Melton Climate Change Study

Document B: Buildings and Built Form

Melton Borough Council

Final report

Prepared by LUC

November 2024

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Chapter 1

Introduction

1.1 This document outlines evidence-based policy options and recommendations for setting requirements for tackling GHG emissions from buildings in Melton borough, taking account of targets to reach net zero by no later than 2050.

1.2 GHG emissions associated with new development include operational emissions from heating and powering our buildings; and embodied emissions from producing a building's materials and their transport and construction/installation on site. These are covered in this document along with consideration of the impacts of built form and orientation on operational carbon emissions; and the challenges of reducing GHG emissions from the existing building stock.

1.3 There is a considerable challenge in retrofitting existing buildings to make them low or zero carbon, therefore it is essential that we build new buildings to high standards from the outset. However, up to now there have been no national regulations in the UK to ensure that buildings are being built as 'zero-carbon' ready. Building energy-efficient, zero-carbon homes offers numerous wider benefits including lower energy costs, improved air quality, reduced reliance on volatile fossil fuels, and job creation in the green technology and construction sectors.

1.4 Operational emissions from buildings amounted to 20% of all UK emissions in 2022 **[See reference 1].** They are therefore a major part of the nation's carbon emissions problem and a key source to be tackled to achieve net zero aspirations. At present, around 80% of the annual GHG emissions associated with buildings are related to the ongoing operational emissions from the existing building stock; the remaining 20% is related to the embodied carbon impacts of new construction **[See reference 2]**.

1.5 Key actions identified in Document A to help decarbonise buildings include replacing fossil fuel heating with zero-emission alternatives; reducing energy demand by maximising the energy efficiency of both existing and new buildings; and ensuring that new developments operate with net zero emissions from the outset and have low embodied carbon. Policies relating to these are explored further below.

1.6 This document is structured as follows:

- Section two focuses on evidence and policy options for reducing operational carbon emissions from buildings
- Section three focuses on tackling embodied carbon emissions
- Section four considers the impacts of built form and orientation on carbon emissions.
- Section five considers the role the Local Plan could play in facilitating the retrofit of the existing building stock, including balancing heritage concerns in retrofitting heritage assets and in conservation areas.

1.7 Each of these sections includes sub-sections on context, policy context and policy options for Melton borough.

Chapter 2

Low Carbon Buildings: **Operational Emissions from New Development**

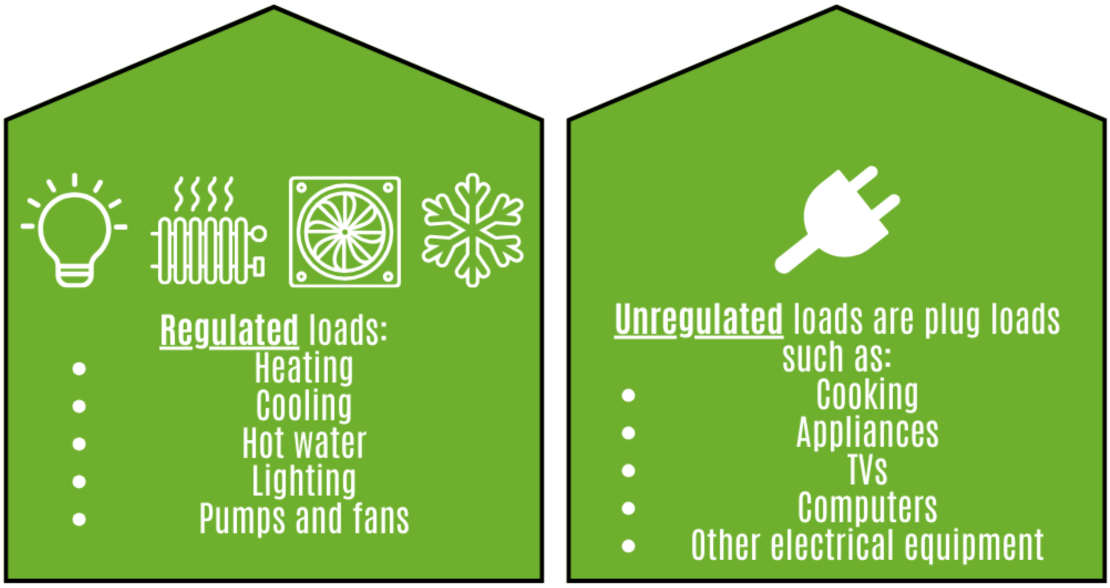
Context

2.1 Operational emissions from buildings (i.e. emissions from heating and powering our buildings) amounted to 20% of all UK emissions in 2022 **[See reference 3]**. They therefore represent a key source of GHG emissions to tackle to help achieve net zero.

2.2 Operational emissions can be separated into regulated and unregulated emissions. Regulated emissions (those covered by Building Regulations) refer to emissions as a result of energy consumed by a building, associated with fixed installations for heating, hot water, cooling, ventilation, and lighting systems. Unregulated emissions refer to emissions resulting from energy consumed by a building that is outside of the scope of Building Regulations, for example energy associated with equipment such as fridges, washing machines, TVs, computers, lifts, and cooking. These can represent up to 50% of total operational energy depending on building type **[See reference 4]**.

2.3 Figure 2.1 below presents an illustration of regulated and unregulated energy loads **[See reference 5]**.

Figure 2.1: Regulated and unregulated energy loads



2.4 In Melton borough, operational emissions from domestic (residential) buildings fell from 137.3 kt CO_2 in 2005 to just 73.3 kt CO_2 in 2022 **[See reference 6]**. Similarly, for commercial buildings, operational emissions fell from 40.2 kt CO_2 in 2005 to just 19.3 kt CO_2 in 2022. Importantly, these figures are totals and take into account a moderately rising population within Melton borough. These falls are a result of ongoing efforts to decarbonise the power grid and improve the energy efficiency of buildings and household appliances. Nevertheless, Document A of this report highlights that domestic, commercial and public sector buildings are still one of the major sources of emissions in the Borough, alongside agriculture and transport; thus more work is needed to further reduce these emissions.

2.5 Key actions identified in Document A to help reduce operational emissions from buildings include replacing fossil fuel heating with zero-emission alternatives; reducing energy demand by maximising the energy efficiency of both existing and new buildings; and ensuring that new developments operate with net zero emissions from the outset.

2.6 Policy options for reducing operational emissions from *new development* are considered further below after an overview of the policy context. The challenges of reducing operational emissions from the *existing* building stock is considered separately in section 5.

Policy Context

2.7 Paragraph 159 of the NPPF states that new development should be planned for in ways that can help to reduce greenhouse gas emissions, such as through its location, orientation and design. Its focus here is on operational emissions. Location, orientation and design (e.g. maximising insulation levels and air tightness) can all play a role in improving the operational emission profile of new development (see section 5 for further details on built form), along with the addition of renewable energy sources. The NPPF also adds that 'any local requirements for the sustainability of buildings should reflect the Government's policy for national technical standards.'

2.8 Alongside planning policy requirements, both national and local, the Building Regulations also play an important role in setting minimum energy standards for new development. These standards have been gradually tightening overtime. The current requirements for operational emissions from new homes and non-domestic buildings are set through 2021 Part L of the Building Regulations (which represented an uplift in Part L requirements over the 2013 Building regulations).

2.9 The previous Government announced its intention that a Future Homes Standard (FHS) and Future Buildings Standard (FBS) would be implemented. These standards are a set of building regulations that were expected to be implemented from 2025, requiring new homes and non-domestic buildings to be 'zero-carbon' ready **[See reference 7]**. The aim of these standards is to ensure that buildings will require no additional retrofitting and will be fully net zero with the decarbonisation of the electricity grid, currently planned for 2030 under the new government **[See reference 8]**.

2.10 The CCC has previously warned however that the power sector is not currently on track to achieve this **[See reference 9]**. It is also not clear how the current Government will take forward these standards, with reports suggesting that they are both keen to increase rooftop solar **[See reference 10]** but also considering making solar PV optional on new homes **[See reference 11]**. Thus, there is considerable policy uncertainty. The technical details of the FHS and FBS were published in March 2024 **[See reference 12]**.

The Future Homes Standard (FHS)

2.11 The FHS builds on the current Approved Document Part L 2021, an interim standard introduced in 2023, which mandates that new domestic dwellings be built with 31% fewer emissions compared to the 2013 building standards. Two options have been proposed to achieve the FHS, known simply as “Option 1” and “Option 2”. Both options eliminate fossil fuel heating sources and assume air source heat pumps as the default replacement technology. They both propose the same insulation and building fabric standards, which are largely the same as current standards (Part L 2021). They differ in terms of air tightness, wastewater heat recovery, ventilation systems and most significantly on a requirement for solar panels, as set out in table 2.1 below.

Table 2.1: Key differences between Option 1 and Option 2 of the FHS

Building element	Option 1	Option 2
Wastewater heat recovery	Yes	No
Airtightness (m3/m2.h @ 50Pa)	4	5
Ventilation	Decentralised mechanical extract	Natural ventilation, with intermittent fans
Solar panels	High efficiency solar PV panels covering equivalent of 40% of ground floor area for side-lit spaces and 75% for top-lit spaces (excluded for flats over 15 stories)	No

2.12 Option 1 is set out as the preferred approach, whereas Option 2 is presented as “the minimal approach to achieve ‘zero-carbon ready’ homes”. Option 1 means significantly lower running costs for occupants and will do more to reduce fuel poverty and reduce carbon emissions, while supporting grid decarbonisation, whereas Option 2 brings a lower up-front cost for housebuilders. These cost impacts are summarised in the Government’s analysis that accompanies the technical standards consultation, shown below in table 2.2.

Table 2.2: Impact of FHS options on carbon savings, energy and build costs

Option	Cost uplift for developers	Annual heating & hot water bill (including standing charges)	Annual average operational emissions (tCO2e/yr)	Cost to retrofit to Net Zero
Typical Existing Home	Not applicable	£1,430-£2,640	2.2-4.6	£11,400-£12,650 (higher if fabric retrofit needed)
2021 Uplift	Not applicable (current standard)	£640	1.4	£9,800
FHS Option 1	£6,200 (4%)	£520	0.05	£0
FHS Option 2	£1,000 (1%)	£1,220	0.1	£0

The Future Building Standard (FBS)

2.13 For non-domestic buildings there are two sets of proposals: one for top-lit spaces in buildings and one for side-lit spaces in buildings. Top-lit spaces have daylight illumination from above via rooflights; they are typically large-volume spaces such as warehouses and sports halls. Side-lit buildings spaces by contrast have daylight illumination from the side via windows and include the majority of spaces in most building typologies such as offices, hotels, and schools. This distinction is familiar to industry and has been used in previous iterations of the energy efficiency requirements.

2.14 The performance targets of the FBS are again mostly the same fabric requirement as currently required under the 2021 standards, except for warehouses and sports halls (both top lit-spaces) which would have enhanced levels of airtightness to support the installation of low-carbon heating systems. The FBS proposes a heat pump for side-lit spaces and radiant electric heating in top-lit spaces. It would also require some enhancements to the efficiency of lighting and heat recovery. Rooftop solar PV are set out as a requirement, with two different potential options proposed:

- **Option 1** (recommended option): Solar PV panel coverage equivalent of 40% of the building's foundation area for side-lit spaces and 75% for top-lit spaces.
- **Option 2** (not recommended option): Solar PV panel coverage equivalent of 20% of foundation area for side-lit spaces and 40% for top-lit spaces.

2.15 The focus of both the FHS and FBS is on regulated energy use within the context of the Buildings Regulations (embodied carbon and unregulated emissions are out of scope).

Implementation of FHS and FBS

2.16 The FHS and FBS are considered deliverable by industry, requiring in some cases no change (in terms of fabric standards) from the 2021 Building Regulations Part L. Developers have been experimenting with new products and specifications to meet the new Future Homes Standard. The Future Homes Hub details these successes and the options for developers to achieve the standard on operational energy **[See reference 13]**. Included amongst them is a pilot delivered in Brooksby within Melton borough by Bloor Homes. Importantly, this is applicable to a range of housing types. Clarion Homes have delivered affordable rent homes in such a pilot in East Hertfordshire that fully achieve the proposed Future Homes Standard **[See reference 14]**.

2.17 The Government acknowledges that complying with these standards will likely increase build costs but suggests there will be wider benefits to local supply chains for renewable technologies and skills developments for the future. The Government's analysis shared as part of the consultation indicates the cost uplift for the FHS should be around £6,200 for Option 1 and £1,000 for Option 2. The majority of the cost difference between the options relates to the cost to install solar PV (a cost which is anticipated to keep falling over time).

Local Policy Context

2.18 Melton borough's existing Local Plan contains policy EN9 – 'Ensuring Energy Efficient and Low Carbon Development', requires major development proposals to demonstrate how the need to reduce operational carbon emissions has influenced design, layout and energy sources and sets out key design considerations including minimisation of heat loss and onsite renewable and low carbon energy generation. In addition, the plan's policies on strategic sites in Melton borough reinforce the need to achieve low carbon emissions and building regulations for energy efficiency and carbon emissions **[See reference 15]**. However, none of these policies set specific standards that development needs to achieve (for example, a target CO_2 emissions reduction above the latest Building Regulations Part L requirements) that are clear to both developers and development management officers.

2.19 Melton borough's Design of Development Supplementary Planning Document (SPD) provides advice to applicants on how to deliver low-carbon homes. This includes design advice on renewable and low-carbon energy and on the fabric profile of new development **[See reference 16]**. However, this document constitutes supplementary advice rather than policy requirements.

2.20 Melton borough's Climate Change Strategy (2024-2036) and Housing Strategy (2021-2026) both recognise that new buildings need to use much less energy and water and be powered by low-carbon energy if they are to align with net zero targets. It notes that the review of the Local Plan is one way to influence local development standards and suggests ensuring that all new buildings are able to operate with net zero emissions **[See reference 17].**

Relying on a Building Regulations led approach

2.21 One policy option is a 'do nothing approach' to remove existing policy guidance on building standards within local plan policies and instead rely on a national Building Regulations led approach to deal with operational energy in new development. This is in line with the Government's long-standing views that Building Regulations offer a standardised process for implementing and raising the standards of buildings, including for energy efficiency; and that this offers a consistent framework for developers as opposed to a varied patchwork of standards set by local authorities in planning policy, which can add time, complexity and cost to developers. Developers both nationally and locally have tended to strongly reiterate these views. They also suggest that Government's wider actions, including written ministerial statements, mean Local Planning Authorities no longer have powers to set their own local policies.

Written Ministerial Statement

2.22 In recent years, there has been some uncertainty as to whether Local Planning Authorities (LPAs) can set energy requirements in their Local Plans that go beyond Building Regulations. Under the Conservative government, the 2023 'Planning – Local Energy Efficiency Standards Update' Written Ministerial Statement (WMS) **[See reference 18]** states that "*Any planning policies that propose local energy efficiency standards for buildings that go beyond current or planned buildings regulation should be rejected at examination if they do not have a well-reasoned and robustly costed rationale that ensures:*

- *That development remains viable, and the impact on housing supply and affordability is considered in accordance with the National Planning Policy Framework.*
- *The additional requirement is expressed as a percentage uplift of a dwelling's Target Emissions Rate (TER) calculated using a specified version of the Standard Assessment Procedure (SAP)…"*

2.23 This appeared to significantly curtail the flexibility with which LPAs can define policies on energy efficiency. However, others have queried the weight to be given to the WMS. The power for LPAs to set their own energy efficiency standards is clearly set out in Section 1(1) of the Planning and Energy Act 2008, and Government clarified in the 2021 Future Homes Standard consultation it had no plans to amend this in the immediate term **[See reference 19]**. In addition the National Planning Policy Framework (NPPF) and Planning Practice Guidance (PPG) are clear that plans should take a 'proactive approach' to mitigating and adapting to climate change, in line with the objectives of the Climate Change Act 2008; and the Levelling Up and Regeneration Act 2023 requires that '*the Local Plan must be designed to secure that the use and development of land in the Local Planning authority's area contribute to the mitigation of, and adaptation to, climate change'* (15C(6)). This bolsters the section 1 power.

2.24 Open legal advice shared by Essex County Council argues that "*The 2023 WMS cannot operate to frustrate or negate the power in section 1(1)*". Spelling it out, Estelle Dehon KC states (para 2.2.): "*the 2023 WMS cannot be interpreted to prevent LPAs from putting forward, and planning inspectors from finding sound, policies which are justified and evidenced and which use metrics other than that specified in the 2023 WMS, and/or do not require calculation by the method specified in the WMS*."

2.25 The WMS could also still be found to be unlawful. A legal challenge has been brought against it in reference to the Planning and Energy Act 2008. The High Court has recently (February 2024) quashed the Planning Inspectorate's attempt to water down net zero buildings policies for a garden village in Oxfordshire in a case seen as intrinsically linked to the WMS **[See reference 20]**.

2.26 Three local authorities have successfully adopted policies based on energy-based metrics, going beyond Building Regulations (Bath and North East Somerset, Cornwall and Central Lincolnshire), and as many as 70 authorities have invested expertise and resources to evidence and develop similar policy approaches for their local areas. The Government's response to the FHS consultation in 2021, re-affirmed by published correspondence between Bath and North-East Somerset (BANES) Council and the Department of Department for Levelling Up, Housing and Communities (DLUHC) in 2022 has provided some confidence for LPAs who may wish to set energy efficiency standards beyond national Building Regulations standards.

2.27 Thus, in line with the Town and Country Planning Association's (TCPA) advice, MBC is advised to view the 2023 WMS as a material consideration, but not interpret it in a way that undermines legislative requirements or powers granted by primary legislation to LPAs **[See reference 21]**. As such, LPAs can depart from the WMS providing there is sufficient evidence to demonstrate their position is rational and justified.

Limitations of a National Building Regulation led Approach

2.28 The national standardisation route can be considered to stifle innovation and not reflect different geographical areas' unique abilities to deliver lower carbon development more rapidly or in different ways. Completely removing planning policies within the local plan that require consideration of operational emissions would also limit opportunities to support and promote exemplar development. There are also several limitations of relying on a future uplift in building regulations standards alone that are important to highlight.

2.29 Achieving net zero development at the earliest opportunity (to stop any avoidable emissions) is a core element of a credible pathway to achieve net zero, particularly given the challenges of reducing carbon emissions from other sectors such as transport and agriculture.

2.30 There is a level of uncertainty because the new government is yet to detail its plans for planning reform in relation to climate change. It has also not yet set out how it plans to proceed with the proposed FHS and FBS improvements to Building Regulations, particularly in relation to the most significant element, the solar PV requirements, and there are significant risks of delays to their implementation. The pathway to full grid decarbonisation, which the FHS and FBS depends on to deliver net zero homes, as opposed to 'net zero ready' homes, is also not clear.

2.31 Fabric performance standards in FHS are not improved, with negligeable changes compared to Part L 2021, which misses an opportunity to significantly reduce energy bills and help tackle fuel poverty. Industry good practice guidelines, such as LETI, are already promoting more ambitious targets, compared to the FHS, as shown in table 2.3 below.

Table 2.3: Comparison of proposed FHS and LETI guide for housing standards

Building Element	FHS Option 1	FHS Option 2	LETI guide for housing
External wall U-value	0.18 W/m².K	0.18 W/m².K	0.13-0.15 W/m².K
Window U-values	1.2 W/m².K (double glazing)	1.2 W/m².K (double glazing)	0.8-1.0 W/m².K (triple glazing)
Air tightness	4 m3/(h.m²) @50Pa	5 m3/(h.m²) @50Pa	<1.0 m3/(h.m²) @50Pa

2.32 The lack of ambition on fabric performance standards also misses an opportunity to reduce the energy demands of new development on the national grid at a time when the electrification of heat, transport, and industry means demand for electricity is expected to grow fourfold **[See reference 22]**. Lower performance standards will necessitate 'reinforcement' of grid capacity and the development of more renewable energy, at great cost both financially, but also in terms of embodied carbon. A lack of grid capacity is already stalling development in parts of England (for example, in Oxfordshire and West London **[See reference 23]**) and imposing significant additional costs on development.

2.33 There is a risk that the preferred options for solar PV element may be weakened or not compulsory. Assessments have shown that the capitalised savings of solar panels far outweigh the initial upfront installation costs, especially given lower installation costs when installed during construction. For example, the average cumulative energy costs saved from having the solar PV installed on a new build (FHS Option 1) 3-bed semi-detached house equates to an average of £38,811 over a standard 25 year loan term **[See reference 24]**. The reduced running costs have clear benefits for households and businesses. The capitalised savings could also translate into improved mortgage affordability for homeowners, which may also help widen housing affordability.

Alternative Policy Options

2.34 The following policy options have been considered for delivering net zero buildings in Melton borough:

- Require development to reduce emissions relative to Building Regulations
- Set targets using third-party accreditation schemes
- Use best practice standards

Policy Option 1: Require development to reduce emissions relative to Building Regulations requirements

2.35 MBC could set zero carbon targets by requiring developments to reduce CO_2 emissions relative to the targets in the Building Regulations.

2.36 Examples of carbon reduction targets included in adopted planning policies (excluding 'net zero carbon' policies which follow) are provided below:

- London Plan policy SI2 requires "*Major development to be net zero-carbon" and for this to be demonstrated via a "detailed energy statement to demonstrate how the zero-carbon target will be met within the framework of the energy hierarchy*". In addition, "*A minimum on-site reduction of at least 35 percent [carbon reduction] beyond Building Regulations 2021 is required for major development. Residential development should achieve 10 per cent, and non-residential development should achieve 15 per cent through energy efficiency measures*" (this excludes minor development). Where it is clearly demonstrated that the net zero target cannot be achieved onsite then any shortfall should be addressed via carbon offsetting arrangements. The GLA's Energy Assessment Guidance **[See reference 25]** provides further advice on how to comply with these policies and can be updated to reflect changes in Building Regulations.
- Sutton Local Plan (2018, policy 31) specifies similar onsite targets but also includes a requirement that "all minor residential developments should achieve at least a 35% reduction in regulated CO_2 emissions on site" (relative to 2013 Building Regulations).

2.37 It is important to be aware when considering setting carbon targets that the requirements in the Building Regulations are being progressively tightened, as highlighted above. Given this context, newer Local Plan policies often refer to these national changes in their policies to future proof them. For example, Solihull's Local Plan (currently at examination) includes the following policy wording (Policy P9): "All new dwellings to achieve 30% reduction in energy demand/carbon reduction improvement over and above the requirements of Building Regulations Part L (2013) at the time of commencement up to March 2025. From April 2025, for all new dwellings to be net zero carbon."

2.38 The last sentence is a way of future proofing net zero and linking that requirement to a specific date, whatever Building Regulations are in place. Note that even if FHS and FBS are introduced in 2025 they would not require buildings to be net zero carbon, only net zero 'ready', so the Solihull policy still sets a standard that goes beyond anticipated national requirements (similar to the London Plan example).

2.39 MBC could consider adopting a similar approach, particularly if MBC did not wish a net zero requirement for new development to apply as soon as the local plan is adopted - though note the evidence cited above regarding the need to move to zero carbon development as soon as possible.

Summary

2.40 Benefits of the approach (over and above the benefits of going beyond Building Regulations highlighted earlier):

- The approach has been used in numerous adopted local plans.
- Straightforward for developers to evidence – they would need to submit Part L calculations which they would need to carry out anyway to demonstrate compliance with Building Regulations.
- If carbon offsetting were allowed (as a last resort where it is demonstrated as a developer cannot achieve the specified target on-site) this could generate funds to invest in energy efficiency improvements to existing homes, reducing emissions and fuel poverty. Further details of carbon offsetting are included in Appendix B.

2.41 Limitations of approach:

- Risk of being superseded in the event of future regulatory changes (anticipated or otherwise), though this could be mitigated through clear outcome-focused policy wording.
- Requires MBC to have suitable expertise to assess the Part L calculations submitted by developers and determine if locally set targets have been achieved; and – if carbon offsetting was allowed - to identify relevant carbon reduction projects and run the schemes. Further details of carbon offsetting are included in Appendix B.
- Not all sources of emissions are covered under Building Regulations (for example unregulated and embodied emissions) so these would be excluded from the target. For the UK to have the best chance of meeting its legally binding carbon budgets, Local Plan policies must aim to mitigate all

avoidable sources of emissions, wherever this is practical within the remit of the LPA. Thus, a net zero operational emissions policy for new development is not in itself sufficient.

- Added costs to developers, increasing as target is increased towards net zero (see viability section below).

Policy Option 2: Set targets using third-party accreditation schemes

2.42 MBC could consider setting zero carbon targets for buildings using ‘off the shelf’ third party assessment tools and certification schemes. For example, by specifying a minimum score to be achieved in credit areas relating to energy performance/carbon emissions.

2.43 This would mean that MBC could simply seek proof of certification/performance rather than having to review detailed energy modelling in-house. MBC could have confidence in the ratings given they are completed by independent assessors (BRE Global, the certification body and operators of BREEAM and Home Quality Mark (HQM), is accredited by the United Kingdom Accreditation Service against these standards to ensure independence, competence, and impartiality) and the cost would be borne by developers.

2.44 Setting policies with reference to ‘off the shelf’ third party accreditation schemes is a well-practiced policy option. The current Local Plan does not make use of any third-party certification schemes. However, the Building Research Establishment Environmental Assessment Method (BREEAM) and Passivhaus schemes are referenced within the Melton borough Design SPD. As such, the key options available to MBC relate to which type of standard to specify, and what performance level to require, for developments in order to achieve net zero targets.

2.45 Three key third party assessment approaches are outlined below: Building Research Establishment Environmental Assessment Method (BREEAM), Home Quality Mark (HQM) and Passivhaus standard.

Building Research Establishment Environmental Assessment Method (BREEAM)

2.46 BREEAM is an industry recognised sustainability assessment and rating methodology from the Building Research Establishment (BRE). Assessment and certification are delivered through accredited third-party assessors. BREEAM assessments cover a wide range of sustainability issues and are completed throughout the lifecycle of the development. The assessments include an analysis of energy use, health and wellbeing, innovation, land use, materials, management, pollution, transport, waste and water.

2.47 BREEAM, first applied to offices, can now be applied to most commercial buildings but does not apply to new build residential buildings (though it can be applied to residential refurbishments). It is commonly included in LPA planning policies to ensure commercial buildings satisfy high standards of sustainability.

2.48 A key point to understand is that both BREEAM and HQM (covered next) address multiple topic areas other than energy/carbon performance. The benefit of this is that these standards prompt developers to consider wider sustainability issues. For this reason, many LPAs, such as Cornwall Council **[See reference 26]**, have set policy requirements for various types and scales of development to achieve a BREEAM Excellent rating. However, the potential downside is that, unlike some performance standards that are focused on reducing energy use and GHG emissions, simply gaining accreditation with BREEAM or HQM will not guarantee that development is low or zero carbon, unless specific credit requirements are introduced within local plan policy.

2.49 For example, Islington local plan Policy S3 (adopted September 2023) sets out requirements for various types of development to achieve an Excellent rating as well as defining a minimum score on key credit areas including under energy (Ene 01) to demonstrate zero carbon **[See reference 27]**.

2.50 MBC could consider specifying BREEAM scoring requirements in this way. For example, by specifying that all major non-residential developments must achieve maximum credits in the “Energy performance”, and “Prediction of operational energy consumption” and “Beyond zero net regulated carbon” categories of BREEAM (or equivalent) to demonstrate that the development has surpassed net zero regulated emissions.

2.51 Central Lincolnshire has taken a different approach to using BREEAM in their adopted Local Plan **[See reference 28]**. Their policy S8 seeks to reduce energy consumption in new non-residential buildings. The main focus of the policy is on demonstrating that certain energy requirements have been met via an energy statement. However, the policy also explicitly allows applicants to take an alternative route of demonstrating BREEAM Outstanding or Excellent to simplify and speed up the decision-making process. The justification ties back to the point made above: *“Whilst this may mean a building which makes use of the BREEAM-related exception clause below is not entirely compatible with the ‘net zero’ ambitions of this Local Plan, the wider environmental and carbon-related benefits of achieving an excellent or outstanding BREEAM rating is considered appropriate as an exception to meeting the main part of the Policy below.”* However, given the focus on driving down carbon emissions here we would not recommend that MBC pursue this approach.

Home Quality Mark (HQM)

2.52 HQM is a scheme for new build homes in the UK, also from BRE. Like BREEAM, it considers a range of sustainability topics, including energy performance, design and construction quality, running costs, and measures to promote occupant health and wellbeing.

2.53 Specifically relating to energy, HQM uses some of the same Standard Assessment Procedure (SAP) outputs that are used to show compliance with minimum standards in Building Regulations. The HQM Energy Performance methodology considers three metrics of the modelled performance of a new building when determining the number of credits achieved for this issue. It is a ratio that defines the performance of a HQM assessed home in terms of its:

- Heating and cooling energy demand (the fabric performance)
- Primary energy consumption (system efficiency)
- Total resulting CO_2e emissions.

2.54 SAP outputs are used to calculate energy performance ratios (EPRs) for these three metrics above, based on the performance improvement of the actual building compared to a notional version of the building that just complies with Building Regulation requirements. A higher EPR scores more credits, with energy and carbon performance scoring a maximum of 60 credits.

2.55 We have not identified many other local plans specifying a HQM requirement, although Islington's local plan provides one example. Policy S3 states that:

> "Major and minor new-build residential developments must achieve a four-star rating (as a minimum) under the BRE Home Quality Mark scheme".

2.56 As with BREEAM, MBC could consider setting requirements for minimum HQM credit scores in specific areas such as to require a higher level of energy/carbon performance. For example, they could require that new build homes achieve sufficient credits in the "Energy performance" and "Towards carbon negative" categories of HQM (or equivalent) to demonstrate that the development produces net zero regulated and unregulated emissions (for example score 4 credits under energy performance category).

The Passivhaus Standard

2.57 The Passivhaus Standard, developed in Germany, focuses on maximising the thermal efficiency of the building fabric using high levels of insulation and air tightness and mechanical ventilation with heat recovery. It is certified through an exacting and independent quality assurance process.

2.58 Passivhaus represents best practice levels of energy and GHG performance. The levels of energy efficiency are very high in Passivhaus, in line with those proposed by the Committee on Climate Change **[See reference 29]**. For example, the Passivhaus standard drives much higher levels of insulation than current Building Regulations.

2.59 A summary of the design targets for Passivhaus homes is presented below **[See reference 30]**.

Table 2.4: Summary of the design targets for Passivhaus homes – energy

Energy	Limiting Standard
Space heating demand	≤15 kWh $m^{-2}a^{-1}$
Heat load	≤10 W $m^{-2}a^{-1}$
Overheating	≤10% occupied hours over 25°C (internal temperature)

Table 2.5: Summary of the design targets for Passivhaus homes – building fabric

Building Fabric	Limiting Standard
Floor/Walls/Roof	≤0.15 $Wm^{-2}K^{-1}$
Windows and doors	≤0.8 $Wm^{-2}K$
Air permeability	≤0.6ach_{n50}
Thermal bridges	Zero

2.60 To achieve the standard, the Passivhaus Planning Tool (PHPP) must be used. PHPP is known to provide very robust and reliable outputs; evidence suggests that the Passivhaus buildings are delivering on design promises, helping close performance gaps in buildings **[See reference 31]**. However, PHPP would be needed in addition to calculations for Building Regulations and potentially also for BREEAM/HQM which may add additional work for applicants and requires suitably trained staff. Achieving the standard creates added construction costs and requires skilled labour; finding appropriately qualified construction workers to build to the exacting Passivhaus standard could be an additional constraint.

2.61 The Passivhaus standard has not been widely used in planning policies in England to date. However, there are some examples. One of the strongest is Bristol City Council's policy CCS2 in the Local Plan Review (not yet adopted; **[See reference 32]**) which actively encourages use of this standard by reducing wider policy requirements on Passivhaus schemes:

2.62 *Where buildings are proposed to be certified Passivhaus standard, the % CO_2 reduction targets … relating to energy efficiency measures, on-site renewables and Allowable Solutions will not need to be met. In these cases, a full Energy Strategy will not be required, and it will be sufficient to submit the technical information required to demonstrate that the Passivhaus standard can be achieved and for the Sustainability Statement to demonstrate that the residual heat/cooling demand for the development has been met sustainably...*

2.63 Other councils such as Cambridge City and Havant simply indicate their support for schemes that use the Passivhaus standard. Central Lincolnshire's Local Plan **[See reference 33]** offers applicants Passivhaus accreditation as an alternative route to demonstrating compliance with policy S7 on reducing energy consumption from residential development.

2.64 Given the robustness of the Passivhaus standard, we recommend that MBC consider explicitly supporting the use of this standard as an alternative route to compliance regarding energy and GHG emissions.

Summary

2.65 Benefits of approach:

- By securing specific credits under Passivhaus, HQM, and BREEAM schemes, developments can demonstrate that they have achieved specified net zero emissions.
- The setting of BREEAM requirements in adopted local plan polices is widespread.
- The use of third-party accreditation schemes would allow MBC to secure zero carbon development without the need for the in-house technical expertise/capacity to interrogate energy statements.
- The accreditation schemes assess a wide remit of sustainability considerations in the built environment (for example transport, water, materials, and waste). Therefore, these schemes could be used in a wide range of policies to create cohesion throughout the Local Plan.

2.66 Limitations of approach:

- Implementing requirements for zero carbon through third-party accreditation schemes will result in additional costs to developers (see viability section for further details).
- MBC will not have control over quality assurance, relying on third party assessors.
- The third-party schemes are updated semi-regularly, for example to keep up with changes in Building Regulations. Local plan policy wording referring to specific ratings and credit requirements introduces a risk of the policy being superseded as updated to the schemes are made. Policy wording therefore needs to be outcome-oriented and/or caveated.
- BREEAM and HQM, like the Building Regulations themselves, are designed to offer flexibility in terms of how a developer achieves the target energy and GHG performance. For example, they would not necessarily prohibit the use of gas boilers. Therefore, if MBC was to adopt this approach they might also consider adopting additional policy wording to address this specific issue.

Policy Option 3: Use best practice standards

2.67 In recent years there has been increasing attention focused on what truly sustainable and net zero carbon developments look like. Some industry bodies have developed evidence-based strategies and metrics for how the built environment could achieve net zero. Key examples are summarised below.

The UK Green Building Council (UKGBC), an industry-led network of professionals, launched the UKGBC Net Zero Carbon Buildings framework for net zero carbon buildings in 2019. This framework sets out high-level principles for achieving net zero carbon for construction and operational energy **[See reference 34]**. It emphasises a 'reduction first' approach and sets out principles, technical requirements, and areas for future development. The framework is expected to be updated over time and evolve with the forthcoming UK Net Zero Carbon Building Standard in 2024 (discussed below).

Building on the UKGBC work, the **London Energy Transformation Initiative (LETI) -** a voluntary group of built environment professionals – developed the **Climate Emergency Design Guide**, a comprehensive resource aimed at creating sustainable and resilient buildings **[See reference 35]**. It outlines key strategies for achieving net zero operational carbon emissions and best practice targets for embodied carbon. The focus is on setting operational requirements in terms of Energy Use Intensity (EUI) targets, an annual measure of the total energy consumed in a building. For example, the target for homes is 35kWh/m^2/year and for offices is 55kWh/m^2/year. LETI argue this is a good indicator for building performance as the metric is solely dependent on how the building performs in-use, unlike carbon emissions, which also reflect the carbon intensity of the grid. Moreover, this metric can be estimated at the design stage and very easily monitored in use (using energy bills). Wider stipulations include that heating and hot water should not be generated using fossil fuels; space heating demand for all building types should be no more than 15 kWh/m^2/yr; and on-site renewable energy should be maximised.

The Royal Institute of British Architects' (RIBA) 2030 Climate Challenge, sets a series of voluntary performance targets on reducing operational energy, embodied carbon, and potable water **[See reference 36]**. They align with the UKGBC and LETI recommendations in regard to EUI and space heating demand, but adopt a phased approach, setting an interim target for 2025 which is less onerous than the final target that would come into place in 2030.

The UK Net Zero Carbon Buildings Standard is a recent initiative to establish a consistent methodology for achieving net zero carbon performance in buildings, supported by UKGBC, LETI, RIBA, RICS, Carbon Trust, CIBSE, and IStructE **[See reference 37]**. It is anticipated that this standard will align as far as possible with existing net zero initiatives and standards and bring together net-zero carbon requirements for all major building types, based on a 1.5°C trajectory. This will enable developers to robustly prove their built assets are net zero carbon in line with the UK's climate targets. A pilot version of the standard was launched in September 2024 **[See reference 38]**.

2.68 These standards generally follow the same broad characteristics of good practice:

- High standards of energy efficiency (for example high levels of insulation and air tightness, heat pumps), such that demand for space heating and all other energy requirements (measured in kWh/m2 per year) are much lower than the level required by Building Regulations;
- Reducing all other energy demands and ensuring that as close to 100% of energy use can be met through on-site renewables, whilst not allowing any fossil fuel combustion on-site; and,
- Reducing the performance gap by considering measures of as-built energy/carbon performance, rather than just modelled performance at the design stage.

2.69 Similar targets have been adopted in some local plan policies. For example, Policy SCR6: Sustainable Construction for New Build Residential Development of the Bath & North East Somerset Local Plan Partial Update (LPPU), adopted 2023 **[See reference 39]**, states:

> "New build residential development will aim to achieve zero operational emissions by reducing heat and power demand, then supplying all energy demand through onsite renewables. Through the submission of an appropriate energy assessment, having regard to the Sustainable Construction Checklist SPD, proposed new residential developments will demonstrate the following:
>
> - Space heating demand less than 30kWh/m^2/annum;
> - Total energy use less than 40kWh/m^2/annum;
> - On site renewable energy generation to match the total energy use, with a preference for roof mounted Solar PV; and
> - Connection to a low- or zero-carbon district heating network where available."
>
> [Carbon offsetting is also required for major developments where the use of onsite renewables to match total energy consumption is demonstrated to be not technically feasible or economically viable. Further details of carbon offsetting are included in Appendix B.]

2.70 The same targets for energy use and space heating demand and broader approach are included in Policy SEC1 – Sustainable Energy and Construction of Cornwall Council's Climate Emergency Development Plan Document (DPD), adopted in 2023 **[See reference 40]**.

2.71 Another example of ambitious energy use and space heating targets set through a local plan can be found within the Central Lincolnshire Local Plan, adopted in 2023. Policy S7: Reducing Energy Consumption – Residential Development, requires all residential developments to:

1. …generate at least the same amount of renewable electricity on-site (and preferably on-plot) as the electricity they demand over the course of a year, such demand including all energy use (regulated and unregulated), calculated using a methodology proven to accurately predict a building's actual energy performance; and

2. To help achieve point 1 above, target achieving a site average space heating demand of around 15-20kWh/m^2/yr and a site average total energy demand of 35 kWh/m^2/yr, achieved through a 'fabric first' approach to construction. No single dwelling unit to have a total energy demand in excess of 60 kWh/m^2/yr, irrespective of amount of on-site renewable energy production. (For the avoidance of doubt, 'total energy demand' means the amount of energy used as measured by the metering of that home, with no deduction for renewable energy generated on-site).

2.72 The targets within this local plan align with the LETI and RIBA targets for space heating and energy consumption. Additionally, unlike the previous examples the policies within this local plan also implement targets for non-residential using similar targets set by LETI and RIBA.

2.73 Figures 2.2 and 2.3 below present LETI's recommended opportunities to reduce energy consumption for residential and non-residential developments.

Figure 2.2: Recommended levers to reduce energy consumption in residential developments [See reference **41**]

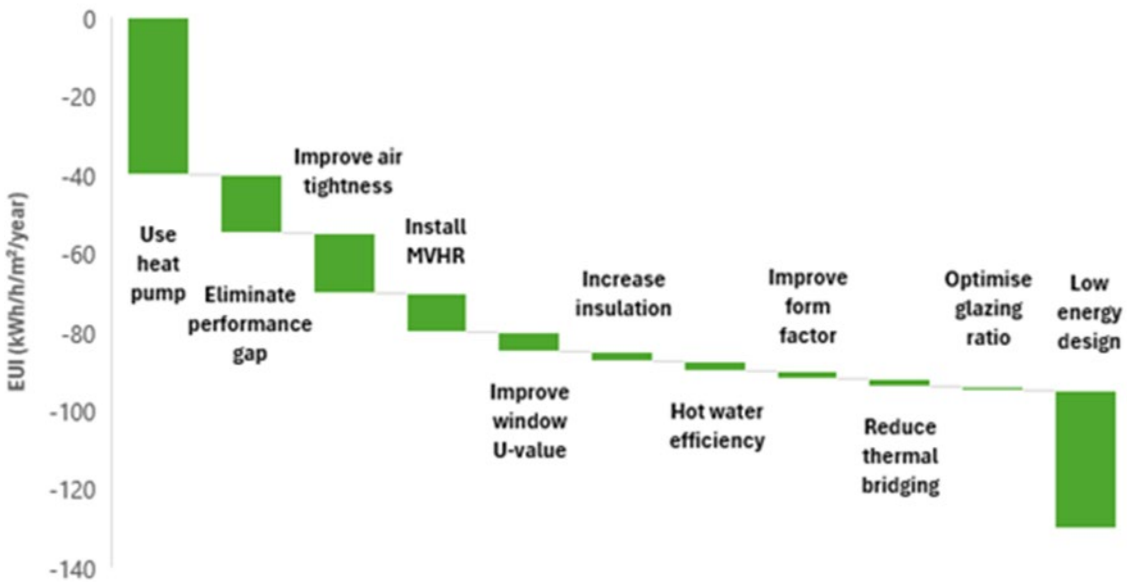
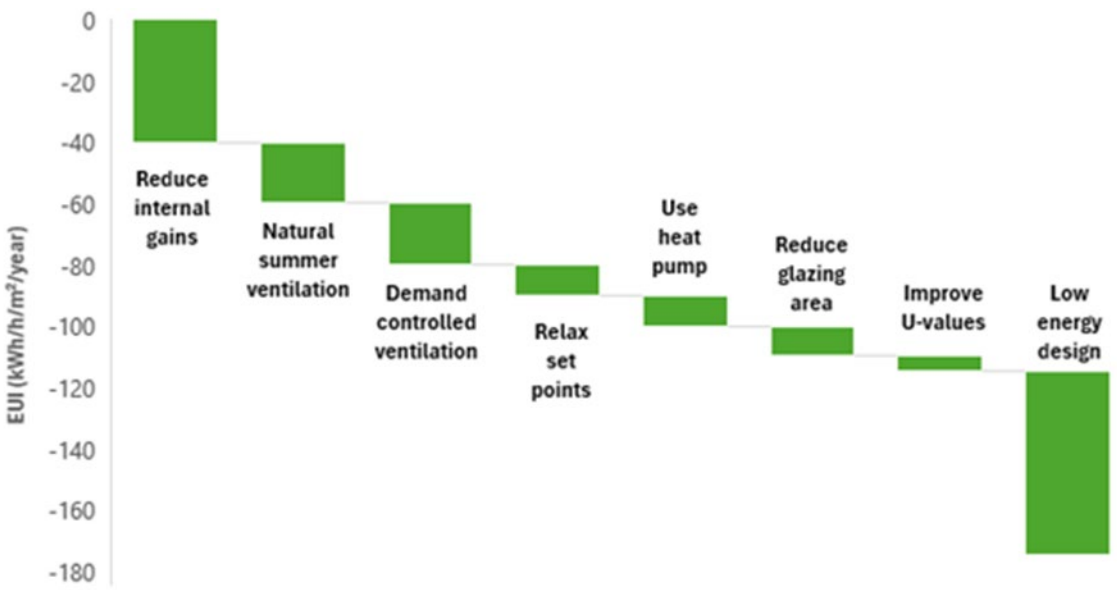


Figure 2.3: Recommended levers to reduce energy consumption in non-residential developments [See reference **42**]



2.74 The levers presented suggest that current technology and practice can be applied towards achieving net zero emissions in buildings based on LETI's estimates. As such, an approach to the targets set by LETI is considered technically viable.

2.75 Therefore, subject to consideration of viability (see below) MBC could require developers to comply with one of the above standards to demonstrate net zero emissions. However, these standards do not form part of an off-the-shelf assessment and thus would require developers to undertake bespoke calculations to prove compliance (above and beyond those required to demonstrate compliance with Building Regulations). They would also require MBC to develop in-house expertise in the relevant metrics and associated toolkits so that they could properly scrutinise energy statements.

Summary

2.76 Benefits of approach:

- Implementing performance targets informed by the best practice standards highlighted will account for both regulated and unregulated emissions in buildings.
- The use of the specific targets highlighted will provide significant energy bill reductions for occupiers.

2.77 Limitations of approach:

- Setting specific targets from the highlighted best practice standards will add costs to developers.
- The introduction of additional operational emissions targets beyond national policy and its future revisions may also send difficult signals to developers in the area who may be preparing for the FHS and FBS.
- These standards do not form part of an off-the-shelf assessment and thus would require developers to undertake bespoke calculations to prove compliance (above and beyond those required to demonstrate compliance with Building Regulations).

- Adopting one of these standards would require MBC to develop in-house expertise in the relevant metrics and associated toolkits so that they could properly scrutinise energy statements.

Viability

2.78 All of the options outlined above are different routes to securing net zero development. The costs of achieving net zero emissions will depend on the package of measures that is selected to meet this standard. In general, this will involve measures such as:

- High levels of insulation
- Using construction methods that ensure the building is very airtight, and that reduce heat loss at junctions and edges (which is known as “thermal bridging”)
- Heat pumps instead of gas boilers
- Mechanical ventilation with heat recovery (MVHR)
- Wastewater heat recovery (WWHR)
- Renewable energy technologies such as solar PV.

2.79 It is important to remember that the costs of developing new buildings can vary widely for a range of factors such as location, ground conditions, site constraints, access, topography, quality of finishes, design complexity, supply chain and management. In addition, construction costs can also be subject to sudden and significant change because of market or economic factors, for example varying exchange rates, skills or materials shortages and interest rates. These extensive factors mean that a benchmark cost analysis is only indicative of the overall cost implications of different energy and carbon performance improvement options and their relative significance.

Residential development

2.80 The available evidence (local plan evidence base work for councils such as Cornwall, Greater Cambridge, West Oxfordshire, Winchester and Essex **[See reference 43]**) suggests that net zero regulated (and unregulated) emissions can be achieved in **domestic buildings** at a cost uplift of roughly 3-7% compared with Part L 2021. Note that for some forms of development costs could be higher – for example Currie & Brown's study on behalf of Greater Cambridge **[See reference 44]** indicated an uplift of 10% for semi-detached homes and 13% for mid-terrace, compared with meeting Part L of the 2021 Building Regulations.

2.81 There would likely be some additional costs associated with undertaking an **HQM assessment** (including registration, certification and consultancy fees) but these are not expected to have a significant impact on capital costs (there is limited evidence here, but Leeds City Council assumed fees of £750 per apartment and £1000 per house **[See reference 45]**). However, MBC may wish to test the impact of a small (around 0.5%) increase in capital costs associated with other sustainability measures used to obtain HQM credits.

2.82 As discussed, an optional route to compliance would be to construct dwellings to the **Passivhaus standard**. Achieving the standard creates added construction costs and requires skilled labour. Information on capital cost uplifts associated with achieving the Passivhaus standards is limited. However, an analysis by AECOM **[See reference 46]** suggested that the uplift could be ~1-2%. Case study evidence from the past decade shows a much wider, and higher, range of costs. However, this is academic as we are not proposing that MBC creates a requirement for Passivhaus accreditation here, we are only suggesting it is encouraged or offered as an alternative route to compliance. This is not considered to have an impact on viability since it is optional.

2.83 Further details of costs are provided in Appendix A.

Non-residential development

2.84 For **non-residential buildings**, drawing on the same sources as cited above it would be reasonable to assume cost uplifts in the range of 6-10%, but these could be significantly higher or lower for individual developments.

2.85 A study by UKGBC investigated options for a high-rise office block to achieve net zero operational (regulated and unregulated) emissions **[See reference 47]**. It indicated that this standard could be achieved through different packages of measures, resulting in cost uplifts of anywhere from 6-17% compared with Part L 2013 (roughly 2-13% increase compared with Part L 2021).

2.86 Viability studies conducted by Currie & Brown on behalf of Greater Cambridge and West Oxfordshire Councils (see reference above) have also evaluated the costs of achieving net zero operational emissions via the **LETI standard** in schools and offices, based on modelled building archetypes. The results indicate that the uplift for schools and offices would be around 0-7% compared with Part L 2013 (which is approximately 0-4% compared with Part L 2021).

2.87 A separate Currie & Brown report published in 2018 found that achieving a 100% reduction in regulated emissions through a combination of onsite measures plus a contribution towards a carbon offsetting fund would result in a cost uplift of around 5-7% compared with Part L 2013 (approximately 1-4% compared with Part L 2021) **[See reference 48]**. Note that this only covered regulated emissions. This study was cited as evidence by Cornwall and BANES Councils, both of which have now adopted policies that require net zero regulated emissions for non-domestic buildings.

2.88 The above-mentioned range includes the comparatively small capital costs of achieving other **BREEAM** credits; this is justified because evidence indicates most BREEAM compliance costs (summarised in box below) arise from meeting the energy and GHG performance requirements. For example, research conducted by Currie & Brown on behalf of the Centre for Sustainable Energy found that, for a building that achieved a BREEAM 'Excellent' rating and a 100% reduction in regulated carbon emissions, only about one fifth of the cost uplift was associated with the wider sustainability measures with the remainder associated with energy efficiency and other on-site carbon reduction measures **[See reference 49]**.

2.89 Further details of costs are provided in Appendix A.

2.90 Note that non-domestic buildings vary more than domestic buildings in their scale, usage, and energy consumption patterns. Published cost information covers a relatively limited number of non-domestic building archetypes, while at the same time indicating a relatively wide range of potential outcomes. Considering this, a cautious approach would be to require non-domestic buildings to achieve net zero regulated emissions (that is not net zero unregulated emissions).

2.91 Lastly, it is important to note that, if the FHS and FBS are introduced in 2025, the baseline energy/carbon performance requirements will be lifted and the cost uplift to achieve net zero (relative to Building Regulations) for both residential and non-residential developments will be further reduced.

BREEAM Certification Costs

Research conducted by the BRE in 2016 suggests that the capital cost uplift of an ‘Excellent’ rating is around 1-2% whereas an 'Outstanding' rating would increase costs by 5-10% **[See reference 50]**. This was cited as evidence in the Climate Change Local Plan review for Lancaster City Council in 2021 **[See reference 51]**.

An earlier report by Currie & Brown **[See reference 52]** assessed the capital cost uplift for an office accommodation and a central atrium with a net floor area of 11,150 m^2 concluding that the capital cost uplift could be up to 0.4% to achieve a BREEAM Excellent level. Both reports present indicative estimates and use Part L 2013 as a baseline for estimating an increase in capital costs.

Recommendation

2.92 This section has set out three approaches that MBC could use to secure 'net zero' development: require development to reduce emissions relative to Building Regulations; set targets using third-party accreditation schemes; or use best practice standards. Each approach has its own benefits and limitations, as summarised at the end of each subsection. MBC is advised to consider these when weighing up which approach (if any) to adopt, including the need for internal expertise and resources to implement some of the approaches. If this is a key constraint for MBC, then an approach based on a third-party accreditation scheme might be a preferred approach.

2.93 Given the evidence collated in Document A it is recommended that MBC considers these options carefully relative to the 'do nothing' approach of relying on the introduction of the FHS and FBS and the decarbonisation of the national grid. This latter approach could contribute to achieving net zero by 2050 (assuming new buildings are built to be genuinely zero carbon in operation once the grid is decarbonised and the latter is achieved before 2050) but it would miss the opportunity to reduce emissions further in the years before grid decarbonisation is delivered. As discussed, adopting this approach would also negate the opportunity to secure co-benefits of early action such as reduced fuel bills and fuel poverty and reduced pressure on the electricity grid.

2.94 In addition to the above MBC should consider introducing policy wording that prohibits fossil fuel heating. This could be included in the local plan even if net zero requirements were not introduced. MBC is also advised keep a close watching brief on ongoing legal proceedings relating to the WMS and national planning policy reforms related to climate change policy.

Chapter 3

Low Carbon Buildings: **Embodied Emissions**

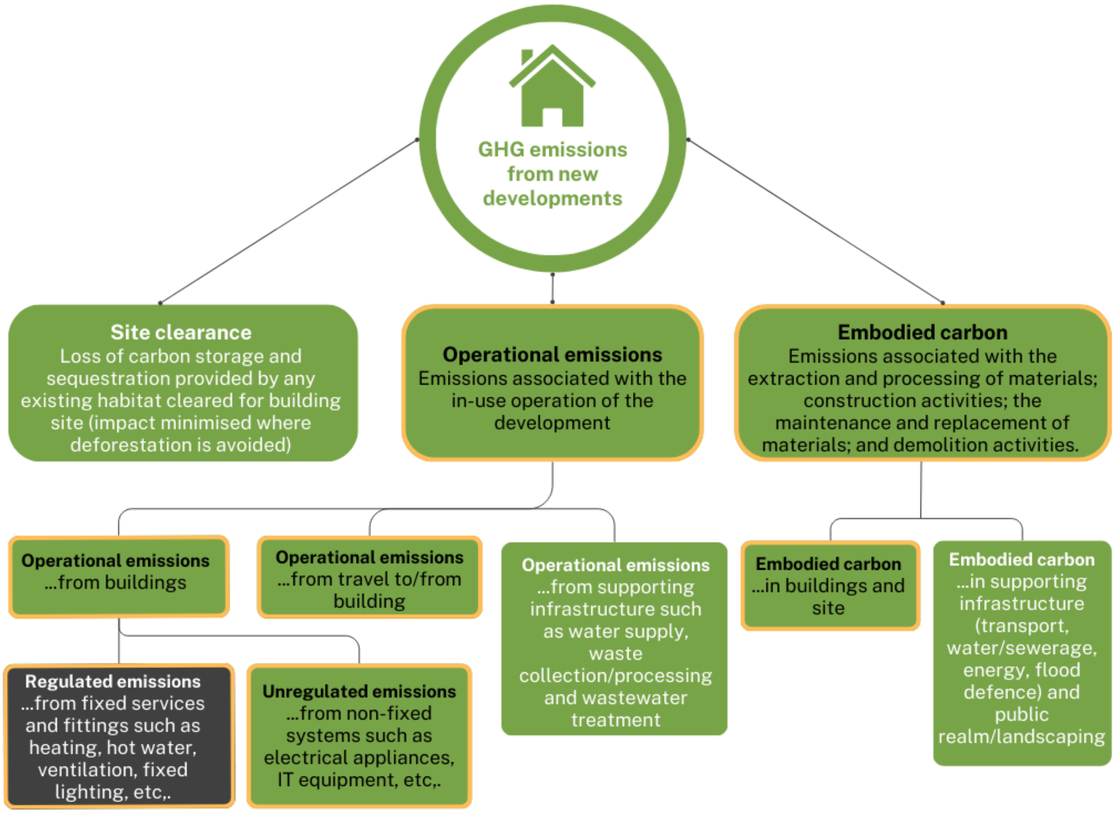
Context

3.1 As highlighted in the sections above, the scope of the current Building Regulations (including the forthcoming FBS and FHS) do not account for the full scope of emissions from buildings.

3.2 While reducing operational emissions can help support MBC's net zero aspirations for the Borough, the greenhouse gas (GHG) emissions that make up the whole life carbon profile of buildings also include embodied carbon. Embodied carbon refers to the carbon emissions emitted through the production of building materials, the transportation of materials to sites, installation, maintenance and replacement of building materials and components, as well as the disassembly, demolition and disposal at the end of life.

3.3 The illustration in Figure 3.1 below presents the full scope of emissions from buildings.

Figure 3.1: Scope of emissions from buildings

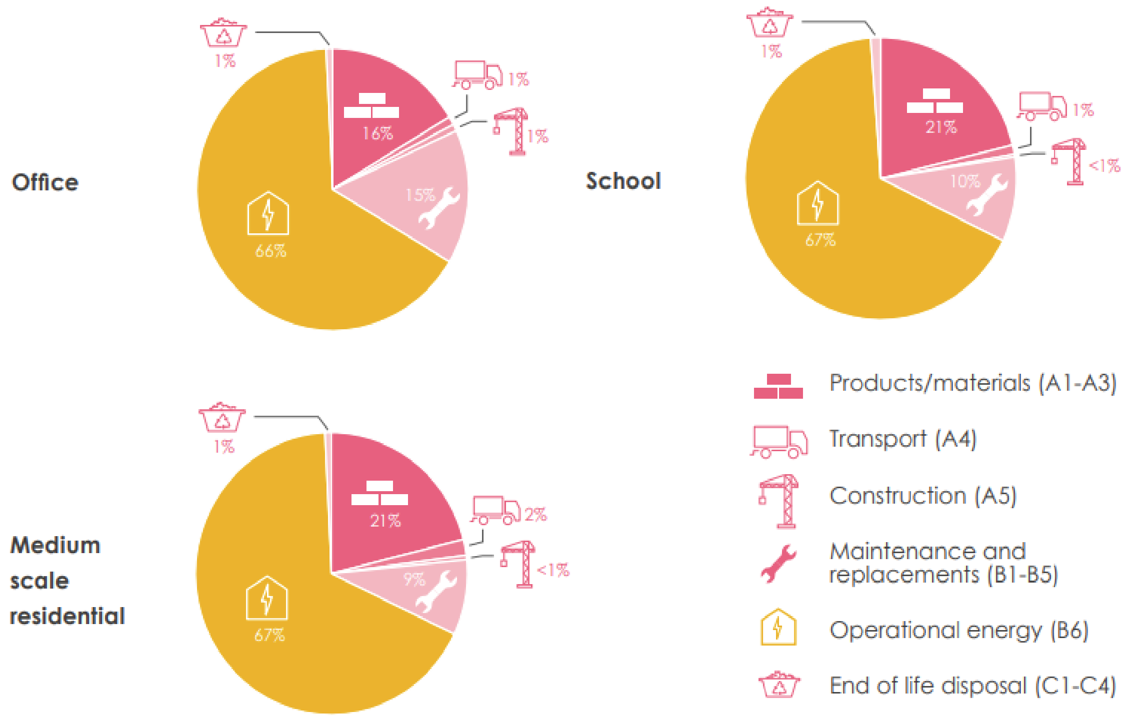


Only emissions in the grey box tend to be quantified in planning or Building Regulations approval processes.

3.4 The boxes highlighted by a yellow border present the major sources of emissions from buildings while the grey box indicates the emissions accounted for within the Building Regulations.

3.5 The proportion of embodied carbon emissions in buildings can vary depending on factors including building type and size. The London Energy Transformation Initiative (LETI) presents an indicative breakdown of whole-life carbon for typical building typologies, suggesting that embodied carbon emissions could range between 16% and 21% of a building's whole life cycle emissions **[See reference 53]**.

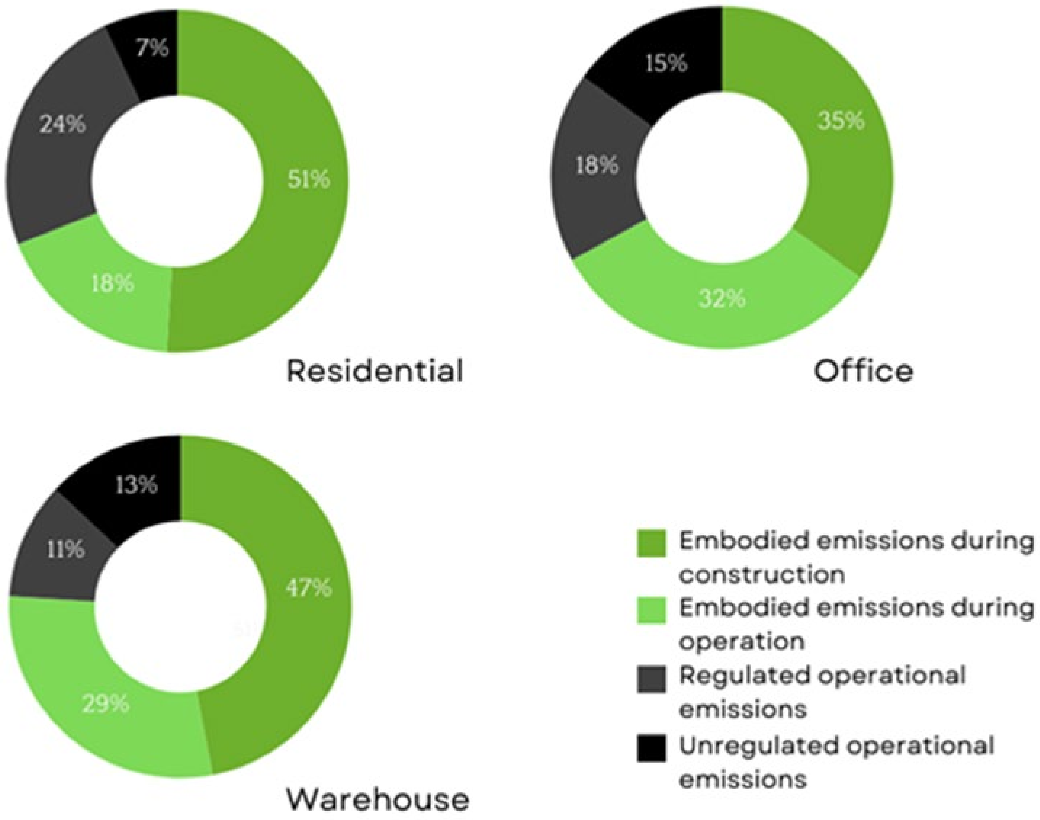
Figure 3.2: Breakdown of whole-life carbon emissions [See reference 54]



3.6 It is important to note that embodied carbon emissions are not limited to the construction and decommissioning phase of a building's life cycle. Further materials are consumed through maintenance and replacement over a building's life (typically taken as 60 years).

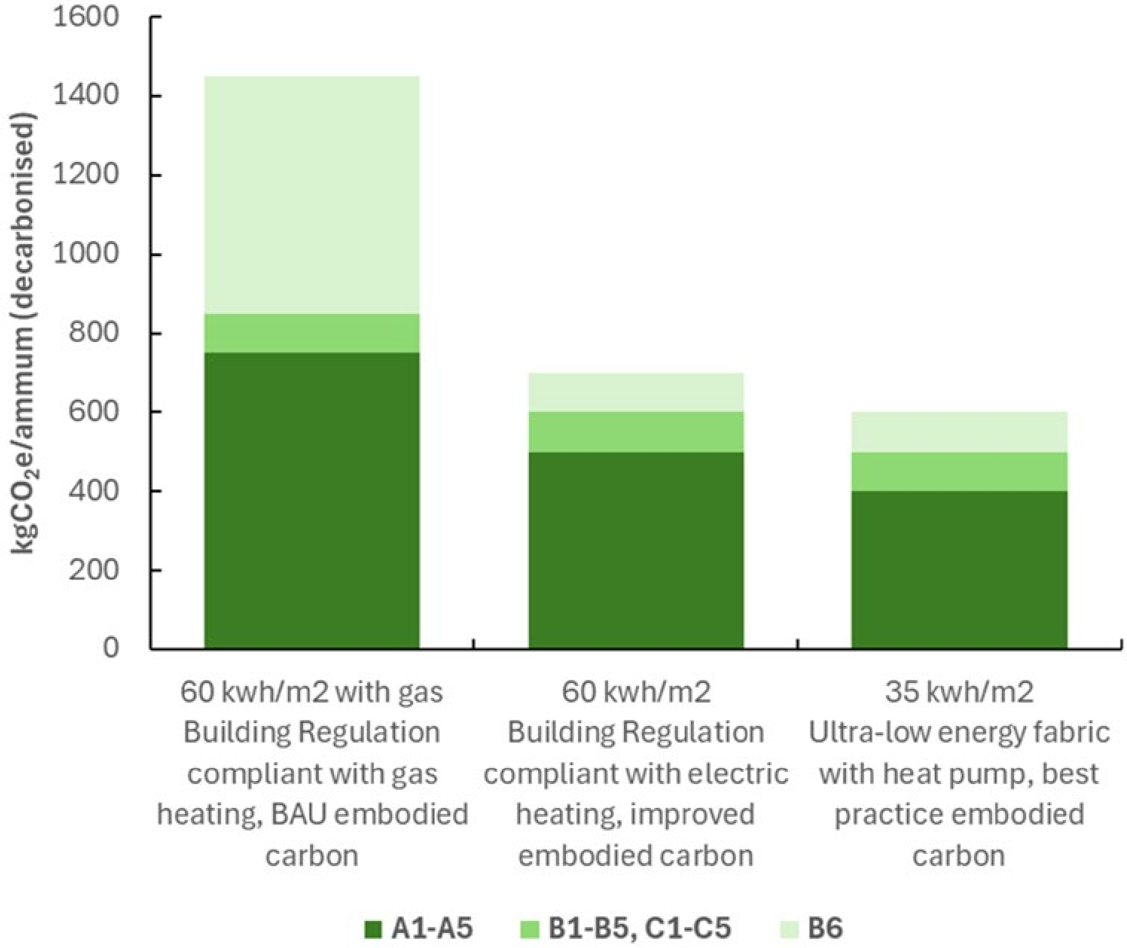
3.7 Another indicative comparison presented by RIBA shows the contribution of embodied emissions, during the construction and operational phase for speculative building types in the Figure 3.3 below.

Figure 3.3: Indicative illustration of the relationship between operational and embodied carbon emissions for building typologies [See reference 55]



3.8 A holistic approach is therefore needed to account for the impact of both operational and embodied carbon emissions from buildings in order to accelerate the progress towards net zero across the Borough. Figure 3.4 below presents an illustrative comparison of three options for residential buildings showing the possible reductions in whole-life carbon emissions **[See reference 56]**. The reduction in emissions is shown between a business-as-usual scenario for embodied carbon against an improved and best-practice embodied carbon scenario, as well as how operational and embodied, can combine to make significant reductions possible.

Figure 3.4: An illustrative comparison showing how a combination of operation and embodied carbon actions can make significant reductions [See reference 57].



3.9 The X-axis above shows a key for three main types of carbon with a building's life cycle – A1-A5: Materials and Construction; B1-B5 & C1-C5: Use-and End of Life; B6: Operational Energy Use only.

3.10 Consideration of embodied carbon emissions alongside operational carbon emissions also tends to increase attention on refurbishing and retrofitting existing buildings (thereby making the most of the embodied carbon already inherent in their construction) rather than developing new buildings which will involve substantial new embodied emissions. This issue is covered in the next section.

3.11 In 2021, the UK's embodied carbon emissions contributed around 40-50 million tonnes of CO_2 annually, more than emissions from aviation and shipping combined **[See reference 58]**. This constitutes around 1 in 10 tonnes of the UK's carbon emissions. There is no authority level data for Melton borough on embodied carbon. However, nationally, embodied carbon currently makes up about 20% of the UK-built environment's emissions **[See reference 59]**.

3.12 Due to ongoing efforts to decarbonise the national grid and improve the energy efficiency of buildings, the balance between operational emissions from buildings (covered in 'Chapter 2 Low carbon buildings: Operational emissions section) and embodied emissions is changing. As operational emissions are further reduced, embodied carbon will represent a greater proportion of emissions from our buildings, potentially representing 40-70% of whole life-cycle emissions for buildings across the UK **[See reference 60]**.

3.13 The House of Commons Environmental Audit Committee found that the "single most significant" policy the Government could introduce to improve the sustainability of the built environment would be a mandatory requirement to undertake whole-life carbon assessments for buildings, set within building regulations and the planning system **[See reference 61]**.

3.14 The Government's response to the House of Commons Environmental Audit Committee's report, referenced above, agreed that whole-life carbon assessments are likely to have a significant role to play in delivering decarbonisation across the sector, indicating that they are likely to be mandated nationally in the future **[See reference 62]**.

3.15 Looking across sectors and their decarbonisation efforts, beyond the built environment, zu Ermgassen et al (2022) estimate that embodied emissions from new housing construction (based on the current government's housing delivery targets), could consume 8% and 27% of the national carbon budgets for 2038-2042 and for 2043-2050 respectively **[See reference 63]**. Unlike operational carbon and other sectors, efforts to reduce embodied carbon have not yet led to significant success. Embodied carbon emissions fell just 4% between 2018 and 2022 according to the UKGBC when they needed to fall by 17% to support the

UK's path to net zero. This is compared to operational carbon that fell broadly in line with where it needed to **[See reference 64]**.

3.16 Melton borough is a rural area with largely sparser densities which reduces the ability to utilise shared infrastructure, potentially leading to more materials and resources being consumed. As highlighted in the Local Housing Need Survey **[See reference 65]**, the building and building types likely to come forward in the Borough are largely detached and semi-detached homes which generally require more materials for construction (compared to typologies such as terraced houses and blocks of flats), leading to higher embodied carbon. Detached homes might also not benefit from economies of scale like multi-family buildings or larger developments that can utilise prefabrication and modular construction **[See reference 66]**. A study by the University of Bath found that the embodied carbon in detached houses can increase by up to 15-20% over a building's lifetime due to the need for more frequent maintenance and material replacement. In contrast, terraced houses, with fewer exposed elements, require less ongoing material input, reducing their overall carbon footprint **[See reference 67]**.

3.17 The greater density and proximity to shared infrastructure in development coming forward in Melton Mowbray provides easier opportunities for developers to achieve embodied carbon reductions. However, in all development contexts choices around materials and construction methods at an early stage can achieve significant embodied carbon reductions that can support a net zero pathway. Sourcing materials locally can reduce the emissions generated through their transport. Designing for longevity, choosing durable materials and producing adaptable designs (allowing for new uses through modification when necessary) can also serve to reduce embodied carbon as the need for demolition and re-build is reduced. For example, Islington's Environment Design SPD promotes a 'long life loose fit' approach to building design.

Policy Context

3.18 Embodied carbon emissions are currently unregulated, nationally, and measurement and mitigation within construction is typically voluntary. To date, no building regulations have been introduced to tackle embodied or whole-life carbon.

3.19 The FHS and FBS, according to the 2023 consultation, will not address embodied carbon emissions at all. This is despite calls from the UK Climate Change Committee and leading industry figures to include embodied carbon emissions. In fact, an addition to the Building Regulations, 'Part Z', has recently been developed and submitted by a large industry representation to the new Labour government that introduces embodied carbon regulation **[See reference 68]**. It is lobbying the government to include its draft in any new FHS/FBS implementation. The group is calling on the government to mandate the measurement and reporting of whole-life carbon emissions for all projects with a gross internal area of more than 1000m^2 or that create more than 10 dwellings, and introduce legal limits on the upfront embodied carbon emissions of such projects, with a view to future revision and tightening as required.

3.20 The previous government also committed to consulting on the measurement and reduction of embodied carbon and sought views on a proportionate means of undertaking a carbon impact assessment that would incorporate all measurable carbon demand created from plan-making and planning decisions **[See reference 69]**. The government's response welcomed the role of planning in supporting the mitigation of carbon impacts on the environment, stating that research into the project-level and sector-wide economic, practical, and technical impacts of measuring and reducing embodied carbon is being undertaken. This research is intended to inform potential future policy decisions in this area.

3.21 Policy EN9 of the Melton Local Plan requires that major development proposals demonstrate, through a design and access statement, how "*effective use has been made of materials that have been reused, recycled, are renewable, locally sourced, have been transported in the most sustainable manner, and have low embodied energy*". As such, the existing policy does give consideration to embodied carbon emissions, requiring developers to consider low-carbon materials to reduce the overall carbon footprint of major developments. However, the local plan update presents an opportunity for MBC to implement a more robust, quantitative approach towards reducing embodied carbon emissions.

Alternative Policy Options

3.22 In the absence of national regulation on embodied carbon, local planning policy provides an opportunity to address this major source of local emissions and progress towards achieving net zero.

3.23 Requiring developers and other applicants to consider embodied carbon, alongside operational carbon, would encourage them to take a holistic view of the sources of carbon emissions from development during its life cycle from materials production, construction, and operation to deconstruction. The main policy mechanisms used by local authorities to reduce embodied emissions in new development are:

- Requiring a 'whole life carbon assessment' to consider the full spectrum of emissions from buildings; and
- Imposing quantitative targets or limits on embodied carbon.

Policy Option 1: Requiring a whole-life carbon assessment

3.24 MBC could require new build developments to undertake a whole life carbon assessment (WLCA), also called a Life Cycle Assessment, and take some action to minimise embodied carbon emissions as a result.

A **Whole Life Carbon Assessment (WLCA)** is a comprehensive multi-step methodology to quantify total carbon emissions (embodied and operational) and other environmental impacts (such as acidification and eutrophication) through the life stages of a building. The EN 15978 standard is typically used to define the different life cycle stages A1-3 ('Cradle to Gate'), A1-3 + A4-5 ('Cradle to Practical Completion of Works'), B1-5 ('Use'), C1-4 ('End of Life'), D ('Supplemental') **[See reference 70]**.

3.25 The main mechanism deployed for assessing the embodied carbon profile of new developments are whole life carbon assessments (WLCAs). These assess the carbon emissions resulting over a building's entire life cycle, from procurement and construction to demolition and disposal (including operational use). These rely on external assessors and do not, therefore, require resources from local planning authorities who might mandate them.

3.26 Requiring a whole-life carbon assessment (WLCA) would allow MBC to look holistically at the combined operational and embodied carbon performance of new developments. The emissions considered as part of the WLCA will include embodied carbon, construction, operation, and demolition emissions, therefore, this approach would go beyond the scope of the current building regulations.

3.27 The WLCA provides a detailed view of a building's emissions which can aid developers in identifying areas to reduce carbon emissions. The WLCA can also aid developers in achieving credits and ratings from third-party accreditation schemes, as such considerations for all the emissions from buildings can also be achieved through the policy options highlighted above ('Going beyond Building Regulations with third-party accreditation schemes'). By so doing, the WLCA undertaken to achieve credits within these schemes can help developers identify opportunities to reduce GHG emissions through the whole life cycle of new developments while the credits achieved will help demonstrate that actions have been taken to lower emissions from the identified opportunities.

3.28 For instance, BREEAM and HQM frameworks involve assessment of the whole-life performance of buildings. Specifically, BREEAM offers up to seven credits within the category labelled 'Mat 01'. Developers can earn these credits by actively reducing the environmental life cycle impacts of their buildings. This reduction is achieved through conducting a rigorous WLC assessment and integrating its outcomes into the design decision-making process.

3.29 With regards to the HQM framework, the relevant assessment category is 'Environmental Impact of Materials'. The primary aim of this category is to minimise the impact of construction products on the environment. While it covers various environmental aspects beyond embodied carbon, the latter remains a critical output of this assessment.

3.30 If MBC decided to use a third-party assessment approach to secure net zero operational emissions from new development then it would be straight forward to also use the same approach to secure a WLC assessment.

3.31 Examples where requirements for WLC assessments have been implemented in local plans show that they are typically applied for larger/major developments. Major developments have greater environmental impacts and the cost of conducting an assessment is distributed across building and design costs. Additionally, larger developments are typically subject to certification requirements for third-party accreditation schemes like BREEAM, Passivhaus, and HQM.

3.32 There is evidence of LPAs instituting planning policies to reduce the embodied carbon within new developments through WLCAs, however, these policies are typically seen in urban areas. For example, the London Plan (2021) **[See reference 71]** includes policy SI2 which sets out an approach to whole-life carbon:

> "Development proposals referrable to the Mayor should calculate whole life-cycle carbon emissions through a nationally recognised Whole Life-Cycle Carbon Assessment and demonstrate actions taken to reduce life-cycle carbon emissions."

3.33 The supporting text highlights the increasing importance of capturing embodied carbon emissions and unregulated operational emissions as operational carbon targets become more stringent, stating that "*a whole life-cycle approach is needed to capture its unregulated emissions (that is. those associated with cooking and small appliances), its embodied emissions (that is. those associated with raw material extraction, manufacture and transport of building materials and construction)*".

3.34 There is also evidence of more rural cases currently under examination exploring the use of WLCAs. Greater Cambridge City Council Local Plan **[See reference 72]** Policy CC/NZ: Net zero carbon new buildings states that:

> "Residential developments of 150 homes or more and non-residential development of 1,000 m^2 or more should calculate whole life carbon emissions through a nationally recognised Whole Life Carbon Assessment and demonstrate actions to reduce life-cycle carbon emissions. This should include reducing emissions associated with construction plants".

3.35 There are more examples of LPAs that have implemented third-party tools in local plans which account for the embodied carbon of new major developments (see operational emissions section). For instance, Policy SEC1 – Sustainable Energy and Construction of Cornwall Council's Climate Emergency Development Plan Document **[See reference 73]**, states that

> Development proposals for major (a floor space of over 1,000m^2) non-residential development should demonstrate how they achieve BREEAM 'Excellent' or an equivalent or better methodology.

3.36 Another recently adopted policy is Policy DM2, Environmentally Sustainable Development of the Eastleigh Borough Local Plan, 2022. This policy requires:

> all other development that is above 500 sq.m of floorspace measured externally (including extensions and conversions to existing buildings) must achieve BREEAM 'excellent' (or equivalent) or BREEAM 'very good' plus 'Passivhaus' certification...

3.37 The highlighted policies also indicate the importance of adopting a presumption against demolition in order to reduce embodied emissions from existing structures. The role of this is considered separately in this report under 'Chapter 5 Refurbishment and change of use of buildings'.

Summary

3.38 Benefits of approach:

- Consideration of embodied carbon including by requiring Whole life Carbon Assessment (WLCA) could further reduce emissions from new developments.
- The WLCA would allow MBC to consider embodied emissions together with operational emissions so as to optimise their relative and combined impacts and avoid the unintended consequences of assessing each in isolation.
- Using well-established third-party accreditation schemes to account for embodied carbon emissions reduces the burden on developers where compliance with these schemes is already required by other policies (for example energy or water).
- MBC would able to rely on external resources for assessing WLCAs as they would be conducted by affiliated third-party assessors. There would not be a need to provide specifically trained internal resources to judge assessments.
- The targets set by BREEAM and HQM are realistic and attainable, providing a clear and feasible roadmap for developers. MBC could assess the progress towards net zero through the number of proposals achieving certification.

3.39 Limitations of approach:

- The required assessments and changes to design/materials would add costs for developers, albeit these are anticipated to be limited especially if this is considered at an early stage of design development. By applying a requirement to major developments only, the costs of meeting these requirements can be more easily absorbed into construction and design costs.
- The scope of accreditation schemes cover a wide range of environmental issues with minimum credits for each category. As such, achieving ratings within each scheme does not necessarily indicate that the maximum credit for each category has been attained. For instance, the materials category within the BREEAM schemes accounts for 13% of the total credits available (with life cycle impacts having a total of 5 credits), as such an 'Excellent' BREEAM

rating can be achieved by maximising the sustainability credits from other environmental issues. However, this could be addressed by defining a specific minimum score on key credit areas relating to embodied carbon, similar to the approach set out for operational emissions above.

Policy Option 2: Setting targets for embodied carbon emissions

3.40 To ensure limits on embodied carbon in new developments, MBC could set specific requirements for developments to achieve minimum scores against specified embodied carbon targets.

3.41 This is a complementary approach to requiring a whole-life carbon assessment; as well as with other potential policies supporting a reduction of embodied carbon emissions such as ‘Refurbishment and change of use’ (see chapter 5), ‘Sustainable building design’ (see chapters 4), and ‘Minimising waste’ (see Document D). The interdependencies between these policies enhances the overall effectiveness, providing a comprehensive solution and supporting net zero aspirations from a reduction in embodied emissions.

3.42 By setting targets for embodied carbon emissions, proposals would need to undergo a whole-life carbon assessment to demonstrate that the set targets have been reached or demonstrate that proposals have strived to achieve set targets.

3.43 This approach would help developers create strategies to identify alternative measures and building elements and quantify the scale of carbon abatement that each alternative would provide to meet the set targets. This process also provides a baseline for building elements for development before carbon-saving measures are developed. This will allow the designer to focus attention on areas where greater carbon mitigation interventions can be made.

3.44 This approach differs from the previous approach as simply requiring a whole-life carbon assessment encourages developers to reduce embodied emissions while setting specific targets implements a benchmark that should be achieved.

3.45 Table 3.1 below presents the recommended embodied carbon targets from LETI and RIBA for building archetypes **[See reference 74]**.

Table 3.1: Summary table of LETI and RIBA embodied carbon targets for building archetypes

Building Archetypes	RIBA Targets $kgCO_2e/m^2$	LETI Targets $kgCO_2/m^2$
Residential	625	300
Office	750	350
School/Retail	540	300

3.46 The primary actions that can be used to reduce embodied carbon emissions in new developments in order to meet set targets include:

- Optimising building structures to use fewer materials
- Selecting materials with lower carbon footprints
- Focusing on the longevity of building materials and components
- Prioritising refurbishment and the reuse of existing structures.

3.47 There are few examples of embodied carbon targets set through local plans. Policy SCR8: Embodied Carbon of the BANES adopted local plan **[See reference 75]** states that:

> "Large scale new-build developments (a minimum of 50 dwellings or a minimum of 5000m^2 of commercial floor space) are required to submit an Embodied Carbon Assessment having regard to the Sustainable Construction Checklist SPD that demonstrates a score of less than 900kgCO^{2}e/m^2 can be

achieved within the development for the substructure, superstructure and finishes."

Bath and North-East Somerset's evidence study to support their new embodied carbon target of 900kgCO2e/m2 on large scale new build development showed that it was a cost neutral approach. They are already considering setting stricter quantitative standards and broadening the reach of the policy to other development in their next local plan **[See reference 76]**.

3.48 It is important to note that this approach only applies to major developments and includes an embodied carbon assessment, which relates to the A1-A5 modules of the whole life cycle assessment. Additionally, this case study presents an example of how accounting for embodied carbon ties into other related topics of the local plan such as Policy SB24 Sion Hill, requiring a demonstration that "*all reasonable opportunities to reduce the embodied carbon emissions associated with the development have been explored, including an assessment of the retention and conversion of the existing buildings, in whole or part. If conversion is not considered feasible, other significant opportunities to reduce embodied carbon emissions should be incorporated into development designs*."

3.49 The scope of third-party schemes, like BREEAM and HQM, and the interdependencies between these approaches (including requiring a whole life carbon assessment and setting embodied carbon targets) means that the implementation of these schemes will provide a framework for monitoring and assessing the impacts of embodied carbon, depending on the rating required. As such, where third-party schemes are implemented, it might not be necessary to set further specific targets for embodied carbon emissions.

Summary

3.50 Benefits of approach:

- Setting targets for embodied carbon would drive reduction in these emissions from new development.

3.51 Limitations of approach:

- Setting stricter standards will add costs to development, albeit these are estimated to be relatively limited especially if these considerations inform design from an early stage. However, targets have only recently been developed and evidence on the costs and technical feasibility of meeting them is still relatively limited.
- Implementation of this policy would require Council officers to develop expertise in embodied carbon to assess applications against the specified embodied carbon targets.

Viability

3.52 The House of Commons Environmental Audit Committee in 2022 found that, unlike the national government, many local authorities are mandating WLCAs of their own accord. The evidence they collected showed that the 'policy is achievable and is working, with few barriers to its introduction'. The report also suggested that WLCAs and related efforts will become national policy in due course. **[See reference 77]**.

3.53 The costs associated with implementing requirements for WLCA through third-party schemes are anticipated to be limited. As set out in the section on operational emissions the key costs related to BREEAM and HQM compliance relating to meeting operational energy and carbon requirements.

3.54 Consideration of the full carbon profile at an early stage of design should facilitate efficient, cost-effective solutions. For example, there may be opportunities to use specific low-carbon materials such as wood to displace high-carbon materials such as cement and steel and store carbon long-term in buildings.

3.55 In contrast, later attempts to deploy low-carbon materials and construction practices can be costly workarounds.

3.56 The cost of procuring low-carbon materials is not anticipated to be onerous for developers however the evidence base around the costs and feasibility of meeting specific targets for different types of development is still relatively limited. Modelling carried out by Essex County Council shows that for semi-detached, terrace and low-rise blocks of flats, the achievement of very ambitious embodied carbon target (below 500kgCO_2e/m^2) and net zero operational carbon would add 8-10% onto housing construction costs, depending on house type. In isolation from efforts to achieve net zero operational emissions, the embodied carbon scenarios represent an additional cost uplift of just 2% and 3%. **[See reference 78]**.

3.57 For larger sites, additional costs are likely to be very small compared with the overall costs of development.

3.58 One of the few barriers stalling the introduction WLCAs, highlighted by the House of Commons Environmental Audit Committee in 2022, was the absence of national legislation or regulations, which has created inconsistencies in the guidance and tools used to assess whole life carbon, increased the cost of WLCAs, and has led to an uneven playing field in conducting assessments **[See reference 79]**.

Recommendation

3.59 It is recommended that MBC institute requirements for major developments (such as 150 homes or more and 1,000 m^2 or more for non-residential developments) to calculate whole-life carbon emissions through a nationally recognised Whole Life Carbon Assessment and demonstrate actions to reduce life-cycle carbon emissions.

Chapter 4

Sustainable building design

Context

4.1 Although the specification of a building's fabric and materials will have a significant impact on the energy demand of a building, even more fundamental are some key design decisions which are typically shaped very early on **[See reference 80]**. These include building form, orientation, ventilation and glazing which are covered below.

4.2 These design decisions have a direct influence on the need for heating, cooling, lighting, and ventilation in buildings. Using building design to help lower space heating and cooling and other energy demands is in line with the energy hierarchy. It can also help reduce peak heating demand on the electricity grid in winter, limit the need to increase energy supplies for cooling in summer, reduce energy costs, and improve comfort for occupants.

4.3 Space heating demand is the amount of heat energy needed to heat a home over a year per square meter. A summary of the factors influencing space heating demand **[See reference 81]** includes:

- Form and exposure
- Air tightness
- Insulation
- Windows
- Ventilation system; and
- Orientation.

Building Form

4.4 A building's form influences energy use and embodied carbon emissions. Form refers to the shape, massing, or configuration of a building. Simple compact building shapes are more energy efficient due to having less exposed external surface area per square meter of internal floor area. This reduces heat loss and in turn, reduces the energy required for space heating.

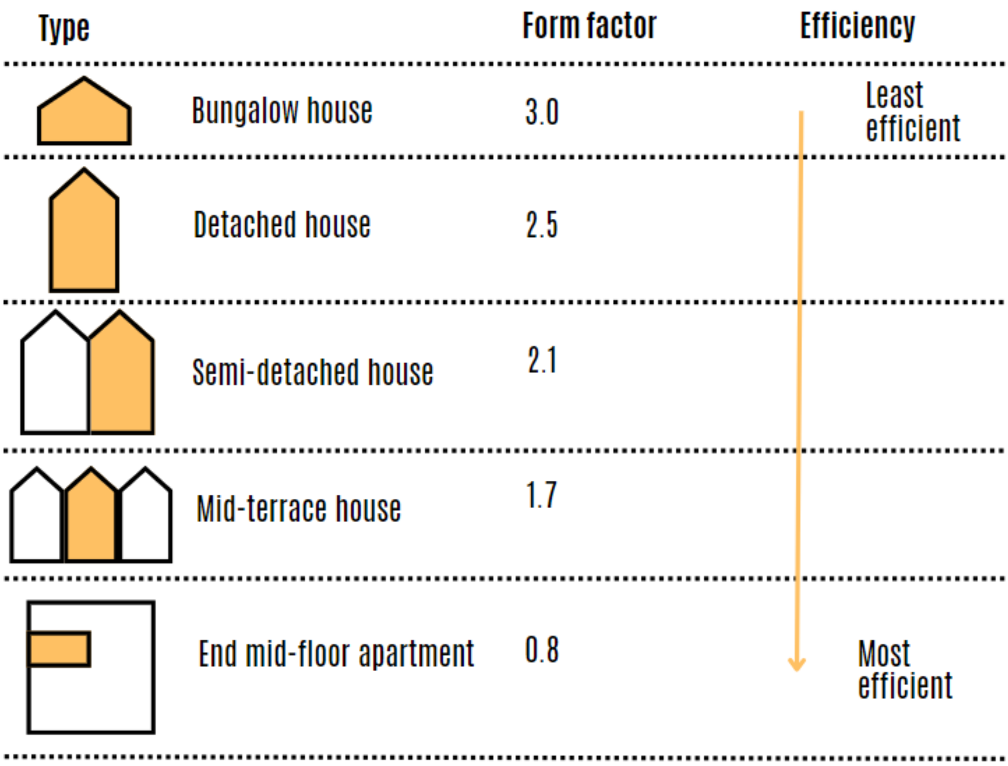
4.5 Buildings with a larger and more exposed surface area, through a complex form, can result in more heat loss, wind exposure, and solar gain, compared to a building of the same scale with a simpler form. Wrapping heated spaces around unheated basements and garages can also create further surface area for heat to escape. An example comparison of two identical 93m^2 dwellings, one a mid-floor end flat and the other a detached bungalow. Despite begin the same size and layout, the flat is significantly more thermally efficient because less of its external surface is exposed. Such a flat would have a heat loss area of 74m^2 compared to the detached bungalow which would have a heat loss area of 279m^2 **[See reference 82]**.

4.6 A building's form factor is a measure of how compact a building is – it is the ratio of its external surface area (that is the parts of the building exposed to outdoor conditions) to the internal floor area. The lower the form factor the more energy-efficient a building is.

Form factor = Exposed external surface area / Gross internal floor area

4.7 In the example above the form factor of the mid-floor flat is 0.8 compared to 3.0 for the bungalow. Figure 4.1 below shows this relationship across a wide range of dwelling types **[See reference 83]**.

Figure 4.1: Types of homes and their form factor



4.8 Similarly, the shape of a home affects its form factor and hence the space heating demand. The different shapes of a detached home can impact heat loss, **[See reference 84]**.

- A regular cube shaped detached home with a form factor of 2.5 requires 4,111kWh/yr
- An L-shaped detached home with a form factor of 2.7 requires 4,395 kWh/yr.

4.9 The above examples indicate that decreasing a building's form factor by reducing the external surface area of the building through joined homes (for example terraced homes or flats) and more compact designs can support the delivery of energy-efficient homes. Such design considerations can have direct impacts for heating demands, lowering overall greenhouse gas (GHG) emissions in the Borough **[See reference 85]**. Evidence also suggests that this design consideration can lead to cost savings for home occupiers as a result of lower heating demand **[See reference 86]**, and improve health and comfort by maintaining more stable indoor temperatures.

4.10 Best practice guidance such as LETI's Climate Change Design Guide and the Passivhaus primer, support considerations for form factor for efficient home designs. The table below presents aspirational form factor targets for developers from LETI's Climate Change Design Guide.

Table 4.1: LETI's form factor targets for building archetypes [See reference 87]

Archetypes	Form factor
Small scale housing	1.7 - 2.5
Medium and large-scale housing	<0.8 - 1.5
Commercial offices	1 - 2
Schools	1 - 3

4.11 The Passivhaus primer also recommends achieving a heat loss form factor of ≤ 3 as a useful benchmark guide when designing small buildings **[See reference 88]**.

4.12 However, as efficient form factors result in simple, compact, and joined building designs, buildings also need to be built to high design standards that respect the local context and principles of good urban design. A balance needs to be struck between responding to the local context, delivering an attractive and well-designed building and achieving a low form factor. The local context for the Borough is presented within its Neighbourhood plans, allowing local communities to create a shared vision for their neighbourhoods through decisions on where new homes, shops, and infrastructure should be located, and importantly, how these developments should look. As neighbourhood plans are part of the statutory development framework, they must be considered when planning applications are assessed.

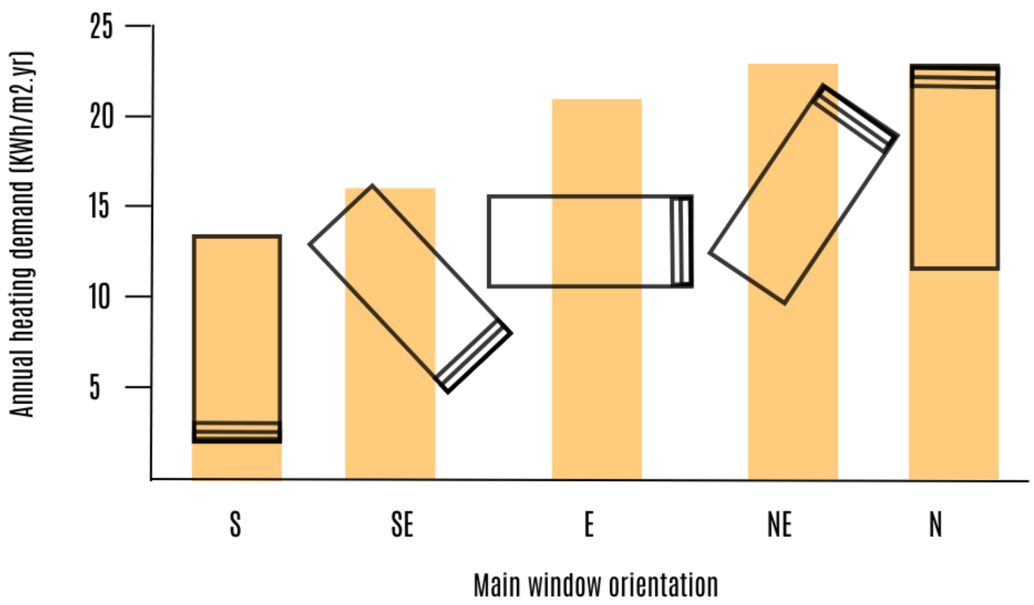
Orientation

4.13 The position of a building and windows in relation to the sun's path and prevailing wind can also influence a building's overall energy consumption and its resilience to climate change.

4.14 A building's orientation, including its windows, is key to minimising energy demand. In the UK, over the course of a year, north-facing windows nearly always lead to net heat loss, whereas south-facing ones can normally be designed to achieve a net heat gain. The optimal orientation is for buildings to have their longest side facing north and south, or as close as possible, within 30 degrees although it is recognised that this cannot always be achieved.

4.15 The illustration in Figure 4.2 below shows the impact of orientation on heating demand **[See reference 89]**. It shows that simply by changing the building's orientation, the space heating demand can change from 13kWh/m^2/yr (southerly orientation) to 24kWh/m^2/yr (northerly orientation).

Figure 4.2: Impact of orientation on annual heating demand



The orientation and pitch of roofs also have clear impacts on the ability to harness energy from solar PV panels. The Energy Saving Trust **[See reference 90]** presents data that identifies that south facing roofs are best. This identifies that the ideal pitched angle is around 30° from the horizontal. Shading will affect the performance of solar PV, although a system can tolerate some shading early or late in the day without much reduction of overall output (it should not be shaded between 10 am and 4 pm). Consideration of shading is therefore required, this can include from nearby buildings, trees or chimneys **[See reference 91]**. A south-facing pitched roof cannot always be achieved but by aligning roof pitch and orientation, a designer can seek to maximise potential energy output.

Solar shading

4.16 There is also a need to consider strategies to limit summer solar gains, to design out overheating. South-facing glazing in particular needs to be designed to prevent the risk of summer overheating. East-west windows can provide useful solar gains, but they too can often lead to overheating due to the low angle of the sun at the start and end of the day **[See reference 92]**.

4.17 East/west orientations which have a higher overheating risk due to increased low-angle sun exposure can benefit from reduced glazed areas and vertical shading, such as shutters to windows which can allow occupants to reduce solar gains to almost zero on the hottest days. South-facing elevations have high-angle sun exposure; solar gain can be controlled here using horizontal shading above windows such as roof overhangs, deeper window reveals and brise solei **[See reference 93]**. This can help to reduce overheating in the summer whilst also allowing lower angled winter sun to still penetrate buildings.

4.18 Currently demand for cooling is dominated by non-domestic buildings in the UK, however, many households are expected to install air conditioning in response to rising temperatures **[See reference 94]**. Research by the UK Energy Research Centre suggests that up to 5-32% of English households will adopt air conditioning by 2050 **[See reference 95]**. This research suggests that if 32% of English households install air conditioning, this will increase the summer peak load by 7GW. Further evidence suggests that by the end of the century, the domestic building stock in the UK will require 75% to 85% of the cooling energy consumption **[See reference 96]**. BEIS's evidence base on future cooling suggests that efficient technologies and passive measures, such as solar shading, can significantly reduce cooling energy consumption **[See reference 97]**.

4.19 It is also important to note that the installation of air condition (AC) systems will have negative impacts on the Borough's net zero aspirations as AC units often rely on hydrofluorocarbons (HFCs) as refrigerants which are potent greenhouse gases (GHGs).

4.20 Managing solar gains can therefore help to minimise the need for energy-intensive active cooling such as air conditioning.

Glazing

4.21 Excessive glazing is the main cause of overheating in the summer and heat loss in the winter. To optimise window design it should consider orientation (see above), daylight and summer comfort, and should work in tandem with other architectural design factors like proportion and elevational composition. To optimise solar gains it is important to minimise heat loss to the north with smaller windows, while providing sufficient solar heat gain from the south (larger windows). This again requires consideration at the design stage to which way a building is orientated. Other factors such as height and overshadowing need to be considered, for example, areas higher up in a building may also be able to reduce glazing, as there is more daylight available and less overshadowing from neighbouring buildings. High specification glazing (triple rather than double glazing) and solar glass tints can help to limit heat loss and overheating to some extent.

4.22 LETI (London Energy Transformation Initiative) set out that the optimum glazing ratios (also called window-to-wall ratio, is the proportion of glazing to opaque surface in a wall) for the UK climate are up to 25% glazed on the southern elevation, no more than 20% on the east/west elevations and as little as possible on the northern elevation **[See reference 98]**. Glazing-to-wall ratios are also a key feature of Passivhaus design.

4.23 Windows sized to balance heat loss and gain can sometimes appear small, however the appropriate introduction of architectural features can improve the balance, for example, use of stepped reveals.

4.24 Horizontal windows tend to work better than vertical and wider, shorter windows can moderate overheating risk and are typically easier to shade with an increased openable area for ventilation. They can also improve daylight distribution in rooms and provide increased privacy to bedrooms. As noted above, local character and context may mean the optimal approach it terms of energy efficiency is not always the right approach.

Ventilation

4.25 Effective ventilation is vital for ensuring good indoor air quality, mitigating heat build-up and removing excess moisture **[See reference 99]**. More energy efficient buildings tend to be more airtight (to reduce loss of heat and draughts), thus ventilation considerations become more critical to prevent condensation, damp and ensure adequate fresh air, thus reducing risks of damage, mould, and health impacts.

4.26 Both background and purge ventilation help maintain air quality and cool buildings.

Background ventilation provides a constant rate of ventilation throughout the day and across the seasons **[See reference 100]**. Natural background ventilation, found in less airtight buildings, includes trickle vents in windows and air bricks. Buildings that have high levels of air tightness, will need mechanical background ventilation.

Purge ventilation provides bursts of fresh air to rapidly cool or renew the indoor air, typically achieved with openable windows **[See reference 101]**.

4.27 A variety of ventilation measures are used within non-domestic buildings. The strategy adopted is strongly influenced by the client and/or functional requirements of the building **[See reference 102]**. Commercial and industrial premises often use air handling units (AHU) and air conditioned commercial spaces, such as offices, increasingly employ combined heating, cooling, and humidity control (HVAC) systems. Existing domestic buildings tend often to use mechanical extraction (extractor fans) in higher risk areas, such as bathrooms and kitchens, this is in line with requirements set out in building regulations.

4.28 Extracting internal air and replacing it with outside air can increase the need for heating and cooling depending on the ambient outside air temperature. However, the need for additional heating energy can be reduced by re-circulating internal air with the fresh outside air, or by using mechanical ventilation with heat recovery (MVHR). MVHR works by recovering heat from the extracted air to pre-heat incoming fresh air using a heat exchanger. It can retain up to 95% of the heat from outgoing stale air, minimising the need for heating. Because it provides continuous ventilation, MVHR supports very high levels of airtightness. The LETI and Passivhaus standards recommend the use of both MVHR in all homes. MVHR will be one of the viable means of complying with the proposed continuous mechanical extract ventilation requirements of the forthcoming Future Homes and Buildings Standard **[See reference 103]** alongside MEV and d-MEV systems.

Mechanical extract ventilation or MEV is a continuous mechanical extract ventilation system which is provided centrally located continuously running mechanical extract fan with ducts running from the moisture producing 'wet' areas such as kitchens and bathrooms. **Decentralised mechanical extract ventilation or d-MEV** works by having individual room fans which operate continuously to draw moisture directly from wet rooms, it operates on both a continuous background trickle and boost modes.

4.29 Alternative ventilation systems also exist which provide some demand control over air infiltration, for example, some air-to-air heat pumps can also provide cooling when operating in reverse, but air-to-air systems do not provide water heating, so may not be the best solution for many buildings, including dwellings.

Natural Ventilation

4.30 Natural ventilation, unlike mechanical ventilation, uses the natural forces of wind and thermal buoyancy to create air movement in and out of buildings. The amount of natural ventilation possible depends on building orientation, the design of internal spaces, and the size and placement of openings in a building. Natural ventilation through open windows with cross-ventilation delivers the greatest flow-rate potential. The LETI and Passivhaus standards support the use of natural ventilation in summer, highlighting this measure as one of the opportunities to reduce energy consumption in residential and commercial developments.

4.31 Natural ventilation is typically considered during the design stage. Design principles that can influence the effectiveness of natural ventilation include the design, size and position of windows and other openings to promote internal airflow and effective cross ventilation. The siting of buildings to benefit from the predominant summer winds and to avoid any external elements (such as buildings or trees) that may obstruct these. Building depth is also a factor, as it is easier to naturally ventilate narrower buildings, it is hard for wind driven air to pass all the way through deep buildings.

Cross ventilation is when the openings in a structure are arranged on opposite or adjacent walls, allowing air to enter, cross the space and exit, it is much more effective than **single sided ventilation**, which should be avoided where possible. **Stack ventilation** introduces cooler air from the outside into the building at a low level, this causes warmer air to rise and leave the space through openings situated at a higher level (such as skylight windows, automatic louvers, and ridge vents). During night in the summer months natural ventilation can provide free cooling, secure windows and other openings that can be left open safely at night can aid this.

Implications for Melton borough

4.32 Overall, the identified building design considerations are critical for improving the energy efficiency of buildings, making buildings more resilient to climate change consequences such as the increased risk of overheating, and improving the health and comfort of occupiers. Some of the identified design considerations can also be applied to existing buildings within the Borough to improve energy efficiency and climate change resilience. For instance, unlike orientation and form, design interventions for improved ventilation, glazing and solar shading can be applied to existing buildings to improve energy efficiency and reduce the risk of overheating.

4.33 Predicted population demographics for Melton borough are for overall population growth, continued population ageing and falling household sizes. These factors are all expected to increase domestic energy demands overall and per person **[See reference 104]**.

4.34 The identified design considerations favour simple, rectangular structures aligned south/north, along with background and purge ventilation measures. However, designs must be context-sensitive, considering site limitations like landscape features, local character, neighbouring buildings, and topography.

4.35 As discussed, the most form efficient types of housing are connected homes such as flats and mid-terraced houses. However, consideration of the local area and its housing stock and market needs to be given, to understand how practical housing delivery is within these house types. The rural nature of the Borough has resulted in the majority of the housing stock being made up larger family housing (72% have 3 or more bedrooms) **[See reference 105]**. 41% of homes are detached houses, 36% are semi-detached and 15% are terraced. There are very few flats (5% of housing stock) with the majority within the social housing sector **[See reference 106]**. The Local Housing Need Survey (2024) **[See reference 107]** sets out that there is a notable relatively weakly developed market for flats in the Borough and that the market is expected to continue to be focused on family house delivery, expect where site or scheme characteristics suggest otherwise (for example, town centre, social housing or older persons extra care schemes).

4.36 The ageing population and market signals also direct housing need towards increased bungalow provision, which is explicitly supported in the adopted Local Plan's housing mix policy alongside a need to rebalance the housing stock toward smaller-sized dwellings with up to three bedrooms. The latter offers some indirect emissions benefits, as smaller homes can help to reduce under-occupation (particularly in the local context of falling household size) and have lower overall space heating/energy demands and so is supported.

4.37 The higher price of detached housing compared to semi-detached and terraced housing locally is significant **[See reference 108]**. There are consequently competing priorities between a more efficient form factor for dwellings, what the market has supplied, future market demand, and whether changing the types of houses built to support a higher form factor could potentially impact deliverability, viability or meeting local housing needs.

Policy Context

4.38 The NPPF states that the planning system should help to shape places in ways that contribute to radical reductions in greenhouse gas emissions, minimise vulnerability and improve resilience. Paragraph 159 states that new development should be planned for in ways that *"avoid increased vulnerability to the range of impacts arising from climate change. When 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 its location, orientation, and design. Any local requirements for the sustainability of buildings should reflect the Government's policy for national technical standards*."

Building Regulations

4.39 The Building Regulations 2010 set out the current standards for buildings in England **[See reference 109]**. Building Regulations relevant to this chapter include those that cover overheating (Part O) and ventilation (Part F).

4.40 Part F of the Building Regulations (2022) **[See reference 110]** sets out the requirements in relation to Ventilation. Part F requires consideration of energy efficiency when specifying ventilation systems, recognising the need for different ventilations solutions in more air tight buildings. Part F has tended to be modified alongside changes to Part L, as requirement for energy efficiency and air tightness have increased over time. It was last updated alongside Part L, to increase minimum whole dwelling ventilation requirements and a shift towards mechanical ventilation systems to reflect increased energy efficiency requirements. The current minimum requirements (suitable for less airtight dwellings) are for background passive ventilation (such as trickle vents to windows) with intermittent extractor fans in rooms such as kitchens and bathrooms. However, the updated regulations now prioritise alternative ventilation methods, these include MEV, MVHR and d-MEV systems.

4.41 Option 1 of the Future Homes Standard (FHS; discussed in Chapter 2) set out the preferred requirement for the FHS to require continuous mechanical extract ventilation systems, from 2025. The consultation set out the expectation that this will most likely be taken forwards by developers through the provision of d-MEV, as the easiest to implement and lowest cost option (it is noted that Option 2 of the FHS would not significantly change requirements above the current minimums).

4.42 Part O of the Building Regulations **[See reference 111]**, sets out the guidance on how to meet the standards for addressing the risk of overheating in new residential buildings in England. The requirements aim to protect the health and welfare of occupants of the building by reducing the occurrence of high indoor temperatures through designing and constructing the building to limit unwanted solar gains in summer and providing an adequate means of removing excess heat from the indoor environment. The requirements state that:

1. "Reasonable provision must be made in respect of a dwelling, institution or any other building containing one or more rooms for residential purposes, other than a room in a hotel ("residences") to:

- limit unwanted solar gains in summer;
- provide an adequate means to remove heat from the indoor environment.
- In meeting the obligations:
- account must be taken of the safety of any occupant, and their reasonable enjoyment of the residence; and
- mechanical cooling may only be used where insufficient heat is capable of being removed from the indoor environment without it."

4.43 The Building Regulations include targets to limit solar gains in buildings or parts of building with and without cross-ventilation, that should be followed.

The Melton Local Plan

4.44 The Melton Local Plan (2011-2036) **[See reference 112]** states that MBC aims to facilitate a sustainable pattern of high-quality development which, amongst others, addresses the causes and effects of climate change and reuses and recycles resources. The environmental objectives of the Local Plan include objectives to "*Prepare for, limit, and adapt to climate change and promote low carbon development" and "Minimise the use of energy and promote forms of renewable energy generation in appropriate locations*".

4.45 Policy EN8 is the strategic Climate Change policy of the Melton Borough Local Plan 2011-2036. It states that all new development proposals will be required to demonstrate how the need to mitigate and adapt to climate change has been considered, subject to considerations of viability. The supporting text for Policy EN8 – Climate Change states that "*New developments should maximise the use of energy efficiency and energy conservation measures in their design, layout, and orientation to: Reduce the overall demand for energy; Reduce carbon dioxide emissions; Reduce heat island effects; Contribute to health and well-being; and Be* *able to adapt to the effects of climate change*". Policy EN8 signposts to key local plan policies to help achieve these aims of EN8, including in terms of sustainable design and construction, Policy EN9 (ensuring energy efficient and low carbon development).

4.46 Policy EN9 – Ensuring Energy Efficient and Low Carbon Development of the local plan states that "*Major development proposals will be required to demonstrate how the need to reduce carbon emissions has influenced the design, layout and energy source used, subject to viability*". The second part of this policy states that "*Development proposals, including refurbishment, will be supported where they demonstrate the following, subject to viability: How the design optimises natural sunlight and solar gain, and prevents overheating including providing non-mechanical means of ventilation and opportunities for cooling from tree planting and landscaping."* It should be noted that Policy EN9 only applies to major developments.

4.47 The Local Plan is supported by a Design of Development SPD, it sets out six core principles for the design of development, this includes designing adaptable and resilient places **[See reference 113]**. Climate change is set out as a key issue, however, there are opportunities to provide additional guidance on how design considerations such as those set out above should be taken into account.

4.48 The Local Plan accounts for the contribution of design measures such as natural lighting, solar gain, and natural ventilation, for reducing carbon emissions. The SPD also states that the design and construction of new buildings will be expected to achieve carbon reduction by reducing the consumption of energy through features that provide passive heating, cooling and natural lighting, and high levels of thermal performance in the building fabric. In relation to a building's orientation, the SPD highlights the use of landscaping to provide solar shading in the summer, as such, the use of a building orientation to limit unwanted solar gains in summer is not explored. However, there is no specific policy or supporting guidance on using a building's form and orientation to achieve emission reduction.

4.49 The Levelling Up and Regeneration Act 2023 **[See reference 114]** provides for the creation of new planning policy documents called Supplementary Plans

(SPs). These are intended to replace SPDs and Area Action Plans under the reformed plan-making system. Thus in theory a revised Design guide could be adopted as a SP. SPs will have the same weight as a local plan, giving communities and applicants more certainty about the plans that applications are determined in accordance with. They will also be subject to consultation and independent examination. However they are not intended to be used routinely, except where they set out either:

- **Authority-wide Design Codes**. These area-wide codes function as a framework for which subsequent detailed design codes can come forward. Design codes can either be included in Local Plans or as SPs.
- **Site-specific supplementary plans**, for example to support a new development opportunity. However, these are limited to a site or two or more nearby sites.
- **Build on existing policies** in the Development Plan, for example to set out a masterplan or design code for a site allocated in a Local Plan.

4.50 Thus, MBC would need to be mindful of these requirements when developing any new design guide.

Alternative Policy Options

4.51 The existing policy within the Local Plan and guidance within the SPD consider some design measures to achieve emission reduction, however, there is an opportunity to achieve further reductions through design-based measures. MBC could enhance the current policy through providing guidance on mechanisms to achieve emission reduction and climate change adaptation.

Enhance Local Plan Policies D1, EN8 and EN9

4.52 A building’s form, orientation, ventilation, and design, including its window placement, can significantly affect its efficiency and the need for energy for heating, cooling, and lighting. As such, seeking effective form, and optimising orientation and design in new buildings in Melton borough can provide both climate change mitigation and adaptation benefits.

4.53 As identified above, the Local Plan includes some considerations for the need to reduce carbon emissions through design and layout, set out in Policy EN9, but only for major developments. Additionally, the Design for Development SPD considers aspects of building height and shape, however, the available policy and guidance are somewhat limited. It is considered that further guidance would be beneficial to strengthen both the policy provided within the Local Plan and the guidance within the Design of Development SPD. MBC could consider explicitly setting out good practice principles and standards that it supports, to provide clarity on what good looks like and what is expected. This should be based on established best practice guidance, such as LETI's Climate Change Design Guide, the Passivhaus Primer, and the Passivhaus Easi Guide, discussed above. These best practice guides provide useful development type-specific targets including form factor, orientation, and window glazing ratios.

4.54 There are examples of local plans including policies that set out expectations around building form and orientation. For example, Policy S6: Design Principles for Efficient Buildings within the Central Lincolnshire local plan, adopted 2023 **[See reference 115]**, states that:

> "When formulating development proposals, the following design expectations should be considered and in the following order:
>
> - Orientation of buildings – such as positioning buildings to maximise opportunities for solar gain, and minimise winter cold wind heat loss;
> - Form of buildings – creating buildings that are more efficient to heat and stay warm in colder conditions and stay cool in warmer conditions because of their shape and design;
> - Fabric of buildings – using materials and building techniques that reduce heat and energy needs. Ideally, this could also consider using materials with a lower embodied carbon content and/or high practical recyclable content;

- Heat supply – net zero carbon content of heat supply (for example, this means no connection to the gas network or use of oil or bottled gas);
- Renewable energy generated – generating enough energy from renewable sources onsite (and preferably on plot) to meet reasonable estimates of all regulated and unregulated total annual energy demand across the year.

Energy statements, as required by Policies S7 and S8, must set out the approach to meeting each of the above principles”

4.55 The Central Lincolnshire Energy Efficiency Design Guide **[See reference 116]** supports Policy S6 through guidance to optimise building orientation and form. The guidance also links to Policy S7: Reducing Energy Consumption - Residential Development and Policy S8: Reducing Energy Consumption - Non-residential within the local plan. The guidance states that:

“Buildings should be kept compact and simple in form, minimising the surface area from which heat loss occurs.”

4.56 The guidance highlights the role of form in reducing space heating demand. Further guidance is also provided to encourage designers to orient buildings to increase solar incidence and heat gains, stating that “*Though this will reduce and limit winter heating loads, it can also increase the likelihood of elevated summer solar gains - potentially leading to overheating.”* The guidance is also an example of how typical targets for form factor can be included within SPDs which, if implement in the context of the Borough, indicates how guidance provided in any Supplementary Plans can support specific policies within the local plan update.

4.57 As consideration of form factor and orientation are required at an early stage of the design process, guidance on these factors is considered to be more appropriate if set out within or alongside the Local Plan’s main design policy (D1) and expanded upon within any future supplementary plans that provide design guidance, including any local design codes.

4.58 MBC could consider options to go further than demonstrate consideration of principles and how they have influenced the design, such as to set out specific requirements and standards, such as specific form factor targets within policy. MBC could also require applicants to demonstrate compliance through a Design and Access Statement or any required sustainability statement, as well as any industry accepted standards such as CIBSE TM59 **[See reference 117]** and CIBSE TM52 **[See reference 118]**.

Summary

4.59 Benefits of approach:

- Considerations for lower form factor in buildings will result in buildings with simpler and more compact designs, often requiring less maintenance as a result of fewer complex features and less surface area exposed to elements.
- The shape and complexity of buildings in the Borough has impacts on the embodied carbon emissions. Simple and compact buildings, with lower surface areas, will result in lower embodied emissions as well as lower construction emissions from the intricate construction processes needed to build more complex forms.
- Support for simple and compact designs has the potential to promote block of flats and terrace building types, more suited to the Borough's falling household sizes. As such, in addition to the benefits from reducing emissions from buildings during operation, this approach allows for higher density developments, efficient land use, and supports development in locations already well served by infrastructure.
- Further consideration for the risk of overheating, through building design and orientation will help mitigate the risk of overheating in building occupiers, and reduce the need for cooling.
- Building Regulations requirements relating to the energy and carbon performance of buildings are anticipated to be tightened further over future years. These are becoming increasingly in line with Passivhaus-like standards on energy efficiency and overheating. Scaling up local expectations on design demands and internal resourcing on evaluating such

design choices will futureproof MBC against such changes to national standards.

4.60 Limitations of approach:

- Accounting for form and orientation through the local plan and guidance documents will require resources from planning officers to assess whether reasonable consideration for these design measures in development proposals.
- MBC will need to develop a framework for assessing whether reasonable design considerations have been made to support climate change mitigation and adaptation through form and orientation. For instance, MBC may consider what form factor would be considered appropriate from reasonable benchmarks. Supplementary checklists or other support tools may be useful to support planning officers in their negotiations with developers. Ultimately these considerations are a means to achieve energy or carbon performance targets so it could be argued that focusing on the outcome is the key priority.
- Development of a revised Design Supplementary Plan would need to navigate the restrictions on SPs highlighted earlier. It will also require additional resources to produce.
- Where specific design targets are set, this approach has the potential to impact viability. A rigid approach may not be practical in the current local housing market context. Instead, a more flexible policy that requires proposals to demonstrate consideration of these factors is recommended.
- Optimising building orientation might conflict with maximizing density due to road layouts or challenging topography. Again, a more flexible policy that requires proposals to demonstrate consideration of these factors is recommended.

Viability

4.61 There are limited challenges to maintaining and enhancing the existing policies relating to form and orientation in Policies EN9 and EN8 (or within Policy D1 if appropriate). MBC should maintain the considerations for design and layout in Policy EN9 for major developments and Policy EN8 for all developments, requiring proposals to consider the need to reduce carbon emissions and adapt to the impacts of climate change, through the design and layout, subject to viability. However, further guidance, strengthening that provided within the current SPD, could be provided on the impact of a compact form factor and orientation on energy efficiency and orientation.

4.62 Additional considerations for a compact form factor and orientation are design-stage actions. These early-stage design considerations can significantly improve efficiency and the liveability of homes and other developments. The Passivhaus Design Easi Guide **[See reference 119]** and the LETI Climate Emergency Design Guide **[See reference 120]** advise on good practice standards for form and orientation, window design, ventilation, and thermal performance, providing a starting point for design considerations. The Good Homes Alliance has also published an overheating risk assessment tool.

4.63 MBC can also highlight aspirational targets for developers from best practice guidance, such as presented within LETI's Climate Change Design Guide and the Passivhaus Primer, discussed above. Compliance, for major developments, could be demonstrated through the statement of sustainability and the Design and Access statement.

4.64 Sustainable form and orientation design considerations are also some of the measures that can be taken to make a building more sustainable, reducing emissions, without significantly inflating capital costs **[See reference 121]**. Other measures such as window layout and proportions are aspects that do not necessarily add extra construction costs, but if optimised within the design can significantly improve the building's performance.

4.65 MBC has the option to set aspirational targets, however, due to differential values observed between detached and semi-detached and terraced house types. These specific measures may require some wider consideration first as to whether there may be potential viability impacts if the targets were set at levels that significantly stifled the delivery of detached dwellings on major development sites with pre-existing viability constraints. Given the overall local context, the scope of the partial local plan update and consideration of the local housing market, setting a too rigid requirement to meet specific targets, such as for form factor, may not be practical or deliverable at this point. This would suggest that the appropriate response is likely that taken most commonly elsewhere in other local plans, towards a policy position that sets out expectations and requires a demonstration of consideration of relevant principles and standards within proposals (whilst allowing a degree of flexibility given site specific constraints etc.).

Recommendation

4.66 It is recommended that in addition to the considerations for design and layout as currently set out in Policy EN9 for major developments within the Local Plan that further guidance is required to strengthen this policy.

4.67 It is recommended that the main strategic climate change policy of the Local Plan (EN8) should set out the overarching need for all proposals to embed the Energy Hierarchy within the design of buildings by prioritising fabric first and passive design responses including optimising orientation, form, windows, shading and landscaping in order to minimise energy demand for heating, lighting, ventilation and cooling.

4.68 It is also recommended that the supporting text for Policy EN9 include wording to support MVHR systems in line with the guidance provided within the highlighted best practice guidance, as well as consideration for cross ventilation measures in design.

4.69 Building form, orientation and window proportions, and ventilation, are primarily design-led considerations, which need to be considered at an early stage in the design process. In line with the preferred ‘core thread’ approach MBC has proposed to address climate change across the whole plan. As part of the proposed Local Plan Update, MBC also proposes to review Policy D1 – Raising the Standard of Design, which is proposed to be made a ‘strategic’ policy. As such, it is recommended that the design policy (D1) is strengthened, with a requirement to consider passive design measures such as form and orientation to maximise natural light, secure wintertime solar gains, and prevent the risk of summer overheating.

4.70 The supporting text to D1 should then also be amended to provide guidance on the importance of these considerations and how they should be considered. The most practical way this should be demonstrated by applicants is likely to be through either the Design and Access Statement or any required sustainability statement, depending on the type and scale of the development. These principles should be a consideration for all types of development, not just major developments. However, it is recommended that any requirements are proportional to the scale and complexity of the development proposal. There should also be appropriate references in the supporting text on the need to balance these considerations against the overall need to achieve well-designed places that work well in their context. This should recognise that there can be complementary or competing design influences that need to be balanced, including local character and the surrounding existing build form.

4.71 It is recommended that any future Supplementary Plans (SP) that provide design guidance should include similar considerations as well. Future SPs may provide opportunities to provide more detailed guidance, however, any specific standards MBC supports should be based on established good practice guidance. Outside planning requirements there may be opportunities to encourage behavioural change by explaining why the factors in this document are important, promoting them in terms of helping to mitigate and adapt to climate change as well as their associated well-being or energy cost-saving benefits.

4.72 The design policies of Neighbourhood Plans are material considerations for planning applications and there are a number of such plans across the Borough. Neighbourhood Plans when developed or refreshed should be encouraged to also consider providing design guidance that reflects factors including orientation and form that can help to provide energy-efficient buildings that work well within their specific local context.

4.73 It is recommended that the supporting text to the housing policies of the Local Plan (relating to the supported housing types and sizes) is amended to;

- explicitly recognise how these policies can also help to reduce energy demand and emissions,
- set out how wider measures to increase the provision of smaller sized homes can help to reduce under occupation and
- support for the delivery of more joined together house types that could offer benefits from being more affordable as well requiring less operational and embedded energy. This consideration should be made subject to viability and to ensure that an inefficient form factor is not used to prevent the delivery of bungalows to meet identified local housing needs.

Chapter 5

Refurbishment and change of use of buildings

5.1 This section considers the role the Local Plan could play in facilitating the retrofit of the existing building stock, including balancing heritage concerns in retrofitting heritage assets and in conservation areas.

5.2 This section should be considered in conjunction with Chapter 3 (embodied emissions) and Chapter 2 (operational emissions) of this report, and Document D (Water and waste), as all these sections address the interconnected themes of reducing embodied carbon, energy efficiency, and water efficiency. The options discussed in each section are related and offer complementary benefits, enhancing overall sustainability.

Context

5.3 Approximately 18% of our annual national CO_2e emissions come from *existing* homes – which are estimated to represent 80% of the homes that will be standing in 2050 **[See reference 122]**. It is, therefore, important to address greenhouse gas emissions associated with the existing building stock in Melton borough as well as new buildings. The key options below relate to reducing operational emissions from existing buildings by supporting energy and water-efficient retrofit and giving due consideration to the carbon emissions embodied in existing buildings by reducing unnecessary demolition and rebuilding. These options are not mutually exclusive. The role of water efficiency for reducing emissions through a reduction in water use is considered in Document D (Water and waste).

5.4 Some local authorities are actively supporting the retrofit of buildings and guidance on how to do this is provided by Local Partnerships **[See reference 123]**. Some retrofit activities are covered by permitted development rights. For activities requiring planning permission, key challenges include issues such as balancing heritage considerations against energy efficiency improvements **[See reference 124]**.

5.5 A 2021 Environmental Audit Committee Report identified that over 10 million owner-occupied homes and over three million private rented homes in England will need upgrading to a minimum Energy Performance Certificate (EPC) C rating by 2035 to hit Government targets **[See reference 125]**.

5.6 Indeed, Melton borough's housing stock is relatively energy inefficient. The Energy Performance Certificates (EPCs) of existing dwellings in Melton borough (around 23,000 homes) indicate the current median energy efficiency score for dwellings in Melton borough is 64 (band D). Newer houses and flats have much higher scores at an average of 83 and 82 respectively (band B) than existing houses and flats at 61 and 68, respectively (band D) **[See reference 126]**.

5.7 The Climate Change Strategy highlights retrofitting of existing buildings in the Borough, as one of the biggest challenges **[See reference 127]**. It states that to keep on track to meet net zero, the Borough will need to significantly increase both the speed and scale of retrofits.

5.8 Clearly driving the retrofit of existing homes (and other buildings) – for example through upgrading insulation, air tightness, heating systems, and a fittings approach to water efficiency – will be a critical part of efforts to reach net zero and achieve wider goals, including to reduce fuel poverty in Melton borough. The route to introducing higher standards and the associated costs are relatively clear for new-build properties. For retrofit, it is much more complex, depending on the buildings design and construction, which means some efficiency measures that work on one project may not be appropriate for another and if retrofit is done poorly it can result in wider building problems such as damp and mould.

Policy Context

5.9 The NPPF (paragraph 157) states that the planning system "*should help to: shape places in ways that contribute to radical reductions in greenhouse gas emissions… encourage the reuse of existing resources, including the conversion of existing buildings; and support renewable and low carbon energy and associated infrastructure*".

5.10 Para 164 of the NPPF states that "*in determining planning applications, local planning authorities should give significant weight to the need to support energy efficiency and low carbon heating improvements to existing buildings, both domestic and non-domestic (including through installation of heat pumps and solar panels where these do not already benefit from permitted development rights)*". It sets out that where the proposals would affect conservation areas, listed buildings or other relevant designated heritage assets, local planning authorities should also apply the relevant heritage policies set out in the NPPF.

5.11 Melton's Climate Change Strategy notes that *"Our biggest challenge however is our existing homes and buildings, which need to be retrofitted.... Existing local homes and buildings are overall older, more diverse and less energy efficient than average. Only a third of local homes are reasonably energy efficient and few have low carbon heating systems."* (p.6).

5.12 It goes on to estimate that to meeting net zero carbon targets *"around two out of three existing homes need to have works done to improve their energy efficiency and more than nine in ten homes need to move to a low carbon compatible heating system, mainly to replace natural gas and oil heating. This retrofitting challenge is made more complex because of the older age, condition and mix of homes and buildings we have. This includes many listed, historic and characterful buildings, which will require more varied and specialist retrofitting considerations, to ensure they preserve their valued local heritage and character." (p.16)*

5.13 Key actions identified in the strategy include (p.20): *“Aim for as many existing homes and buildings, as is practically possible, to reach a decent standard of thermal efficiency (an EPC rating of A-C) by 2035.”*

5.14 Policy EN9 (Ensuring Energy Efficient and Low Carbon Development) of the Melton Local Plan states that major development proposals, including refurbishments, will be supported where – amongst other things – they optimise natural sunlight and solar gain, prevent overheating, prevent heat loss from all elements of the building envelope and consider on-site renewable, low carbon or de-centralised energy provision.

5.15 The supporting text states that “*The retrofitting of existing buildings so as to maximise opportunities to prevent heat loss from all elements of the building envelope will be supported where it: does not harm heritage assets or their significance; and protects the character of conservation areas*.”

5.16 The Design for Development SPD emphasises the importance of preserving architectural features when converting retail or commercial buildings into residential spaces. It highlights that losing elements like historic shopfronts can hinder future restoration to commercial use.

5.17 This is a useful start to retaining existing structures specifically for converting from non-domestic to domestic buildings, however, further guidance should be provided on how to go about retrofitting existing buildings to boost their energy efficiency, reduce water demand, and reduce operational carbon emissions.

Alternative Policy Options

Develop guidance to encourage energy-efficient retrofitting of existing buildings to reduce operational emissions

5.18 MBC could provide guidance on energy-efficient retrofitting, either by signposting to existing guidance or through the creation of a Supplementary Plan. Depending on the building type and constrains, retrofitting measures could include:

- Drought-proofing
- Replacing windows and doors
- Improving insulation
- Upgrading heating, cooling or air handling systems;
- Upgrading lighting systems;
- Upgrading thermal elements;
- On-site energy generation;
- Installing water-efficient fixtures; and
- Enhancing hot water systems.

5.19 MBC could consider including the various improvements highlighted above within guidance to encourage developers and residents to make these improvements as part of works to larger and smaller buildings as well.

5.20 There is excellent guidance, freely available, on energy-efficient retrofitting that MBC could promote to developers and building owners. Examples include:

- LETI's Climate Emergency Retrofit Guide **[See reference 128]**

- The Energy Saving Trust offers a range of guidance on energy efficiency, renewables and heating **[See reference 129]**
- Historic England provides a range of technical advice guides on retrofitting historic buildings **[See reference 130]**
- UKGBC's guidance aimed at encouraging retrofits in commercial buildings **[See reference 131]**
- The previous Government produced guidance aimed at decarbonising the public sector estate that includes a section on considering decarbonisation solutions and technologies as part of a 'whole system' approach **[See reference 132]**.

5.21 Such guidance could also refer to the Passivhaus EnerPHit standard **[See reference 133]** which is a version of the Passivhaus standard adapted for whole house retrofits. This is a stretching standard for those who want to make their extensions and/or retrofits as low carbon and sustainable as possible. And such schemes could be promoted by MBC as examples of best practice that can help upskill the construction industry, as well as inspiring other householders in the area.

5.22 Another option would be for MBC to develop its own guidance on retrofitting. This guidance could cross-reference requirements in the Building Regulations but seek to go beyond them.

5.23 Part L of the Building Regulations covers 'consequential improvements' which refer to energy efficiency improvements that are consequential to changes to a building. Regulation 28 of the Building Regulations and Section 12 require that, for an existing building with a total useful floor area of over 1000sqm, additional works may be needed to improve the overall energy efficiency of the building (*"to the extent they are technically, functionally and economically feasible"*) if proposed work consists of an extension or specified works to building services.

5.24 Part G of the Building Regulations covers sanitation, hot water safety, and water efficiency in buildings. It limits water use to 125 litres of water per person per day to promote sustainable water use and reduce overall consumption. The optional technical standards state that "*where there is a clear local need, LPAs can set out Local Plan policies requiring new dwellings to meet the tighter Building Regulations optional requirement of 110 litres/person/day*" **[See reference 134]**.

5.25 Part F of the Building Regulations focuses on ventilation in buildings, ensuring that indoor air quality is maintained for the health and comfort of occupants. It outlines standards for ventilation systems in both residential and non-residential buildings and specific air flow rates for different areas of a building.

5.26 It should be noted that, existing buildings are not required to be brought up to the Building Regulations standards, except where subject to change. It should also be noted that while consequential improvements are more explicitly outlined in Part L of the Building Regulations, broader improvements for water efficiency and ventilation, contribute to improving building performance overall.

5.27 However, planning authorities can play a crucial role in facilitating appropriate retrofitting efforts. A common point of contact with planning authorities occurs when individuals consider undertaking construction or renovation projects, as such there are key opportunities where planning can engage with retrofitting initiatives. For instance, works to listed buildings and conservation areas or for home extensions and modifications that may or may not require planning permission.

5.28 Many extensions and adaptations now benefit from extended permitted development rights, allowing certain works without the need for formal planning permission. However, homeowners often contact planning departments through householder and pre-application advice services to clarify whether their projects require permission. This interaction presents a valuable opportunity to influence design proposals early in the process, even for projects that do not need planning permission. By utilising local planning advice services, planners can provide guidance and best practices that highlight the benefits of incorporating retrofitting measures.

5.29 Examples of similar guidance published by other councils include:

- West Oxfordshire, Cotswold and Forest of Dean District Councils commissioned a toolkit for developing new homes and retrofit projects that are net zero carbon **[See reference 135]**. Note this is made available for use and adaptation under a Creative Commons licence.

- Royal Borough of Kensington and Chelsea's Greening SPD - includes a chapter on retrofitting existing buildings to help developers and residents increase energy efficiency **[See reference 136]**
- Epping Forest's sustainability guidance for householders on refurbishments and extensions [See reference **137**]
- Cornwall Council's report providing guidance on upgrading the energy efficiency of historic buildings **[See reference 138]**

5.30 MBC could also go one step further and seek to require such consequential improvements on smaller buildings via a new local plan policy or require householder developments such as extensions to achieve specific energy or sustainability requirements beyond that required by the Building Regulations. For example, it could introduce a requirement that any proposal should not increase modelled fossil fuel or grid electricity consumption at the property; and that, if after adopting energy efficiency measures the proposal would still result in a net increase in energy consumption for the whole property, 100% of the increase must be met via on-site renewables. However, there are few examples of stretching policies in this area, likely due to concerns about the added costs that such a policy would place on homeowners wishing to adapt their properties and associated concerns about the social/political acceptability of such a policy. For these reasons, an approach that encourages good practice through the provision of good-quality guidance is recommended instead.

Summary

5.31 Benefits

- Signposting existing guidance or developing new guidance on retrofitting should help to support more retrofitting activity and thus reduce operational emissions form the existing building stock.
- This can be achieved at low cost to MBC and would not impact development viability.

5.32 Limitations

- The availability of appropriate financial incentives (for example, Government grants and loans) is ultimately the key driver of retrofit activity.
- Policies that would increase the cost of householder extensions may be politically challenging to implement.

Prioritise retention and retrofit over demolition and rebuild to reduce embodied emissions

5.33 Existing buildings have significant carbon emissions 'embodied' within them related to the materials they are built from and the construction process. Moreover, demolition of such structures and then re-construction involve substantial further emissions. It follows that demolition, and reconstruction should be avoided where possible. To do so, the potential for buildings to be re-used, updated and retrofitted needs to be promoted. Simultaneously, the rationale for demolition and re-build needs to be better justified by developers.

5.34 Retention and retrofit/refurbishment of existing buildings, can, in many cases, meet residential and commercial needs without resource- and emissions-intensive construction. Some local plans now indicate a preference for retention and refurbishment of existing buildings over demolition and reconstruction. Examples of this are explored below.

5.35 A policy could be introduced requiring developers to demonstrate it is not practicable to retain, adapt and retrofit an existing building to meet user needs before seeking to demolish an existing building and construct a new one on the same site.

5.36 Camden Council's adopted Local Plan Policy CC1 includes a requirement that:

> "all proposals that involve substantial demolition to demonstrate that it is not possible to retain and improve the existing building".

5.37 This policy puts the onus on the developer to prove that retention and refurbishment was not possible. The supporting text to the policy indicates that:

> "all proposals for substantial demolition and reconstruction should be fully justified in terms of the optimisation of resources and energy use, in comparison with the existing building. Where the demolition of a building cannot be avoided, we will expect developments to divert 85% of waste from landfill and comply with the Institute for Civil Engineer's Demolition Protocol and either reuse materials on-site or salvage appropriate materials to enable their reuse off-site. We will also require developments to consider the specification of materials and construction processes with low embodied carbon content".

5.38 Central Lincolnshire's Local Plan also includes a 'presumption against demolition' as part of its embodied carbon policy (policy S11) **[See reference 139]**. It states the following:

> "To avoid the wastage of embodied carbon in existing buildings and avoid the creation of new embodied carbon in replacement buildings, there is a presumption in favour of repairing, refurbishing, re-using and re-purposing existing buildings over their demolition. Proposals that result in the demolition of a building (in whole or a significant part) should be accompanied by a full justification for the demolition. For non-listed buildings demolition will only be acceptable where it is demonstrated to the satisfaction of the local planning authority that:

1. the building proposed for demolition is in a state of such disrepair that it is not practical or viable to be repaired, refurbished, re-used, or re-purposed; or

2. repairing, refurbishing, re-using, or re-purposing the building would likely result in similar or higher newly generated embodied carbon than if the building is demolished and a new building is constructed; or

3. repairing, refurbishing, re-using, or re-purposing the building would create a building with such poor thermal efficiency that on a whole life cycle basis (that is. embodied carbon and in-use carbon emissions) would mean a lower net carbon solution would arise from demolition and re-build; or

4. demolition of the building and construction of a new building would, on an exceptional basis, deliver other significant public benefits that outweigh the carbon savings which would arise from the building being repaired, refurbished, re-used, or re-purposed."

5.39 These requirements are quite detailed and set a high bar – it may be useful for MBC to engage with these planning authorities and learn how the policy has been implemented in practice, including any lessons learned, if this type of approach was of interest.

5.40 Essex's Embodied Carbon Study **[See reference 140]** recommends adopting a 'presumption against demolition' policy approach drawing partly on the Lincolnshire example above. They outline suggested wording regarding what justification is required where substantial or total demolition and re-build is sought. This includes requiring a detailed explanation of why the existing building cannot be retained, including an assessment of structure condition, contamination and the public benefits of the proposed new building that could not be delivered through a retrofitting option.

5.41 A policy similar to the above examples could be adopted by MBC. MBC might want to consider limiting the policy to major developments only as this is where the greatest embodied carbon savings would be delivered; it would also avoid adding to the requirements imposed on small scale developments.

5.42 This requirement provides a useful driver for wider improvements to the energy efficiency of existing buildings when specific works are proposed, However this requirement should be made for major retrofitting, applying to buildings over a certain size such as 1000 sqm floor area.

5.43 Note that where demolition and reconstruction is justified then separate new policies on minimising embodied carbon would apply (see 'Low carbon buildings - embodied emissions).

Summary

5.44 Benefits of approach:

- Constructing new buildings is very carbon-intensive, in addition to the emissions produced during a building's life cycle. Retrofitting the existing building stock can lead to energy savings and associated construction emissions, coupled with the potential of job creation as a result of support for retrofitting in the Borough **[See reference 141]**.
- Retrofitting buildings is recognised as essential to achieving UK decarbonisation targets. Upgrading existing buildings can help retain the embodied carbon in existing structures in the Borough.
- There are also health and social benefits that can be derived from improvements to existing dwellings such as benefits to communities avoiding the disruption associated with demolition and construction.
- Retrofitting can provide cost savings for developers relative to a new build scheme (for example, no need for demolition, disposal of construction waste, construction of foundations and new structure).

5.45 Limitations:

- MBC will need to objectively interrogate developers' claims that retention of an existing building is impractical. As such, there is a need for specialist knowledge and resources to assess technical surveys/reports.
- Converting existing buildings to new uses carries the risk that the size and quality of the spaces created is compromised compared to designing and constructing a new building.
- Different building types will require retrofitting measures and strategies that are unique to the type and use of the building. As a result, there may be some difficulty in providing guidance where guidance is generalised, or assessing and monitoring compliance, where an appropriate framework or benchmark is not developed.

Viability

5.46 Providing guidance encourages rather than requires developers to consider retention and retrofitting existing buildings. Thus developing retrofit guidance is not anticipated to materially impact development viability.

5.47 With regard to costs for MBC, signposting existing guidance would be straightforward and developing a guidance document would not be onerous to produce. There are many existing guidance documents that MBC could draw from, as indicated above - noting in particular the guidance from Forest of Dean made available under a Creative Commons licence. For older properties and heritage assets, guidance is available from Historic England and the Sustainable Traditional Buildings Alliance **[See reference 142]**. Ideally, staff would also be upskilled so they can effectively advise applicants.

5.48 To maximise impact, guidance to support retrofit could be combined with a policy preventing the unnecessary demolition of buildings. However, diverse building types, such as residential, commercial, and heritage buildings, require distinct retrofitting strategies. For instance, older buildings may have constraints that limit the types of insulation, energy systems, or retrofit measures in general, that can be installed. Expert views indicate that a one-size-fits-all approach is ineffective; instead, retrofitting must be customized to address the specific characteristics and needs of each building type **[See reference 143]**.

5.49 As highlighted, heritage buildings (pre-1919) offer a unique challenge regarding reuse and retrofit. There are planning constraints on how heritage buildings can be repaired or altered. Also, these buildings often behave very differently to modern buildings because of their building materials and construction methods. Therefore, they are not easy to assess against modern building standards. Any guidance would need to take this in to account in their development.

5.50 The previous government carried out a comprehensive review looking at the barriers to retrofitting historic buildings **[See reference 144]**, and what actions are needed to overcome these. It identified five key challenges including planning, industry and planning capacity, skills, information and costs. Planning was identified as a key barrier because of confusion over what consents were needed, the cost of preparing applications and the time taken to obtain permission.

5.51 The previous government set out its ambitions to make retrofitting to historic buildings easier and more consistent across the country, including:

- Revisions to the NPPF to make obtaining permission easier, with new section giving significant weight to the need for historic building retrofit when determining applications.
- Proposed introduction of National Development Management Policy, intended to bring consistency to the planning process, specifically on improvements to historic buildings.
- Interest in and proposing a consultation on greater use of local listed building consent orders including the potential for England-wide listed building consent orders.

5.52 Historic England set out the need to adopt a Whole Building Approach requiring the integration of fabric measures (such as insulation, new windows, draught proofing), and services (particularly ventilation, heating, controls and renewables) along with proper consideration of how people use a building **[See**

reference 145]. The whole building approach is a systematic process for devising and implementing suitable, coordinated, balanced and well-integrated solutions. These are based on a thorough understanding of a building in its context and how it performs, to avoid harm to the significance of a building and minimise the risks of negative or unintended consequences. The whole building approach can help to ensure works maintain a healthy and comfortable internal environment and allow works to be undertaken in a way that is proportionate, effective, and cost efficient. Actions do not however need to be taken all at once, they can be planned to be undertaken in stages. More detail can be found in Historic England's range of online technical advice on retrofit for increased energy efficiency in historic buildings **[See reference 146]** and their 2024 publication "Adapting Historic Buildings for Energy and Carbon Efficiency' **[See reference 147]**.

5.53 The provision of good quality guidance on energy efficient retrofit is important and should help to support more retrofitting activity. For owners of existing homes and other buildings it is the availability of appropriate financial incentives (for example Government grants and loans) that is likely to be the most important driver of widespread energy upgrades to existing buildings. A 'zero carbon' policy for new homes linked to a carbon offset fund could help to generate funding for energy efficiency upgrades to existing housing stock (see Appendix B in relation to Carbon Offsetting). However, MBC would need to identify resource for in-house energy or carbon expertise to implement such a scheme (for example, to identify and work up appropriate carbon reduction projects to fund).

5.54 For applications seeking demolition and re-build where a policy prioritises retention, it would be necessary for the Council to review the evidence submitted in order to judge the acceptability of the justification provided. Ultimately a qualitative judgement will be required on how strong the justification is and this would need to be informed by staff with the relevant expertise.

5.55 The challenges to prioritising retrofitting and retention are primarily economic, highlighting the need to develop the retrofit economy, which encompasses manufacturing, installation, and maintenance services. Additionally, there are significant financial barriers regarding how retrofitting can be funded, especially for low-income households. Research indicates that addressing these economic hurdles is crucial for scaling up retrofit initiatives and ensuring equitable access to energy-efficient solutions **[See reference 148]**.

5.56 There are specific cost implications of encouraging retention of buildings over demolition and construction for developers. Retrofitting is currently disincentivised by policy on VAT. New build projects are VAT exempt on labour and building materials, whereas VAT is charged at a rate of 20% on retrofit projects **[See reference 149]**. There are various exceptions such as, amongst others, the conversion for a housing association of a non-residential building into a qualifying dwelling or communal residential building and the renovation or alteration of empty residential premises, which can have a zero VAT rate or reduced VAT rate of 5%. As such, a working knowledge of VAT rates is needed for designers to highlight circumstance under which lower VAT rates may apply **[See reference 150]**. It should be noted that the government introduced a time-limited zero VAT rate for installation of certain Energy Saving Materials **[See reference 151]**. However, unless further secondary legislation is introduced to extend the period of the zero rate, the installation of Energy Saving Materials will revert back to the 5% reduced rate from 1st April 2027 **[See reference 152]**.

5.57 In any case, the disparities in VAT rates between retrofit projects and new builds can distort behaviours, impacting decision-making in construction and renovation **[See reference 153]**.

5.58 The financial implications of retrofitting can be significant. The Net Zero Carbon Toolkit developed for West Oxfordshire, Cotswold and Forest of Dean District Councils states that these costs depend hugely on the baseline building's characteristics and condition **[See reference 154]**. However, the toolkit provides indicative retrofit costs for an unrenovated 90m^2 semi-detached dwelling which can range from £5-15k for a shallow retrofit which, if starting with a poor baseline, could save around 30% in carbon emissions, through to £45-55k for a deep retrofit which would include significantly improving the building fabric, changing the heating system to a heat pump and fitting roof mounted solar PVs.

5.59 Table 5.1 below provides some insight into the potential costs of some retrofit interventions for the 90m^2 semi-detached dwelling **[See reference 155]**.

Table 5.1: Indicative prices for retrofit interventions for a 90m^2 semi-detached dwelling [See reference 156]

Measure	Shallow	Deep
Fit 100% low energy lighting	£20	£20
Increase hot water tank insulation by 50mm	£50	£50
Loft insulation – add 400mm	£500	£500
Fit new time and temperature control on heating system	£150	£150
Improved draught proofing	£150	N/A
100% drought proofing	N/A	£2,000
Cavity wall insulation – 50mm	£600	£600
Floor insulation	N/A	£1,500
Insulate all heating and water pipework	N/A	£500
Fit mechanical ventilation and heat recovery (MVHR)	N/A	£7,000
Condensing gas boiler	£3,800	N/A
Air source heat pump	N/A	£9,000
Half glazed doors – double glazed	£1,500	N/A
Half glazed doors – triple glazed	N/A	£2,000
External wall insulation	N/A	£11,000
Double glazing	£7,000	N/A
Triple glazing	N/A	£8,400
Solar PV, 3kWp (21m^2 area)	N/A	£6,500
Miscellaneous and enabling works	£1,000	£5,000

5.60 There is limited research on the potential costs for non-residential developments.

5.61 Homeowners and developers can also face challenges in securing funding for retrofitting projects, especially in low-income areas. However, the Departments of Business, Energy and Industrial Strategy and of Levelling Up, Housing and Communities suggest that there is funding across several existing government schemes to support reuse and retrofit **[See reference 157]**, including:

- the Local Authority Decarbonisation (LAD) Scheme;
- the Home Upgrade Grant (HUG);
- the Social Housing Development Fund; and
- the new Energy Company Obligation (ECO) scheme.

5.62 A House of Commons Committee report identified that a major barrier to retrofitting in the built environment is the lack of consumer demand and trust in the sector **[See reference 158]**. It suggests that public awareness and understanding of low embodied carbon products, including buildings, is limited. Research within the report indicates that many customers are unwilling to pay extra for energy-efficient upgrades, leading to negative perceptions of newer energy technologies due to perceived higher costs.

5.63 The House of Commons Committee report recommended that policies on retrofit and embodied carbon target homeowners as well as practitioners to create market demand for sustainable buildings. As the Borough has high owner occupation, and there are few regulatory pressures or requirements to upgrade or improve buildings, so when homeowners make planning inquiries, these interactions can become key opportunities to encourage and promote retrofitting initiatives.

5.64 Whilst developers are currently disincentivised from pursuing retention by the tax system and retrofitting can result in added cost to developers, retrofitting can lead to significant savings primarily as a result of the avoided costs of demolition, waste disposal, and constructing new foundations and structural elements.

Recommendations

5.65 It is recommended that MBC should make guidance on energy-efficient retrofitting readily available, either by signposting existing guidance or providing further guidance than is provided in the Design for Development SPD through any forthcoming SP or 'Local Guidance' document. This should be signposted to for all relevant planning enquires and form a standard part of preapplication advice service, to enable consideration of retrofitting measures at an early stage of the design process. The guidance should promote the wider benefits of retrofitting measures, particularly energy bill savings and payback periods, as these may offer more motivating factors than tackling emissions and energy demand alone.

5.66 For significant impact, policies or guidance supporting retrofit should be combined with policy support to avoid unnecessary demolition of buildings in Melton borough. The development of guidance is not expected to be capital and resource intensive for MBC, however, encouraging the retention of buildings over demolition and construction has specific cost implications for developers.

5.67 MBC should also consider developing a policy requiring developers to demonstrate it is not practicable to meet user needs by retaining and improving an existing building prior to pursuing demolition and redevelopment.

Appendix A

Summary of key cost and viability evidence

A.1 A number of Local Plan viability assessments and other studies have considered the cost implications of achieving low energy or net zero carbon new developments in recent years. A summary of these viability assessments, used to inform the policies in this report, is provided within the Net Zero Local Plan Evidence Base for Mid Sussex District Council **[See reference 159]**. The tables below present the summary of the cost information gathered, as referenced in Chapter 3: Low carbon buildings embodied emissions. EO stands for ‘extra over’ costs.

Table A.1: Cost and viability data – evidence from published viability studies that examined net zero carbon operational buildings, based on modelled archetypes

Source	Description	Capital costs (£/m2)	EO costs (£/m2)	£ uplift	% uplift	Standard assessed	Compared with
Cornwall	Semi	£1,553	£13	£1,196	1%	30 kWh/m2/year	Part L 2021
Cornwall	Terrace	£1,465	£31	£2,609	2%	30 kWh/m2/year	Part L 2021
Cornwall	Bungalow	£1,634	£20	£2,115	1%	30 kWh/m2/year	Part L 2021

Source	Description	Capital costs (£/m2)	EO costs (£/m2)	£ uplift	% uplift	Standard assessed	Compared with
Cornwall	Detached	£1,513	£7	£1,030	1%	30 kWh/m2/year	Part L 2021
Cornwall	Low rise flats	£1,824	£51	£1,786	3%	30 kWh/m2/year	Part L 2021
Cornwall	Medium rise flats	£2,077	£56	£4,436	3%	30 kWh/m2/year	Part L 2021
Cornwall	Semi	£1,582	£42	£3,790	3%	15-20 kWh/m2/year	Part L 2021
Cornwall	Terrace	£1,507	£73	£6,134	5%	15-20 kWh/m2/year	Part L 2021
Cornwall	Bungalow	£1,681	£66	£7,058	4%	15-20 kWh/m2/year	Part L 2021
Cornwall	Detached	£1,553	£48	£6,894	3%	15-20 kWh/m2/year	Part L 2021
Cornwall	Low rise flats	£1,845	£71	£6,698	4%	15-20 kWh/m2/year	Part L 2021
Cornwall	Medium rise flats	£2,087	£63	£5,277	3%	15-20 kWh/m2/year	Part L 2021
Greater Cambridge	Semi-detached	None	None	£12,880	10%	15-20 kWh/m2/year	Part L 2013
Greater Cambridge	Mid terrace	None	None	£13,985	13%	15-20 kWh/m2/year	Part L 2013
Greater Cambridge	Block of flats	None	None	£302,735	5%	15-20 kWh/m2/year	Part L 2013

Appendix A Summary of key cost and viability evidence

Source	Description	Capital costs (£/m2)	EO costs (£/m2)	£ uplift	% uplift	Standard assessed	Compared with
Greater Cambridge	School	None	None	£208,865	0%	55 kWh/m2/year	Part L 2013
Winchester	Semi-detached	1,535	85	7,905	6%	15 kWh/m2/year	Part L 2021
Winchester	Detached	1,508	68	9,656	5%	15 kWh/m2/year	Part L 2021
West Oxon	Mid-terrace	None	None	None	5%	"Good practice"	Part L 2013
West Oxon	Mid-terrace	None	None	None	7%	"Ultra-low energy"	Part L 2013
West Oxon	Medium rise flats	None	None	None	6%	"Good practice"	Part L 2013
West Oxon	Medium rise flats	None	None	None	6%	"Ultra-low energy"	Part L 2013
West Oxon	Office	None	None	None	6%	"Good practice"	Part L 2013
West Oxon	Office	None	None	None	7%	"Ultra-low energy"	Part L 2013
West Oxon	School	None	None	None	5%	"Ultra-low energy"	Part L 2013

Table A.2: Cost and viability data – research based on design teams ‘re-imagining’ two case study projects that were at the design stage

Source	Description	Capital costs (£/m2)	EO costs (£/m2)	£ uplift	% uplift	Standard assessed	Compared with
UKGBC	High-rise office	£3,320	None	None	6%	Intermediate target	Part L 2013
UKGBC	High-rise office	£3,370	None	None	8%	Stretch target 1	Part L 2013
UKGBC	High-rise office	£3,660	None	None	17%	Stretch target 2	Part L 2013
UKGBC	High-rise residential	£2,810	None	None	4%	Intermediate target	Part L 2013
UKGBC	High-rise residential	£2,860	None	None	5%	Stretch target	Part L 2013

Table A.3: Cost and viability data – case studies from the Passivhaus Institute (note, each line represents as-built costs for a different project)

Source	Description	Capital costs (£/m2)	EO costs (£/m2)	£ uplift	% uplift	Standard assessed	Compared with
Passivhaus Trust	Terrace	£1,529	£176	None	13%	Passivhaus	Part L 2013
Passivhaus Trust	Terrace	£1,296	-£26	None	-2%	Passivhaus	Part L 2013
Passivhaus Trust	Flats	£1,453	£120	None	9%	Passivhaus	Part L 2013
Passivhaus Trust	Terrace/Semi	£1,751	£339	None	24%	Passivhaus	Part L 2013
Passivhaus Trust	Flats	£1,807	£384	None	27%	Passivhaus	Part L 2013
Passivhaus Trust	Terrace	£2,070	£548	None	36%	Passivhaus	Part L 2013
Passivhaus Trust	Flats	£1,542	£189	None	14%	Passivhaus	Part L 2010
Passivhaus Trust	Terrace	£1,517	£175	None	13%	Passivhaus	Part L 2013

Source	Description	Capital costs (£/m2)	EO costs (£/m2)	£ uplift	% uplift	Standard assessed	Compared with
Passivhaus Trust	Terrace	£2,035	£528	None	35%	Passivhaus	Part L 2013
Passivhaus Trust	Terrace/Flats	£1,966	£488	None	33%	Passivhaus	Part L 2013
Passivhaus Trust	Semi-detached	£1,927	£456	None	31%	Passivhaus	Part L 2013
Passivhaus Trust	Terraced	£1,954	£474	None	32%	Passivhaus	Part L 2013

Table A.4: Cost and viability data – CCC research on houses constructed to meet 'ultra-high' energy efficiency standards

Source	Description	Capital costs (£/m2)	EO costs (£/m2)	£ uplift	% uplift	Standard assessed	Compared with
CCC	Detached	£1,430	£59	£6,900	4%	15 kWh/m2/year	Part L 2013
CCC	Semi	£1,522	£57	£4,800	4%	15 kWh/m2/year	Part L 2013
CCC	Low rise flat	£1,389	£29	£2,000	2%	15 kWh/m2/year	Part L 2013

Source	Description	Capital costs (£/m2)	EO costs (£/m2)	£ uplift	% uplift	Standard assessed	Compared with
CCC	High rise flat	£2,390	£26	£1,300	1%	15 kWh/m2/year	Part L 2013

Appendix B

Carbon Offsetting

B.1 This appendix sets out opportunities to establish a carbon offsetting policy and central offsetting fund, drawing on best practice examples and considering implications for and risks to MBC.

What is a carbon offsetting policy and fund?

B.2 Carbon offsetting is the process of compensating for residual carbon emissions from a building by contributing, usually financially, towards measures to reduce emissions elsewhere.

B.3 Some LPAs allow carbon offsetting where a carbon target cannot be achieved on site. This involves developers making a payment into a carbon offset fund to pay for carbon reduction projects elsewhere in the LPA area (for example funding carbon emissions reductions from existing buildings by installing insulation, upgrading heating systems or solar PV panels).

B.4 As a matter of best practice in carbon management, offsetting should be understood a last resort after all direct mitigation options have been exhausted. There is evidence that low or medium rise domestic developments can generally achieve net zero regulated emissions without offsetting **[See reference 160]** but that it is more challenging for non-domestic or higher density developments **[See reference 161]**.

Best practice examples

GLA carbon offsetting approach

B.5 The London Plan includes a net zero-carbon target for major development, and they have published detailed guidance on carbon offset funds for LPAs (recently updated) **[See reference 162]** including on how to calculate the amount of carbon to be offset. The aim of the net zero-carbon standard is to achieve significant carbon reductions on site and to get as close to zero-carbon as possible. Only then should offsetting be considered, that is as a last resort measure. We concur with this approach and would recommend MBC take a similar position as it ensures on-site carbon savings – which are more certain – are locked in before looking to offsetting.

B.6 Carbon offsetting involves a cash in-lieu contribution (via Section 106 agreement) to the relevant LPA's carbon offsetting fund. Alternatively, the development can make up the shortfall off-site by funding a carbon reduction project directly, provided the LPA has approved this approach.

B.7 The London Plan requires LPAs to:

1. set up a carbon offset fund to collect carbon offset payments from developers to meet any carbon shortfall from new development and ring fence these funds to secure delivery of carbon savings within the relevant LPA

2. set a price for carbon, that is a price per annual tonne of carbon, that developers pay to make up any shortfall in on-site carbon savings, securing contributions through Section 106 agreements

3. identify a suitable range of projects that can be funded through the carbon offsetting fund

4. put in place suitable monitoring procedures to enable reporting to the GLA.

B.8 These steps are expanded on below.

1. Setting up the fund including setting the price

B.9 The GLA guidance states that LPAs should either establish a dedicated carbon offset fund or administer the funds through their Section 106 processes. In either case the funds should be ring-fenced for the sole purpose of delivering carbon reduction projects.

B.10 LPAs are directed to develop and publish a price for offsetting carbon based on either: a nationally recognised carbon pricing mechanism (see below), or the cost of offsetting carbon emissions across the LPA (based on an assessment of feasible carbon offsetting measures, their anticipated carbon savings and costs). The price set should not put an unreasonable burden on development and should be tested through a viability study.

B.11 In the latest guidance, the GLA's recommended price for offsetting carbon is £95 per tonne (previous to the new London Plan it was £60 per tonne). Bristol also uses the same carbon offset price. This price was tested as part of the viability assessment of the London Plan 2020 and was informed by a GLA commissioned study undertaken by AECOM **[See reference 163]**. Many London boroughs use this price, but some have commissioned their own research to set a bespoke price (for example Lewisham charges £104 per tonne) and Islington takes a different approach that factors in unregulated emissions as well as regulated emissions.

B.12 The GLA indicates that the overall funding contribution should be calculated over 30 years (the assumed lifetime of the development's services). For example, using the GLA's recommended price equates to £95 x 30 years = £2,850 per tonne of carbon to be offset.

2. Securing, collecting and spending payments

B.13 Mechanism: The GLA guidance states that LPAs should secure offsetting payments through Section 106 of the Town and Country Planning Act 1990 (as amended). Section 106 agreements are the appropriate mechanism to use (bearing in mind the s.106 tests) as the mechanism is well established. Community Infrastructure Levy is a fixed charge per unit of floorspace and does not account for the varying carbon performance of developments.

B.14 MBC is advised to avoid specifying actual projects to be funded within individual section 106 agreements as this would limit flexibility and could create issues if specified projects could not be progressed as anticipated.

B.15 Calculating the payment at the planning determination stage provides early certainty for the LPA about what funding will be available and encourages the developer to assess and consider their carbon impact early in the design process.

B.16 Note that if an LPA pushes developers hard to minimise carbon emissions on-site then the size of the offsetting fund will be reduced. Viability considerations may also act to reduce carbon offset funding. For example, Haringey Council in north London have identified that they have a smaller pot of collected funding compared to some other London boroughs and two of the reasons they state are:

- Officers have challenged developers to go further in reducing their on-site emissions, resulting in higher on-site carbon reductions and lower offset contributions.
- Balancing of s106 contributions against the viability of the proposal in providing other policy requirements such as affordable housing, which may result in contributions being capped.

B.17 Timing of collection: The GLA notes that LPAs generally choose to take payment on commencement of construction on site. Some choose to split the payment, with 50 per cent paid on construction commencement and 50 per cent prior to occupation. Taking payment later than commencement of works can increase uncertainty about when funding will be received and is likely to lead to a gap between the development being occupied and offset projects being implemented. LPAs should be aware of the time limits that apply to discharging Section 106 agreements and ensure funds are collected and spent in time.

B.18 Spending: The GLA recommends that LPAs pool offset payments for carbon offsetting projects. This will allow LPAs more flexibility in developing and delivering their carbon offsetting project pipeline. More details on identifying relevant projects to fund are provided in the next section.

B.19 LPAs can use existing Section 106 process to administer and monitor the use of offset funds. If an LPA determines that additional funds are needed to pay for staff to develop and manage identified offsetting projects, the GLA recommends a maximum of 10 per cent of the fund is allocated to cover this; this should be set out clearly in the agreement. Given MBC's limited internal energy expertise/resources, this approach might create an opportunity to either create and fund a new internal energy officer role; or fund external advice on project identification, costing and delivery.

3. Identifying projects to fund

B.20 Offsetting projects should deliver tangible carbon savings. The GLA's 2022 offsetting report indicates that energy efficiency and renewable energy installations projects were the most popular, primarily taking place in LPA corporate estates, housing and schools **[See reference 164]**.

B.21 In line with the widely used energy hierarchy, the GLA states that reducing energy demand is the first and often most cost-effective approach to decarbonise buildings, which is why they recommend that LPAs prioritise energy efficiency measures such as improvements to building fabric and upgrading to more energy efficient services. To maximise the impacts of these types of projects, particularly for more costly measures, LPAs are encouraged to combine offset funds with other sources of funding.

B.22 The primary focus for offset funds is to achieve carbon savings but, where possible, projects should maximise co-benefits, that is. wider environmental, social and economic benefits that align with an LPA's strategic priorities identified in climate change plans/strategies and Local Plans (for example reducing energy bills of deprived communities). The main types of projects funded in London are summarised in the GLA's carbon offset funds report with the most popular being energy efficiency measures and renewable energy projects **[See reference 165]**.

Assessing a project's eligibility

B.23 The core purpose of a project funded by carbon offset funds should be to deliver carbon savings. LPAs tend to require that projects be delivered within their administrative area. When selecting offsetting projects to fund, LPAs should also consider defining eligibility and marking criteria including in relation to:

- the carbon cost effectiveness of the project (that is. £ per tonne of carbon saved). LPAs may want to set an upper limited on the cost per tonne of carbon saved.
- whether the project offers additionality that is. will it result in carbon savings that would not have been delivered without the offset funding? As the GLA admits, this can be challenging! For example, would a domestic insultation project have happened anyway without the offset funding. MBC would need to decide how they would determine this and how strict they wished to be.
- what co-benefits the project offers
- the deliverability of the project, over what timescales and with what monitoring (a proportionate approach is recommended to establishing monitoring requirements, with larger and more expensive projects required to provide more detailed reporting)

B.24 It is important to note that the GLA does NOT require a strict 1:1 ratio (that is. the cost of the offset measure to save one tonne of carbon compared to the offset price per one tonne of carbon). Such a ratio would, they suggest, only allow simple retrofitting measures to be implemented and would leave more complex and costly measures without funding. Thus, they support a more flexible approach, including setting a carbon cost effectiveness cap (that is. max price per tonne of carbon) as much as three to five times higher than the carbon offset price to give maximum flexibility.

How to find suitable projects

B.25 Most LPAs in London have tended to focus on identifying projects within their own estate, including social housing (presumably using a combination of in-house expertise and external advice).

B.26 The GLA reports that setting up an application process for individuals, community groups and businesses to apply for offset funding has worked well in multiple LPAs, making projects more visible whilst reducing the demands on LPAs to source projects. For example, Camden Council set up the Camden Climate Fund which is financed from carbon offset payments. There are three separate grants available for households, businesses and community groups to install renewable energy systems and make energy efficiency improvements. The application process should be made as simple as possible for residents, communities and businesses, with clear assessment criteria.

4. Reporting/transparency

B.27 The GLA reports annually on the overall progress of London's carbon offset funds and we would suggest that MBC do similar to ensure transparency. Following the GLA model, this could be done by providing information on the following:

- Amount of carbon offset fund payments committed
- Amount of carbon offset fund payments collected
- Amount of carbon offset fund payments spent

- The type of projects being funded, associated co-benefits and cost per tCO_2 saved.
- The carbon offset price being used.

Other examples of carbon offsetting

B.28 The City of Westminster has created guidance on a carbon offset fund to ensure funding is secured from any new developments which are unable to fully achieve the carbon savings required at the development site. The guidance sets out similar principles to the GLA guidance, however it sets out essential and desirable criteria as well as a list of priority projects. The priority projects are divided by theme: public sector buildings and assets, commercial buildings, sustainable travel and transport, knowledge and learning, low carbon energy and homes and communities. MBC could utilise a similar approach as a guide for those that would like to apply for funding.

B.29 The Milton Keynes Carbon Offset Fund (administered by the National Energy Foundation) was launched by Milton Keynes Council back in 2008. It applies to all residential developments of 11 or more dwellings and non-residential developments with a floor space of 1000 sqm or more. Requirements are set out in a Sustainable Construction SPD **[See reference 166]**. The scheme has helped over 8,000 households in Milton Keynes to receive measures such as free energy efficient light bulbs, and subsidised loft and cavity wall insulation.

B.30 Bristol has also set out an approach to carbon offsetting in their Local Plan Review Draft Policies and Development Allocations (2019). The approach is broadly in line with the GLA's, focusing on reducing carbon emissions on site first and then allowing offsetting of residual emissions via a payment (same carbon cost of £95 per tonne of CO_2 calculated over 30 years) towards "renewable energy, low-carbon energy and energy efficiency schemes elsewhere in the Bristol area" or via agreeing "acceptable directly linked or near-site provision".

B.31 Southampton City Council has implemented carbon offsetting since 2012. In 2015 the approach was amended to apply only to new developments of over 10 dwellings or 1000 sqm. The Southampton Carbon Offset Fund offsets one year of emissions rather than the lifetime of the development, at a cost of £210/ tCO_2.

B.32 Greater Manchester is also considering establishing carbon offsetting. A detailed evidence base report was produced for the Greater Manchester Combined Authority in 2020. It proposed setting a carbon price of £113 or £118 per tonne but questions whether a higher price might be needed to achieve Greater Manchester's target of net zero emissions by 2038.

Risks/issues for MBC

B.33 The overarching issue for MBC in relation to carbon offsetting is MBC's lack of internal technical expertise/resource to set up and run a carbon offsetting fund, including setting a carbon price, securing payments, selecting/designing suitable projects for funding, delivering projects and monitoring/reporting.

B.34 Islington Council has been operating carbon offsetting since 2012, but they benefit from having an in-house Energy Services Team who review energy strategies submitted with planning applications (as part of the development management process), identify projects to receive carbon offset funding and prioritise and deliver them. However, some London boroughs have reported that limited staff resource has constrained their ability to spend offset funds.

B.35 MBC is understood to lack such in-house expertise currently so would need to either buy this in (for example note example above of Milton Keynes working with the charity, National Energy Foundation) or take a decision to build this expertise in the Council. MBC could also consider the opportunity to invest in a shared expert resource with other LPAs, with might improve cost efficiency.

B.36 MBC could decide to use some of the funding secured for carbon offsetting to create and fund a new internal energy officer role to manage the fund; and/or fund external advice on project identification, costing and delivery.

Implications for MBC to establish carbon offsetting

B.37 In summary, to establish and implement a carbon offset key steps for MBC would include the following:

1. Agree on how to secure and fund the necessary expertise to establish and run a carbon offset fund (see key issue identified above)

2. Develop a clear planning policy (and supplementary guidance as necessary) setting out when offsetting will be accepted (for example as a last resort after on-site measures have been maximised), how (and when) payment will be secured (that is. via s106) and what types of projects it will be spent on

3. Set up a carbon offset fund with appropriate governance and ring-fenced funding for carbon reduction projects

4. Set a price for carbon (the simplest approach would be to use a nationally recognised approach as per GLA and Bristol)

5. Identify the types of projects to be funded and set out clear eligibility and marking criteria to assess potential projects

6. Establish monitoring and reporting procedures (for example annual reporting on spend and delivery) to ensure that funds are being spent effectively and efficiently and that delivery of the projects is achieved.

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