summers will be hotter and generally dryer but the potential for extreme, intense rainfall, droughts, heatwaves, flooding and storms will all increase.

3. Carbon dioxide concentrations have risen from a pre-industrial 280 parts per million (ppm) in the 1750s, to 300ppm in the 1950s, and over 400 ppm in 2018. The 2021 provisional figure released by the US National Oceanographic and Atmospheric Administration is 421 ppm which is comparable with the 410 ppm in 2020 cited by the Intergovernmental Panel on Climate Change.[3] Without action, at the current rate of change this could reach 900 ppm by the end of the century.[4] The impacts of rising greenhouse gas concentrations are clear, globally, the 10 warmest years on record have all occurred since 2005.[5] The global average temperature has risen at an unprecedented rate, by between 1.25°C and 1.5°C since 1880 and every year since 1976 has been hotter than the long-term average. Global temperatures are rising by at least 0.3°C per decade.[6] Arctic summer ice coverage has decreased by an average of 2.6% per decade since 1979, and global sea level has risen by 17 cm in the 20th century. In the UK, the ten warmest years on record have occurred since 2002, rainfall has increased by 5% and sunshine by 7%.[7] It is clear that the earth is warming rapidly, rainfall patterns are changing, there are droughts, wildfires[8], and unprecedented flooding, while water shortages

[3] Climate Change 2021, The Physical Science Basis, Summary for Policy Makers. Intergovernmental Panel on Climate Change, 9 August 2021
[4] United States National Oceanographic and Atmospheric Administration, Climate Change: Atmospheric Carbon Dioxide. 2020
[5] Met Office Observations, 2018
[6] Met Office 2018
[7] Met Office Observations, 2018
[8] E.g. West Coast USA, Australia, Siberia, UK, Turkey and Israel.

and rising sea levels bring the threat of flood, geo-political instability and mass migration.

4. Around the world, 39% of the population live within 100 kilometres of the coast and are at risk of flooding if sea levels continue to rise. 600 million of these people live in a 'low-level coastal zone', and 200 million on a coastal flood plain at risk of displacement due to climate induced sea level rise.[9] Large parts of the East and Southeast England are included in this, and in Wales, Gwynedd Council is considering the future of the village of Fairbourne which is threatened by rising sea levels and surface water flooding. It is possible that Fairbourne will become the first settlement in the UK abandoned due to climate change.[10]

5. As much as 90% of the greenhouse warming is absorbed by the oceans causing sea level rise due to thermal expansion and the melting of polar ice. The oceans release heat to the atmosphere more slowly than land, therefore, even if emissions are stopped now, the oceans and existing atmospheric greenhouse gases will continue to cause atmospheric warming for many decades. The level of climate change we experience therefore depends on how quickly we cut emissions now. Even if we stop all emissions today, we will not prevent some changes due to the inertia that exists in our atmosphere. However, the sooner we cut emissions, the smaller these changes will be, and the greater our ability to adapt.[11]

6. While human populations can to some extent adapt to changes in climate, the ecosystems on which we all depend will find this more difficult. Warmer and more acidic oceans, due to the absorption of CO_2, are impacting on marine life, for example coral bleaching has been widely reported while some fish species are moving to cooler waters in higher latitudes. Habitat is closely linked to climate, as climate changes so this will cause changes to habitats, species distribution,

[9] Effects of Climate Change. Met Office, August 2021
[10] Shoreline Management Plan. Gwynedd Council, May 2013
[11] Effects of Climate Change. Met Office August 2021

biodiversity loss and extinctions. Agricultural patterns will also be changed. While some areas will be able to grow a wider variety of crops, others will be taken out of production altogether due to rising temperatures, water shortages, changes to rainfall patterns and inundation by the rising sea levels. Climate change can also accelerate the introduction and spread of invasive species. It is these global changes in climate and ecosystems that are contributing to the sharp decline in biodiversity, and it is this link between climate and biodiversity that leads to the inclusion of biodiversity measures in this document and indeed, the governments' introduction of a Biodiversity Net Gain requirement and metric. There is little to be gained from including policies for the protection of biodiversity in a Development Plan if climate change is allowed to accelerate, significantly changing the climatic conditions on which our biodiversity depends.

7. The UK Governments' Department for Business, Energy and Industrial Strategy (BEIS) has stated that "reducing emissions now will keep the scale and rate of change within our ability to adapt. It makes good economic sense to take action now to drastically cut greenhouse gas emissions. If we delay acting on emissions, it will only mean more radical intervention in the future at greater cost, and larger impacts on society. Taking action now can also help to achieve long-term, sustainable economic growth from a low-carbon economy."[12]

8. Following the signing of the Kyoto Protocol in 1997 UK government introduced the Climate Change Act 2008, setting a legally binding target to reduce greenhouse gas emissions to 80% compared to 1990 levels by 2050[13]. In response to increasing evidence of the impacts of climate change, the 2008 Act was amended in 2019[14] to introduce a new target to achieve net zero emissions by 2050. In

[12] Department for Business, Energy and Industrial Strategy, UK Government 25 July 2019
[13] Climate Change Act 2008
[14] Climate Change Act 2008 (2050 amendment) Order 2019

addition, the Planning and Compulsory Purchase Act 2004 [15] includes a requirement for Local Development Documents (taken as a whole) to include policies designed so that development and the use of land contribute to the mitigation of, and adaptation to, climate change. This has been reiterated in the government's National Planning Policy Framework, most recently amended in July 2021 and in the Environment Agency's 3rd Adaptation Report [16] published in October 2021. The EA report highlights the urgency for, and the scale of, response required to deliver the degree of adaptation needed given the changes in climate that are already inevitable due to existing GHG concentrations.

9. The planning system is only able to direct the form and location of new development within the limits of regulation and with regard to national policy. There are few mechanisms for the planning system to address the issues of emissions from existing development, therefore, it is increasingly important that all new development should be as 'low carbon' as possible if the worst effects of climate change are to be avoided. Similarly, the landscape of energy generation is changing, and will need to continue to change. De-carbonising the grid will require a switch from fossil fuel energy generation to renewables. The nature of renewable forms of generation lends itself to a less centralised system and a change in the associated visual impacts. Large coal, oil and gas fired power stations, with their own, but now accepted impacts on the landscape, are being replaced by wind turbines and solar arrays supported by on-site generation such as PV and heat pumps. The planning system will have to negotiate this change and seek to enable the decarbonisation of the grid while managing the visual changes in our urban and rural landscapes.

[15] Planning and Compulsory Purchase Act 2004 Section 19(1A)(added by Planning Act 2008)
[16] Living better with a changing climate, report to Ministers under the Climate Change Act. Third Adaptation Report, Environment Agency, October 2021

10. To emphasise the scale of the change required it is important to note that renewables account for around 43% of the UK electricity generation, de-carbonising the grid will therefore require more than a doubling of our renewables supply. However, this accounts only for electricity supply. If transport, gas and oil for domestic, commercial and industrial purposes are included, renewables account for only 17% of the UK energy consumption, the remainder being fossil fuels.

11. The IPCC has concluded in its 6th Assessment Report[17] that "unless there are immediate, rapid and large-scale reductions in greenhouse gas emissions, limiting warming to close to 1.5ºC or even 2ºC will be beyond reach." UK Government Ministers have described the potential outcome of inaction as 'climate change catastrophe'. It is therefore more important than ever that climate change becomes the foremost consideration in the development process. We must achieve the goal of net zero emissions by 2050, with significant cuts now if the carbon budgets needed to keep to 1.5ºC or 2.0ºC are not to be exceeded. The UNEP Emissions Gap Report 2022 is unambiguous in its conclusions stating that "…the international community is falling far short of the Paris goals, with no credible pathway to 1.5ºC. Only urgent system-wide transformation can avoid climate disaster."[18] The science has never been clearer; action must be significant and rapid if we are to avoid the worst effects of global climate change. With every challenge comes opportunity, the transformation of our economy and society will bring economic opportunities in the energy supply, construction and energy efficiency industries. Transformation will require new supply chains, new skills and new jobs while energy efficiency and low carbon living has the potential to create healthy, attractive and safe places to live and work.

[17] AR6 Climate Change 2021: The Physical Science Basis. Intergovernmental Panel on Climate Change, 2021.
[18] United Nations Environment Programme Emissions Gap Report – Closing the Window, October 2022.

12. The issue for consideration is then what action can be taken through the planning system here in Derbyshire to contribute to the required GHG reductions nationally while adapting to the impacts of climate change and building resilience? This guide and assessment tool therefore aim to assist in the preparation of future Local Plans as well as in Development Management decision making, ensuring that as far as possible, future development in Derbyshire takes full account of the need to mitigate and adapt to the impacts of climate change, rapidly moving to a resilient, net zero emissions society, supporting green jobs and a healthier environment. The guide does not have a statutory basis, but it should be used as an evidence base resource, as a guide to the issues that may be considered in relation to climate change and planning.

Purpose and structure of the guidance

"Human-induced climate change is already affecting many weather and climate extremes in every region across the globe. Evidence of observed changes in extremes such as heatwaves, heavy precipitation, droughts, and tropical cyclones, and, in particular, their attribution to human influence, has strengthened since AR5."

IPCC, Sixth Assessment Report, 9 August 2021

13. Both climate change science and policy are changing rapidly as scientific evidence is amassed and our responses refined, bringing target dates forward and broadening the scope of proposed interventions. The purpose of this Planning Guidance is to assist in the development and review of planning policy at all levels, including neighbourhood and local plans, and to assist Development Management officers in making informed decisions. The guidance has been drafted by, and for, the Derbyshire Planning Authorities, to provide information to help underpin future policy and development management decision making which will aim to address the causes of climate change and implement the actions needed to adapt to the changes that are now inevitable. It is also hoped that the guide and accompanying assessment tool will be used proactively by developers and communities to help shape their proposals and actions. As this document is guidance only, it does not have any legal status but may be used as an evidence-base to assist in the development of emerging policy.

14. The guidance will seek to assist in the development of planning policy that will:
    - Maximise reductions in GHG emissions from energy use, embedded energy and the creation of wastes
    - Improve community and infrastructure resilience to the impacts of climate change
    - Mitigate pollution of the air, land and water, including noise and light pollution

- Contribute to the health and wellbeing of our communities and natural systems
- Facilitate transport choices, prioritising demand reduction, active travel and modal shift to other clean alternatives such as public transport, Battery Electric Vehicles and hydrogen fuel
- Conserve and enhance the natural environment and contribute to natural capital and biodiversity enhancement and carbon sequestration
- Facilitate clean growth in the economy, taking advantage of demand for green technologies and services
- Recognise the co-benefits that may be realised through the implementation of climate change adaptation and mitigation, contributing to biodiversity net gain, nutrient neutrality, local design, air quality, flood alleviation an ultimately, quality of life.

15. Climate change is the most important issue facing humanity and should be a consideration in every decision. This guidance will not therefore provide draft policies, these are to be made in light of local circumstances and priorities, but it will identify a number of climate related issues or design considerations that should be taken into account in the design and implementation of development proposals and can be included in development plan policies. However, a number of emerging policies from across the country will be included in the 'Good Practice' section below.

16. The issues or design considerations identified in this document will be accompanied by short descriptive text, the rationale behind inclusion and in some cases, suggested specifications, targets or outcomes.

17. The overall aim of the guide is to ensure that as far as possible, the planning process consistently contributes to climate change mitigation and adaptation in

line with the duties set out in the Climate Change Act[19] and the Planning and Compulsory Purchase Act[20] and government policy. The guide seeks to ensure that development makes a significant contribution to achieving the GHG reductions necessary to reach the national target of net zero by 2050 and remain within the carbon budget needed to limit climate change to 1.5ºC. Climate change is a universal issue that must be addressed, its impacts will be felt globally, but will affect us all locally. We must therefore ensure that the planning system plays its' part in driving the required actions, whether mitigation or adaptation, consistently across the whole county of Derbyshire.

Vision Derbyshire, the background

18. The Government intends to publish a White Paper (WP) on Devolution and Local Recovery as a means to 'level up' all parts of the country. The WP will set out proposals for local government structural reform in England along with the role which greater devolution will play in the national pandemic recovery. At a regional level, unitary and upper tier local authorities in the East Midlands have formed a Strategic Alliance. This formal partnership has enabled strategic co-ordination and alignment of local government resources to support connectivity, trade, investment and growth, to ensure the region has a clear voice. Locally, a non-structural reform model of local government, 'Vision Derbyshire', has been developed to ensure that within Derbyshire, all levels of local government work in a cooperative and coordinated manner.

19. The development of a case for change and proposition to central government is focused around four key ambitions or themes as follows.
    - Seize innovation - pioneering skills and technologies for a sustainable future economy

[19] Climate Change Act 2008 and Climate Change Act 2008 (2050 Amendment Order) 2019
[20] Planning and Compulsory Purchase Act 2004 Section 19(1A)(added by Planning Act 2008)

- Establish relentless ambition - creating opportunities for everyone in Derbyshire and making these visible:
- Build proactive communities - harnessing the energy in Derbyshire's communities and empowering people to make change:
- Live and work sustainably - committing to a zero-carbon footprint in our tourism, wider economy and ways of working.

20. Vision Derbyshire has reached the Implementation plan stage and a number of workstreams have been identified within each theme. A planning and climate change workstream has been identified under the 'live and work sustainably' theme to achieve rapid delivery of an agreed planning policy approach across the County. The Climate Change Planning Guidance is a key output of this Vision Derbyshire theme and has been drafted in collaboration with the National Park Authority and the District, City and Borough Councils across Derbyshire. This is intended as an umbrella document to drive consistency across Derbyshire in the approach to the mitigation and adaptation to climate change through the planning system.

International, national and legislative policy and strategy context

> *Low-likelihood outcomes, such as ice sheet collapse, abrupt ocean circulation changes, some compound extreme events and warming substantially larger than the assessed 'very likely' range of future warming cannot be ruled out.*
>
> *IPCC, Sixth Assessment Report, 9 August 2021*

International agreement

21. The United Nations Framework Convention on Climate Change (UNFCCC) or Rio Summit[21], was adopted in June 1992, establishing the objective to stabilise greenhouse gas (GHG) concentrations in the atmosphere at a level that would prevent dangerous human induced interference with the global climate system. The convention set non-binding limits of GHG emissions for individual countries and established a framework for the introduction of legally binding protocols to set out how the UNFCCC objectives could be achieved.

22. The UNFCCC Kyoto Protocol[22] was adopted by 192 parties in December 1997. The signatories include all but 4 United Nations member states. The protocol introduced a commitment to reduce the atmospheric concentration of six GHGs, Carbon dioxide, Methane, Nitrous oxide, Hydrofluorocarbons, Perfluorocarbons and Sulphur hexafluoride. The protocol set binding targets for these reductions over a number of commitment periods, effectively establishing carbon budgets. In 2010 the adoption of the Cancun Adaptation Framework[23] called for further action on adaptation to climate change and gave adaptation the same priority as

[21] United Nations Framework Convention on Climate Change, 9 May 1992
[22] United Nations Framework Convention on Climate Change Kyoto Protocol, 11 December 1997
[23] UNFCCC Decision 1/CP.16 II, The Cancun Agreements

mitigation, drawing attention to the need for significant adaptation measures in developing and developed countries alike.

23. The United Nations Framework Convention on Climate Change Conference of the Parties (COP) took place in Paris in 2015[24] and resulted in the signing of the Paris Agreement. Signed by 195 member states including the UK, the Paris Agreement identified the following goals:
    - A long-term goal of keeping the increase in global average temperature to well below 2°C above pre-industrial levels;
    - To aim to limit the increase to 1.5°C, since this would significantly reduce risks and the impacts of climate change;
    - The need for global emissions to peak as soon as possible, recognising that this will take longer for developing countries;
    - To undertake rapid reductions in greenhouse gas thereafter in accordance with the best available science.

24. The meeting in Paris was hailed as a make-or-break opportunity to secure an international agreement on approaches to tacking climate change, a commitment to a longer-term goal of near zero net emissions in the second half of the century and supporting a transition to a clean economy and low carbon society. It should be noted that although the Paris agreement recognised the need for emissions to peak as soon as possible, emissions were expected to rebound by about 4.8% in 2021 following a 5.8% drop due to the Covid 19 pandemic in 2020, but 2021 data indicates a rebound of 6.4%[25] indicating a continued rise in global emissions.

25. COP26 held in Glasgow in November 2021 aimed to ensure that countries' near-term commitments for GHG emissions reduction were ambitious enough to

[24] Decision1/CP.21 'The Paris Agreement' United Nations Framework Convention on Climate Change 26 January 2016
[25] International Monetary Fund Indicators Dashboard. June 2022

achieve the Paris Agreement commitment to limiting global increases in temperature to between 1.5 and 2.0°C through the submission of Nationally Determined Contributions (NDCs) every five years. 153 countries have now agreed new 2030 emissions targets, to meet next year to strengthen commitments, including a move away from the unabated use of coal, halting and reversing deforestation, reducing methane emissions and speed up the switch to electric vehicles. Further progress has been made regarding adaptation plans with over 45 countries making submissions and record the amount of adaptation finance being agreed globally. Progress has also been made towards delivering the $100 billion climate finance goal by 2023 at the latest. 34 public finance institutions have also agreed to end international support for unabated fossil fuel energy within 12 months with additional agreement on the provision of financial help for poor countries to tackle climate change. The draft agreement did not set binding targets for the end of fossil fuel use but instead asks states to 'phase out' subsidies for fossil fuels. This is the first time that fossil fuels have been specifically mentioned in a COP agreement. COP27 will be held in Egypt in 2022 and is promised to be a "radical turning point in international climate efforts." Pledging to meet annually, rather than every 5 years is seen by many as a significant step forward.

National legislation and policy

> *"Global surface temperature will continue to increase until at least the mid-century under all emissions scenarios considered. Global warming of 1.5°C and 2°C will be exceeded during the 21st century unless deep reductions in CO_2 and other greenhouse gas emissions occur in the coming decades."*
>
> *IPCC AR6, 9 August 2021*

Planning and Compulsory Purchase Act 2004

26. Not only is it national policy that the planning system addresses the issues of climate change adaptation and mitigation[26], it is also set out in the Planning and Compulsory Purchase Act[27], placing a legal duty on local planning authorities to include in their plans "policies designed to secure that the development and use of land in the local planning authority's area contribute to the mitigation of, and adaptation to, climate change". Clearly this legal duty requires that local development plans take account of the need for climate change mitigation and adaptation in development proposals and the policies that direct them. It is important to note that here mitigation and adaptation are given the same weight and should therefore be equally considered in the drafting of policy and its implementation.

Climate Change Act 2008 and Amendment

27. In the context of the Paris Agreement, legally binding greenhouse gas targets were introduced in the UK by the Climate Change Act[28] setting the initial target as a

[26] National Planning Policy Framework July 2021
[27] Planning and Compulsory Purchase Act 2004, S19 (1A)
[28] The Climate Change Act 2008

reduction to 80% of 1990 GHG emission levels to be achieved by 2050. In support of this target the act also introduced carbon budgets (based on a set of GHGs) limiting emissions over a series of four-year periods. The 2018-2022 carbon budget sets the annual equivalent of emissions 24% below 1990 levels [29]. However, the current GHG emissions levels have been reduced by up to 44% on 1990 levels[30]. Although this may suggest that the next budget period may be considered to be 'in credit', in a drive to limit global temperature rise to as close to 1.5ºC as possible, section 1(1) of the 2008 Act has been amended[31] to establish a revised and more ambitious emissions target of net zero to be achieved by 2050 with further announcement of an interim target of 78% reduction by 2035.

Planning and Energy Act 2008

28. The Planning and Energy Act 2008 makes provision for the inclusion in development plans, policies imposing reasonable requirements for 'a proportion of energy used in development in their area to be energy from renewable sources in the locality of the development', and for development in their area to comply with energy efficiency standards that exceed the energy requirements of building regulations.'[32] However, the Act goes on to require that such policies included in development plans must not be inconsistent with relevant national policies. While not yet national policy, the Future Homes and Buildings Standard introduced to complement the Building Regulations, will ensure that new homes built from 2025 will produce 75-80% less carbon emissions than homes delivered under the current regulations and that they will be 'Net Zero ready and will need no retro-fitting. Given that the Climate Change Act 2008 sets a legal target of net zero by 2050 and in light of the findings and warnings of the IPCC AR6, a requirement for

[29] The Climate Change Act 2008 (Credit Limit) Order 2016, Carbon budget for 2018 – 22 period is 55,000,000 carbon units.
[30] 2020 UK Greenhouse Gas Emissions, Final Figures 2 February 2021, BEIS/ONS
[31] The Climate Change Act 2008 (2050 Target Amendment) Order 2019
[32] Planning and Energy Act 2008, S1 (1c)

all new homes to achieve an 80% GHG reduction from 2025 and to be net zero well in advance of the 2050 target date would not appear unreasonable or irrational.

Town and Country Planning (General Permitted Development) (England) Order 2015

29. In most cases the installation of small-scale renewable energy equipment, including micro wind turbines, heat pumps, solar thermal and solar PV is permitted development within certain thresholds including not extending beyond 0.2m from the roof face or being higher than the roof line. In relation to listed buildings, scheduled monuments, conservation areas and world heritage sites, the installation of such equipment is not permitted development, however, the benefits of the installation of small-scale renewables should be weighed carefully against the harm to a conservation area or the significance of heritage assets.

National Planning Policy Framework (July 2021)

30. It is clear from the NPPF that the planning system has the potential to make a significant contribution to both climate change mitigation and adaptation in the UK.

31. The NPPF states that: "The purpose of the planning system is to contribute to the achievement of sustainable development… Achieving sustainable development means that the planning system has three overarching objectives, which are interdependent and need to be pursued in mutually supportive ways (so that opportunities can be taken to secure net gains across each of the different objectives): a) an economic objective; b) a social objective; and c) an environmental objective – to protect and enhancing our natural, built and historic

environment; including… mitigating and adapting to climate change, including moving to a low carbon economy."[33]

32. Planning should help to: shape places in ways that contribute to radical reductions in greenhouse gas emissions, minimise vulnerability and improve resilience; encourage the reuse of existing resources, including the conversion of existing buildings; and support renewable and low carbon energy and associated infrastructure.[34]

33. The planning system should support the transition to a low carbon future in a changing climate. Plans should take a proactive approach to mitigating and adapting to climate change. Policies should support appropriate measures to ensure the future resilience of communities and infrastructure to climate change impacts.[35]

34. The NPPF also indicates that plans should take account of climate change impacts over the longer term, including factors such as flood risk, coastal change, water supply and changes to biodiversity and landscape. New development should be planned to avoid increased vulnerability to the range of impacts from climate change and that, where new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaptation measures, including through the planning of green infrastructure and can help to reduce greenhouse gas emissions, such as through location, orientation and design reflecting the government's policy for national technical standards and local requirements.[36]

[33] NPPF, Paragraphs 7 and 8. July 2021
[34] NPPF, paragraph 152
[35] NPPF, paragraph 153
[36] NPPF, paragraph 154

Planning Practice Guidance, 2019

35. Planning Practice Guidance: Climate Change (last revised 2019) makes it clear that effective spatial planning is an important part of a successful response to climate change as it can influence the emission of greenhouse gases. In doing so, local planning authorities should ensure that protecting the local environment is properly considered alongside the broader issue of protecting the global environment. Planning can also help increase resilience to climate change impact through the location, mix and design of development. Addressing climate change is one of the core land use planning principles which the NPPF expects to underpin both plan-making and decision-making. To be found sound, local plans will need to reflect this principle and enable the delivery of sustainable development in accordance with the policies in the NPPF. There is a requirement to adopt pro-active strategies to mitigate and adapt to climate change in line with the provisions of the climate change Act 2008.[37]

36. There is therefore a clear requirement for the plan-making and decision-making processes to adopt the measures needed to meet the UK Government and legal targets of achieving net zero emissions by 2050 to mitigate the effects of climate change and keep global temperature increases to as near to, or below 1.5°C. Similarly, development plan policies and the decision-making process should also take into account the need for climate change adaptation.

Planning White Paper (August 2020)

37. The planning white paper 'Planning for the Future' published in August 2020 set out the government's proposals for reform of the planning system and sought comments from interested parties. In doing so it identifies 3 pillars of the future planning system; Planning for the future; Planning for beautiful and sustainable places, and; Planning for infrastructure and connected places. The section

[37] National Planning Practice Guidance: Climate Change. 15 March 2019

concerning beautiful and sustainable places states that "From 2025, we expect new homes to produce 75-80 per cent lower CO_2 emissions compared to current levels[38]. These homes will be 'zero carbon ready', with the ability to become fully zero carbon homes over time as the electricity grid decarbonises, without the need for further costly retrofitting work."[39] It is clear therefore that if this aspiration is to be achieved, then this requirement must be implemented without delay through planning policy and development management decisions. Further aspirations focussed on decarbonising transport and maintaining the health of ecosystems and biodiversity are also included in the proposals contained in the white paper.

UK Government 10 Point Plan for a Green Industrial Revolution (November 2020)

38. The UK government published its 10 Point Plan for a Green Industrial Revolution in November 2020. The plan identifies aspirations for both policy and investment in proposals for the greening of the UK economy and infrastructure.

39. The 10 point plan seeks to:

    1. Quadruple UK offshore wind capacity by 2030
    2. Implement 5GW of UK low carbon hydrogen production by 2030
    3. Advance the deployment of both large, and small-scale nuclear power, including small and advanced modular reactors
    4. Phase out internal combustion engine cars by 2030 and hybrids by 2035 requiring the switch to electric or hydrogen powered cars and light vans
    5. Assist in the funding of zero emissions public transport including buses and cycling infrastructure provision

[38] Future Homes Standard, January 2021
[39] Planning for the Future. Ministry of Housing, Communities and Local Government, August 2020

6. Tackle the emissions from air travel and shipping, positioning the UK at the forefront of aviation and maritime technology to push forward low carbon travel by government investment in research and development
7. Put buildings, homes, workplaces schools and hospitals at the heart of the green economy making buildings more efficient setting a clear path away from a reliance on fossil fuel boilers in the next 15 years
8. Capture 10 mega tonnes of carbon dioxide by 2030 with £1 billion of funding for carbon capture, use and storage (CCUS) hubs in industrial centres
9. Safeguard landscapes, restore habitats for wildlife, combat biodiversity loss while adapting to climate change and creating green employment
10. Unleash innovation and develop new sources of finance by raising research and development investment to 2.4% of GDP by 2027, nurturing product development, new business models and influencing consumer behaviour.

Draft Energy National Policy Statements 2021

40. In September 2021 the government launched a consultation on the revised National Policy Statements for energy infrastructure.[40] The Policy Statements consist principally of a suit of 7 documents covering the overarching energy policy in EN-1, natural gas generating infrastructure EN-2, renewable energy generating infrastructure EN-3, gas and oil supply infrastructure EN-4, the electricity network infrastructure EN-5, and finally the appraisal of sustainability and habitats regulations assessment for EN-1 to EN-5.

41. The policy documents set out the case for an urgent need for offshore wind, solar PV, wave, tidal range, tidal stream, energy from waste, natural gas, low carbon

[40] Planning for new energy infrastructure, Draft National Policy Statement for Energy Infrastructure. September 2021

hydrogen, and nuclear reactors, including small modular, advanced modular and large-scale reactors, as well as fusion power plants. Natural gas and other combustion plants, including energy from waste and biomass will still be required to meet peak demand periods, but will operate with carbon capture, utilisation and storage to reduce their GHG emissions.

UK Hydrogen Strategy 2021:

42. Hydrogen is one of a handful of new, low carbon solutions that will be critical for the UK's transition to net zero. As part of a deeply decarbonised, renewable energy system, low carbon hydrogen could be a versatile replacement for high-carbon fuels used today – helping to bring down emissions in UK industrial sectors and providing flexible energy for power, heat and transport. The UK Hydrogen Strategy sets out how the country will drive progress in the 2020s, to deliver a 5GW production ambition by 2030 and position hydrogen to help meet the Sixth Carbon Budget and net zero commitments.

43. The UK Hydrogen Strategy includes the promotion of both Blue[41] and Green[42] hydrogen. Blue H_2, produced from natural gas, is seen as a bridge to a truly low carbon source of energy although it has the disadvantage of having the potential to create greater CO_2 emissions per KWh of energy than simply burning the natural gas unless it is linked to an effective carbon capture and storage system. Future green H_2, from the electrolysis of water using wind or solar power, will replace blue H_2 as the grid further decarbonises. The government is seeking to secure 5GW of low carbon[43] H_2 production capacity by 2030. The government have invited consultation responses on a 'UK Low Carbon Hydrogen Strategy' published 17 August 2021.

[41] Blue hydrogen made by extracting hydrogen from natural gas, usually by reaction with steam.
[42] Green Hydrogen, made by electrolysing water using renewable electricity from wind or solar.
[43] Low carbon hydrogen can include processes requiring carbon sequestration in the production of hydrogen.

Future Homes and Buildings Standard

44. The government consultation on the proposed Future Homes Standard was launched in October 2019 seeking views on proposed changes to Part L and F of the Building regulations (England and Wales). The revised building regulations will require that from 2025 all new homes will achieve 75 - 80% carbon emissions reductions compared with current Building Regulations standards and will be net zero ready, meaning that retrofitting of zero carbon technologies will not be required as the grid is decarbonised. The government has also stated that it will introduce an interim uplift in building standards from 2021 which require a 31% reduction in emissions compared with previous Building Regulations standards, and that from 2025 no new homes should be built with fossil fuel heating, such as a natural gas or oil-fired boiler.

Future Buildings Standard 2021

45. The aim of the Future Buildings Standard is to improve energy efficiency in new and renovated buildings while ensuring that the design and construction is sustainable. It applies to all types of non-domestic buildings including residential uses such as care homes and halls of residence. The standard intends to deliver highly efficient non-domestic buildings using low carbon heat and future proofed against potential over heating without the need for energy intensive air conditioning systems.

46. Like the Future Homes Standard, the Future Buildings Standard will come into force from 2025 but includes an interim uplift in buildings regulations applicable from 2021, increasing energy efficiency standards and introducing a ‘fabric first’ approach to energy efficiency. This is intended to encourage the phase out of fossil fuelled heating systems.

47. Rather than banning specified technologies, the Future Buildings Standard will set performance-based standards. It is however unlikely that the new standards will be met without the introduction of low carbon technologies.

Net Zero Strategy: Build Back Better. October 2021

48. The strategy identifies a series of policies and proposals to deliver a pathway to UK emissions reductions meeting the targets of the 6th carbon budget (to 2037) and ultimately toward the net zero target of 2050. The key policies for power generation are for the decarbonisation of electricity supply by 2035, to increase the supply of renewable energy and by 2030 to secure 40GW of additional offshore wind capacity, to secure an investment decision on a large-scale nuclear power plant by the end of the current parliament, launch a new Future Nuclear Enabling Fund to further the development of small modular nuclear reactors, and the deployment market of flexibility measures to assist in smoothing of energy price spikes.

49. In relation to fuel supply the main themes are industrial decarbonisation through the Industrial Decarbonisation and Hydrogen Revenue Support scheme (IDHRS) to fund new hydrogen generation and carbon capture business models. This will include £100 million towards the provision of 250MW of electrolytic hydrogen in 2023 with further funding in 2024. Future oil and gas exploration and licensing on the UK continental shelf will also be further regulated to reduce GHG releases.

The Environment Act 2021

50. The Environment Act seeks to improve protection of the natural environment including emissions to air, land and water, the protection and recovery of biodiversity and the regulation of waste and resource efficiency. The Act enables the establishment of the regulatory Office of Environmental Protection (OEP) with the functions of contributing to environmental protection, the improvement of the

natural environment, and as a watchdog, overseeing the governments' plans, actions and targets in this area of responsibility. While the main aims of the Act are to protect and improve air and water quality and to improve and restore biodiversity, these functions have a considerable overlap with climate change adaptation and mitigation in areas such as flood prevention and carbon sequestration or offsetting.

Derbyshire strategy and policy

Derbyshire Climate Change and Carbon Reduction Manifesto, May 2019

51. While not making a climate emergency declaration, the County Council has published a Climate Change and Carbon Reduction Manifesto setting out 14 wide ranging pledges (Climate manifesto pledge (derbyshire.gov.uk)) including the reduction of emissions from council buildings and operations by 55% by 2022 compared to 2010, promoting energy efficiency and renewable energy generation, driving down the GHG emissions from procurement, supporting the development of low carbon transport and working with businesses both local and internationally to reduce emissions.

Derbyshire Environment and Climate Change Framework 2019

52. Councils across Derbyshire have been working together to develop this Framework. The Environment and Climate Change Framework seeks to reduce greenhouse gas emissions to levels which are consistent with the allocated carbon budgets for Derbyshire and to reduce carbon emissions to net zero by 2050. The Framework contains carbon budgets and suggested trajectories, outlining an approach to tackle climate change and improve the environment, which can be adopted by all partners across the county. The Framework will allow relevant strategies and action plans to be adaptive over time and respond to

research findings, technological developments and cultural and economic changes as they occur. The Framework does not encompass actions to adapt to a changing climate, these will be addressed in a separate action plan document.

Derbyshire Low Emission Vehicle Infrastructure Strategy 2019

53. The Low Emission Vehicle Infrastructure Strategy (LEVI) was launched in 2019 and seeks to encourage and facilitate the growth in provision of low emission vehicle charging infrastructure, both electrical and hydrogen, public, commercial and private. The County Council is working collaboratively with local partners to accelerate the adoption of low emission vehicles across the county, and in doing so seeks to make a major contribution to improving local air quality and to reducing greenhouse gas emissions. The LEVI Strategy sets out a 10-point action plan including commitments to work through the planning system, with planning authorities, developers and landowners, to provide LEVI and to encourage and facilitate the uptake of low emission vehicles. To date the LEVI has been instrumental in the provision of 240 publicly accessible Electric Vehicle Charge Points (EVCPs) across the county, with a more planned for coming years.

Review of climate change policy approach in local plans

Existing Local Plan policy review and declarations of Climate Emergency

54. The existing policies contained in the local plans of the Derbyshire Local Planning Authorities have been collated and included as appendix 3, linked below, giving an overview as of August 2021. It can be seen that there is a considerable range in the degree to which climate change and other environmental issues have been considered, largely reflected in the date of adoption, some plans being drafted earlier than others. Many of the plans are now due for review or replacement and it is anticipated that this guide and associated metric will assist in developing consistent and robust climate change related policies to enable Derbyshire as a whole to contribute to achieving the target of net zero by 2050.

55. The link below accesses a summary of policies contained in Derbyshire District, Borough and City Council local plans as Appendix 3: Derbyshire Borough, District and City Council local plans.

56. Declarations of Climate Emergency:

- **South Derbyshire District Council**, declared a climate emergency June 2019, committed to council carbon neutrality by 2030 and district wide by 2050. SDDC have published a Climate and Environment Action Plan 2021 – 2030, a Natural Resources Strategy and a Carbon Management Plan.

- **Derbyshire Dales District Council**, declared a climate emergency May 2019, committed to council carbon neutrality by 2030. DDDC have published 'The Path to Net Zero' climate change strategy and action plan 2020 - 2030

- **Derby City Council**, declared a climate emergency May 2019 and published its Climate Change Action plan 2022 - 2024. The Council has identified the actions needed to achieve Net Zero by 2035.

- **High Peak Borough Council**, declared a climate emergency October 2019, committed to carbon neutrality by 2030. 'Towards Carbon Neutrality 2030, Climate Change Action Plan 2021/22 (part 1) and 'Aiming Low: the way to Net Zero 2021 to 2030' have been published by the Borough Council.

- **Bolsover District Council**, no declaration.

- **Peak District National Park Authority** committed to carbon neutrality by 2050 and has published its Peak District National Park Climate Change Action Plan 2009- 2011. This has been followed by the National Park Management Plan 2019-23, Corporate Strategy 2019-24 and the Carbon Management Plan 2020 – 2050. The Park Authority has also published a Climate Change Adaptation Report and Vulnerability Assessment.

- **Chesterfield Borough Council**, declared a climate emergency in 2019, committed to council carbon neutrality by 2030 and across the borough by 2050. The Borough Council has published its Climate Change Action Plan 2020 – 2023. The Climate Change Assessment Tool ensures that climate change is a mandatory consideration in all decision making in the authority. The tool can be accessed through the Chesterfield Borough Council website.

- **North East Derbyshire Borough Council,** declared a climate emergency in 2019 and committed to carbon neutrality by 2030 and Climate Change Action Plan 2019 - 30

- **Amber Valley Borough Council,** in July 2019 declared a climate emergency and committed to carbon neutrality by 2030.

- Erewash Borough Council, in October 2019 committed to carbon neutrality by 2050 as part of its Natural Resources Strategy, Carbon Management and Adaptation Plans.

- **Derbyshire County Council, Derbyshire County Council,** in 2021 recognised that there is a climate crisis and reaffirmed the commitment to becoming net zero by 2032 or sooner and county wide net zero by 2050. In 2019 the County Council published the Derbyshire Climate Change and Carbon Reduction Manifesto, Environment and Climate Change Framework and the Low Emission Vehicle Infrastructure Strategy.

Examples of Good Practice

57. Many local authorities have developed their own sustainable development guides, or Supplementary Planning Documents, and some have included the issue in Local Plan Policy. Coverage across the country is neither complete nor uniform in its consideration of climate change and similarly the approach varies greatly between authorities. This guidance attempts to draw on existing good practice to encourage and enable the development of policy and to provide an evidence base to assist decision making which is effective in achieving the GHG reductions required to reach net zero by 2050 while remaining within identified carbon budgets, without losing sight of the need to include the principles of adaptation. Below are examples of good practice in both policy and implementation of development.

58. Below is a selection of examples of adopted and emerging planning policy along with examples of developments incorporating design features which contribute to climate change mitigation, adaptation and resilience, demonstrating that the adoption of such measures can lead to an attractive resilient and sustainable form of development.

59. **Solihull Metropolitan Borough Council, Solihull Local Plan: Draft Submission Plan 2020:** Policy P9, Mitigating and adapting to climate change: This policy requires all new dwellings to be net zero from 2025 and non-residential development to conform to the BREEAM Excellent standard. Electric vehicle charging points are also required along with requirements for renewable energy provision, reduction of embedded energy in building materials and options for carbon offsetting.

60. **Greater Manchester Combined Authority, Places for Everyone, joint Development Plan Publication, 2021:** Policy JP-S 2 Carbon and Energy, aims to

deliver carbon neutrality for the Greater Manchester area by no later than 2038, all new development will be net zero by 2028 by following the energy hierarchy, vehicle charging points will also be required. All developments are to be accompanied by a carbon assessment demonstrating how the design and layout of the development will maximise whole life carbon reductions.

61. **Bristol City Council, Bristol Local Plan Review 2019,** Draft Policy CCS2: Towards zero carbon development:

    Energy use in new development:
    Development will be expected to:

    - Minimise the demand for heating, cooling, hot water, lighting and power through energy efficiency measures; then
    - Meet its remaining heat/cooling demand sustainably, as set out below; then
    - Maximise on-site renewable energy generation; and then
    - Meet any outstanding reduction in residual emissions through carbon offsetting.

    Development will be expected to achieve:

    - A minimum 10% reduction in regulated CO_2 emissions through energy efficiency measures; and
    - A minimum 35% reduction in regulated CO_2 emissions through a combination of energy efficiency measures and on-site renewable energy generation.

      After applying on site measures, development is expected to achieve a 100% reduction in its remaining regulated and unregulated emissions through the use of carbon offsetting as set out below.

62. **Cornwall County Council Climate Emergency Development Plan Submission Document, November 2021:** The draft DPD and draft policies included have been

developed to help deliver Cornwall County Council's Climate Change Action Plan, decarbonising lifestyles, creating resilient communities, protecting and enhancing the environment, rebalancing the need to travel, ensuring health and wellbeing of residents, embedding practices and standards making buildings and places more efficient and developing a whole system approach.

63. Cornwall County Council are seeking, through this document, to achieve a carbon neutral Cornwall by 2030 and acknowledge that not all decisions will be popular. "This is a climate emergency; we need to act now. We are consulting with interested parties throughout the process of developing this DPD. We know of the real benefit these new policies offer by improving health (better air quality, warmer homes, more opportunity to walk and cycle and supporting healthier diets) and creating a more resilient economy with better energy security and new green industries and practices."

64. **Milton Keynes Council, Plan: MK 2016 - 2031:** The Milton Keynes Council Local Plan 2016 – 2031 includes policies seeking to achieve a 19% carbon reduction improvement upon the requirements in Building Regulations Part L 2013, or achieve any higher standard than this that is required under new national planning policy or building regulations. There are also requirements to ensure that the 'as built' energy and carbon performance of new buildings matches the calculated design performance through the use of a recognised monitoring regime applied to a sample of buildings during their first year of occupancy.

65. **Derbyshire Dales District Council, Climate Change Supplementary Planning Document, July 2021:** The SPD supports the District Council's local plan and declaration of a climate emergency. It is split into five sections concerned with: Securing and enhancing green infrastructure; Managing drainage, flood risk and

water conservation; Using less energy, increasing energy efficiency and promoting renewable energy; Reducing the need to travel and promoting sustainable transport; and Improving building design and layout to meet the objectives of the SPD. A checklist included as appendix A provides a tool for developers to consider potential measures to improve planning applications in relation to climate change.

66. **Goldsmith Street, Norwich:**

Goldsmith Street, Norwich. With permission of Mikhail Riches Architects. Public space, including street trees, accessible paths and motor vehicle restrictions between residential areas at Goldsmith Street Norwich

A multi award winning, including the RIBA Stirling Prize, low carbon housing scheme in Norwich, the largest social housing scheme in the UK and built to 'Passivhaus' standards. Designed by Riches Hawley Mikhail for Norwich City Council. The scheme consists of 4 terraced streets designed to reflect the

traditional road layout while incorporating passive solar design principles. The scheme also includes public green space enabling active travel permeability.

67. **Gusto Homes, Nottinghamshire/Lincolnshire:** Several residential developments including Lincoln (LN1 2ZF & LN6 7SS) and at Collingford, Nottinghamshire (NG23 7RL). Developments consisting of low energy, low carbon homes, built by a commercial construction company as market housing, not part of a demonstration project, simply a refinement of the product that the developer has been building since the late 1990s. Including triple glazing, air management systems, solar PV, wastewater heat recovery, passive solar design and high levels of insulation meaning that central heating is not normally required. An example of fabric first design and construction.

68. **Joseph Rowntree Housing Trust, Derwentthorpe, York:** Derwentthorpe is a large-scale low carbon, mixed tenure development extending to 481 homes, located to the east of York city centre. The development is connected to a low carbon district heating system, producing up to 50% fewer emissions than conventional domestic heating systems. The design includes many characteristics of a low carbon development, including SuDS and street layout and detailing to encouraging active travel. However, the provision of solar PV has been largely omitted and this is reflected in plot and block orientation. Street trees, public spaces and green infrastructure have been incorporated into the design and contribute to a highly permeable layout encouraging active travel.

69. **Poundbury, Dorset:** A compact, mixed-use development incorporating a wide variety of dwelling types and business, industrial, retail and service premises in a high-quality public realm. While this development lacks a number of other features that are considered necessary for climate change mitigation and adaptation, it does demonstrate how a varied street layout, the absence of formal road markings

and active travel permeability can contribute to encouraging higher than average active travel rates.

70. **Adnams Distribution Centre:**

Adnams Distribution Centre, Reydon. Wildflower meadow planting, green roof, Sustainable Drainage systems and low embedded energy building materials. Image provided by Adnams Plc.

Located at Reydon in Suffolk, the distribution centre is an example of a large-scale commercial building using sustainable construction techniques. The walls are made from hemp and lime which provide a high degree of thermal insulation and reduce energy demand. This is complemented by a green roof which, while providing over 1 million litres of clean water each year through a rainwater harvesting system, also provides a valuable meadow habitat supporting, among other things, a wide variety of insect pollinators. Fifteen years after construction the building continues to demonstrate how sustainable construction techniques

can be applied to commercial buildings on a large scale bringing financial savings and environmental benefits.

71. **The Essex Design Guide:** The Essex Design Guide is accessed as a web page. It is not intended as a design guide specifically related to climate change but does include many of the measures which will significantly contribute to climate change mitigation and adaptation.

72. **New Homes Policy Playbook, UK Green Building Council:** The New Homes Policy Playbook and resource pack is designed to assist local authorities to drive up the sustainability of new homes to deliver what is required from all homes, from both environmental and social perspectives. Like this guidance, the Policy Playbook seeks to ensure that local authorities adopt a consistent approach

RTPI and TCPA guidance, October 2021

73. Written by the Royal Town Planning Institute (RTPI) and the Town and Country Planning Association (TCPA), the guide provides an accessible introduction to the broad issues involved in planning for climate change. It is intended to help planners and politicians play their full part in tackling the climate crisis and is designed to inform the preparation of strategic and local development plans being prepared by local and combined authorities in the UK. It replaces the previous edition of this guidance published in 2018.

74. The guide cannot cover the full breadth of all the planning policy issues raised by climate change. Instead, it focuses on the broad approaches to handling carbon reduction and climate adaptation through the planning system. It refers to the relationships between planning and other systems, such as building regulations, but focuses on the former. It does not contain detailed material on important elements such as green infrastructure, biodiversity, and food security. Nor does it

repeat the guidance on flood risk assessments published by government agencies. There is a growing body of detailed and practical advice on addressing climate change issued by a range of cross-sector organisations, as listed in Section 6 of the guide. It does not repeat any of this material but offers signposts to it where appropriate.

Association for Environment Conscious Building

75. The AECB (Association for Environment Conscious Building www.aecb.net) is a network of individuals and companies with a common aim of promoting sustainable building. Running since the 1980's the AECB are the largest and oldest network for sustainable building. Bringing together contractors, trades people, self-builders, architects, designers, engineers, manufacturers, housing associations, local authorities and academics to help develop, share, train and promote sustainable building best practice. The AECB promote excellence in design and construction and their publication 'The New Homes Policy Playbook: Driving sustainability in new homes – a resource for local authorities', February 2021, provides a wealth of information on the development of policy and its contribution to climate change mitigation an adaptation.

Over Haddon Village Hall, Derbyshire: Solar PV and air source heat pumps, within the Peak District National Park and on the edge of the Over Haddon Conservation Area. Image with permission of Over Haddon Village Hall.

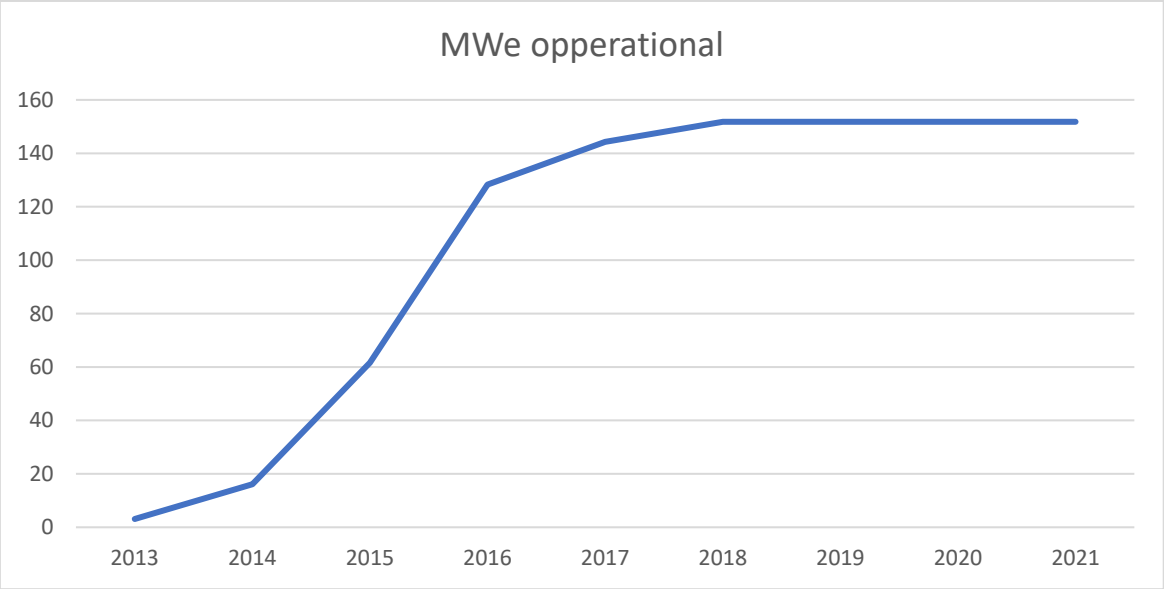
Existing and proposed renewable and low carbon energy resource in Derbyshire (BEIS data and local authority information)

76. BEIS publish quarterly data listing renewable energy proposals, existing schemes, withdrawn, refused and expired planning applications. The data is available as a dataset which can be downloaded and edited, or in a plotted point data map format linked to the dataset. The most efficient method of accessing this data is via the BEIS web pages. This will not only give access to the most up to date information but will also eliminate the potential for transcription errors although there is a delay of approximately 1 month in the publication of the BEIS data. Both the database and the mapped form can be accessed at: Renewable Energy Planning Database: monthly extract - GOV.UK (www.gov.uk)

77. The data set includes planning and development status, locational information, and installed capacity as MW of electricity equivalent. As of August 2021, schemes either installed, submitted, under construction or benefitting from planning consent in Derbyshire amount to 309.1 MWe capacity. Of this, schemes either operational or under construction amount to 178.3 MWe, the majority of this (124.5 MWe) being ground mounted photovoltaics.

78. The graph below shows the total MWe renewable operational capacity within Derbyshire for installations greater than 1 MWe, currently standing at 151.8 MWe. A further 145.8 MWe capacity is either under construction (15 MWe) or benefits from planning consent (139 MWe)[44].

[44] Renewable energy developments in Derbyshire greater than 1 MWe consented or under construction, July 2021. BEIS



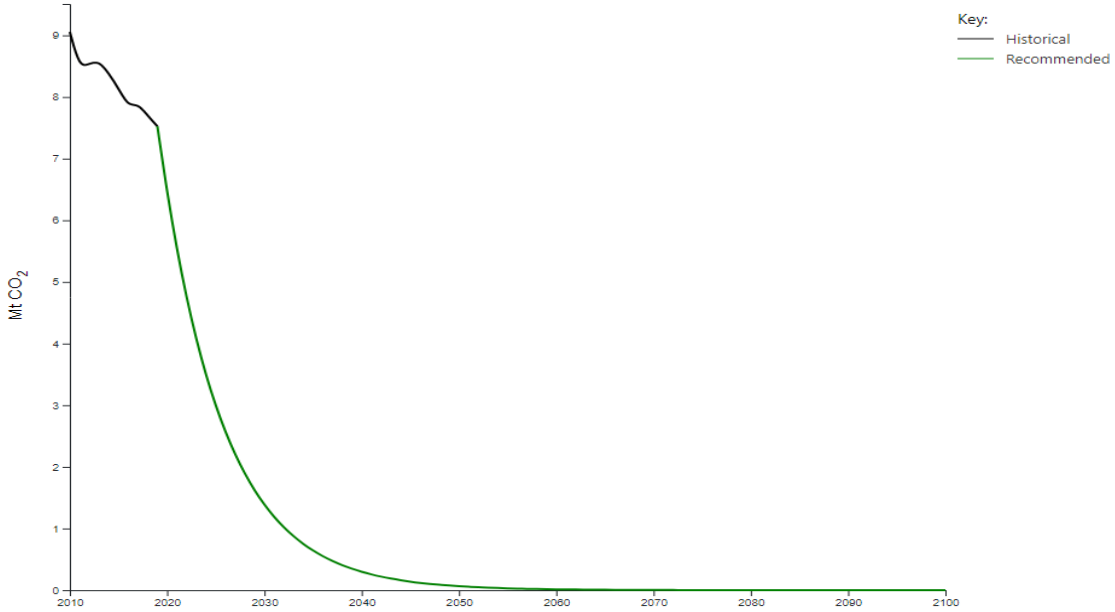
Graph showing cumulative total renewable energy generation capacity (DNC) in Derbyshire. BEIS data. *The graph shows a steady increase in renewable energy generation capacity from near zero Mega Watts in 2013 to over 150 Mega Watts in 2018, thereafter generation capacity has remained more or less constant to the present.*

79. The local authorities of Derbyshire have commissioned a study of the available renewable energy resource in the county. The study provides a spatial assessment of the renewable energy opportunities across Derbyshire and the Peak District National Park area, including those parts of the National Park outside Derbyshire. The study seeks to provide an evidence base to ensure better integration of energy system planning with the growing need to address and mitigate climate change at local and regional levels. The report provides local authorities and wider stakeholder groups with a clear overview of the existing energy system, future system projections and an assessment of energy opportunities, to enable better design of low carbon planning policy, ensuring that future energy development in the study area is located in a sensitive and appropriate manner, while supporting the transition to a net zero economy.

Renewable energy study - Derbyshire County Council

Carbon Reduction Pathways

80. The Tyndall Centre for Climate Change Research hosted at the universities of East Anglia, Manchester, Newcastle and Cardiff have developed the web-based 'Tyndall Carbon Budget Tool'[45]. The tool can be used to generate carbon budgets and pathways for local authority areas at district level and aggregated district groupings giving county level data. These budgets and pathways are based on achieving the scale of reductions necessary to meet the Paris Agreement target of keeping global temperature rise to "well below 2°C and pursuing 1.5°C". The pathways provide a clear graphical representation of the cuts in CO_2 emissions necessary to stay within the cumulative budget if the Paris target is to be realised. The graph below shows the CO_2 pathway projection for Derbyshire, highlighting the need for rapid and significant reductions in CO_2 emissions.



Tyndall Centre for Climate Change Research CO_2 pathway for Derbyshire

The graph shows a steady decline in measured carbon dioxide emissions from 2010 to 2020 amounting to a decrease of approximately 1.5 mega tonnes CO_2 over 10 years, followed by a very rapid drop in emissions by 6.5 mega tonnes CO_2 in the following 10 years to 2030, required to achieve the target of limiting warming to between 1.5 and 2°C and reaching net zero by 2050.

[45] Developed at Manchester University, Tyndall Centre for Climate Change Research.

81. The area to the left of the curve above represents the cumulative carbon budget for Derbyshire for the period 2020 to 2100. This budget has been calculated by the Tyndall Centre for Climate Change Research as a 'fair' contribution to achieving the Paris Climate Change Agreement global temperature target of limiting climate change to between 1.5 to 2.0°C. The Derbyshire budget amounts to 45.2 million tonnes of CO_2, emissions over the period 2020 to 2100. At the current rate of emissions, this budget will be exceeded in less than six years. This demonstrates why speed of reduction in emissions is so important. Significant reduction in emissions are therefore needed if the Paris Agreement target is to be achieved.

82. Tyndall Centre pathways and budgets can be generated for each of the Local Authority areas in Derbyshire at: Local and Regional Implications of the United Nations Paris Agreement on Climate Change (manchester.ac.uk). The Tyndall Centre data does not enable analysis beyond District/Borough Council level, it is therefore not possible to use this data to provide a budget and pathway for the Peak District National Park Authority area.

Derbyshire joint policy approach to climate change

> *This report[37] is clear. Time is running out. For the 2021 United Nations Climate Change Conference in Glasgow, known as COP26, to be a turning point, we need all countries to commit to net zero emissions by 2050, backed up by concrete, long-term strategies, and enhanced Nationally Determined Contributions which collectively cut global emissions by 45% by 2030, compared to 2010 levels.*
>
> *UN Secretary-General Antonio Guterres[46]*

83. This Planning Guide seeks to ensure that a broad range of issues related to climate change are consistently included in the consideration of plan making and the development management decision making process across the county of Derbyshire at all levels of local government. The guide will not be prescriptive in the wording of policy, this is a matter for individual authorities to consider in light of local circumstances, it will however identify the key themes and issues that are relevant to development proposals when considering impacts on climate change and the need to achieve the national net zero target by 2050.

84. Development plan policies may be drafted to include climate change mitigation and adaptation throughout the plan in addition to a specific climate change chapter. By integrating climate change throughout the plan, it is seamlessly included in the consideration of proposals while being reinforced and expand upon by its own chapter.

[46] 'United in Science 2021, A multi-organization high-level compilation of the latest climate science information'. WMO, UN, IPCC, WHO, MO and Global Carbon Project. 16 September 2021.

85. In addition to the identified issues, the guide is accompanied by a metric, an assessment tool, designed to give an indication of the degree to which proposals have included climate change mitigation and adaptation measures in their conception and implementation. The tool does not attempt to identify the climate impact, reduction of climate impact or degree to which the proposal is adapted to possible climate change scenarios in terms of tonnes of GHG or degrees of temperature rise. The tool will suggest whether or not the issues have been considered and included, it will also give an indication of which issues have been omitted or superficially included and therefore where further discussion and revision may be required to achieve adequate climate change mitigation or adaptation.

86. The issues or measures for consideration have been grouped by topic and are discussed below. Each issue is accompanied by a short description and rationale, explaining what the relevance is and how this can contribute to mitigation or adaptation. The issues are reflected in the assessment tool, but where there has been some contraction of the list, grouping similar issues and outcomes to ensure that the system is informative while remaining useable in the development management and policy fields, and potentially by developers bringing forward proposals. The issues list is not exhaustive, and as technologies develop there may be scope for further additions to the assessment tool.

87. Details of how to use the assessment tool are included in the tool itself. However, in summary, the tool presents 8 sets of measures which may contribute to mitigation or adaptation. These are categorised as:

    Built Environment, Design and Layout
    Commercial, Design and Layout
    Securing Enhanced Green Infrastructure
    Renewable Energy Generation
    Reducing the Need to Travel, Encouraging Active Travel

Managing the Water Environment
Sustainable Approach to Minerals
Sustainable Approach to Waste Development.

88. Each section lists a number of measures or design features the inclusion of which may contribute to tackling climate change. These can be identified as:
    Not considered
    Considered and rejected
    Partially implemented
    Fully implemented
    Not relevant

89. The selection of 'Not considered' will score 0, while 'Fully implemented' will give a higher score as each measure is weighted depending on its potential to contribute to greenhouse gas reductions. The selection on 'Not relevant' will remove that option from the calculation so that the final score for that category will be a % of only the relevant measures.

90. The scoring summary view displays the total score of relevant measures categories as a 'Red, Amber Green' graph for each category and as a % of the total score available for that form of development. There is no 'pass/fail' score, the RAG rating only directs the user to measures that may be considered if climate change performance is to be improved. The system does not attempt to quantify emissions reductions or savings as this is considered to require too much data to be manageable. The aim of the tool is therefore to direct the decision maker to those areas where there may be greater potential for improvement. The tool may be used in Development Management to assess proposals, it's use by developers may be encouraged to provide an assessment as part of a submission or it could be considered to assist in the assessment of the potential for policy outcomes to mitigate climate change.

Net Zero ambition

> *"Business as usual is not an option. Climate impacts are inevitable, and our thinking must change faster than the climate."*
>
> *Environment Agency 3rd Adaptation Report. October 2021*[47]

91. One of the main aims of local plan policies should be to reduce the climate change impact of developments enabling the national target, established in the Climate Change Act 2008, to be met while keeping emissions within the scientifically identified carbon budgets and trajectories highlighted, for example, by the Tyndall Centre.

92. The national target established in the Climate Change Act 2008 (as amended) is net zero emissions by 2050. It can be seen from the carbon budgets and pathways that achieving net zero by 2050 will be very challenging, requiring early and significant reductions of regulated emissions across all sectors of the economy and society. It is therefore proposed that developers, through the application of individual or a combination of measures, seek to ensure that all development, including development not considered major, be net zero emissions. In practice this may be achieved by minimising energy demand, maximising on-site renewable energy generation and ensuring that adequate provision is made for low or zero carbon transport infrastructure. Residual energy demand, not provided by on site generation should be capable of being sourced from renewable supplies, but such additional demand should be minimised.

93. Where significant alteration to an existing building is proposed, the development should minimise the addition to the existing energy demand. This should be

[47] Living better with a changing climate, report to Ministers under the Climate Change Act. Third Adaptation Report, Environment Agency, October 2021

through a fabric first approach, ensuring that the additional energy demand is minimised through, for example, high specification insulation and glazing.

94. All new buildings, whether residential or commercial, should include electric vehicle charging infrastructure in line with the requirements of building regulations. 'Smart' charge points capable of displacing charging to those times of day when there is lower demand for electricity or higher rates of renewable energy generation may therefore provide an additional benefit by increasing the efficiency of grid infrastructure. For commercial and retail developments, community buildings and education establishments, electric vehicle charge points should be provided for a proportion of parking places and should be of 'Fast' (>22 kW) or 'Rapid' (50 – 350 kW) charge capacity.

95. The measures listed below can therefore be used in combination to drive down the GHG emissions for a development to meet the national net zero target and to enable changes to lifestyles, further lowering emissions and contributing the climate change mitigation and adaptation. A key to achieving net zero emissions is decarbonising and greening the grid, supplying our energy needs from renewable or zero carbon sources. In the UK fossil fuel use accounts for over 80% of the national total energy use if road fuels and industrial applications are included. It is therefore vital that wherever possible, reliance on fossil fuels is reduced, a reduction in overall demand for energy, through efficiency measures, will enable the fossil fuel component, be that domestic energy or road fuel, to be reduced, resulting in more energy being available for the electrification of industry and transport, and a greater proportion of that demand being met from renewables.

96. It should not be forgotten than many of the design features listed here contribute to climate change mitigation and adaptation in a number of ways, realising an variety of co-benefits, for example, street trees can provide cooling shade, improve

air quality, provide biodiversity gain, nutrient neutrality and sustainable drainage and flood water management.

Mitigation, adaptation and resilience

"Many changes in the climate system become larger in direct relation to increasing global warming. They include increases in the frequency and intensity of hot extremes, marine heatwaves, and heavy precipitation, agricultural and ecological droughts in some regions, and proportion of intense tropical cyclones, as well as reductions in Arctic sea ice, snow cover and permafrost."
IPCC AR6, 9 August 2021

The Built Environment: Energy Efficiency, Building Design and Layout

97. The following considerations should be included in all developments. They are to be considered as an intrinsic part of the design process required to achieve the national target of net zero by 2050, and 75% - 80% reduction in CO_2 emissions from homes by 2025,[48] with further reductions to zero by 2030. The development of local design guides should include consideration of both mitigation and adaptation measures to future proof development proposals. RIBA also provide guidance on the topic of building design and climate action, this can be found at:
https://www.architecture.com/about/policy/climate-action
and
https://www.architecture.com/about/policy/climate-action/2030-climate-challenge/resources

98. **The Energy Hierarchy:** It should be expected that developers will implement the energy hierarchy throughout the design and construction processes.
    i) Save energy and eliminate wasted energy, use only what is needed.
    ii) Use energy efficiently, high efficiency appliances, lighting and equipment.
    iii) Use energy from renewable sources.

[48] Planning for the Future. Ministry of Housing, Communities and Local Government, August 2020

iv) Use low carbon energy and where possible, capture the carbon emitted.

v) Use conventional (fossil fuel) energy as a last resort and participate in meaningful offsetting and carbon capture to compensate for carbon emissions.

99. The hierarchy is set out below and should be implemented through the design, construction and specification of buildings, whether commercial or domestic.

- Consider a 'fabric first' approach to design and construction. What is the building made from and how is it constructed? What are the embedded energy and waste implications of construction and future use of the building?
- Include high specification insulation to reduce energy demand and heat loss. This should be coupled with high levels of airtightness, moving towards standards of high energy efficiency, for example Passivhaus standard.
- Specify and install high efficiency lighting and appliances and/or plant where fitted.
- Include renewable energy systems where possible, roof mounted PV or thermal panels, or wind turbines for example. Consider these from the outset so that roof orientation and shading are taken into account in the design process.
- Consider low emissions and low carbon heating options such as district heating schemes or heat pumps.
- And finally, where none of these options are possible, any shortfall in energy demand may be met from the grid connection.

100. Where no renewables can be included in a design, carbon off-setting should be considered through legal agreement and commuted sums calculated per tonne

of CO_2 over the calculated building life (See Bristol City Council Local Plan Review 2019).

101. **Embedded/Embodied carbon:** Embedded carbon describes the emissions arising from sourcing, manufacture, supply and use of the materials and processes used in construction. Concrete for example has a high embedded energy derived from quarrying, transport, and particularly processing of the minerals used. In the UK, the embodied emissions from the construction of a building can account for up to half of the carbon impacts associated with the building over its whole lifecycle, it is therefore important that these are reduced as far as practicable. Where practical, the reuse of existing buildings worthy of retention may help to reduce the use of new materials, and embedded carbon, as well as maintaining their contribution to local character.

102. Design and access statements should be requested as evidence of actions taken to reduce embedded carbon and maximise opportunities for reuse and recycling of construction materials through the provision of a circular economy statement. Calculations of whole life carbon emissions should be made using a nationally recognised whole lifecycle carbon assessment methodology[49] and demonstrate actions taken to reduce lifecycle carbon emissions. The statement should demonstrate how both the design and layout of the proposal will contribute to minimising whole life GHG emissions of the proposal. A recognised quality regime should be implemented to ensure that the 'as built' performance of the building matches the calculated, specified, performance in terms of energy use and GHG emissions. This will require post construction monitoring of the development to verify as built specification compliance. Reporting of such monitoring should be a requirement of the consent.

[49] RICS Whole Life Carbon Assessment for the Built Environment Professional Statement 2017 or its successor, accepting that other methodologies will evolve over time.

103. **High specification insulation:** Floor, wall, and ceiling. This can greatly reduce the energy required to heat a property. Care is required to ensure that the design allows for adequate natural shading and ventilation to prevent summer over-heating. Consider the embedded energy in the insulation materials. The need for active cooling through air conditioning systems should be avoided. While higher specification insulation will reduce energy demand, the embedded energy/emissions in the insulation materials must be taken into account. Although these issues are covered by Part L of the Building Regulations, the Planning and Energy Act 2008 does enable Local Authorities to set energy efficiency standards above those require by the Building Regulations. Where this is the case, documents supporting an application should set out how insultation specifications will contribute to energy efficiency.

104. **Triple glazing:** High specification triple glazing can reduce heat loss and reduce noise transmission improving both energy performance and quality of life. Developers should consider triple glazing with low-emissivity coatings, insulated frames and the avoidance of 'cold bridges' in window design and specification. To prevent heat loss windows should be specified with a U value below 1.0W/m^2. Glazing products are available which claim to have U values as low as 0.5W/m^2. High transmittance value glazing can be used to ensure maximum solar gain during the winter months. Again, documents supporting an application should set out how glazing systems will contribute to energy efficiency. As stated above, the Planning and Energy Act 2008 does enable Local Authorities to set energy efficiency standards above those require by the Building Regulations, this approach may be considered in emerging or reviewed Local Plans.

105. **Passive solar design (PSD), warmth, ventilation and cooling:** In its basic form a PSD house collects heat from the sun through south facing windows, this is

absorbed by the mass of the building and slowly released into the living space. By benefitting from the collection of the available natural heat, a PSD building can greatly reduce the energy demand associated with space heating. The temperature can be controlled by roof overhangs which provide shade from the high summer sun, low-emissivity blinds and natural ventilation. Ideally a PSD building will have its principal elevation facing within 30º of South. Passive solar design principles should be applied as much as possible to contribute significantly to energy demand reduction in buildings. Where PSD features are incorporated it is important to consider the potential for overheating in a warming climate. Shading and passive, natural ventilation should therefore be considered as equally important design features if summer overheating is to be avoided. A number of residential developments across the UK have applied PSD principles resulting in attractive, comfortable homes which are low emission and have low running costs. The RIBA Stirling Prize 2019 winning Goldsmith Street development in Norwich applies many of the PSD principles while maintaining a highly attractive street scene.

106. **Highly efficient specification:** Passivhaus buildings achieve at least a 75% reduction in space heating requirements compared to standard UK house construction[50]. However, the Passivhaus Standard considers far more than heating and insulation efficiency, it provides a tried and tested approach to deliver net-zero ready new and existing buildings optimised for a decarbonised grid, providing a high level of comfort using very little energy for heating, and importantly, cooling. The residual heat and energy demand can therefore be met by PSD or on-site renewables for example PV coupled with heat pumps, or solar thermal. As 'Planning for the Future' published in August 2020 and the Future Homes Standard set out, the governments intension to require significant reductions in residential GHG emissions from 2023, achieving 31% savings from

[50] Passivhaus Trust UK, The UK Passivhaus Organisation.

2023, and 75% to 80% reduction from 2025 based on Building Regulations 2021 standards. The introduction of higher building insulation, and construction specifications designed to achieve high standards of energy efficiency, will have to become the norm to achieve this level of emissions reduction. It is clear from the emissions trajectories required to keep global warming to between 1.5°C and 2°C that the introduction of significantly higher energy efficiency standards will need to be achieved as soon as possible.

107. **Green roofs:** Green roof technology has been around for some time and construction techniques and specifications are now well established. There are multiple benefits in the use of green roofs including: greater insulation and thermal mass, reduced rainfall run-off rates, and the provision of habitat. However, not all buildings will lend themselves to green roofs. Although there are methods of constructing green roofs at almost any angle, and even green walls can be constructed, the technique is more commonly applied to shallow

pitch roofs. Also, the basic structure of the building must be capable of supporting the mass, including the wetted mass of the roof materials.

Green roof planted with sedum and drought tolerant species

108. The use of green roofs should be considered as a contribution to several climate change mitigation and adaptation themes, including SuDS, flood protection, biodiversity enhancement and net gain, thermal insulation and energy demand reduction. However, they are not easily retrofitted but are capable of incorporating thermal or PV solar installations.

109. **Plot and block orientation:** From the outset, the layout of a development proposal can have a considerable influence on the implementation of passive solar design and measures for the utilisation of renewable energy. While building orientation can contribute to passive heating and the deployment of solar PV, it is important to consider the potential for over-heating. Designs should therefore also consider the need for shading, ventilation and cooling.

110. Buildings will ideally face south or within 30^{o} of south to take advantage of sunlight. Where a south facing aspect is not possible, roof pitches should be orientated to provide a south facing pitch to maximise both the area available for, and the efficiency of, PV or solar thermal collectors either roof mounted or building integrated (BIPV). Asymmetrical pitch roof structures can offer a greater surface area available for solar panels and prevent shading of nearby properties. Roof overhangs can also provide additional shade during the summer months when cooling may be a priority if over-heating is to be avoided. Residential developments which include a mix of dwelling types and sizes allow greater flexibility in site layout and individual building plot orientation, to accommodate both passive solar design and the provision of solar PV installation.

111. **District heating and CHP:** District heating including Combined Heat and Power (CHP) may be feasible where there is either a local heat or fuel source from nearby industrial or agricultural activities. Typically, a district heating system will include ducting from the source to end user, and in place of a domestic boiler, each property will include a controllable heat exchange unit. Alternatives may be comprised of a centralised CHP plant making use of a local fuel source, often a waste from other businesses, providing both heat and electricity to a development.

112. Centralised heat sources may be more suited to industrial or commercial development as the contractual arrangements between heat supplier and end user may be less complex. Where on-site renewables such as air source heating or roof mounted or building integrated PV are feasible, district heating systems may be less attractive. District heating systems, where considered, will ideally be developed and implemented at the time of construction as there is a significant level of infrastructure involved including heat ducting and domestic heat exchangers as well as contractual arrangements for the operation of the system and supply of heat. All of which will need to be in place before the development can be occupied.

113. **Small-scale renewables:** On a domestic scale, new build housing and significant extensions to existing dwellings should seek to include small scale renewables. Roof mounted or building integrated PV or solar thermal water heating, and either ground or air source heating may be considered individually or in combination. Provision should be maximised to reduce reliance of grid connection. The addition of battery storage can further reduce the need for grid connection, enabling PV generation during the day to be used in the evenings when PV generation is absent or greatly reduced. Clearly not all buildings will be suitable for the deployment of small-scale renewables and in Conservation Areas, on listed buildings or in areas affecting there setting, while not impossible, the

installation of renewables will require careful consideration of its impact on the heritage asset.

114. **Controlling external lighting:** Consider the design and requirement for external lighting to avoid light being effectively wasted lighting areas that do not need to be lit, or simply being directed upward as light pollution. External lighting will ideally be directed to where needed and controlled by timer or motion sensor. External lighting is likely to be a relatively small proportion of energy use but potential negative impacts on ecology and visual amenity should also be considered. Recent studies have identified significant reductions in insect populations in illuminated areas.[51] The reduction of external light 'spill' may offer a significant advantage in realising biodiversity gain.

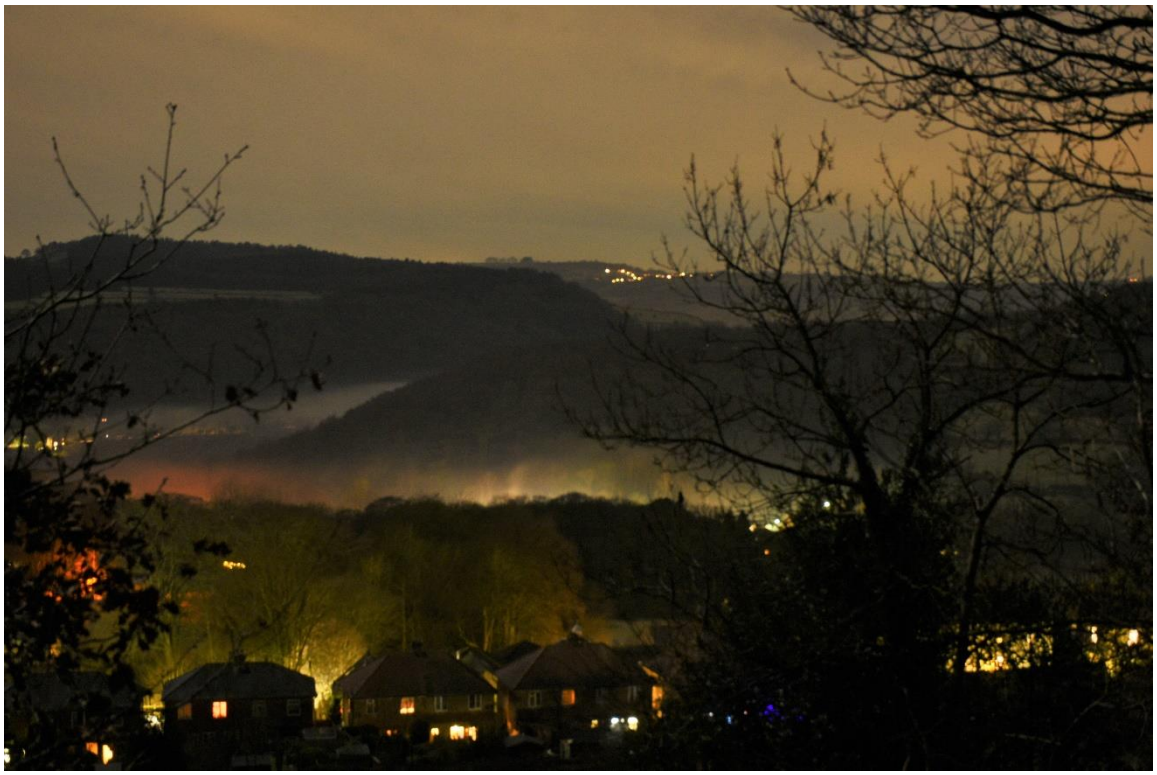


Image of light pollution in a rural setting, illuminated valleys and darker hills.

[51] 'Street lighting has detrimental impacts on local insect populations.' Scientific Advances 2021

115. **Substantial extensions to, existing dwellings:** The extension of an existing dwelling may provide opportunities for the installation of improved energy efficiency measures to reduce the climate change impacts of the building as a whole, or to improve the resilience of the building to the impacts of climate change, for example from flood risk or overheating. The feasibility of such opportunities should be identified in an energy assessment report to accompany a planning application. The extension of an existing building may be considered preferable to demolition and redevelopment of the site as it can represent the efficient use of the embedded energy in the existing structure. However, this requires careful and evidenced consideration, taking account of the whole life of the building including future emissions from occupation and use. The balance rests with the degree to which the fabric of the original building can be improved in thermal efficiency and the embedded carbon costs of those improvements.

116. **Refurbishment of existing dwellings:** Where refurbishment of, an existing dwelling is proposed, the new elements of the dwelling should be constructed to the highest energy performance standards so as to add the minimum additional GHG emissions to the building. The proposal should take a 'fabric first' approach, minimising the embedded energy, maximising efficiency and where possible adding on site renewable energy generation capacity to the building. Potential for renewable energy generation will ideally form part of the initial design brief and be reflected in the design and access statement.

117. **Non-Residential Development:** As with residential developments, where there is proposed extension to, or refurbishment of, an existing commercial building, then it should be requested that measures are taken to improve the environmental performance of the unit as a whole by maximising the efficiency of the additional floorspace. This may be through the provision of on-site renewable energy generation capacity or improvements to thermal performance.

118. Proposals for new commercial buildings should take a fabric first approach, minimising the embedded energy, maximising efficiency and where possible adding on site renewable energy generation capacity to the building. Potential for renewable energy generation should form part of the initial design brief and be reflected in the design and access statement.

119. **Reducing energy demand:** The reduction of energy demand is critical to meeting the emissions reduction targets set by legislation. Energy efficiency in the materials, construction processes and occupation of the development are key to long term demand, and therefore emissions, reductions. An efficient building will be capable of generating a greater percentage of its energy demand on-site and in some cases may be a net exporter of energy. Demand reduction can be achieved through scheme design and the specification of fixtures and fittings.

120. **Renewable energy generation on site:** All new development should seek to maximise on-site renewable energy generation as a contribution to the goal of net zero emissions. On site generation may take the form of solar PV or thermal, wind, or hydro as appropriate to the site. Low carbon energy may include biomass, heat pumps or energy from waste, this list of technologies is not exhaustive. Where the use of low carbon and renewable energy is not possible, carbon off setting should be considered.

121. Where appropriate, information supporting an application should set out how on-site energy generation has been considered and incorporated. Where on-site generation is not included in a proposal, the applicant should be requested to provide justification for its omission in light of local and national policy to achieve net zero emissions by 2050 and the associated legal requirement. The statement should include details of the measures included which will reduce the overall

energy demand of the development in line with government targets and how residual emissions will be offset.

122. Developments unable to achieve adequate emissions reductions (80% reduction be 2025 and net zero from 2030) should contribute to carbon off setting, equivalent to 20% of the 'as built' regulated energy demand at a negotiated rate per tonne of CO_2 equivalent for 30 years.

123. **Modern Methods of Construction and materials:** Proposal design should include a 'fabric first' approach to reduce embedded carbon in the fabric of the development and in the methods of construction while driving up energy efficiency in the finished building. Modern methods of construction can include innovative off-site and modular construction techniques where the quality control benefits of factory production can greatly reduce energy demand and whole life emissions.

124. Information setting out how the design and construction of the development contributes to climate change mitigation and adaptation should be requested in support of an application.

125. **Net Zero Ready:** There are many definitions of a 'Net Zero Ready' building but in its simplest form it can be applied to any building which does not require modification to become a zero emissions building other than connection to a zero-emission energy supply such as an air source heat pump or the provision of solar PV on the roof.

126. Thermal insulation levels and glazing efficiency should at a minimum be capable of achieving 80% emissions reductions based on 1990 base line and high standards of efficiency will be expected through revised building regulations

standards. Roof orientation and structure should be designed to accommodate solar PV or thermal installation without alteration, including the provision of suitable cable ducting where necessary. A net zero ready building will enable the occupier to make the switch to net zero at a later date by replacing a gas boiler with air source heat or adding solar PV for example. Cabling should also be provided to enable a fast EV charging point to be installed if an EV charge point is not provided.

127. **Natural cooling and ventilation:** In a warming world with greater likelihood for heatwaves the potential for buildings to overheat should be considered from the outset. Roof overhangs, window recesses, louvres and external blinds, when used in conjunction with effective natural ventilation, can significantly reduce the risk of overheating. Careful design of landscaping, including the planting of appropriate species of street trees can also greatly influence both air quality and temperature.

128. **Horticulture and recycling:** It is not possible for the planning system to require that residents participate fully in horticulture or recycling, however, the provision of adequate outdoor space in gardens may encourage or facilitate a culture of cultivation of fruit and vegetables off setting some 'food-miles'. While minor in its direct contribution to climate change mitigation, it does have an educational benefit and may raise a better awareness of some related issues. Similarly, the provision of adequate space for the storage of recycling and composting bins will not necessarily mean that they will be used, it does however make their use less problematic and more likely. As with horticulture, the direct contribution of individual actions may be small and cannot be enforced through the planning system, only encouraged and facilitated. Where adequate bin storage is not provided there is a clear detriment to the amenity of the area and recycling rates are reduced.

129. For commercial developments the provision of adequate waste bin/skip storage space may assist in on-site waste segregation, reducing waste being sent to landfill and assisting in recycling.

130. **Building for Life:** Published by the Design Council, Building for Life (BfL12) provides a guide to well-designed homes and neighbourhoods. The guide has been redesigned to reflect the NPPF and help local planning authorities assess the quality of proposed designs. While not specifically aimed at addressing the issues of climate change, the principles of good design can contribute to the creation of an attractive, popular and desirable neighbourhood incorporating many of the features that will contribute to reducing the negative impact on the development on climate change.

Historic Built Environment

131. **Heritage and the environment:** It is possible to adapt and retrofit historic buildings to reduce energy use and the resultant greenhouse gas emissions with little or impact on the external appearance, but specialist advice is needed. Guidance and case studies on the retrofitting of climate change mitigation measures to historic assets can be found on the Historic England and RIBA websites, it is considered to be more appropriate to provide links to the Historic England and RIBA websites than reinterpret the detailed guidance here.

https://historicengland.org.uk/research/heritage-counts/heritage-and-environment/
and
https://historicengland.org.uk/content/heritage-counts/pub/2020/heritage-environment-2020/

Recycling historic buildings to tackle climate change:
https://historicengland.org.uk/whats-new/news/recycle-buildings-tackle-climate-change/

The RIBA and Climate Action:
https://www.architecture.com/about/policy/climate-action

There are a raft of supporting climate change guidance documents supporting this by the RIBA available here: https://www.architecture.com/about/policy/climate-action/2030-climate-challenge/resources

132. **Historic and cultural environmental assets:** Renewable energy development has the potential to disturb or damage historic or cultural environmental assets, or to adversely affect their setting. Proposals should therefore be accompanied by an assessment appropriate to the nature and scale of the proposal, this might relate to visual impact, or the physical impacts associated with the development of archaeological sites. Ground mounted PV development will be accompanied by the creation or roadways, cable routing and sub-stations. There may also be battery storage facilities and drainage work in addition to the fixing of the PV panel mountings them-selves, all of which have the potential for direct impact on archaeological assets over an extensive area, whether known or otherwise. Similarly, wind turbines may have a relatively small footprint individually, but are also accompanied by roadways and cable routing and associated infrastructure.

Reducing the Need to Travel and Promoting Sustainable Development

133. **Design for active travel priority:** The majority of trips are for only a few kilometres and almost half being less than 10km, even in a relatively rural area. Where possible these trips should be encouraged to be taken either on foot, by cycle or on public transport. The design and layout of a development can contribute to encouraging active travel and the use of public transport. Compact and mixed-use developments with good interconnectivity may encourage active travel if safe, low traffic or traffic free routes are provided and these are potentially more convenient than use of the private car. Further detailed discussion about street design will be published in a guide to planning for streets and places.

134. Convenient motor vehicle routes through developments should be discouraged, directing through traffic around neighbourhoods and avoiding 'rat running'. Developments should encourage pedestrian and active travel permeability and connectivity with existing pedestrian and cycle routes through design features while discouraging vehicle traffic.

135. While traffic-free routes for active travel should be encouraged, the need to consider security and natural surveillance must also be considered.

136. **Priority ambiguity, surfaces and layout:** To encourage active travel and reduce car dependence, the creation of priority ambiguity can assist in enforcing reduced traffic speeds in residential and commercial areas by creating a semi-pedestrianised layout where pedestrians and cyclists are anticipated, and speed limits reduced. Variation in carriageway width and alignment, street trees, staggered frontages and changes in surface treatments can all contribute. Removal of raised kerbs can assist in creating a more pedestrian orientated environment. Physical features and reduced speed limits may also be necessary to remind motorists of pedestrian and cyclist priority, but signage in particular must be carefully considered to prevent clutter and confusion. Derbyshire County Council is undertaking an asset review and reduction programme to review the need for existing signage and identify where signs can be moved or changed to reduce the visual impact. This work will lead to a best practice guide.

137. **Interconnectivity:** Development layout should consider the active travel connectivity both within the development and with adjoining neighbourhoods, existing and proposed active travel infrastructure. Where possible, pedestrian and cycle routes should permeate the development providing convenient access to local facilities including public transport and cycle routes, including the Key Cycle Network and other nearby networks.

138. **Cycle space:** Each dwelling should be provided with space for secure cycle storage, this could be a garage, shed or locker. Provision of secure cycle storage and parking, and where appropriate, shower and changing facilities for cyclists, should be provided at all commercial, community and retail buildings, for staff and where applicable, visitors and those using the facility. Consider the provision of e-bike charging at educational, commercial and community facilities.

139. **Public Transport, Transport Assessments and Travel Plans:** All major developments should include an assessment of public transport demand and demonstrate how the development design will make choice of public transport easier. Pedestrian and cycle routes should be designed through developments to public transport nodes, local destinations and services including schools and shops, encouraging active travel in preference to motor vehicles. Measures to reduce reliance on private cars and increase active or public transport use will contribute to reducing emissions and mitigation.

140. **Live-work Units / Working from Home / Broadband and 5G:** Developments should seek to include mixed uses and support the potential for working from home. High speed broadband connectivity should be considered a high priority. Enabling home working has the potential to make significant contributions to climate change mitigation and locally, improving air quality. Working from home for just 1 day per week can reduce the carbon footprint of an individual's commute by as much as 20%. Although not everyone will be able to work from home, those that can are almost inevitably going to need high speed broadband connectivity. Residential developments should include high speed broadband connection.

141. **Proximity to employment and services:** Arguably the key to minimising journeys is the location of new development in relation to existing service centres.

Strategic Housing and Employment Land Allocation Assessments (SHELAAs) are therefore important tools in considering the relationship between residential, employment and service uses. The potential for connectivity between uses and the demand for transport should therefore form an important part of site allocation. Local Plan policies should place great importance on the location of development in relation to the services needed to support it using, for example, the 20-minute neighbourhood concept [52] encouraging active travel and connectivity with existing pedestrian, cycle and public transport routes.

142. **Ultra-Low Emissions and Electric Vehicles and Vehicle Charging Infrastructure:** Battery electric Vehicles (BEVs) are increasingly popular and from 2030 it will not be possible for manufacturers to place internal combustion engine (ICE) vehicles on the market. Hybrid vehicles will also be restricted from being placed on the market from 2035. Suitable charging infrastructure is therefore likely to be needed in all new developments to meet demand for vehicle charging. All dwellings should be fitted with a smart EV charge point capable of communication with the distribution network to displace charging to those times when renewable generation capacity is available to meet demand, or times when demand is low and capacity is available. Ideally, domestic infrastructure should be based on a 'Fast' charging standard as a minimum (7 - 22KW).

143. Similarly, commercial, retail and educational developments may benefit from the provision of fast or rapid charging infrastructure for a % of staff and customer parking spaces and such provision may contribute to encouraging the transition to electric vehicles.

[52] 20-Minute Neighbourhoods – Creating Healthier, Active, Prosperous Communities. An Introduction for Council Planners in England, TCPA, March 2021.

144. The proliferation of publicly accessible EV charge points will contribute to addressing range anxiety among electric vehicle owners and fleet users. Ideally, charge points will be a minimum of fast charging specification (7-22KW) and universally accessible. Charging hubs and forecourts may seek to provide rapid/ultra-rapid charge points (50-350KW). While applications for the installation of EV charge points or hydrogen fuelling stations should be supported, designated sites and their settings may require specific consideration to avoid unnecessary harm to heritage assets.

7.3 kW domestic electric vehicle charge point.

145. Further information on this topic can be found in the Derbyshire County Council Low Emission Vehicle Infrastructure Strategy and Action Plan and the Manual for Derbyshire Streets. Applications for hydrogen fuelling stations, both private

(associated with business fleet) and public hydrogen fuelling stations should be encouraged and supported.

Securing Enhanced Green Infrastructure, Natural Capital and Biodiversity Net Gain:

146. **Biodiversity and Natural Capital:** All new developments will be required secure a degree of biodiversity net gain[53]. From November 2023 the DEFRA Biodiversity Net Gain Metric should be used in conjunction with an assessment of wider biodiversity issues such as inter-connectivity of habitats, wildlife corridors and landscape character.

147. Existing trees, hedges and biodiversity features of importance that are consistent with the wider landscape character should be retained and considered in the design from the start. A Biodiversity Gain Plan should be submitted with the application and accompanied, where appropriate, by surveys of the site and nearby potentially affected biodiversity assets ensuring that these are taken into consideration and suitable protection, enhancement or, where appropriate and acceptable, offsetting is in place.

148. Green roofs may be considered as a contribution to biodiversity gain and can be included on a wide range of buildings. Where considered, expert advice should be sought regarding the range of plant species used, enabling the roof to function while contributing to local biodiversity value.

149. A Derbyshire Natural Capital Strategy has been commissioned with the objective of fully understanding the state of the natural capital assets, the extent, quality and abundance of the natural environment, and the ecosystem services that we derive from them, taking the word 'environment' in the broadest possible

[53] Environment Act 2021

meaning. The study will explore the pressures that will be exerted on the environment over the coming years, including climate change, and consider the wealth of ecosystem services that will need to be delivered in Derbyshire for society, the economy and the environment to prosper. Central to this will be understanding what ecosystem services will be needed where, and what natural capital assets are required in order to deliver them. The Derbyshire Natural Capital Strategy will therefore become an important reference work for developers and planners when considering the impacts of a proposal on the natural environment and its implications for biodiversity net gain.

150. In terms of climate change, carbon sequestration along with water management, including nutrient neutrality and flood risk will be key elements of natural capital considerations. One of the outcomes of the Natural Capital Strategy should be an understanding of the desirability of different land uses in different areas, according to their current importance for, and future potential to deliver the necessary ecosystem services. This will feed into strategic economic and land use decision making. The Natural capital Strategy will therefore provide the context for the appropriate siting of certain environmental interventions and natural capital enhancements as well as other land uses. Natural Capital decision making therefore has a key role to play in both climate change mitigation and adaptation.

151. **Trees, Landscaping and Public Open Space:** In line with the requirements of the NPPF, designs should take advantage of the climate change benefits of trees, for carbon sequestration, the provision of shade, impact on local air quality and aesthetic benefits contributing to health and wellbeing. Tree planting proposals should take advantage of specialist advice regarding species selection and location in relation to buildings, roads, other infrastructure and wider landscape character. The inclusion of trees and green spaces within a design should be

considered from the start. Adequate provision will be required for the ongoing maintenance of green infrastructure and the aftercare of new planting.

152. **Multiple benefits:** Many measures providing natural capital benefits may contribute to several climate change mitigation, adaptation and resilience goals. Tree planting may provide cooling shade, flood water control and carbon sequestration as well as habitat creation. Similarly, the creation of wetlands as part of a SuDS scheme can contribute towards flood water control, carbon sequestration, habitat creation and potentially assist in achieving nutrient neutrality. The potential importance and contribution of schemes proposed in terms of biodiversity should not therefore be underestimated and should be considered in the wider context of the services that natural capital provides, not least, health and wellbeing.

Managing the Water Environment

153. **Drainage Hierarchy:** The traditional approach of directing drainage to the sewer system or local water course via a network of pipes can no longer be sustained. This approach decreases run off times and prevents groundwater recharge. In addition, rapid transfer of surface water to water courses can lead to downstream flooding and the transfer of pollution. Sustainable Drainage Systems (SuDS) are the preferred option.

154. The drainage hierarchy is:

    i) Surface water drainage should be directed to infiltration as a first priority, including permeable surfaces, swales, flood storage areas, water gardens and soakaways as most appropriate to the character of the wider landscape.
    ii) Surface water should be directed to surface water body through natural run off.
    iii) Connection to an existing drainage system – where capacity exists.

155. **Managing Flood Risk:** Development should be directed to sites which are in low flood risk areas or where adequate flood prevention or mitigation measures can be implemented as part of the development, or else must satisfy the NPPF sequential and exceptions tests as applicable that not only protect the development from flooding, but do not increase flood risk elsewhere. Increased flood severity is a highly likely outcome of climate change and should therefore be taken into account when considering the location of development. The Environment Agency's 3rd annual Assessment Report [54] states that it is impractical to continue to build bigger and higher flood defences to accommodate increasing flood risk. The likelihood and severity of potential flooding must be considered from the outset and high-risk areas should not be considered for development.

156. **Sustainable Drainage Systems:** SuDS are now considered as a standard approach to surface water management. Pathways and private drives should be permeable and public green spaces designed for recreation and surface water attenuation with swales and temporary wetland areas. Attenuation and balancing ponds should be designed with a naturalistic appearance. Avoiding steep sided and enclosed balancing ponds, with over engineered headwalls and fencing which can be unattractive and have reduced ecological value. Well-designed SuDS should form an important element of biodiversity gain and public space provision.

157. Roof water should be directed to soakaways or other SuDS features, and this may be complemented by the use of green roofs to attenuate flow where appropriate.

[54] Living better with a changing climate, Report to Ministers under the Climate Change Act. Environment Agency, October 2021

158. **Managing water demand:** All developments will ideally include technologies designed to reduce the daily water consumption per head as required by building regulations. These may include for example low flow taps, low flush toilets, grey water recycling and rainwater harvesting systems for non-potable water. The Building Regulations (Part G) does enable a water consumption target of 110 litres per person per day in water stressed areas, although the Government Committee on Climate Change[55] has suggested that there is scope for a lower water consumption figure to be applied nationally. The Environment Agency 3rd Annual Report states that the impacts of climate change will exacerbate water stress caused by reduced rainfall, evaporation and abstraction, increased efficiency in water use and demand reduction is therefore likely to be increasingly important and may be considered as measures to 'future proof' a development. All measures to reduce the consumption of water per head in a development should be set out in documents supporting an application.

[55] The Committee on Climate Change, UK housing Fit for the future. 2019

Sustainable Approach to Minerals and Waste Development

159. **Sustainable Transport of Minerals or waste:** The reduction of GHG emissions from mineral and waste transport, particularly road transport, is a high priority. The transport of minerals or waste by more sustainable modes including rail, water, conveyor and pipeline, and the potential to use alternative, low carbon, road fuels should be considered. All proposals for new minerals or waste development, including those at an existing site, should provide climate change mitigation and adaptation measures proportionate to its scale and likely predicted impact. These measures should include sustainable transport planning.

Railway wagons being loaded with crushed limestone, Smalldale, Derbyshire

160. **Site restoration and aftercare:** Site restoration should take place in a phased manner at the earliest opportunity. Where appropriate this may include the provision of renewable energy development and/or contribute to biodiversity net gain taking account of local designations. Mineral development restoration has

the potential to provide carbon sequestration though this must be balanced within the context of landscape character conservation and enhancement and the provision of a coherent and resilient ecological network. It is recognised that any proposals for restoration to uses including the provision of renewable energy schemes are likely to require independent planning approval.

161. **Resource efficiency:** Where proposals include the extension or continued use of an existing site, climate change mitigation, adaptation and resilience measures may be included as site improvement measures.

162. Working methods should maximise efficiency of both plant use and mineral utilisation, minimising waste and increasing the supply of secondary and recycled aggregates, re-use and re-working of minerals from tipped waste minerals. This should include the careful management of soils and overburden to enable reuse in restoration while protecting the characteristics of soils.

163. **GHG management and reduction:** A greenhouse gas reduction plan should be produced, approved and implemented to ensure that as far as practicable, measures to reduce the GHG emissions from the operation are reduced through plant selection and maintenance, working practices and the use of low carbon energy sources and fuels, this may include the provision of electric vehicle chare points and the use of low emissions plant.

164. **Management system certification:** The application of international standards including ISO 14001: Environmental Management, 9001: Quality Management or 50001: Energy Management will provide evidence of externally verified processes and practices contributing to climate change mitigation and adaptation. Operators should be encouraged to use a systems approach to the verification of environmental performance.

165. **Management of the water environment:** The use of potable water and the treatment of wastewater have a GHG cost which should be kept to a minimum. Therefore, water use should be minimised and where possible, water recycling should be implemented.

166. The natural water environment, including groundwater should be protected as a valuable resource and for its contribution to biodiversity. Climate change projections indicate that warmer, dryer summers are highly likely, and this will increase stress on the water environment with implications for both the available resource and impacts on biodiversity.

167. **Biodiversity gain:** As with all developments, proposals for mineral extraction should demonstrate that a net biodiversity gain can be achieved. This may require a degree of adaptation to the impacts of climate change. See comments above paragraph 145 above.

Species rich field headlands

168. Designated areas and, where possible, existing habitats and soils, should be retained. Restoration plans must take account of protected and retained habitat features within and near to the site. These habitats and soils should be conserved and enhanced in restoration proposals.

169. **On-site renewables:** Many mineral proposals may provide opportunities for the generation of renewable energy either during operation or as part of site restoration. Solar or wind energy may be included in plant design while solar PV, ground or water source heat may be exploited as part of site restoration. In the case of existing minerals permissions, where restoration schemes have been agreed, this will require the submission of the relevant planning application for renewables.

170. Where new minerals proposals are brought forward the potential for the inclusion of renewable energy development alongside or following mineral working should be considered.

171. **Application of the Waste Hierarchy:** The waste hierarchy should be applied to all forms of development including minerals and waste. Proposals should include a Site Waste Management Plan detailing how the hierarchy will be applied and residual wastes managed, contributing to operational efficiency.

172. **Flood risk reduction and resilience:** Proposals for the winning and working of mineral resources should, like other forms of development, take account of flood risk and the impacts of flood risk on not only the proposed development, but on other locations. Minerals can only be worked where they exist. Where a risk of flooding exists, the form of development should be resilient to that risk. Development may not be considered acceptable where it will give risk to an increased risk of flooding elsewhere.

Promotion of Renewable Energy Technologies

173. **Solar Technologies:** Panel orientation is important and when including building or roof mounted systems the overall block and plot layout of a proposal will take this into consideration early in the design process. There are also considerations relating to visual amenity and impacts. The positioning, structure and colour of panel mounting fixtures and frames should be given consideration, darker more recessive fixings being the least obtrusive. Panels should not result in excessive glint or glare, they are engineered to absorb light rather than reflect it. Solar slates/tiles may be less conspicuous but are more costly, they may however be considered where affecting the fabric or setting of listed building, in Conservation Areas, the Peak District National Park or Derwent Valley World Heritage Site and buffer zone.

174. **Photovoltaic:** PV panels need to be facing south or within 30^{o} of south to deliver the required efficiency whether roof, wall or ground mounted. PV can be mounted on domestic or commercial buildings. To get close to achieving the CO_2 reductions necessary, all new buildings should include as much renewable energy generation capacity as possible. Solar PV should be maximised on roof spaces. If PV is not to be installed, then the roof structure should be designed and specified to enable the later installation of PV panels capable of a significant contribution to the energy demand of the building. Ideally, building integrated PV will form part of the initial design brief. Where PV and heat pumps are installed together, the PV can contribute to the running of the heat pump, particularly if coupled to a battery system.

175. Ground mounted PV has an important role to play in the future provision of low carbon energy. There are significant location and design considerations in site selection including but not limited to, the impacts of glint and glare on road users and air traffic, food production security, agricultural land quality, the loss of best and most versatile agricultural land and, the ability of a landscape to

accommodate large scale ground mounted PV arrays while minimising the impact on landscape character, areas of multiple environmental sensitivity, and ecological and cultural assets.

176. As with roof mounted and BIPV, arrays must be close to south facing and not overshadowed. Topography will therefore be a locational consideration determining whether or not a site is suitable for ground mounted PV. On a practical level, the availability of a suitable electricity grid connection may prove to be the deciding factor in an applicants' final site selection for large scale solar parks.

177. Although the PV panels themselves are effectively passive, simply absorbing energy from the sun and converting it silently to electricity, the associated inverter, substation and electricity transmission infrastructure required for large scale commercial solar parks does have the potential to generate a low hum often associated with electrical infrastructure. Such infrastructure is therefore best located away from sensitive receptors such as dwellings.

178. **Battery storage:** Large-scale battery storage facilities are not in themselves necessarily a source of renewable energy, they are however often associated with renewable resources as a means of evening out the delivery of electricity to the grid. Batteries can be used to store renewables generated at times of low demand, to be released to the grid at times of high demand and low generation. Battery systems and their associated transformers and inverters can be a source of low frequency noise and should therefore be located away from sensitive receptors or suitable acoustically screened.

179. **Solar thermal:** Potential for inclusion in any development where there is demand for hot water, domestic or commercial. Solar water heating requires a similar

orientation to PV, within 30º of south. Solar thermal and PV may be combined and an assessment as to the most beneficial use of roof space should be undertaken.

180. **Large-scale wind:** Most likely available as off-site, grid connected development or associated with commercial or mineral proposals. The Derbyshire Renewable Energy Study identifies areas where there is a suitably unconstrained wind resource which may have potential to be developed on a commercial scale. It is unlikely that large scale wind turbines will be associated with residential development.

181. Suitable stand-off distances will be required between individual turbines and receptors sensitive to either noise or shadow flicker. The extent of these stand offs will depend on the size of the proposed turbine and its setting.

Wind turbine, Griffe Grange and Bone Mill Quarry, Derbyshire

182. **Small-scale wind:** There may be scope for small scale wind on residential developments but is most likely to be associated with on-farm, rural or commercial developments. Proposals will include landscape, visual and

ecological impact assessments. As with large scale wind turbines, noise and shadow flicker are potentially issues affecting detailed site location, vibration may also be an issue to be considered where small turbines are to be building mounted.

183. **Hydro Power:** The potential for hydro power development in Derbyshire will form part of the commissioned renewable energy study to accompany this guidance. It is however not thought that there is significant potential in Derbyshire. Individual commercial buildings may benefit from small scale schemes where an existing flow control structure exists. The energy potential from a hydro plant is largely a function of flow and head, the vertical distance the water falls. In Derbyshire there are few opportunities for high head hydro schemes. There are a number of weirs on Derbyshire rivers, but these tend to be low head with limited generation potential. Hydro schemes are also regulated by the Environment Agency, requiring an abstraction licence. Where opportunities for environmentally acceptable and commercially viable hydro power exist, these should be exploited where acceptable.

184. **Heat Pumps:** Heat pumps should be specified for residential space heating in preference to fossil fuel boilers, they can operate from a combination of grid connected electricity, battery storage, or on-site renewables. All forms of heat pump-based space heating systems are most suited to installation as part of the original construction of the building as they operate at relatively low temperature and normally take the form of under-floor heating. Retrofitting can therefore be costly and difficult. Air source heat pumps do not require trenching or bore holes. The heat pump is mounted externally and resembles an air conditioning unit.

Air source heat pumps, Over Haddon Village Hall, Derbyshire. Image with permission of Over Haddon Village Hall.

185. Ground Source heat pumps require either shallow trenching to accommodate heat exchanger coils extending over a substantial area of garden or other open ground, or deep bore holes drilled into strata a significant distance below the surface.

186. Similar to ground source heat, water source heat pumps require heat exchanger coils to be located in a water body or in some cases can be installed as an open loop system. Again, as with hydro schemes, these are regulated by the Environment Agency and require a combination of ground water investigation

consent, abstraction licence, ordinary watercourse consent or environmental permit.

187. All heat pump systems require an electrical connection to drive the pump, this can be provided by other renewable energy sources such as wind or PV with backup battery storage or grid connection to enable operation during unfavourable weather conditions. Other forms of low carbon space and water heating may also be considered.

188. **Mine-water heating and geothermal:** Mine-water heat is based on water source heat extraction on an industrial scale, making use of the relatively high temperatures present in deep min-water. Schemes will typically consist of a surface building to house the heat pump and ancillary equipment. Like district heating schemes, the commercial exploitation of mine water heating requires the heat source to be reasonably close to the recipient. The former coal field areas of the county may provide some opportunity for mine water heat to be exploited.

189. Geothermal energy typically comes from either residual heat in geologically active areas or from heat generated from natural radioactive decay. Derbyshire does have some natural 'warm' springs, notably at Matlock Bath and Buxton. The renewable energy study commissioned to accompany this guide is anticipated to provide more information on this topic although the exploitable resource is likely to be small.

190. Where geothermal energy is proposed, development should be accompanied by appropriate geological survey information to establish the viability of the heat source and the impacts of the associated bore hole drilling.

191. **District heating and Combined Heat and Power:** District heating including Combined Heat and Power (CHP) may be feasible where there is either a local heat or fuel source from nearby industrial or agricultural activities. Typically, a district heating system will include ducting from the source to end user, and in place of a domestic boiler, each property will include a controllable heat exchange unit. Alternatives may be comprised of a centralised CHP plant making use of a local fuel source, often a waste from other businesses, providing both heat and electricity to a development.

192. Centralised heat sources may be more suited to industrial or commercial development as the contractual arrangements between heat supplier and end user may be less complex. Where on-site renewables such as air source heating or roof mounted PV are feasible, district heating systems may be less attractive. District heating systems, where considered, will need to be developed and implemented at the time of construction as there is a significant level of infrastructure involved including heat ducting and domestic heat exchangers as well as contractual arrangements for the operation of the system and supply of heat. All of which must be in place before the development can be occupied. The retrofitting of district heating systems is likely to be prohibitively expensive.

193. **Biomass, energy from waste and anaerobic digestion:** A variety of fuel sources based on biomass can be used in heat or combined heat and power systems, including fuel crops, agricultural wastes and industrial or forestry residues. Biomass may be considered to include anaerobic digestion and some forms of energy from waste. Typically, a biomass plant will be used for industrial or commercial energy supply and heating or a centralised energy and heat network for larger developments although small scale biomass boilers are available. The viability of such systems is reliant on the fuel supply chain and therefore needs careful planning. As with district heating systems, a management and

maintenance body is likely to be required. Anaerobic digestion may include farm residues, sewage sludges or fuel crops for a CHP scheme.

194. **Hydrogen Technologies:** Hydrogen is most likely to be considered as a fuel source for industrial processes and fleet vehicles although fuel cell vehicles for the private market are being developed by several car manufacturers and the addition of hydrogen to the domestic gas supply is being considered. The production of hydrogen as a fuel will require a high-capacity electrical connection and either a water or natural gas feed stock. It can only really be considered to be low carbon if generated by the electrolysis of water using renewable energy sources. The UK government has published the 'UK Hydrogen Strategy' setting out a vision for the development of hydrogen production in the UK, both from blue, fossil fuel feed stock and by electrolysis to produce green H_2. Blue hydrogen may provide an easily accessible supply to kick start the development of H_2 vehicles and associated infrastructure but is unlikely to make a contribution to climate change adaptation unless coupled with carbon capture and storage, CO_2 being a by-product of blue H_2 production.

195. Hydrogen fuelling facilities are not considered suitable for residential installation. Proposals for commercial or publicly accessible hydrogen fuelling facilities are likely to come forward as the use of hydrogen is adopted, particularly for public service and both light and heavy goods vehicles. It may therefore be prudent for emerging development plans to include consideration of the requirements for hydrogen fuelling infrastructure to enable its introduction in suitable locations.

196. **Community led Schemes:** Increasingly there are community groups seeking to develop environmental projects such as community funded renewables schemes, allotments, habitat creation or self-build programmes. Such schemes

may be realised through collaboration or association with an enabling scheme but may also form part of allocations for self-build.

197. **Nuclear:** Government energy policy clearly indicates that nuclear fission technologies will play an ongoing part in the energy supply in the UK for the foreseeable future. The development of large-scale nuclear stations, such as that being developed at Hinkley Point in Somerset, take several decades to plan and implement. Their locational requirements are quite specific, and it is very unlikely that a site in Derbyshire could be identified. However, small modular and advanced modular reactors (SMR and AMRs), originally developed for maritime operations, are being considered as an option for onshore energy supply. These modular reactors can be accommodated in a wide variety of locations and deliver energy to the grid in around 5 years compared to 25 to 30 years for a large reactor. The locational requirements for AMR/SMRs are significantly more flexible than for large scale fission generators. The potential for deployment in Derbyshire should be considered.

198. Nuclear Fusion power is also referenced in government energy policy, but so far, no proven, working fusion reactor has been built. Research reactors have generated more energy than used for 'ignition', but to date running times are measured in fractions of a second and energy output is only 'measurable'. While several national and international agencies are conducting research, the development of a commercial fusion reactor is likely to be many years, if not decades, away. However, if successful, fusion will have the potential to provide clean, GHG free energy without the long-term waste management issues or public safety concerns associated with fission. A site for a fusion research and demonstrator facility is being considered in the East Midlands.

Climate Change Planning Guide: Abbreviations

AD	Anaerobic Digestion: The biological digestion of organic material to produce gas (methane) for combustion, also produces a waste material similar to compost and suitable for use as a soil improver.
AMR	Advanced Modular Reactor (Nuclear): Small nuclear reactor similar in scale to those used for marine applications.
AR6	Intergovernmental Panel on Climate Change 6th Assessment Report, 6th annual report of the Conference of the Parties
ASHP	Air Source Heat Pump: Mechanism, similar to a fridge or air conditioning unit, to extract heat from air and concentrate it where needed.
ASHP	Air Source Heat Pump: Mechanism, similar to a fridge or air conditioning unit, to extract heat from air and concentrate it where needed.
BEIS	Department for Business, Energy and Industrial Strategy, UK Government department
BEV	Battery Electric Vehicle: Vehicle operated entirely by electrical battery power.
BIPV	Building Integrated Photovoltaics: Photovoltaic panels built into a building or structure, not free standing or roof mounted, but forming part of the structure. Examples being 'solar tiles'.
BMV	Best and Most Versatile (agricultural land classification)
BNG	Biodiversity Net Gain
BREEAM	Building Research Establishment Environmental Assessment Method
CO_2	Carbon dioxide: Principal greenhouse gas, often used as a measure of global warming potential

CO_2e	Carbon Dioxide equivalent: Any combination of a collection of greenhouse gases expressed as a quantity of carbon dioxide giving the same global warming potential.
COP	United Nations Framework Convention on Climate Change Conference of the Parties
CSH	Code for Sustainable Homes
D2	Derby and Derbyshire
DNC	Designed Net Capacity: The net output of an energy generating installation – total energy output minus the energy needed to operate the system.
DVMWHS	Derwent Valley Mills World Heritage Site
EV	Electric Vehicle: Vehicle operated entirely by electrical battery power.
EVCP	Electric Vehicle Charge Point: Fast: 7-22KW Rapid/ultra-rapid 50-350KW
FRA	Flood Risk Assessment
GHG	Greenhouse Gas
GSHP	Ground Source Heat Pump
h_2	Hydrogen
ICE	Internal Combustion Engine: An engine (or vehicle) powered by an internal combustion engine using fossil fuels.
IPCC	Intergovernmental Panel on Climate Change
KW	Kilo Watt
LED	Light Emitting Diode
LEVIS	Derbyshire Low-Emission Vehicle Infrastructure Strategy

LP	Local Plan
Met Office	UK Meteorological Office
MfDS	Manual for Derbyshire Streets
MMC	Modern Methods of Construction
MWe	Mega Watts electricity
NOAA	United States National Oceanographic and Atmospheric Administration
NP	Neighbourhood Plan
NPPF	National Planning Policy Framework 2021
Passivhaus	Design and specification of dwelling reducing to almost zero the amount of space heating required.
POS	Public Open Space: Area identified in a development plan for use by the public for recreation
ppm	Parts per million: Measure of concentration, used as an expression of the concentration of one substance in a mixture, normally gases in low concentrations where concentrations would be significantly less than 1%. 400ppm = 0.0004%
PRoW	Public Right(s) of Way: Statutory designation of a route for use by the public, including public footpaths and bridleways
PSD	Passive Solar Design: A combination of design features in a building specifically for the capture and retention of heat from the sun, the purpose of which is to reduce the need for additional heating
PV	Photovoltaic (solar electricity): Generally referring to solar panels used to convert sunlight directly into electricity

SAMs	Scheduled Ancient Monuments: Statutory designation of sites, features or buildings of historic cultural importance.
SMR	Small Modular Reactor (Nuclear): Small nuclear reactor similar in scale to those used for marine applications.
SPD	Supplementary Planning Document: Statutory document forming part of the development plan.
SPG	Supplementary Planning Guidance: Non-statutory document providing guidance only, may be developed into an SPD where there are appropriate policies in the development plan, on which the SPG will provide more detailed guidance.
ST	Solar Thermal (Water heating): Panels, normally containing a liquid for heat transfer, used to convert sunlight (infra-red) into heat, normally for water or space heating.
SuDS	Sustainable Drainage System: System of permeable surfaces, swales and water features and ponds to reduce surface water run-off, increase permeability of the ground and encourage groundwater re-charge and slow surface flow in preference to direct, piped connection with sewers or water courses.
UKHS	UK Hydrogen Strategy, August 2021 UK Government policy statement on the development and implementation of hydrogen as a fuel.
ULEV	Ultra-Low Emissions Vehicle: Frequently a hybrid of battery electric or hydrogen fuel cell and internal combustion engine to power a vehicle, greatly reducing the fossil fuel use and reducing emissions. ULEVs can frequently run for short periods in a BEV mode.
UNEP	United Nations Environmental Programme
UNFCCC	United Nations Framework Convention on Climate Change

WP	White Paper: UK Government policy document, precursor to legislation
WTG	Wind Turbine Generator: A wind turbine, device for converting wind energy directly to electricity, either horizontal axis (windmill) or vertical axis (anemometer).