EPOA
Essex Planning Officers Association

Wider Benefits of Embodied Carbon & Circular Economy Planning Policy in Greater Essex

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Revision v1

Delivering healthy, efficient, climate resilient homes and buildings in Greater Essex.

This **research focuses on the wider benefits associated with reducing embodied carbon emissions from new development.** It has been prepared by the Built Environment Planning Unit at Essex County Council and published by the Essex Planning Officers Association on the Essex Design Guide.

The paper provides further evidence to support the recommended planning policies on energy and carbon that have been developed in collaboration with officers from the Local Authorities in Greater Essex. Embedding the policies into local plans and other planning documents supports the **delivery of healthy, affordable to run, climate resilient, energy efficient homes and buildings in Essex**.

This research paper has been produced to draw upon the latest body of information and outline the wider benefits of addressing embodied carbon emissions from new development. It will support the existing Essex evidence base and planning policy on embodied carbon. This includes the **Embodied Carbon and Circular Economy Planning Policy Statement (October 2025, re-issued April 2026)**, which is published on the Essex Design Guide and is recommended to local authorities in Essex for inclusion in their Local Plans and other planning documents. The Policy is underpinned by the technical evidence in the Essex Embodied Carbon Policy Study (re-issued Sept 2025).

Considering embodied carbon in the construction sector encourages innovative design and introduces new supply chains for local materials. This will widen procurement options, strengthen local competition and benefit the local economy. By establishing limits on embodied carbon, industry will be encouraged to recycle and reuse materials. The growth of these practices will create opportunities for circular economy projects, such as material exchanges. An additional benefit of limiting embodied carbon will be the decrease in emissions and air quality issues associated with construction and landfill waste, benefitting public health and economic productivity.

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Website: Essex Built Environment Quality | Essex Design Guide

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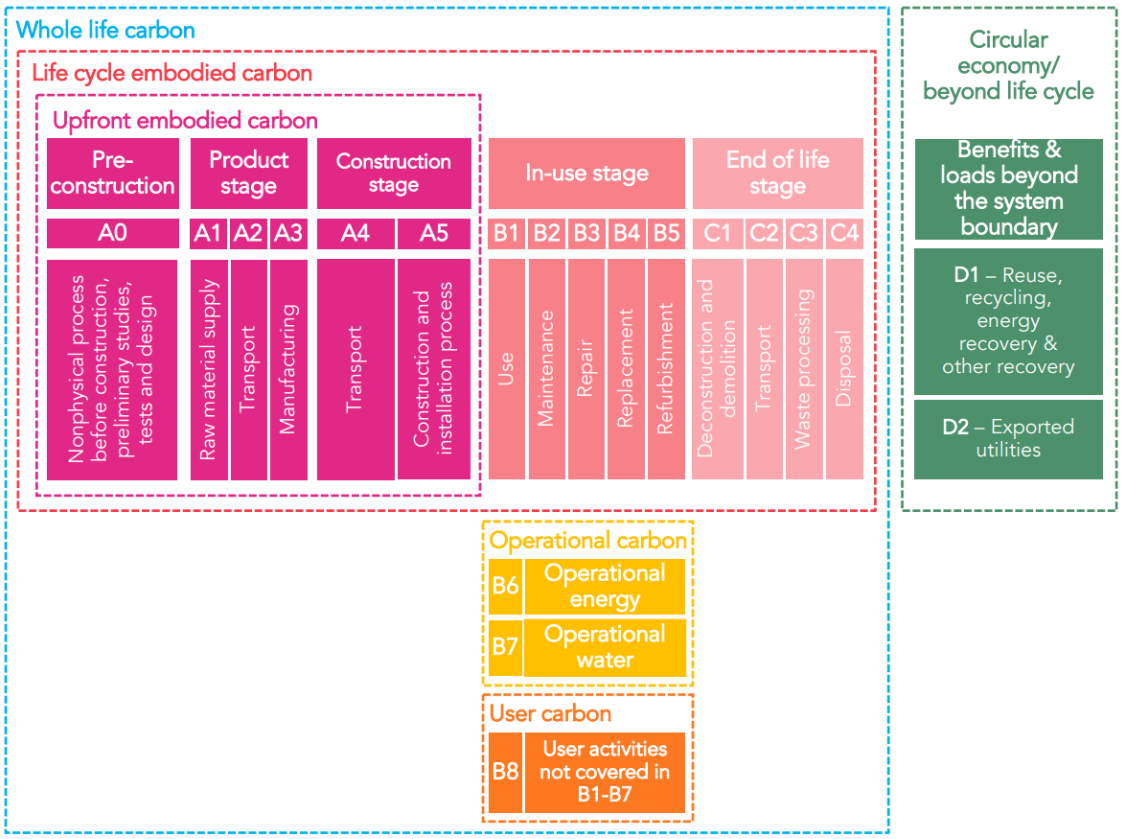
1. Introduction

Definition

The RICs definition states that 'the embodied carbon emissions of an asset [in this case, a building] are the total GHG [*Greenhouse Gas*] emissions and removals associated with materials and construction processes, throughout the whole life cycle of an asset (modules A0–A5, B1–B5, C1–C4, with A0 assumed to be zero for buildings.)'. (See Figure 1).



Modular information for the different boundaries of the building assessment. *This version of the diagram is adapted from a combination of the diagram from the BS EN 15978, RICS 2023 and LETI.*

Figure 1

Embodied carbon is categorised based on the different boundaries of the building assessment, with upfront embodied carbon being the category addressed by the Embodied Carbon and Circular Economy Planning Policy Statement (October 2025) for Greater Essex. Upfront embodied carbon refers to the greenhouse gas emissions associated with material and construction processes up to practical completion (modules A0–A5): raw material supply, manufacture, transport and construction of all building elements. It excludes the biogenic[1] carbon sequestered in the installed

[1] Biogenic carbon is carbon derived from biological sources and is part of the Earth's natural carbon cycle. It is absorbed from the atmosphere by plants and trees and stored within organic matter such as soil.

products at practical completion. The Essex approach focuses on this category of embodied carbon, as it is the area most easily influenced by policy and addressed by client and design teams during the planning process[2].

According to the 2021 Net Zero Whole Life Carbon Roadmap technical report from the UK Green Building Council, 20% of built environment emissions can be attributed to embodied carbon. As buildings become more energy efficient, the emissions associated with the energy used to operate them, also known as their operational carbon emissions, are reduced. Subsequently, the embodied carbon emissions of construction materials start to account for a greater portion of total building emissions than operational carbon[3].

Circular Economy

As embodied carbon relates to the carbon inherent in making new materials, it will also become beneficial to develop policies that encourage material reuse and resource efficiency, transitioning to a circular economy. By designing new construction to be easily demountable, deconstructing buildings carefully, and reusing materials wholly and locally, the resource intensive linear process of material use and disposal will be mitigated, ultimately reducing waste[4].

National Policy

There is currently no national policy addressing embodied carbon, as the issue is not scoped into the Building Regulations Approved Documents including Part L: Energy and Greenhouse Gas Emissions (March 2026) (also referred to as the Future Homes Standard). The government has indicated that a consultation will be launched on a national approach to reducing embodied carbon[5]. However, there has been no indication as to when this will happen, or how such a policy would function within or alongside existing and proposed legal frameworks, including Approved Document Part L.

Waiting for a national policy on embodied carbon to be developed delays the beneficial impacts outlined in this paper, given the urgency of achieving emissions reductions and the wider benefits to the Essex people, environment and economy that can be achieved, local authorities are choosing to develop locally evidenced approaches. The Climate Change Committee (the government advisory body on climate change) has noted that the built environment is off-track to reach statutory carbon mitigation goals by 2050 and has stated that "*Where local authorities are putting in place ambitious and well-evidenced plans and are delivering low and net*

[2] Essex Embodied Carbon Policy Study | Essex Design Guide – p. 17
[3] Essex Embodied Carbon Policy Study | Essex Design Guide - p. 3
[4] Essex Embodied Carbon Policy Study | Essex Design Guide - p. 20.
[5] The Future Homes and Buildings Standards: 2023 consultation - GOV.UK

zero carbon developments and transport services, they should be allowed to go ahead of national standards."[6] This indicates the necessity of adopting a stringent approach to address embodied carbon as soon as possible and the responsibility of local authorities to develop policy which will achieve this.

Essex Policy

Essex has taken the initiative, by being one of the first county councils in England to develop an advisory policy position for lowering embodied carbon in new homes and buildings. The Embodied Carbon and Circular Economy Planning Policy Statement for Greater Essex is based on conclusions drawn in the Essex Embodied Carbon Policy Study. This study provided the technical evidence to support a consistent Essex-wide planning policy approach towards reducing embodied carbon construction emissions. With the support of the Built Environment Planning Unit, the policies in the statement are being taken forward by district planning authorities across Greater Essex as they prepare or review their local plans.

There is a perception that lowering embodied carbon emissions may affect site viability or reduce immediate financial return to the developer. However, evidence assembled through the Essex Embodied Carbon Policy Study suggests that the recommended policy can be achieved without affecting viability in many circumstances and that, in addition to ensuring that pollution mitigation targets are achieved, lowering embodied carbon has several co-benefits for the economy and public health as outlined in the following sections.

[6] Local-Authorities-and-the-Sixth-Carbon-Budget.pdf - p. 9

2. Local Economy and Local Supply Chains

The embodied carbon associated with building materials or products encompasses emissions released during transportation, meaning that imported building supplies will typically have higher embodied carbon. Procuring construction materials as locally as possible can both lower embodied carbon and stimulate the local economy, by providing opportunities for businesses within the Greater Essex region.

There are already precedents in the built environment sector for lowering transport distances and therefore embodied carbon by expanding local supply chains. For example, Octopus Energy has created a domestic UK supply chain for its heat pumps, a low energy technology, by purchasing Northern Irish manufacturer Renewable Energy Devices (RED), the only manufacturer securing 80% of parts for its products within the country[7]. This decision has created 100 local jobs in the region, as well as furthered UK energy independence goals[8].

The Scottish timber industry is a successful example of a scaled local supply chain for a low embodied carbon material. Carbon storage is approximately 50% higher in homes built with timber frames than in masonry homes and up to 400% higher for larger buildings that, instead of concrete, use engineered timber products, such as Cross-Laminated Timber (CLT)[9]. This has raised the appeal of timber as a construction material to developers aiming to limit embodied carbon and stimulates more demand from the local supply chain. The Scottish economy is greatly benefitting from the use of these local materials, with the timber industry supporting over 30,000 jobs and generating £878 million of Gross Value Added (GVA) annually[10].

The Embodied Carbon and Circular Economy Planning Policy Statement , as well as the Love Essex Waste Strategy, promote the adoption of circular economy principles that will also encourage local supply chains for reused construction materials. As defined by the UK government, circular economy is 'intended to start the transition away from the traditional linear economy that operates on a "take-make-dispose" basis. The circular economy model promotes using products and materials for as long as possible through local maintenance, repair, reuse, [...] and recycling, as well as by lowering consumption'[11].

[7] Octopus Energy invests in Northern Irish heat pump experts to build thousands of heat pumps a month | Octopus Energy
[8] Octopus Energy invests in Northern Irish heat pump experts to build thousands of heat pumps a month | Octopus Energy
[9] Timber in construction roadmap 2025 - GOV.UK
[10] The timber industry - The timber industry | Forestry and Land Scotland
[11] The circular economy and sustainable manufacturing - The circular economy and sustainable manufacturing - POST

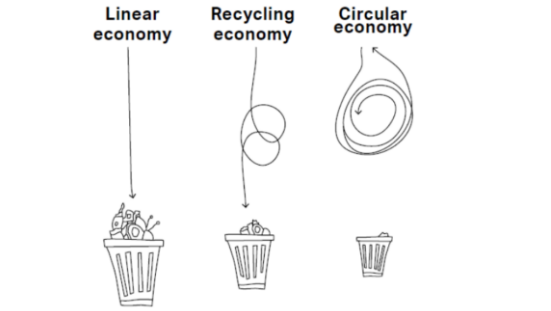


Figure 2

In the context of construction, this might mean creating a regional database of surplus materials which could be sold between local construction sites or made available for purchase by material suppliers, as part of a 'material exchange'. This would establish a local supply chain for materials, while also limiting the creation of landfill waste and reducing embodied carbon emissions. An example of this is being pioneered in Enfield with its Excess Materials Exchange, which is a digital platform where materials from demolition projects can be listed and then reused in other local construction projects[12].

[12] Online platform launched to recycle building materials | Enfield Council

3. New Materials and New Business

In addition to supporting local supply chains, mandating reductions in embodied carbon can also stimulate innovation and accelerate the adoption of new materials. To reduce embodied carbon in construction, some developers are turning to new, less carbon-intensive materials. Hemp-based products are one such example. Hempcrete, supplied domestically by companies such as UK Hempcrete, is a low carbon, bio-based material which can be wet-mixed and cast around a structural frame onsite[13]. Hemspan, a company situated in the UK specialising in bio-based building materials, also creates insulation, construction board and 'bio-blocks' out of hemp and other natural materials[14]. Hemspan (who have their flagship development in Essex[15]) actively contributed comments to the Embodied Carbon and Circular Economy Planning Policy Statement during its draft phase, which illustrates that such policies are of interest to these innovative businesses.

There are also sustainable enterprises making low embodied carbon products in Essex. For example, the sustainable masonry manufacturer Lignacite has a plant in the county where it produces lower embodied carbon concrete blocks using ash, wood particles and recycled sand[16]. Another company with a footprint in Essex is the UK-based sustainable developer GS8, which is building self-described 'carbon negative' housing developments across the region. The housebuilder makes use of UK companies for new low embodied carbon materials, such as recycled plastic (Smile Plastics[17]), bio-based insulation (Mykor[18]) and low embodied carbon plaster (Adaptavate's Breathaplasta[19])[20]. That GS8 can make these material choices, indicates that sourcing new low embodied carbon materials domestically is achievable. A case study exemplar of a GS8 development in Essex can be found on the Essex Design Guide exploring the technical outcomes.

By requiring reductions in upfront embodied carbon, opportunities are provided for innovative materials to emerge on the market, creating an environment that allows manufacturers of these new materials to expand. For Essex, this could align with the aims of the Essex Growth Agency and Ambitious Essex Growth Hub to stimulate new business and entrepreneurship in the county. The purpose of this Hub is to provide free business advice, signpost to other support providers, offer training and provide advice on funding and investment. If the Hub directs its services to emerging circular economy businesses and investment opportunities, there is potential to foster new economic links to existing businesses in the Greater Essex region.

[13] UK Hempcrete - Frequently Asked Questions - UK Hempcrete
[14] Hemspan Products - Shop Sustainable Insulation Materials UK - Hemp House Insulation
[15] https://hemspan.com/rochford-park-climate-positive-homes-essex/
[16] Lignacite - Raw Materials For Concrete Blocks | Lignacite
[17] Smile Plastics - Our Story - Smile Materials
[18] Mykor - Mykor Insulation
[19] Adaptavate Breathaplasta - Breathaplasta | Adaptavate
[20] GS8 Design and Materials Approach - Our design

4. Lean Design and Presumption Against Demolition

There may be concerns that the adoption of new materials and design approaches could result in a cost uplift to development, especially since some of these innovative products have not been scaled to a level of production equivalent to more conventional building materials. However, analysis in the Essex Embodied Carbon Policy Study has found that the upfront embodied carbon targets it recommends should not incur additional costs to the developer and are not expected to affect viability. This is also supported by the Westminster City Council: embodied carbon evidence-base, which finds that the LETI band C for upfront embodied carbon that has been adopted by Essex, can be achieved at no additional cost uplift[21].

Furthermore, the Essex evidence shows that even lower figures for upfront embodied carbon emissions than LETI band C can be delivered at a very low additional cost (between 1-4% depending on the residential typology)[22]. Such limited impact on cost arises, in part, due to recommendations that developers take a more considered approach to design when addressing upfront embodied carbon. 'Lean design' is one such methodology recommended in the Embodied Carbon and Circular Economy Planning Policy Statement . The aim of this method is that the building form does not result in excess structure and material use, and that material choices represent the lowest upfront embodied carbon options. By reducing material usage and simplifying form factor, embodied carbon is limited, and cost savings arise.

Avoidance of cost can also be furthered when waste from the site is reused for other purposes, either within the proposed buildings or as part of the landscaping. Simplified lean designs are also typically faster to construct, economising more of the budget as a result. Essex offers design recommendations on minimising surface area and simplifying form factor to create leaner designs in its published Essex Building Specification Guidance.

Adopting a low embodied carbon material modular design approach can also produce savings. By having fabric build up or structural components designed and fabricated off-site and at scale, building costs can be reduced. Hemspan is promoting a low embodied carbon pre-fab approach with its Biohaus designs[23]. Such modular elements can also decrease build times, again leading to cost reductions.

[21] p. 41 - *Westminster City Council: embodied carbon evidence-base*
[22] p. 7 - Essex Embodied Carbon Policy Study
[23] Hemspan Biohaus Design - BIOHAUS® - Climate Positive Living

An additional low embodied carbon design principle is the presumption against demolition. This forms one of the core clauses in Policy GE2 set out in the Embodied Carbon and Circular Economy Planning Policy Statement . By retaining as much of an original structure as possible, money is saved for the developer on the cost of building supplies and embodied carbon is limited through reduced material usage.

The above examples illustrate that a variety of design approaches can be adopted to achieve the recommended upfront embodied carbon limits. Rather than disrupting construction and resulting in cost uplifts, these methods can instead accelerate build times and lead to savings when applied with intention.

5. Health

In addition to economic opportunities, limiting upfront embodied carbon can lead to public health benefits and, in turn, alleviate the burden on the NHS. Construction sites emit significant levels of particulate matter, which lowers air quality around the development. Low air quality causes 36,000 premature deaths every year in the UK. The 2019 London Atmospheric Emissions Inventory (LAEI) shows that 'approximately 30% of particulate matter (PM10) emissions come from construction, along with 8% of fine particulate matter (PM2.5) and 4% of nitrogen oxides (NOX)'[24].

Mandating the reduction of embodied carbon can help address this issue. By reducing material use through lean design and the avoidance of demolition, less particulate matter will be generated onsite through transport and construction. In addition, minimising waste through material efficiency and reuse means that less refuse goes to landfill or incinerators, reducing the emissions created in these processes.

As embodied carbon encompasses the entire construction process, developers may also try to curtail embodied emissions by transitioning to electric construction equipment, such as electric cranes, as well as fleets of electric vehicles for transportation[25]. This will also limit the release of greenhouse gases that would have been produced by hydrocarbon fuelled equipment, again decreasing the negative health effects of air pollution.

In addition to the improvements in air quality during the construction phase, public health benefits from lowering embodied carbon also emerge for residents during occupancy. This is because reducing these emissions can have an impact on volatile organic compounds (VOCs), which are gases released from thousands of solid and liquid products. Some VOCs can have potential negative impacts on health, including irritation, allergies, headaches, organ damage and cancer. These compounds are often released into the air from chemicals inherent in building materials and products, such as paints and adhesives. Their presence in the building fabric means that the concentration of VOCs can be up to ten times higher indoors than outdoors[26].

Low embodied carbon materials are often natural and bio-based products, such as wool, timber and hemp, which have undergone minimal chemical processing and contain little plastic. As a result, they emit fewer VOCs and limit the associated health risks, such as respiratory issues. Buildings constructed with these bio-based, low embodied carbon materials will have the added benefit of creating a healthier indoor environment for residents[27].

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[24] p. 3 - Air quality and emissions in construction (Centre for Low Emission Construction report) - Air quality and emissions in construction

[25] Reducing embodied carbon in new construction – McKinsey and Company

[26] Indoor Air Quality - UK Parliament Briefing (2023) - p. 9.

[27] Natural Building Materials for Interior Fitting and Refurbishment—What about Indoor Emissions? - PMC

The adoption of low embodied carbon natural materials can also limit the risk of damp and mould, improving another aspect of indoor air quality. A large proportion of natural low embodied carbon materials, like timber, wool and hemp, are classed as breathable products, which allow moisture to pass through them [28][29]. Many modern construction materials, like cement render, vinyl paints, gypsum plaster and non-bio-based insulation, are often not breathable and hold moisture inside walls [30][31][32].

By incorporating breathable natural materials into the building fabric, water vapour can permeate through the construction (even where it is airtight), and the internal humidity of the building can be kept in balance[33]. This limits the build-up of condensation, which can lead to damp and mould. By managing moisture through vapour permeable construction, it diminishes the risk of respiratory conditions caused by exposure to damp, such as asthma, bronchiolitis and allergies[34]. Combatting these illnesses is especially prescient in the wake of Awaab's law[35] and will also reduce pressure on the NHS, which spends around £895 million a year on first year treatment costs for health conditions that arise due to excess cold and damp in homes[36]. When additional costs regarding care, lost economic output from sickness, and mental health costs are considered, the full price of damp and cold homes to society rises to around £15.4 billion per year[37]. So, by adopting embodied carbon standards which assist in mitigating this problem, savings across a broad range of areas can be achieved.

[28] Breathability: The Key to Building Performance by Neil May (2005)
[29] Airtightness, Vapour Control and Breathability – ASPB Briefing Paper
[30] An Introduction to Breathability – ASPB Briefing Paper
[31] p.2 Sustainable and Breathable Building Products and Systems for Retrofit
[32] A Review of Breathable Walls and Breathable Paints: Innovations and Sustainability in Building Materials
[33] p.2 Sustainable and Breathable Building Products and Systems for Retrofit
[34] Health inequalities: Cold or damp homes
[35] Awaab's Law: Why so many UK homes still have a mould problem - BBC News
[36] Health inequalities: Cold or damp homes
[37] Health inequalities: Cold or damp homes

6. Conclusion

Embodied carbon will gain increasing prominence as a source of emissions in the built environment as operational emissions are mitigated. Essex research has found that building to the upfront embodied carbon limits established in Essex policy should not incur additional costs to the developer and is not expected to affect viability. Furthermore, the Essex evidence shows that even greater savings in embodied carbon emissions above our recommended minimum targets can be achieved at reasonable additional cost[38].

There are in fact many opportunities, both economic and public health related, which could be realised by introducing the policies in the Embodied Carbon and Circular Economy Planning Policy Statement . These could have specific benefits for Essex, stimulating local supply chains, and offering opportunities for entrepreneurship as well as new skills and jobs. The potential for improvements to air quality highlights a route to better public health outcomes, which also has a positive impact on economic productivity. In light of this evidence, the narrative around reducing embodied carbon should widen to encompass these co-benefits, rather than just strictly focusing on emissions reduction.

[38] p. 7 - Essex Embodied Carbon Policy Study

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