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A Local Plan for

Lancaster District

2020 – 2031

Plan period 2011 - 2031

Exploring Opportunities for a Low Carbon District

[May 2021]

Shaping
a better future

LANCASTER CITY COUNCIL
Promoting City, Coast & Countryside

Contents

1.0 Introduction

1.1.1 Climate Change is an ever-increasing threat to the residents and natural environment of Lancaster District. The Intergovernmental Panel on Climate Change state that anthropogenic carbon emissions have increased immensely since the mid-1800s, because of population growth and economic expansion. They state that this is extremely likely to be the cause of global warming that has been detected since the 1950s. Global warming and climate change have had noticeable impacts. For instance, the frequency and intensity of extreme weather events is increasing, including flooding, droughts, and such. Further effects consist of sea level rise and acidification, snow and ice melt, and temperature increases.

1.1.2 These impacts have cataclysmic repercussions for both the natural and anthropogenic systems. For instance, the extinction of species is accelerating, due to the direct and knock-on effects of climate change. Anthropogenic consequences include escalations of unemployment, disease prevalence, mortality, food insecurity and so forth. These impacts will unceasingly worsen if emissions continue, and they will become irreversible and extreme by 2100 if further action is not taken. This can, however, be prevented if atmospheric carbon dioxide equivalent concentrations stay below 450 parts per million, which would require emissions to reduce to almost zero by 2100, but we are anticipated to reach 450 parts per million by 2036 with current trends.

1.1.3 Lancaster District contributes to anthropogenic emissions, and therefore has the ability to reduce its emissions to mitigate climate change. The largest sources of the District's emissions are on-road, residential buildings, livestock and industrial buildings and facilities. These are areas in which planning can be an agent of positive change, working alongside the Government's ambitions and requirements. Subsequently, this paper begins to explore the actions that planning could adopt, support and encourage, to work towards reducing our emissions.

2.0 Policy and Legislation

2.1 International Agreements

2.1.1 The Paris Agreement, adopted by the UK in 2015, is a legally binding international treaty concerning climate change. The Agreement primarily establishes a requirement for all Parties to reduce their greenhouse gas emissions through nationally determined contributions, in order to mitigate and adapt to climate change. The requirements are further supported by regular reporting on their emissions and implementation efforts. The overarching aim of the Agreement is to keep global temperatures to well below 2^{o}C, preferably 1.5 ^{o}C, compared to pre-industrial levels. The Paris Agreement frames the entirety of the UK Government response to climate change. This includes the elements which function through the planning system.

2.2 Legislation

2.2.1 Domestic legislation is the foundation of numerous powers and responsibilities which contribute to climate change mitigation and adaptation. These include the following:

2.2.2 The Planning and Compulsory Purchase Act 2004, Section 19 (1A) states that "Development plan documents must (taken as a whole) include 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." Section 33A additionally establishes the "Duty to co-operate in relation to planning of sustainable development", with Section 39 requiring that the planning authority preparing a plan, must do so "with the objective of contributing to the achievement of sustainable development."

2.2.3 The Environmental Assessment of Plans and Programmes Regulations 2004 entrenched the Strategic Environment Assessment Directive of the European Union into UK legislation. The legislation outlines requirements for the assessment of environmental impacts for plans and programmes within the scope of the Regulations, including climate change mitigation and adaptation.

2.2.4 The Climate Change Act 2008 commits to reducing the UK's greenhouse gas emissions to net zero by 2050, compared to a 1990 baseline. The Act administered a system of carbon budgeting, established the Committee on Climate Change, encourages activities that reduce or remove greenhouse gas emissions, makes plans for adaptation to climate change, and so forth.

2.2.5 The Planning and Energy Act 2008 allows local plans to "include policies imposing reasonable requirements for—

> (a) a proportion of energy used in development in their area to be energy from renewable sources in the locality of the development;
>
> (b) a proportion of energy used in development in their area to be low carbon energy from sources in the locality of the development;
>
> (c) development in their area to comply with energy efficiency standards that exceed the energy requirements of building regulations."

Section 43 of the Deregulation Act 2015 includes a provision to remove the capabilities of point C, subject to a further statutory instrument. This has not yet been made; hence all these powers remain.

2.2.6 The Building Regulations and Approved Documents establish the obligations and conditions for particular aspects of building design and construction, including those regarding environmental performance. The aspects which implicate climate change mitigation and adaptation are ventilation (Part F), water efficiency, drainage and waste disposal, combustion appliances and fuel storage systems, and conservation of fuel and power (Part L). Part L and F are anticipated to be updated in the Future Homes Standard 2025. Changes to the former would mandate a 31% reduction in CO2 from new dwellings compared to current standards in 2022, followed by a 75% reduction in 2025. Additionally, Building Regulation 26 also explicitly states that "Where a building is erected, it shall not exceed the target CO_2 emission rate for the building that has been approved pursuant to regulation 25."

2.2.7 The Environment Bill was announced in July 2018, but did not receive first reading in the House of Commons until 30th January 2020. It was anticipated that the Bill would come into law in Autumn 2021 but due to the COVID-19 pandemic, progress on the Bill has been put on hold. The Bill is substantial and will legislate significant new governance structures for managing and improving the environment, in conjunction with more specific proposals on waste and resources, air quality, water and nature and biodiversity. Measures are also included to tackle significant environmental challenges including the plastics crisis, biodiversity loss and air pollution. Therefore, the Bill in its entirety should have positive impacts on climate change mitigation and adaptation, albeit without explicit mention.

2.3 National Policy

2.3.1 The 25 Year Environment Plan, released in 2018, explicitly discusses and makes plans for climate change mitigation and adaptation. Its policies more broadly focus on:

- "Using and managing land sustainably
- Recovering nature and enhancing the beauty of landscapes
- Connecting people with the environment to improve health and wellbeing
- Increasing resource efficiency, and reducing pollution and waste
- Securing clean, productive and biologically diverse seas and oceans
- Protecting and improving the global environment"

Climate change is discussed across all of these themes, thus it is evident that the Government are supportive of a low carbon agenda.

2.3.2 The Government's Ten Point Plan for a Green Industrial Revolution, released in 2020, sets out expectations for:

1. Advancing Offshore Wind
2. Driving the Growth of Low Carbon Hydrogen
3. Delivering New and Advanced Nuclear Power
4. Accelerating the Shift to Zero Emission Vehicles
5. Green Public Transport, Cycling and Walking
6. Jet Zero and Green Ships
7. Greener Buildings
8. Investing in Carbon Capture, Usage and Storage
9. Protecting our Natural Environment
10. Green Finance and Innovation

The entirety of this document is based upon mitigating and adapting to climate change, accelerating our path to net zero, but points 5, 7 and 9 specifically impact local planning authorities. Points 1 and 3 are also of particular importance with the District's strategic location as a site of wind and nuclear power opportunities.

2.3.3 There are many other government strategies that have been recently published and are relevant to this topic, such as:

- Bus Back Better: national bus strategy for England – Department for Transport, 2021
- Energy white paper: Powering our net zero future - Department for Business, Energy and Industrial Strategy, 2020
- Gear Change: A bold vision for cycling and walking – Department for Transport, 2020
- The Road to Zero: Next steps towards cleaner road transport and delivering our Industrial Strategy - Department for Transport, 2018
- The Clean Growth Strategy: Leading the way to a low carbon future – Department for Business, Energy and Industrial Strategy, 2017
- The Industrial Strategy – Department for Business, Energy and Industrial Strategy, 2017

2.4 Planning Policy

2.4.1 The National Planning Policy Framework (NPPF) sets out the "Government's planning policies for England and how these are expected to be applied." It's primary purpose is to achieve sustainable development. This means that the planning system is comprised of three overarching objectives, being economic, social and environmental objectives. The latter is defined as an objective "to contribute to protecting and enhancing our natural, built and historic environment; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy." The Framework also establishes a presumption in favour of sustainable development. Furthermore, chapter 14 explicitly addresses 'planning for climate change', emphasising the ways in which local planning authorities should address mitigation and adaptation.

2.4.2 The Planning Practice Guidance is a series of online documents which advise on compliance with national planning policy and legislation. There are various documents applicable to creating a low carbon future which considers climate change mitigation and adaptation. These include:

- Air Quality
- Climate Change
- Effective Use of Land
- Environmental Impact Assessment

- Flood Risk and Coastal Change
- Green Belt
- Housing: optional and technical standards
- Natural Environment
- Renewable and low carbon energy
- Strategic environmental assessment and sustainability appraisal
- Transport evidence bases in plan making and decision taking
- Travel Plans, Transport Assessments and Statements
- Waste
- Water supply, wastewater and water quality

2.4.3 The Government consulted on National Model Design Codes in early 2021, with the intention to create "more beautiful places [which] requires a greener approach, with more energy efficient buildings, integrating with the natural environment and contributing positively to the net zero carbon target by 2050." If this was to be enforced, there is the explicit intent that this would be done so to assist in the creation of low carbon developments.

2.4.4 The Government additionally consulted on a 'Planning for the Future' White Paper in 2020. The aim of this document is to reform the planning system. It immediately acknowledges that the planning system is central to combating the challenges climate change, with the intention that this reformed planning system would "most effectively address climate change mitigation and adaptation and facilitate environmental improvements."

2.4.5 Lancaster District Local Plan was adopted in 2020, consisting of the Strategic Policies & Land Allocations DPD and the Development Management DPD. The latter contains policies that are used to assess and ultimately determine planning applications for development. Due to the Council's Climate Emergency declaration, 32 of these policies immediately went under review. These fall under the categories of green and blue infrastructure, transport, water management, heritage, and sustainable design, energy efficiency and renewable energy. This study will help to inform most policies under review in some capacity.

3.0 Lancaster District in Context

3.1 Climate Change Impacts

3.1.1 Greenhouse gas emissions have been rising since the industrial era. This has led to significant warming since the mid-20th Century. Atmospheric carbon dioxide concentrations stood at 410.5 ± 0.2 parts per million in 2019, with a 1.2^{0}C ± 0.1^{0}C increase in global temperatures detected in 2020, compared to pre-industrial temperatures. The Paris Agreement aims to limit global warming to well below 2^{o}C, preferably 1.5 ^{o}C, compared to pre-industrial levels. The average yearly increase in atmospheric carbon dioxide concentrations over the last decade is 2.37 ppm per year. Therefore, at current rates, 1.5 ^{o}C warming (estimated at 430 parts per million) will be reached by 2028, and 2^{o}C warming (estimated at 450 parts per million) will be reached by 2036.

3.1.2 The increase in greenhouse emissions cause changes in the hydrological cycle, warmer land and air, warming oceans, melting ice, rising sea levels, ocean acidification, global greening, changes in the ocean currents, and more extreme weather. These are already wreaking havoc across the world. These physical changes to the climate system result in food insecurity, risk to water supply, conflict, climate migration, localised flooding, flooding in coastal regions, damage to marine ecosystems, failing fisheries, biodiversity loss, changes in seasonality, heat stress, increase in habitable region for disease-carrying pests, increased forest mortality and risk of fires, and damage to infrastructure.

3.1.3 In the UK, we can expect warmer and wetter winters, hotter and drier summers, and more frequent and intense weather extremes. The Met Office predict that the UK, by 2070, will have 60% drier Summer's, being 1-6^{0}C warmer, and 30% wetter Winter's, being 1-4.5^{0}C warmer. 2020 in the UK was the third warmest year on record. Winter 2019 – 2020 was particularly warm and wet, with three named storms bringing widespread flooding damage and disruption. Together, these storms contributed to the wettest February on record.

3.1.4 Following this was a remarkably sunny and dry April and May. England had its driest May on record, and it was the sunniest spring by some way. Increased public demand and low rainfall meant some areas were concerned about water shortages in early June, particularly in north-west England, as it is more reliant on surface water supplies, thus naturally less resilient to exceptionally low rainfall.

3.1.5 Summer was more unsettled, with some areas receiving well above average rainfall – restoring river levels and reservoirs, alongside delivering 3 notable heatwaves in June and August. The heatwaves were noteworthy for particularly warm temperatures at night. 16 'tropical nights' were recorded – where the temperature remains above 20^{0}C. These conditions used to be rare in the UK and are particularly harmful to health. It is believed that 2556 deaths occurred due to these three heatwaves – nearly three times the figures from events in 2019 and 2018. Heat-related mortality in persons older than 65 years increased by 21% between 2004 and 2018 in the UK. Autumn then saw the wettest day on record in the UK on Saturday October 3rd – with widespread heavy rain from Storm Alex.

3.1.6 Human induced climate change has made every major heatwave analysed so far in Europe in recent years (2003, 2010, 2015, 2017, 2018 and 2019) more likely and more intense. The Arctic heatwave in June 2020, with temperatures of 38°C in Siberia, would have been 'almost impossible' without climate change. City dwellers are also more exposed to extreme heat due to the Urban Heat Island effect, which can lead to city temperatures being up to 5^{0}C warmer than surrounding areas.

3.1.6 However, the number one climate change risk in the UK is not heatwaves, but flooding. Approximately 1.8 million people in the UK are living in areas at significant risk of flooding – a number which could increase by over 40% to 2.6 million by the 2050s. There has been a long-term trend of increased high river flows over the last five decades, which is most noticeable in the North and West of the UK. It is likely that anthropogenic greenhouse gas emissions have already increased flood risk in the UK and we will continue to experience more frequent and extreme events. More severe rainfall is expected as a warmer atmosphere holds more moisture. For around every 1^{o}C of warming, the atmosphere holds an extra 6 - 7% of moisture and could result in a similar increase in rainfall. However, this relationship may be underestimated – with changes in rainfall intensities reflecting a 12%–14% increase in moisture per degree. The experience of more frequent and intense flood events in the UK is having, and will continue to have, significant impacts on our health. Such impacts range from death due to drowning, injuries, vector-borne and waterborne diseases, to depression and post-traumatic stress disorder.

3.1.7 There are also 1.63 million people living in coastal communities that are at risk of being affected by a 1 metre rise in sea level. These risks threaten people's and communities' health, including livelihood security, water quality and supply, safe drinking water availability, soil quality and supply, crop yields, and disease vector ecology.

3.1.8 The threat of climate change and its associated impacts have, and will intensively continue to, affect the District and its population. Therefore, it is imperative to consider all measures which can be taken to reduce emissions and adapt to extremes to limit the risk.

3.2 Lancaster District Emissions and Sources

3.2.1 There are three types of emissions. Scope 1 emissions are direct emissions from owned or controlled sources in the District. This covers stationary combustion (such as heating sources and fuels), mobile combustion (vehicles owned/controlled by a firm burning fuel), fugitive emissions (being leaks from greenhouse gases, such as refrigeration) and process emissions (released during industrial processes and on-site manufacturing). Scope 2 emissions are indirectly produced by the District, through the purchase of electricity, heat and steam. Scope 3 emissions are all other indirect emissions that occur in a value chain. This includes purchased goods and services, employee commuting, business travel, waste disposal, use of sold products, transportation and distribution, leased assets and franchises, and investments.

3.2.2 Lancaster's subsector inventory summary for 2018 total all scope emissions are shown in Figure 1. The largest subsector by far is on-road emissions, at 448,783 tonnes of carbon dioxide equivalent (tCO_2e). This was 0.1% of the UK's 2018 emissions alone. Followed by residential buildings at 242,688 tCO_2e, livestock at 156,944 tCO_2e and industrial buildings and facilities at 118,949 tCO_2e.

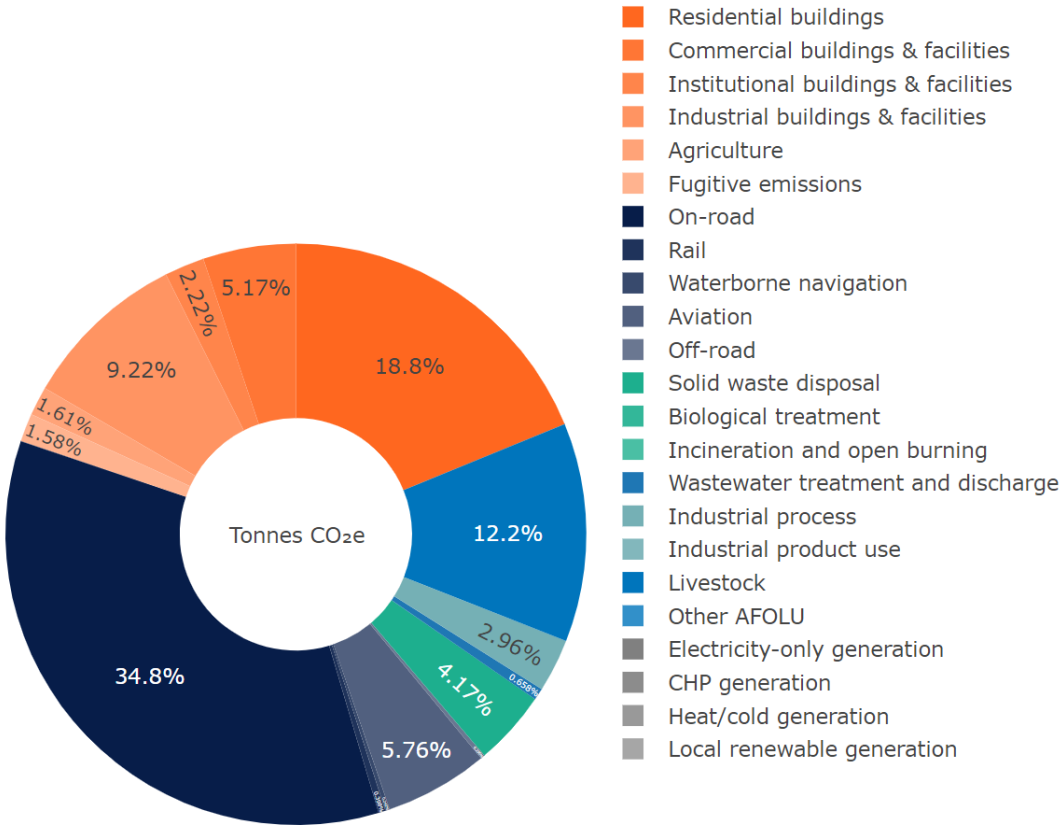


Figure 1: Lancaster District's total emissions. Scatter Cities Data.

3.2.3 Planning can positively impact these high emission sectors in a multitude of ways. For example, in new developments it can require renewable energy generation to produce clean energy and/or higher energy efficiency standards to reduce energy consumption, both of which reduce scope 1 and 2 emissions by reducing fossil fuel production and consumption. Planning can lead to improvements in walking and cycling infrastructure, which encourage modal shift and active travel, to reduce car use, and therefore on-road emissions. It may allocate land more appropriately or encourage land use change to create more efficient land use in agriculture to reduce livestock emissions. It could impact

scope 3 emissions by requesting the use of local suppliers and low carbon materials, recycling and reusing of demolished material, and the organisation of waste management plans.

3.2.4 Given the extent of the District's emissions, it is critical that all avenues that can reduce these emissions are explored.

4.0 Energy Efficiency

4.1 Introduction to Energy Efficiency

4.1.1 Energy efficiency is about how we can waste less of the gas and electrical energy we consume. Being energy efficient reduces our energy consumption, thus reducing emissions, and this subsequently decreases the cost of energy bills. Energy efficiency is determined through the fabric components of a building, including air permeability, insulation, window glazing, building orientation, ventilation, building layout, window size and orientation, and so forth.

4.2 Energy Efficiency Regulations for Domestic Dwellings

4.2.1 For new buildings, energy efficiency requirements are established in the national building regulations, namely Part L: Conservation of Fuel and Power and Part F: Ventilation. However, Local Authorities are able to set higher standards if they wish, as per the Planning and Energy Act 2008. New dwellings are then given an Energy Performance Certificate (EPC) rating from A (most efficient) to G (least efficient).

4.2.2 The Government are anticipated to introduce an uplift to the Part L standards in 2021, with the aim for new dwellings to produce 31% less CO2 emissions from regulated energy, compared to current 2013 standards. This would come into effect in 2022 and involve minor fabric improvements to improve energy efficiency. This uplift would be an interim requirement, prior to the introduction of the Future Homes Standard in 2025. This aims for new dwellings to produce 75-80% less CO2 emissions from regulated energy, compared to current 2013 standards. These homes require higher fabric standards for increased energy efficiency, such as triple glazing (versus double glazing of the Part L uplift), but still relies on some low carbon technology to reach the emissions target. These homes are described as 'zero carbon ready' for when the grid decarbonises.

4.2.3 However, it is possible to reach approximately 75% less emissions entirely through fabric standards, by constructing the highest energy efficiency level house. This would require the use of the highest fabric efficiency measures, including:

- Very high levels of insultation
- Extremely high-performance windows with insulated frames
- Airtight building fabric
- 'thermal bridge free' construction
- A mechanical ventilation system with highly efficient heat recovery

This is generally known as the Passivhaus standard. Passivhaus homes additionally can become net zero carbon (from regulated energy), with bolt-on technology, such as solar PV, to produce the little energy it does use.

4.2.4 Introducing these measures for new development will contribute to reducing the District's second-largest emissions source, being residential buildings which account for 18.8% of the District's emissions. This can be furthered through retrofitting of the existing housing stock as well.

4.3 Viability Assessment for Domestic Dwellings

4.3.1 External viability consultants have undertaken a viability assessment of delivering these four levels of fabric standards for energy efficiency. They are summarised below in Table 1:

Table 1: Summary of optional energy efficiency standards for buildings investigated by Three Dragons.

Measure	Emissions savings on current standards	Cost uplift on current standards
Part L 2021	31%	4% (c£4-6.5k per unit)
Future Homes Standard 2025	75%	11% (c£11-18k per unit)
Passivhaus	75%	4% (c£4-6.5k per unit)
Passivhaus plus	100% potential	7% (c£7-11k per unit)

4.3.2 Therefore, the most cost-effective means of achieving the Government's targeted emission savings, are by implementing the Part L 2021, followed by Passivhaus in 2025. This would further provide time for the necessary upskilling and supply chain improvements which are required to implement Passivhaus standards on a large-scale. As Passivhaus plus is still 4% lower in cost compared to the Future Homes Standard, it is also considered that it is reasonable to expect its implementation before the end of the Plan period to maximise carbon reductions. Furthermore, as the supply chain and skills improve, the costs will decrease.

4.4 Energy Efficiency Regulations for Non-Domestic Buildings

5.4.1 For new buildings, energy efficiency requirements are established in the national building regulations, namely Part L: Conservation of Fuel and Power and Part F: Ventilation. However, Local Authorities are able to set higher standards if they wish, as per the Planning and Energy Act 2008. New buildings are then given an Energy Performance Certificate (EPC) rating from A (most efficient) to G (least efficient).

4.4.2 The Government are anticipated to introduce an uplift to the Part L and F standards in 2021, with the aim for new dwellings to produce 27% less CO2 emissions from regulated energy, compared to current 2013 standards. This would come into effect in 2022. This uplift would be an interim requirement, prior to the introduction of the Future Buildings Standard in 2025. At the time of writing, an emissions reduction target has not yet been disclosed for the Future Buildings Standard. These buildings will require low-carbon heating and hot water systems to meet the targets, alongside fabric improvements, but the diversity of non-domestic buildings means that the solutions required to meet the Future Buildings Standard will vary across the building mix. These buildings are to be 'zero carbon ready' for when the grid decarbonises.

4.4.3 Introducing these measures for non-residential development will contribute to reducing the District's fourth and sixth-largest emissions sources, being industrial buildings and facilities accounting for 9.22% of the District's emissions, and commercial buildings and facilities at 5.17%.

More detail can be found in the Energy Efficiency evidence paper.

5.0 Low Carbon Construction

5.1 Construction Industry Impacts

5.1.1 The construction industry in the UK accounted for 21 million tonnes of carbon in 2016, including all emission scopes. These emissions result from the operational energy used in the construction process, operational energy for on-site staff facilities, the use of generators, employee commuting, the

distribution and transport of materials, the embodied carbon of materials and so forth. The latter arise from the manufacture and acquisition of materials and are a prominent source of emissions in construction; it can represent over half of the whole life carbon impacts for an energy efficient new building. Yet, whilst 6% of the UK's annual emissions are due to embodied carbon from construction, they are largely unrecognised in importance.

5.2 Low Carbon Materials

5.2.1 The World Green Building Council suggests that "all buildings and infrastructure projects should achieve at least a 40% reduction in embodied carbon by 2030". This means that we need to be building with lower carbon materials.

5.2.2 The embodied carbon of a material can be measured in different ways. The first is measuring 'cradle to gate' emissions. These are the carbon emissions produced from resource extraction, manufacturing, transport and so forth, until the material leaves its production factory. However, others sometimes incorporate delivery to site, construction, repairs, demolition, landfill scenarios and so forth, known as 'cradle to grave', and if recycling processes are accounted for it is recognized as 'cradle to cradle'.

5.2.3 However, estimating cradle to grave/cradle involves making assumptions about subsequent life cycle events which are presently unknown. Therefore, results may be greatly inaccurate. Furthermore, transport and end of life processes differ considerably for every individual construction project. Accounting for the recycling of a material at its eventual end of life point can also drastically reduce its embodied carbon, regardless of the emissions produced in its cradle-grave stage, so it is not always an accurate representation.

5.2.4 The World Green Building Council recommends that architects, designers and constructers use One Click LCA software to calculate cradle to gate embodied carbon impacts, with opportunity to participate in a benchmarking scheme - similar to EPC ratings. This information can be used to build skills and knowledge, adjust design and procurement decisions, for carbon offsetting, to inform future project designs and so forth, all leading to the reduction of embodied carbon.

5.2.5 The most efficient, practical ways to reduce embodied carbon is through refurbishing existing buildings, reducing material use, reusing materials from deconstructed buildings, and using low carbon materials. See the embodied carbon reduction pyramid in Figure 2.

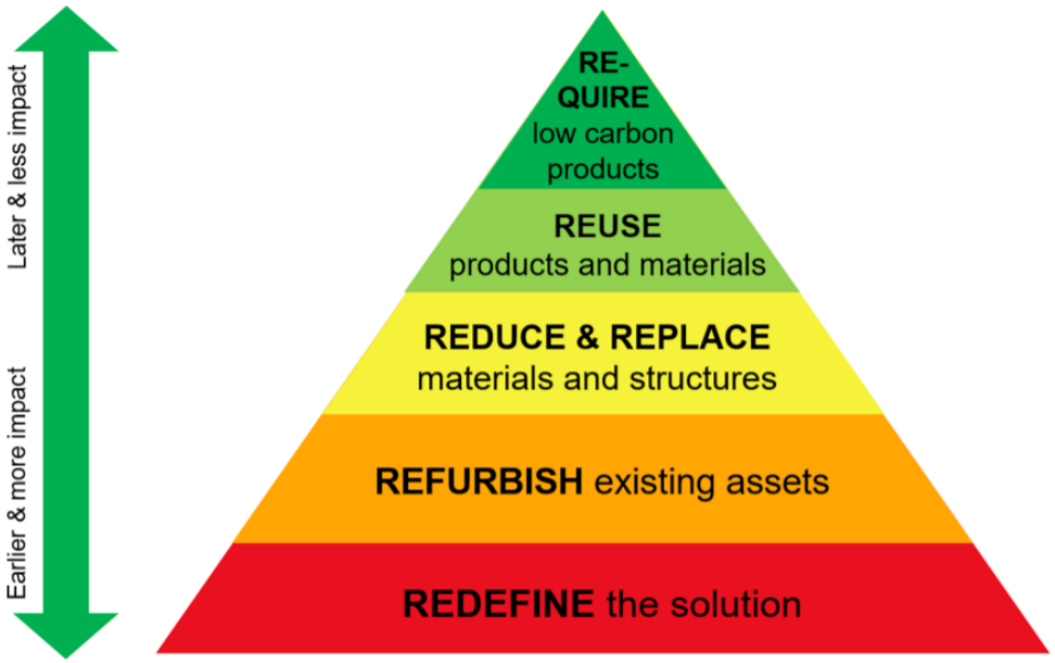


Figure 2: Embodied carbon reduction pyramid. CNCA and OneClickLCA.

5.2.6 The highest embodied carbon materials used in projects are often steel and concrete. Steel can be replaced with cross-laminated timber for structural elements, which natural requires less concrete in the foundations and less insulation due to its lighter weight and insultation properties, further reducing embodied carbon. The concrete can then use supplementary cementing materials, of which there are many, such as fly ash from coal plants or even vegetable fibres and other agricultural waste. This reduces the amount of Portland cement required in concrete, thus reduces the embodied carbon. Fly ash and blast furnace slag can also be compacted to create low carbon blocks, as an alternative to traditional clay bricks. There are flooring systems and plasterboards available made from recycled materials.

5.3 Modern Methods of Construction

5.3.1 Modern Methods of Construction (MMC) is a term used to describe a range of offsite manufacturing and onsite techniques that provide alternatives to traditional house building. The 2017 Housing White Paper expressed support for the contribution MMC is expected to make to helping solve the nation's housing crisis and achieve the step-change in housing output that is required. It highlighted the potential for a 30% improvement in the speed of construction of new homes through the adoption of innovation, with a potential 25% reduction in costs, as well as the potential for advances in improving quality and energy efficiency.

5.3.2 There are multiple ways in which emissions are reduced from adopting MMC, this includes:

- Wastage is monitored more easily and therefore minimised through the process of production. A study by KLH Sustainability, concluded that modular results in over 45% reduction in material use and over 50% reduction in waste generation, compared to traditional construction.
- Offsite manufacturing minimises the time and operational energy spent on site. Therefore, minimising pollution and disruption at a site level.
- HGV movement reduces over 40% at construction sites for modular construction, compared to traditional construction.

- MMC workers are likely to live more local to a specific factory, minimising travel. Focusing populations in specific locations additionally allows for greater uptake in active travel in those areas, thus further minimising the impact on the environment.
- Materials, particularly those used in panelised and volumetric modular systems, can be more readily reused in MMC, than those used in traditional structures. These materials are also more often cross-laminated timber, with a lower embodied carbon than traditional materials.

5.3.3 The Citu home, based in Leeds, is an excellent example of how to build low carbon homes using MMC and with regard for embodied carbon, amongst other considerations like energy efficiency. Citu Studio has the capacity to produce 750 homes per year, with their online platform allowing for different configurations of house types, finishes and fittings by prospective buyers. Citu homes have triple glazed windows and light wells, bamboo floors, timber frames, recycled glass wool insulation, achieves air tightness ten times greater than UK building, have MVHR systems, co-owed solar arrays to produce energy, and some even have green roofs; all to reduce energy consumption, improve clean energy production, and reduce embodied carbon. With the timber frame, each house stores 23 tonnes of carbon and prevents the emissions of 88 tonnes of CO2, compared to building an equivalent masonry house; roughly equivalent to removing 19 cars from the road. The wall insultation at a u-value of 0.1 W/(m2K), is much improved on the current typical new build u-value of 0.3-0.6 W/(m2K). Thus, Citu homes are three times better at retaining heat than an average new build. Whilst Citu homes maximise the opportunities for a low carbon home, it exemplifies the multiple avenues that can be taken to achieve some level of carbon reduction.

A Citu development in Leeds. Citu.

6.0 District Heating

6.1 Introduction to District Heating

6.1.1 At present 37% of the UK's greenhouse gas emissions is accounted for by heating, industrial processes, cooking, provision of hot water or through the heating of space. District heating can be an important way to decarbonise heating and reduce greenhouse gas emissions. There is growing recognition that district heating and cooling networks can make a contribution towards meeting our future thermal energy demands in areas where heat density is sufficiently high to develop networks that can provide heat at affordable costs. Where such networks are allied to a low carbon heat source, it also offers the opportunities to support the decarbonisation agenda.

6.1.2 District heating systems use a network of pipes to deliver heat from a place where heat is generated to multiple customers where heat is used. The heat is typically in the form of hot water and is transported through a network of pre-insulated underground pipes. The heat may be generated in an energy centre using a range of technologies (for instance surplus heat recovered from an energy from waste facility or other industrial plant, water source heat pump, gas combined heat and power (CHP), solar thermal, biomass etc).

6.1.3 The network can fulfil two functions. Firstly, it can provide heating with hot water being taken out of the energy centre and distributed to those homes and businesses within the network. However, the network can also fulfil a cooling role with cold water returning to the energy centre providing the opportunity to cool buildings. This can be particularly beneficial where there is a high number of energy efficient buildings within the network which would benefit from low-carbon cooling opportunities in summer months

6.2 Opportunity in the District

6.2.1 A 'Heating Mapping and Masterplanning in Lancaster' study was undertaken in 2019 by Element Energy. The data and mapping collected identified a series of clusters where potential heat networks could be investigated. Key characteristics of these clusters included:

- High volume of heat delivered.
- High heating and/or cooling demand density.
- Deliverability: including high levels of engagement, presence of planned new development and strong local planning policies for heat networks.
- Proximity to low carbon heat source(s).
- Potential for innovative district heat network systems.
- Mix of user types to provide steady level of heat demand.

6.2.2 The study identified demand for heating in Lancaster City Centre, which is concentrated at Lancaster Royal Infirmary and the University of Cumbria Campus. North of the River Lune the main heat users are Salt Ayre Sports Centre and Lancaster & Morecambe College. There is also demand identified in both Morecambe and Heysham, however heat users in these areas are more widespread, meaning that any network provided would have to be extensive in length (and consequently facing greater installation costs). Significant users in the Morecambe area include the Bay Leadership Academy and properties off Regent Road in the West End. Lancaster University is also a significant heat user, but has an existing district heating system.

6.2.3 A key element in identifying opportunities for heating networks is finding heat sources to power such a network. Whilst stand-alone energy centres can be delivered to power a heating a cooling network, there are significant benefits to finding existing heat sources where heat is a continual and secure output. For instance, this could be heat which is generated from manufacturing purposes, energy generation or treatment processes. An example of a heat source identified in the District is Lancaster Waste Water Treatment Works.

6.2.4 Seven potential heat sources were identified, and subsequently eight clusters were determined as potential heat network sites. See Figure 3 below.

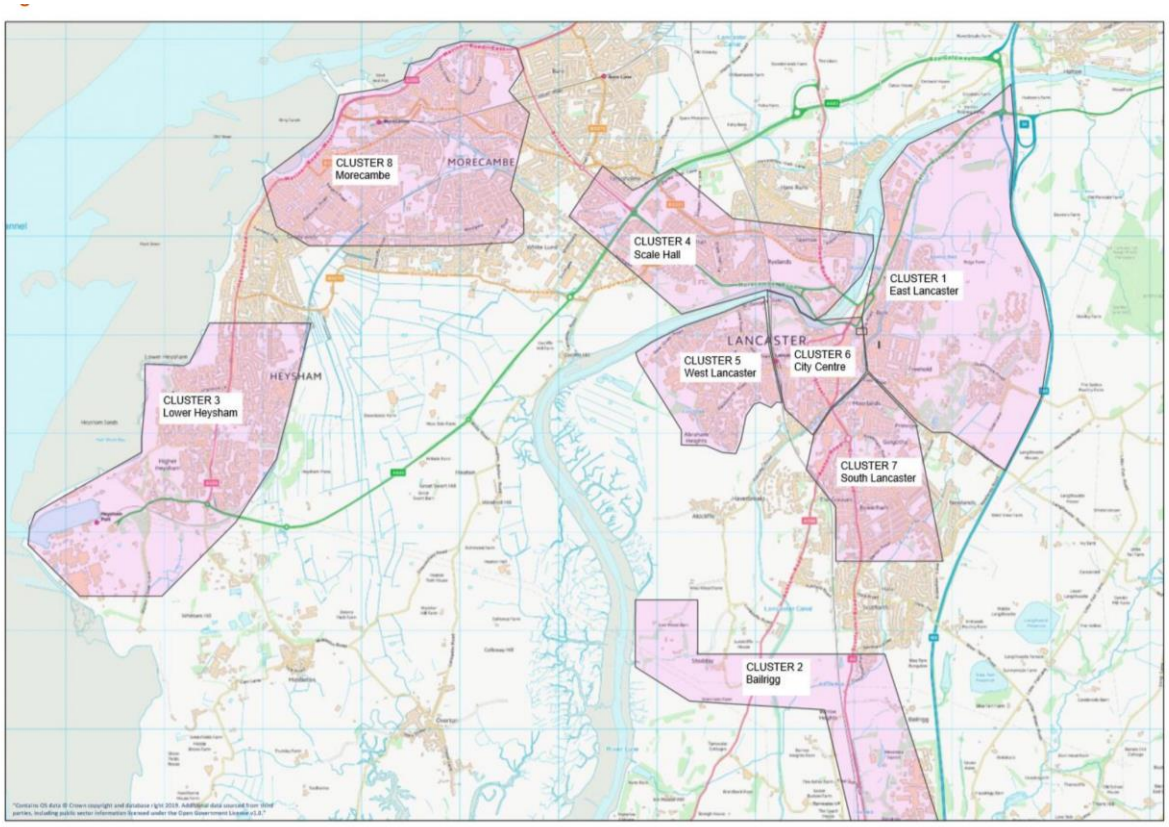


Figure 3: Indicative Clusters for Potential Heating and Cooling Networks. Element Energy, 2019.

6.2.5 This study provides a critical piece of evidence which demonstrates that there are clearly a number of opportunities to support heating and cooling networks across the district which can be achieved through new development or, alternatively through Council-led projects. This study demonstrates that, subject to other planning considerations, the inclusion of district heating and cooling networks within the Local Plan process is both justified and effective.

Greater detail is provided in the District Heating Study.

7.0 Renewable and Low Carbon Technologies

7.1 Meeting Government Targets

8.1.1 Whilst a Fabric First approach to producing low carbon development is preferable, as it reduces energy consumption, there are alternative means of achieving the Government's emissions reduction ambitions for development. This is through employing renewable and low carbon technologies. This includes:

- Air source heat pumps
- Ground source heat pumps
- District heating systems
- Solar hot water panels/systems
- Solar Photo Voltaic systems
- Wind turbines
- Hydropower systems
- Biomass

- Combined Heat and Power Systems
- Rainwater harvesting systems
- Grey water recycling systems
- Low energy light and appliances
- Waste-water heat recovery systems
- Mechanical ventilation with heat recovery systems

7.1.2 Some of these technologies are implemented on a micro-scale only (defined as having a capacity of 45kW for micro heat (thermal) and 50kW for micro-electricity), others on a macro-scale only, and some can be applied domestically or on a large scale. However, they all contribute to reducing emissions related to energy production.

7.2 Renewable Energy Technology

7.2.1 To reach the 2050 net zero target, we must decarbonise the grid. This involves producing more renewable energy, particularly as electricity demand could double; see Figure 4. Renewable technologies include solar hot water systems, solar PV systems, wind turbines, hydropower and biomass. However, the latter is not overly encouraged by the Council due to issues regarding air quality and the sustainability of biomass material sources. These technologies can be applied either on a micro or macro scale.

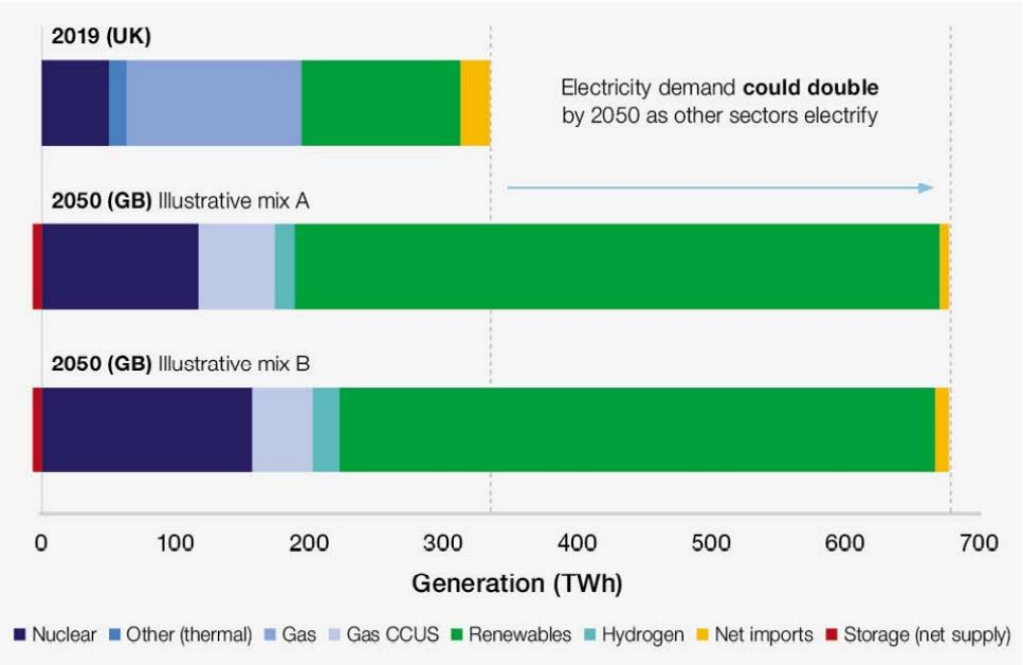


Figure 4: Electricity mix today and illustrative 2050 mixes. Energy White Paper Powering our Net Zero Future, December 2020

7.2.2 Renewable technologies play a clear role in achieving a low carbon future, and they provide the opportunity to offset what energy is used within a building, whether domestic or non-domestic, in existing or new buildings. Although, whilst there is clearly opportunity to encourage increased deployment of renewable energy technologies through positive planning policies and potential local targets, amendments to permitted development rights has meant that many micro-renewable energy schemes no longer require planning permission. Therefore, whilst micro-renewable schemes are not under the remit of the Local Plan Review, they are greatly encouraged. Macro-renewable schemes

require planning permission, but are encouraged where appropriately sited and of an appropriate scale.

7.3 Low Carbon Technology

7.3.1 Low carbon technologies are also essential in achieving a low carbon future. Low carbon technologies include air source heat pumps, ground source heat pumps, district heating systems, combined heat and power (CHP) systems, rainwater harvesting systems, grey water recycling systems, waste-water heat recovery systems and mechanical ventilation with heat recovery systems.

7.3.2 All of the listed technologies, excluding district heating systems, can be deployed on a domestic scale. CHP systems can also be applied on a larger, communal scale when utilizing a district heating system. Please refer to the previous section for more information on district heating networks.

7.3.3 There is opportunity to encourage increased deployment of low carbon technologies through positive planning policies and potential local targets. However, as with renewable technologies, amendments to permitted development rights has meant that many domestic low carbon technologies do not require planning permission. Therefore, whilst domestic schemes are not under the remit of the Local Plan Review, they are greatly encouraged. Larger scale schemes require planning permission, but are encouraged where appropriately sited and of an appropriate scale.

7.4 Funding

7.4.1 There are multiple financial initiatives that can be accessed to support domestic upgrading to renewable and low carbon technologies. The first of these is the Smart Export Guarantee. Until April 2019 members of the public and business were able to access the Governments Feed in Tariff (FIT) for schemes up to 5MW capacity and was designed to encourage smaller renewable electricity installations. Different technologies were given different amounts of support. The FIT guaranteed an income from renewable energy installations for 20 years (25 years for PV). Whilst this is now closed existing schemes are still receiving payment until the end of their 20/25-year contract. The Smart Expert Guarantee was announced in January 2019 and is designed to replace the FIT. This pays households for the excess renewable electricity that they generate but do not use themselves. It covers the following technologies:

- Solar PV
- Wind
- Hydro
- Micro CHP
- Anaerobic digestion

Individuals must sign up to an energy supplier to obtain this payment. These then set the tariffs that get paid and whether they are set at a fixed or variable rate.

7.4.2 The Renewable Heat Incentive (RHI) supports renewable energy technologies that produce heat, rather than electricity. Similar to the FIT, the RHI is designed to compensate for the additional costs of using renewable heating technologies in place of conventional heating technologies. Technologies eligible to receive the RHI support include biomass boilers, ground source heat pumps, air source heat pumps and solar thermal panels. Introduced in April 2014, the RHI will be closed to new applications from March 2022. Those already signed up will continue to receive payments for 7 years.

7.4.3 In April 2020, the Government launched their proposals for the Clean Heat Grant, the successor to the RHI. The intention is that this will be targeted at households and small non-domestic buildings to support the installation of heat pumps and in certain circumstances biomass. The Clean Heat Grant is expected to begin in April 2022, with funding committed for two years, to March 2024. Further

details will be announced after the analysis of the consultation which ended 5th March 2021. The proposal suggests a flat rate £4000 grant for technologies eligible under the scheme.

7.4.4 At the time of writing, there is no Government funding available to contribute to the initial investment cost of domestic renewable and low carbon technologies, as was recently available under the Green homes grant. This was available to homeowners or residential landlords and could have be used towards the costs of installing energy efficient improvements to homes, this includes the installation of low carbon heating. Applications must have been received by the 31st March 2021. The grant must be claimed, and the improvements installed and completed by the 31st March 2022.

7.4.5 For large scale schemes, the Rural Community Energy Fund (RCEF) is a £10 million programme which supports rural communities in England to develop renewable energy projects, which provide economic and social benefits to the community. RCEF provides support to rural communities in two stages:

- Stage 1: Grants of up to £40,000 for a feasibility study for a renewable energy project
- Stage 2: Grants of up to £100,000 for business development and planning of feasible schemes

Similarly to the micro scheme incentives, this is not a grant to cover the purchase of the technology itself.

7.5 Delivery

7.5.1 Presently, renewable and low carbon technologies are not often provided in new developments. However, a survey by Redrow Homes showed that 63% of would-be homebuyers want to purchase a more environmentally friendly home, while 82% said they were willing to pay more for one. Therefore, we would encourage developers to offer these technologies to the purchaser at the point of sale, as a particular kitchen specification would be.

7.5.2 Furthermore, with the Government's intentions to mandate a 31% reduction in CO2 from new dwellings compared to current standards in 2022, followed by a 75% reduction in 2025, it must be considered how this is to be achieved. Due to the current skills gap in high energy efficiency home construction, the Government intend to meet this initial 31% target by providing some level of greater fabric standards, but relying on the implementation of low carbon heating sources, such as air source heat pumps, or solar PV systems to account for the shortfall. Additionally, even in homes of the highest fabric standards which reduce around 75% of emissions, they will require the use of technology, such as solar PV, to become net zero carbon.

Please refer to the macro- and micro- renewable energy generation paper for further evidence and information on this subject. We intend to identify the existing and potential capacities of the varying scales of renewable and low carbon technologies in the District, to better inform the potential generation and suitability of areas in the District to support the transformation to renewable and low carbon technologies.

8.0 Opportunities to Design for Mitigation and Adaptation

8.1 Designing for Mitigation and Adaptation

8.1.1 We are already experiencing climate change, as evidenced earlier. Increased rainfall events, rising sea levels and warmer seasons are both a challenge and opportunity to reconsider how we plan, deliver, adapt and use our spaces. If we do this successfully and swiftly, we can assist in futureproofing our villages, towns, cities and regions from the more severe and costly impacts of climate change. Subsequently, we can encourage places to be healthier, happier, just and thriving.

8.1.2 With the net zero carbon 2050 target, we recognise that we can both support and expand our understanding of the practical and creative ways in which places can facilitate this ambition. It is important to consider a whole place approach to this net zero carbon challenge. Through revising how we live, move about, use space, support local business, and become more self-sufficient, we can consider varying ways to reduce emissions, alongside adapting to the impacts of climate change.

8.2 Water Management

8.2.1 Considerations in design for water are key to adapting to climate change impacts, notably flooding. A house should be built with an extra floor on the ground level, acting as stilts, to prevent valuables being damaged by flooding. Plug sockets in a home should also be installed at 70cm above floor height on the ground floor, to ensure the electrics are not damaged in the event of flooding. These designs must also be mindful of those with disabilities, to create accessible, as well as adaptable, homes. Inside a home, it is additionally important to install water efficient appliances, to keep water consumption rates at 110 litres or less per person per day, to ensure a sustainable clean water supply. Failure to do so may cause water shortages, particularly in times of drought.

8.2.2 Water consumption can also be reduced through installing rainwater harvesting tanks. These collect and store rainwater, which is most often used in the garden during drier spells. This water would otherwise flow into the drain, therefore the tanks also alleviate flooding. The system may also be used for flushing toilets, amongst other uses. Similarly, greywater recycling reuses the water from showers, baths, hand washing, dishwashers and washing machines primarily for flushing toilets; this again reduces household water consumption and has the same benefits aforementioned.

8.2.3 Outdoors, there are many design options to manage water to reduce flooding. Green roofs and walls on the building are partially or completely covered with vegetation and a growing medium, planted over a waterproofing membrane. It may also include additional layers such as a root barrier and drainage and irrigation systems. They reduce and slow rainwater run-off by retaining water in the plants and growing medium, thus slowing and reducing the amount of rainwater entering the sewage system and drains, consequently reducing flooding. As green roof/wall plants mature and root systems grow, water retention may increase. Likewise, rain gardens achieve the same outcome through the same process, but on the ground.

8.2.4 Infiltration can further be assisted by the installation of soakaways. These are square or circular excavations, filled with rubble or lined with brickwork, pre-cast concrete or polyethylene rings/perforated storage structures surrounded by granular backfill. They can also be grouped and linked together to drain large areas, such as highways. These provide stormwater attenuation (capturing the rainwater for slow release) and treatment, and groundwater recharge. Thus alleviating flooding by temporarily storing water in heavy rainfall, whilst assisting the natural process of recharging underground water sources.

8.2.5 Water can also be stored in retention ponds, which provide both stormwater attenuation and treatment. Well-designed retention ponds will also support emergent and submerged aquatic vegetation along their shoreline. Runoff from each rainfall event is detained and treated in the pond, which controls flow rates as water is stored and slowly released once flooding has passed.

8.2.6 Swales are also used in water management. Swales are linear grass covered depressions which transports surface water run off overland from the drained surface to a storage or discharge system. It additionally provides temporary storage for storm water, thus reducing peak flows. Similarly, bioretention areas are shallow landscaped depressions, which are typically under drained and rely on engineered soils, enhanced vegetation and filtration to remove pollution and reduce run off

downstream. They reduce the volume and rate of run off from frequent rainfall events, as well as treating it.

8.2.7 A significant driver of flooding is the use of impermeable surfaces which prevent the natural flow of water into the ground. This can be combatted by the use of pervious surfaces. A pervious surface could be porous or permeable. Porous surfaces allow for water infiltration across the entire surface. Permeable surfaces are themselves impervious to water, but voids formed through the surface allow the infiltration of water.

8.2.8 As evidenced, there are many design options which are able to adapt to climate change impacts associated with droughts and flooding, which can improve our resilience to these events. For more information, please refer to the Water Management paper.

8.3 Energy Efficiency

8.3.1 As previously discussed, there are multiple design measures which improve the energy efficiency of a buildings, such as very high levels of insultation, airtight building fabric, and a mechanical ventilation system with highly efficient heat recovery. These measures all reduce energy consumption, and therefore emissions, which contributes to mitigating climate change.

8.3.2 Siting and orientating the building to maximise solar gains for heat and light additionally reduce energy consumption, as does the use of light wells or sky lights. Similarly, green roofs have insulation properties, decreasing heating demand. These fabric measures can be enhanced through the use of the highest efficiency electrical appliances and fixtures and equipping a building with a smart meter; further reducing energy consumption.

8.3.3 As evidenced, there are many design options which can mitigate climate change through reducing consumption.

8.4 Renewables and Low Carbon Technology

8.4.1 The inclusion of renewable energy in a development mitigates climate change through producing and consuming clean energy, rather than consuming energy from fossil fuels. Installing low carbon technology has a similar outcome, as it reduces the amount of fossil fuels consumed, thus reducing emissions. These include:

- Air source heat pumps
- Ground source heat pumps
- District heating systems
- Solar hot water panels/systems
- Solar Photo Voltaic systems
- Wind turbines
- Hydropower systems
- Biomass
- Combined Heat and Power Systems
- Rainwater harvesting systems
- Grey water recycling systems
- Low energy light and appliances
- Waste-water heat recovery systems
- Mechanical ventilation with heat recovery systems

8.4.2 As evidenced, there are many design options which can mitigate climate change through producing and consuming clean energy.

8.5 Green Infrastructure

8.5.1 Green Infrastructure, as defined in the proposed National Planning Policy Framework, is "a network of multi-functional green and blue spaces and other natural features, urban and rural, which is capable of delivering a wide range of environmental, health and wellbeing benefits for nature, climate, local and wider communities and prosperity."

8.5.2 Recreational and accessible green space, such as parks and gardens, mitigate climate change as they absorb carbon dioxide from the atmosphere, which consequently reduces atmospheric greenhouse gases. These spaces additionally assist in adaptation to climate change as expanding green space and maintaining its quality in urban areas stabilises the microclimate and improves air quality which mitigates heat extremes, as a result of climate change impacts. Open green space also manages surface water run-off providing storage for excess water, particularly in urban areas. They can also temporarily store storm water and aid with infiltration. Lining streets with trees additionally improves air quality, stabilises microclimates, and provides shading to mitigate heat extremes and reduce the urban heat island effect, alongside managing surface water run-off through interception, uptake and infiltration which assists in flood adaptation. Furthermore, allotments decrease the risk of food insecurity by increasing self-sufficiency and enhancing soil quality which reduces stresses caused by climate change.

8.5.3 Similarly, peatlands, wetlands and woodlands are all green space which play a crucial role in absorbing carbon dioxide from the atmosphere, thus reducing emissions and mitigating climate change. Ensuring peatland, wetland and woodland existence, maintenance and creation reduces flood risk as they increase the water retention capacity and intercept rainfall, which slows the infiltration process. Preserving and enhancing the natural ecological structure reduces vulnerabilities and increases resilience of ecosystems and biodiversity to climate change impacts. This enhances and prolongs the mitigation and adaptation measures mentioned above. Moreover, cultivating diverse forests reduces the risk of fires, an increasing threat of climate change impacts.

8.5.4 How we design and consider the landscape is also important in mitigation and adaptation. As mentioned, green space will absorb carbon from the atmosphere, which mitigates climate change. However, also using appropriate agricultural and forestry practices increases water retention capacity, subsequently reducing flood risk in urban areas, and thus adapting to climate change impacts. Further regarding agriculture, livestock account for 12.2% of the District's emissions. However, using agricultural land more efficiently can reduce this.

8.5.5 Green roofs, as previously discussed, have multiple benefits for mitigation and adaptation regarding water management and energy efficiency. However, they also provide benefits as a green space. Green roofs and walls absorb carbon, therefore mitigating climate change. Furthermore, they create a natural habitat for wildlife which reduces vulnerabilities and increases resilience of ecosystems and biodiversity to climate change impacts, and improve air quality and stabilise microclimates to mitigate heat extremes and reduce the urban heat island effect.

8.5.6 As evidenced, there are many design options which can mitigate climate change through the existence, expansion and enhancement of green space, and are able to adapt to climate change impacts associated with heat extremes, droughts and flooding, which can improve our resilience to these events.

8.5.7 The existing green infrastructure spaces within the District can be seen in Figure 5. Having an awareness of these spaces allows us to examine where there is opportunity for enhancement.

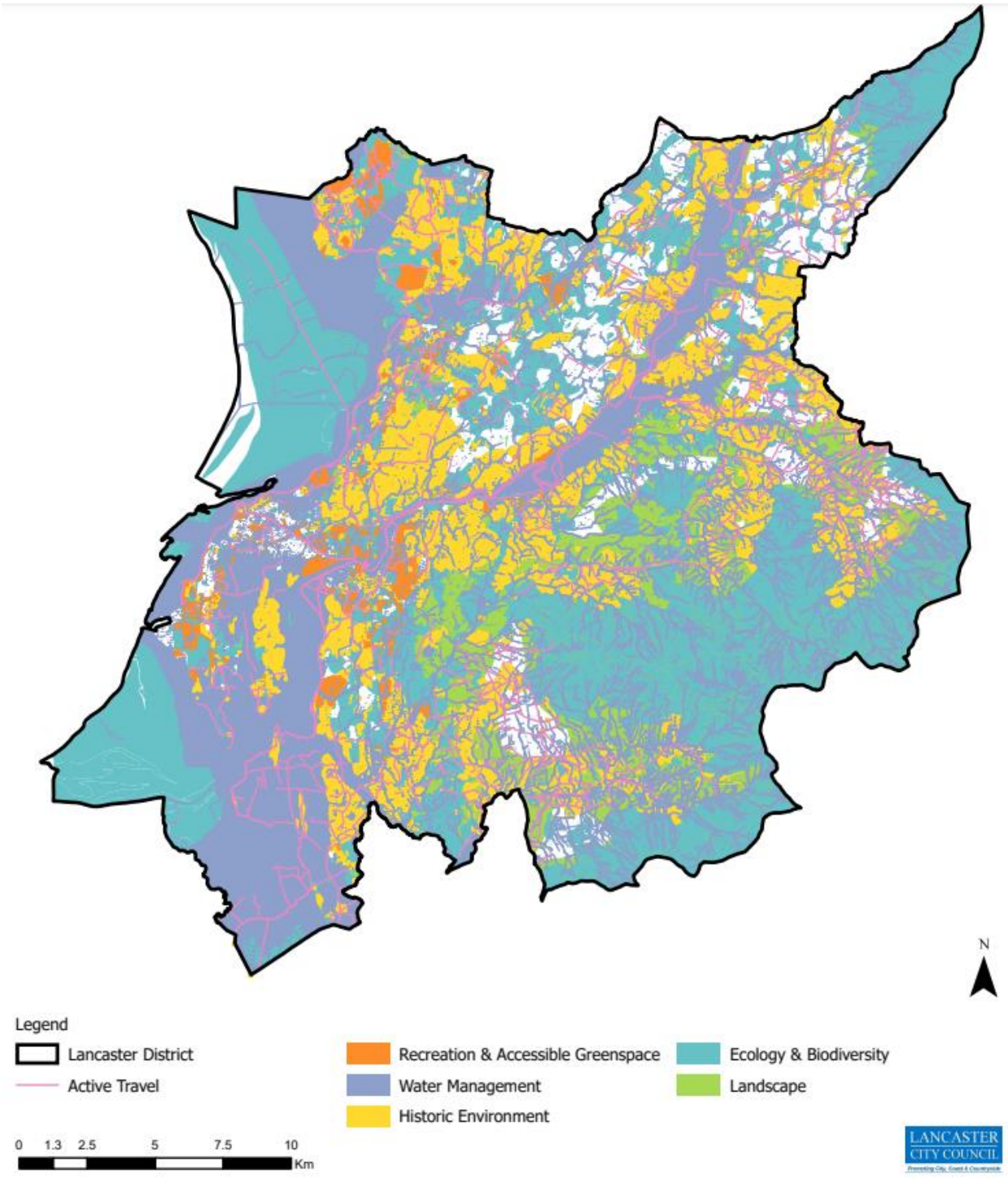


Figure 5: The existing green and blue infrastructure network in Lancaster District.

8.6 Sustainable Transport

8.6.1 Designing to prioritise sustainable transport, including walking, cycling, public transport and electric vehicles, can have a great impact in mitigating climate change, through reducing emissions. Presently, on-road emissions are the largest source of Lancaster District's total carbon dioxide equivalent emissions, accounting for 34.8%.

8.6.2 Modal shift must be prioritised to reduce these emissions. This requires improvements to the walking and cycling network, such as creating larger pathways with frequent sheltered stop points for both pedestrians and cyclists, which include charging for electric bicycles and such, or establishing new cycle lanes on roads, with distinguishable natural barriers for protection from cars.

8.6.3 Access to public transport must also be improved. This may be designating sustainable travel-only zones, particularly in areas of the poorest air quality, such as city centres. It may also involve assigning increased public transport stops, to be accessed by anyone within a 5-minute walk; approximately every 400m. These access points would benefit from secure bicycle storage at slightly further intervals, to encourage mixed modes of sustainable transport. Secure bicycle storage could also be provided in new developments to support this shift.

8.6.4 Creating connections to the existing walking and cycling network in new developments would also contribute to mitigating climate change, as it would greater encourage this shift. As would the creation of car-free zones, or limited car parking. Similarly, the installation of electric vehicle charge points would ease the shift to electric vehicle use, as it would improve convenience, which is often prioritised when it comes to transport.

8.6.5 These measures prioritising modal shift will design out the dependency on cars, which will subsequently reduce emissions, and therefore mitigate climate change.

8.5.6 Figure 6 demonstrates the existing and aspirational cycle route network in the District, showing cycle pathways exclusively. Having an awareness of these spaces allows us to examine where there is opportunity for enhancement and expansion, to support modal shift.

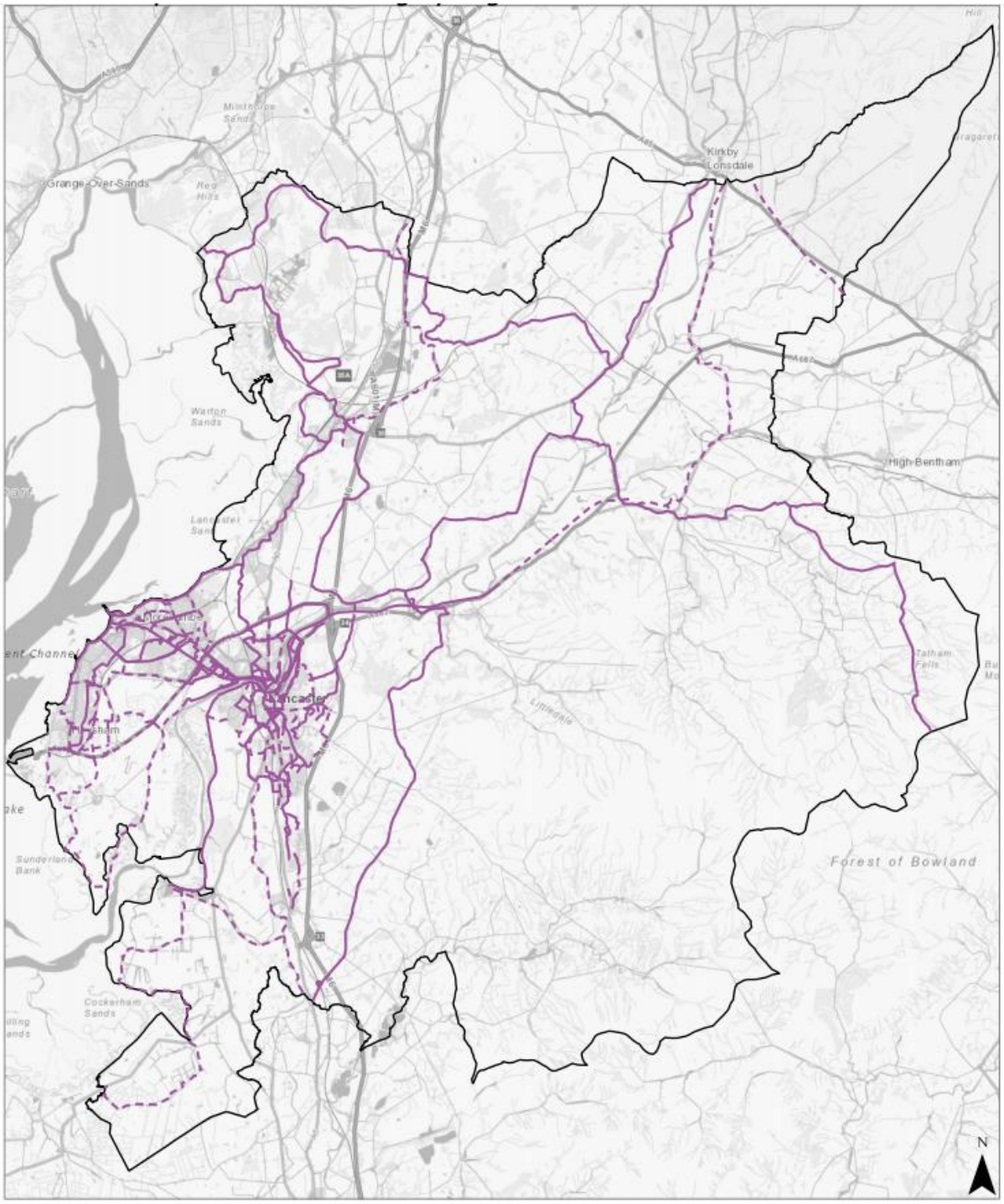
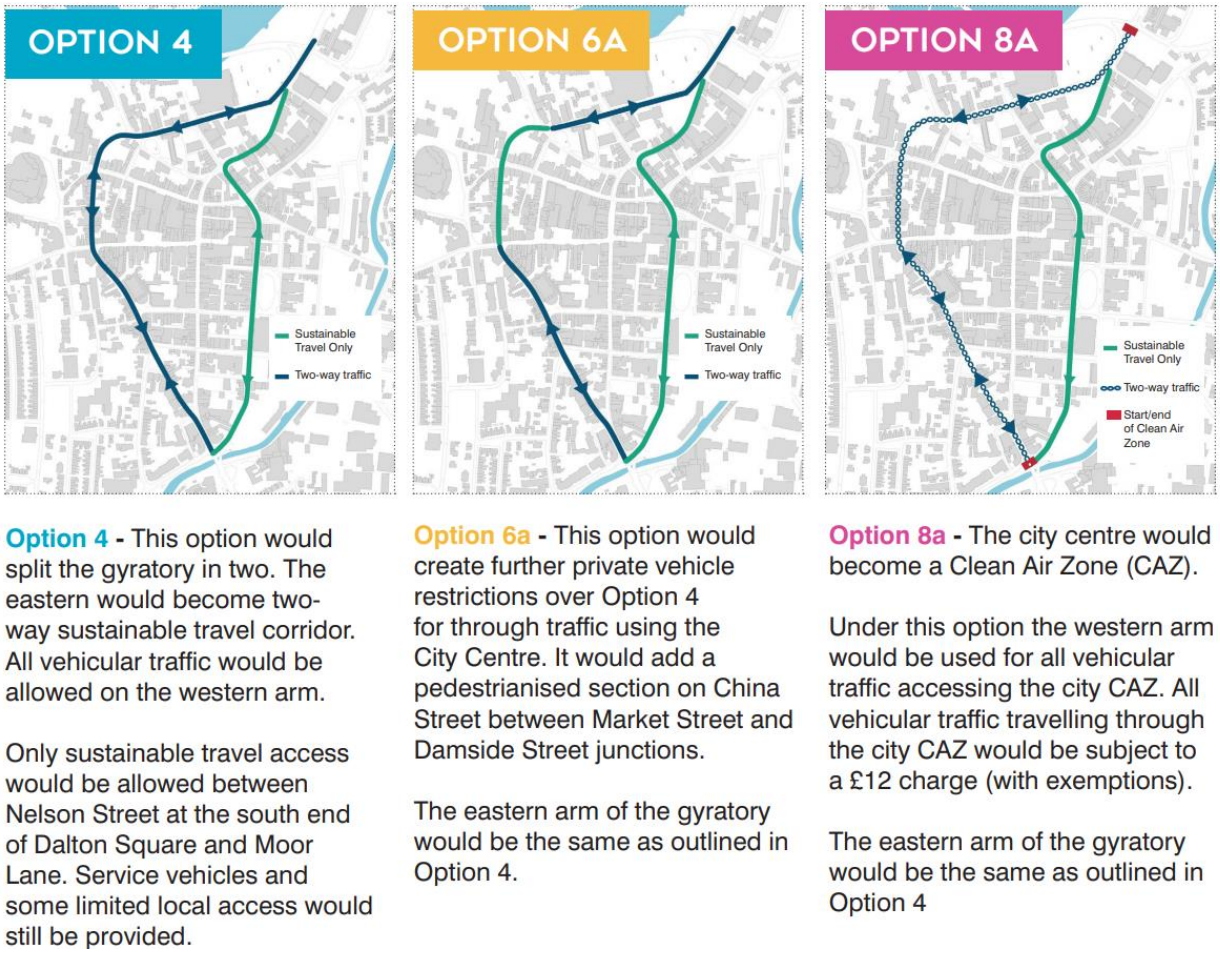


Figure 6: The existing and aspirational cycle route network in Lancaster District.

8.5.7 Figure 7 looks at the possible route options as identified in the February 2021 consultation on the Lancaster City Centre Movement and Public Realm Strategy. The strategy follows principles set out in the District of Lancaster Highways and Transport Masterplan that proposed a city centre with less traffic, better air quality and improved sustainable travel. Route 4 consists of a sustainable travel corridor in the east, which would split the gyratory system in two, with two-way traffic for vehicles allowed on the western arm, and the eastern arm prioritised mainly for sustainable travel. Route 6a consists of no through city centre traffic which would limit through-traffic using the city centre. The eastern arm of the gyratory would be prioritised for sustainable travel with the western arm allowing two-way traffic for access with a section at China Street being fully pedestrianised. Alternatively, route 8a consists of a city centre clean air zone which would see the city centre become a Clean Air Zone (CAZ), with a congestion charge for all vehicles travelling through the city centre except for exemptions. Use of the gyratory would also be split between vehicles subject to the congestion charge, and a sustainable travel corridor.



Option 4 - This option would split the gyratory in two. The eastern would become two-way sustainable travel corridor. All vehicular traffic would be allowed on the western arm.

Only sustainable travel access would be allowed between Nelson Street at the south end of Dalton Square and Moor Lane. Service vehicles and some limited local access would still be provided.

Option 6a - This option would create further private vehicle restrictions over Option 4 for through traffic using the City Centre. It would add a pedestrianised section on China Street between Market Street and Damside Street junctions.

The eastern arm of the gyratory would be the same as outlined in Option 4.

Option 8a - The city centre would become a Clean Air Zone (CAZ).

Under this option the western arm would be used for all vehicular traffic accessing the city CAZ. All vehicular traffic travelling through the city CAZ would be subject to a £12 charge (with exemptions).

The eastern arm of the gyratory would be the same as outlined in Option 4

Figure 7: Lancaster City Centre Movement and Public Realm Strategy consultation route options.

8.7 20-minute Neighbourhood

8.7.1 A 20-minute neighbourhood is a complete, compact and connected neighbourhood, where people can meet their everyday needs within a short walk or cycle. The idea of the 20-minute neighbourhood presents multiple benefits including boosting local economies, improving people's health and wellbeing, increasing social connections in communities, and tackling climate change.

8.7.2 Within a 20-minute neighbourhood you would typically find:

- Education centres for all ages
- Pharmacies
- Medical centres
- Community centres
- Grocery stores
- Play areas
- Open green space
- Natural green space
- Sports centres
- Diverse, accessible and affordable homes
- A well-connected walking and cycling network
- Local food production

8.7.3 There are both economic and social benefits to 20-minute neighbourhoods, but there are also benefits for climate change. Creating walkable environments, with energy efficient homes, that use low carbon heating sources, existing in a greener environment, has all the mitigation and adaptation benefits previously mentioned. 20-minute neighbourhoods also go further in encouraging us to live locally in all aspects, which can drastically reduce individual's and the District's carbon footprint.

8.8 General Home Features

8.8.1 There are some more general design features which adapt our buildings to climate change. These include reflective blinds to prevent overheating indoors, which can be assisted by ceiling fans to reduce indoor temperatures, white roofs can reflect sunlight and create a cooling effect, and insect screens will prevent disease vectors, such as mosquitos, entering homes.

8.8.2 Other general design features can mitigate climate change. This includes low carbon materials, as previously discussed, built-in recycling bin storage in kitchens to reduce waste and therefore emissions, and community compost sites to reduce food waste, and again decrease emissions.

8.8.3 As evidenced, there are many design options which can mitigate climate change through the existence, expansion and enhancement of green space, and are able to adapt to climate change impacts associated with heat extremes, droughts and flooding, which can improve our resilience to these events.

9.0 Carbon Offsetting

9.1 Introduction to Carbon Offsetting

9.1.1 Carbon offsetting is compensating for carbon dioxide emissions arising from an activity, which in this regard is development, by participating in schemes designed to make equivalent reductions of carbon dioxide in the atmosphere, for example large scale tree planting projects like the One Million Trees project.

9.1.2 Carbon offsetting could occur on a development site. For example, policies may require onsite renewables or planting, which would be a direct offset contribution. Alternatively, contributions could be made to an offset fund, which is controlled by the Council, which would then be used to fund green infrastructure and afforestation projects, retrofitting of the existing housing stock, and support renewable energy and low carbon projects across the District.

9.1.3 The immediate aim of offset funds is to achieve carbon savings. However, there are multiple co-benefits to this approach. These wider economic, social and environmental advantages include:

- Fuel poverty alleviation
- Decreasing energy bills
- Enhancing air quality
- Health improvements for residents
- Development of innovative technologies
- Reducing operation costs for small- and medium-sized enterprises
- Generating local employment and increasing skills

9.2 Carbon Offset Funds through Section 106 payments

9.2.1 Carbon offsetting is achievable through currently planning legislation and guidance, as has been successfully done in a number of local authorities. In these authorities, carbon offsetting has been used to meet zero carbon standards in a more cost-effective way for them. It has allowed these authorities to achieve a greater carbon reduction overall when on-site offsetting requirements have not been technically possible.

9.2.2 The one-off payments made by a developer are based on a 30-year period; being the assumed lifetime of many carbon reducing technologies. Alongside this, it is often assumed that the electricity grid will be de-carbonised within this 30 year period, and therefore offsetting schemes will no longer be necessary.

9.2.3 Carbon offsetting payments are collected through "Section 106" agreements. These are legal obligations entered into by developers to mitigate the impacts of a development proposal. They are used to fund infrastructure that is required to support the development or mitigation to make an otherwise unacceptable development acceptable, in planning terms. For example, new residential developments place additional pressure on existing social, physical and economic infrastructure in the surrounding area. Developer contributions aim to balance this extra pressure with improvements to the surrounding area to ensure that a development makes a positive contribution to the local area (for example, contributions towards education, providing areas of open space or highway improvements).

9.2.4 Once a carbon offset fund has been established, a price for carbon is set. This is usually a price per annual tonne of carbon. A suitable range of projects are then identified which can be supported through the carbon offsetting fund. On the submission of a planning application, a developer must provide, for example:

- a calculation of what the carbon shortfall is
- a commitment stating that any shortfall identified will be met off-site
- confirmation of the offsetting approach which will be taken; being payment into an offset fund, or an off-site project if this has been agreed with the Local Planning Authority.

9.2.5 There are no restrictions as to who can be a recipient or beneficiary of offset funds, providing that the project aligns with the Local Planning Authority's identified priorities for offset funds. Recipients may include local businesses, public sector organisations, community organisations or not-for-profit organisations. It is also possible for individual households to receive or benefit from funding. However, this will significantly increase the administrative burden for investing carbon offset funds, hence Local Planning Authorities may choose to devote funds via community and public sector organisations to target their benefits to certain groups, such as the fuel poor.

9.3 Case Studies

9.3.1 Islington Council's zero carbon and offsetting policy has been operating since 2012. They use these funds to retrofit the existing housing stock. Once the contribution is collected via the Section 106 agreement, the energy strategies submitted by developments, which outline the anticipated carbon shortfall of the site and the offset payment that the developer will pay, is reviewed by the Energy Services Team. This team is additionally responsible for identifying projects to receive the funding, subsequently prioritising them according to their feasibility and Islington's wider aims, for example alleviating fuel poverty and minimising the area's contribution to climate change. Projects are recommended to Islington's Affordable Energy Board for sign-off, then the Energy Services Team deliver projects and report progress to the Board.

9.3.2 Southwark Council presently implements planning policies that require high standards in new residential development. This includes a requirement for carbon emission savings of, at minimum, 35% against the 2013 Part L building regulations: for all major developments. This can be achieved through fabric and technological measures, but, when the target is demonstrated to be not possible on-site, carbon offset payments will be taken in lieu to meet the target off-site. Current payments are set at £95 per tonne of carbon dioxide per year over a period of 30 years.

9.3.3 Bristol's Local Plan review draft policies in it's 2019 consultation includes the opportunity for carbon offsetting. A draft policy outlined that 'development will be expected to achieve a minimum 10% reduction in regulated CO2 emissions through energy efficiency measures, and a minimum 35% reduction in regulated CO2 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'. This policy also establishes payments at a rate of £95 per tonne of carbon dioxide per year over a period of 30 years. However, this policy differs from those above by establishing targets for energy efficiency and renewable energy measures, to be met alongside the offsetting scheme.

9.4 Prioritising On-site Reductions

10.4.1 As featured in Bristol's draft policy, it is important that energy efficiency and renewable energy measures are prioritised, to directly reduce carbon emissions and maximise these savings. There are also considerable risks involved in carbon offsetting.

9.4.2 If the payment rate is set too high, the increased costs for developers will limit development, or transferred to homeowners in higher house prices. Much of the country is in the midst of a housing crisis, with an undersupply of homes, declining affordability levels for households on average incomes and declining levels of home ownership. A primary objective of the Government is for the planning system to significantly increase house supply to address these problems. Subsequently, local planning authorities are required to forecast and meet the housing needs of their and are tested on the actual delivery of housing against their intended housing trajectory. Therefore, local planning authorities must do their utmost to meet the District's housing needs, which an offsetting fund may hinder.

9.4.3 Alternatively, if the payment rate is set too low, carbon offsets will be used in place of on-site measures. Setting the charge too low incentivises developers to use offsets instead of delivering high energy performance levels on-site. Whilst levying a carbon offset charge has great potential for positive investment in carbon savings, it will always be undesirable in achieving the maximum carbon savings possible on-site through fabric standards and the installation of renewable energy. The principal objective is for new buildings to be zero carbon or carbon 'negative' in performance (operational energy). Buildings which do not comply with policy will either contribute to climate change for their entire lifetime or will require costly retrofit. However, carbon offset payments are

often calculated on the basis of abating carbon emissions for only a 30-year period, yet the building lifetime would be significantly greater than that. Therefore

9.4.4 There is also the risk that the projects funded by carbon offsetting fail to deliver measurable carbon savings. There is a danger of the carbon offsetting schemes not being effective and therefore coming into disrepute. If the programme is unable to demonstrate that offset payments will deliver carbon savings, requests for contributions will be challenged.

9.4.5 Therefore, whilst carbon offsetting schemes work well for some authorities, it is deemed that other methods of achieving carbon savings are more appropriate and effective.

10.0 Economic considerations

10.1 Encouraging Economic Growth through Planning

10.1.1 Lancaster City Council wishes to play a leading role in improving educational attainment and skills and raise aspirations within the district. It is important to ensure that local people get the right education, skills and inspiration to enable them to get jobs. Lancaster City Council wants to work with developers to ensure that local people have the skills and the opportunity to access employment generated from major new developments in the district.

10.1.2 The Council's Corporate Plan and Economic Regeneration Vision both recognise the need to improve skills and access to jobs for people in the district. As part of its Economic Vision the Development Management DPD, adopted in December 2014, notes that:

'The Council will seek to meet the challenges of sustainable growth with both the district and regional economy, creating conditions which will enable managed growth and establish a strong, diverse and vibrant local economy.'

10.1.3 The Council's Corporate Plan and Economic Regeneration Vision both recognise the need to improve skills and access to jobs for people in the district. As part of its Economic Vision the Development Management DPD, adopted in December 2014, notes that: 'The Council will seek to meet the challenges of sustainable growth with both the district and regional economy, creating conditions which will enable managed growth and establish a strong, diverse and vibrant local economy.'

10.1.4 The planning system plays an important role in creating the conditions for economic growth. It can also be used as a powerful tool to directly promote the use of local people through the construction and implementation of proposals which can generate significant levels of employment through the development phase. The Council's strategy envisages significant housing, retail and economic growth, the employment and skills potential of which should be captured to ensure maximum local benefit.

10.1.5 An Employment and Skills Plan (ESP) is requested on applications for residential development (20 or more units), commercial development (1000m^2 new floorspace), and associated infrastructure projects of a significant scale (such as schools). The condition ensures that local labour will be used during the construction phases of a development scheme and that local people are provided with the opportunity for training and apprenticeships in accordance with an approved ESP.

10.2 Green Economy

10.2.1. A green economy is defined as low carbon, socially inclusive, and resource efficient. In such an economy, employment and income growth are driven by investment into economic activities, infrastructure and assets that allow reduced carbon emissions and pollution, enhanced energy and resource efficiency, and prevention of the loss of biodiversity and ecosystem services. A green economy would be supported and enabled by a thriving low carbon and environmental goods and services sector.

10.2.2 Transitioning to a green economy requires a workforce with the correct skills. This includes not only skills in the low carbon and environmental goods and services sector, but also those needed to help all businesses use natural resources efficiently and sustainably, and to be resilient to climate change. Government evidence indicates that, in general, businesses are currently not certain about their future green skills needs. However, some sectors do identify specific skills needs, including energy generation, the construction industry and the food and agriculture sectors; which can be influenced by planning. Therefore, it is imperative that planning supports the development of skills, employment and business in these sectors.

10.2.3. This could involve, for example, supporting training in passivhaus design, construction or certification, training in retrofitting, development of manufacturing sites for low carbon technologies or materials, development of large-scale renewable energy generation, implementation of new local food markets, implementation of sustainable or ecological tourism activities and such.

10.2.4 Therefore, considering that here are significant pockets of unemployment and deprivation within the District, particularly amongst younger people, there is great opportunity in which planning can support the transition to a green economy, whilst significantly benefitting residents of the District.

11.0 Concluding comments

11.1.1 This evidence paper confirms a strong commitment from national policy and legislation to reduce emissions, through promotion of sustainable development, mitigation and adaptation in development, energy efficiency requirements, the use of renewable and low carbon technologies, safeguarding biodiversity and the natural environment, sustainable travel, and more.

11.1.2 The largest sources of the District's emissions are on-road, residential buildings, livestock and industrial buildings and facilities. Therefore, these are the areas which must primarily be targeted to reduce emissions. This paper has found that this can be achieved through:

- prioritising a fabric first approach to reduce energy consumption in buildings;
- considering the importance of embodied carbon and committing to alternative approaches to traditional construction to increase carbon savings in this area;
- promoting and utilising district heating networks within the District;
- supporting and/or requiring the installation of domestic renewable energy and low carbon technologies;
- encouraging and/or requiring designing places which can mitigate and adapt to climate change, in areas regarding water management, green infrastructure and sustainable transport; and
- advancing the District's green economy through supporting the development of green skills, employment and businesses.

11.1.3 Therefore, there are multiple areas in which planning policy in the District can influence the transition to a low carbon future. Securing these measures through the Local Plan Review will further

support the Government's ambitions. We aim to undertake a more thorough study in the future to quantify the precise impact that these policies could have.