COTSWOLD DISTRICT COUNCIL

Sustainable construction policies

Embodied carbon topic paper

December 2023 | Rev C

Levitt Bernstein People.Design

Etude

Sustainable construction local plan policies | Supporting documents

This document

Operational energy and carbon

Technical evidence base / New buildings only

Recommends specific policies to reduce new buildings' operational energy use, require low carbon heating systems, increase renewable energy generation and ensure that targeted performance is delivered. Demonstrates that they are technically feasible and comments on their viability.

Embodied carbon

Topic paper / New buildings and retrofit

Explains the concepts of upfront embodied carbon and life cycle carbon. Recommends and assesses specific policies.

District heating

Information paper for officers / New buildings and retrofit

Explains the different types of district heating systems, how they compare with an individual heating system and which systems would help to deliver Net Zero.

Retrofit

Topic paper / Retrofit

Articulates the crucial role of retrofit to achieve Cotswold's carbon targets and how the Local Plan (and wider planning system) can better support and incentivise decarbonisation.

This work was led by

COTSWOLD DISTRICT COUNCIL

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The consultant team includes two organisations who have previously collaborated on a range of new construction and retrofit projects, net zero guidance and policy work. It includes architects, engineers, conservation and energy specialists. It brings together a diverse set of skills with a shared ethos of collaboration, practicality, and commitment to accelerate the reduction of carbon emissions from buildings.

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Introduction to embodied carbon and its importance

Beyond operational energy and carbon

In order to reduce carbon emissions associated with new development and retrofit across their estimated operational lifetime and beyond, emphasis must also be placed on the reduction of whole life carbon.

Why is Embodied Carbon important?

Both operational and embodied carbon must be reduced to address the climate crisis. Operational carbon is more closely monitored in current legislation and policy. However, embodied carbon must be drastically curtailed.

Upfront Embodied Carbon

Upfront Embodied Carbon refers to the initial amount of embodied carbon associated with the construction of the building.

Life Cycle Embodied Carbon

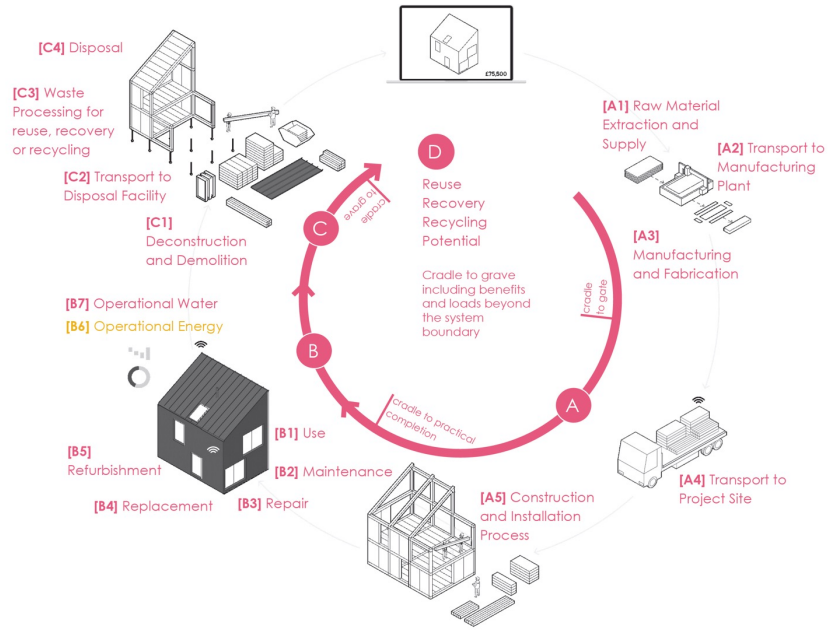
Life Cycle Embodied Carbon refers to the greenhouse gas emissions associated with the manufacture, transport, construction, repair, maintenance, replacement and deconstruction of all building elements.

What is Whole Life Carbon

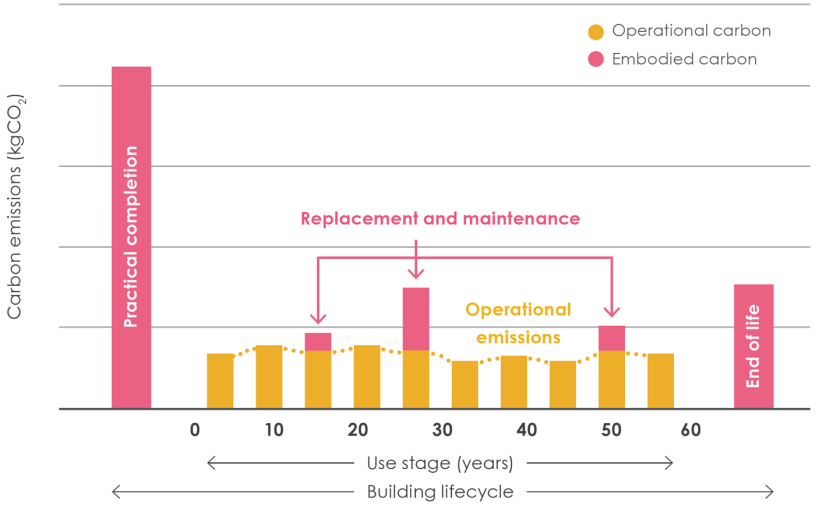
Whole life carbon brings together upfront embodied carbon, operational carbon, and carbon emissions associated with replacement, maintenance and finally end of life.

Relationship between embodied carbon and circularity

As embodied carbon relates to materials, it is important to develop policies which do not only seek to reduce embodied carbon but also help to transition to a circular economy in which we stop the resource intensive linear process of use and disposal.



Life cycle assessment stages for Whole Life Carbon (Source: LETI)



Interaction between operational and embodied carbon throughout the lifetime of a building (Source: LETI)

1.0

What is embodied carbon?

Embodied carbon key terms

The making of materials, their transport, repair and deconstruction affects how much carbon is associated with them. Embodied carbon can be assessed according to different boundaries. This is a summary of the key boundaries and the terms associated with them.

Upfront embodied carbon

Upfront embodied carbon refers to the greenhouse gas emissions associated with material and construction stages: raw material supply, manufacture, transport and construction of all building elements. Designers have the greatest ability to reduce upfront embodied carbon pre/post-planning by considering how a building can be optimally designed and through the materials specified.

Life cycle embodied carbon

Life cycle embodied carbon includes both upfront embodied carbon and the embodied carbon associated with:

- **in-use**: maintenance, replacement and refrigerant leakage.
- **end of life**: waste processing of demolition/deconstruction and disposal of any products.

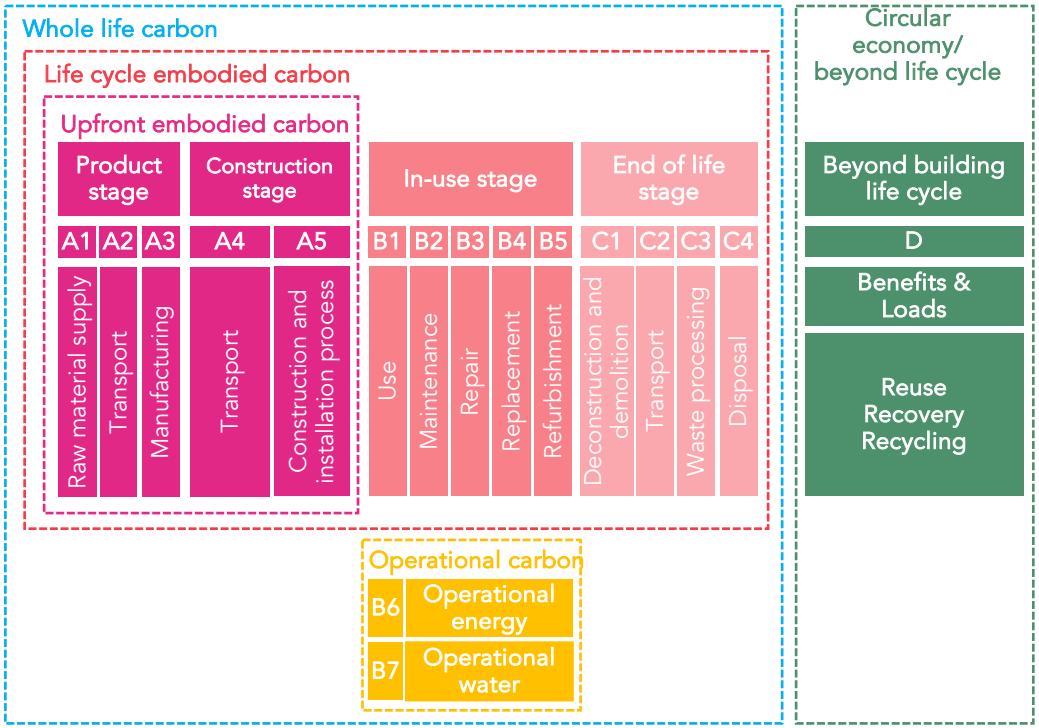
While design teams have some influence (e.g. through design for deconstruction), building owners and occupiers who will maintain and refurbish the building will have the most influence.

Operational carbon

Operation carbon refers to the emissions associated with energy and water use during operation. This can and should be reduced further through planning policy (see separate evidence base).

Whole life carbon

The sum of life cycle embodied carbon and operational carbon.



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

Circular economy/beyond life cycle

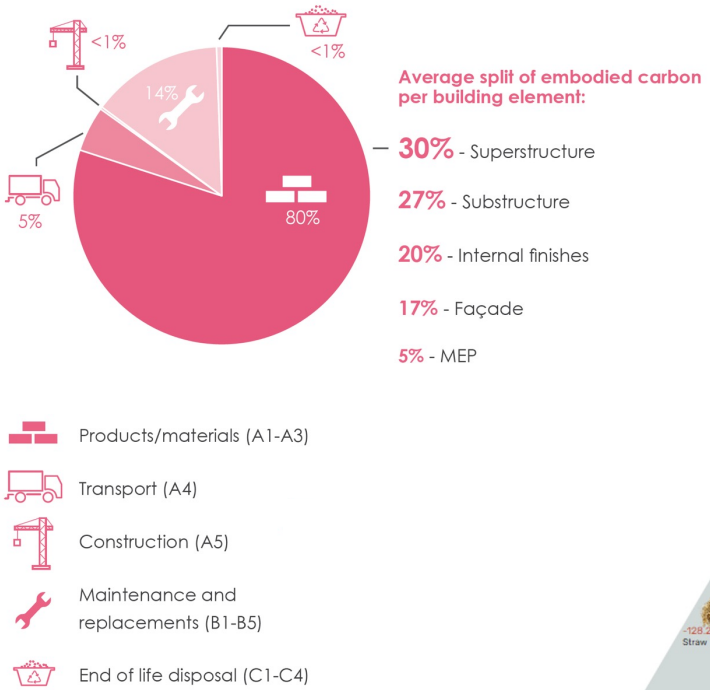
A circular economy seeks to ensure materials can be re-used again and again and are ultimately diverted from landfill. This is outside of embodied carbon assessments, but reviews important principles of material re-use, recovery and recycling.

Upfront embodied carbon – materials and their quantities

Upfront embodied carbon associated with one particular material is calculated by multiplying its embodied carbon rate by its quantity.

Materials used in superstructure and substructure are generally used in large quantities, so their selection is likely to have a significant impact on the overall upfront embodied carbon.

Using a high embodied carbon material may be acceptable if it is used in small quantities. If used in large quantities, lower carbon alternatives should be investigated.



Reducing embodied carbon for the largest uses/greatest quantities (Source: LETI)

Selection of materials commonly used in the UK:

The material selection pyramid is illustrating high embodied carbon materials at the top and low embodied carbon materials at the bottom (modules A1-A3, based on global warming potential). Follow link www.materialepyramiden.dk to see the pyramid in more detail. These are Danish figures and are not intended to be used in the UK, but the hierarchy is useful as an illustration.

How the reduction upfront embodied carbon aligns with the planning process

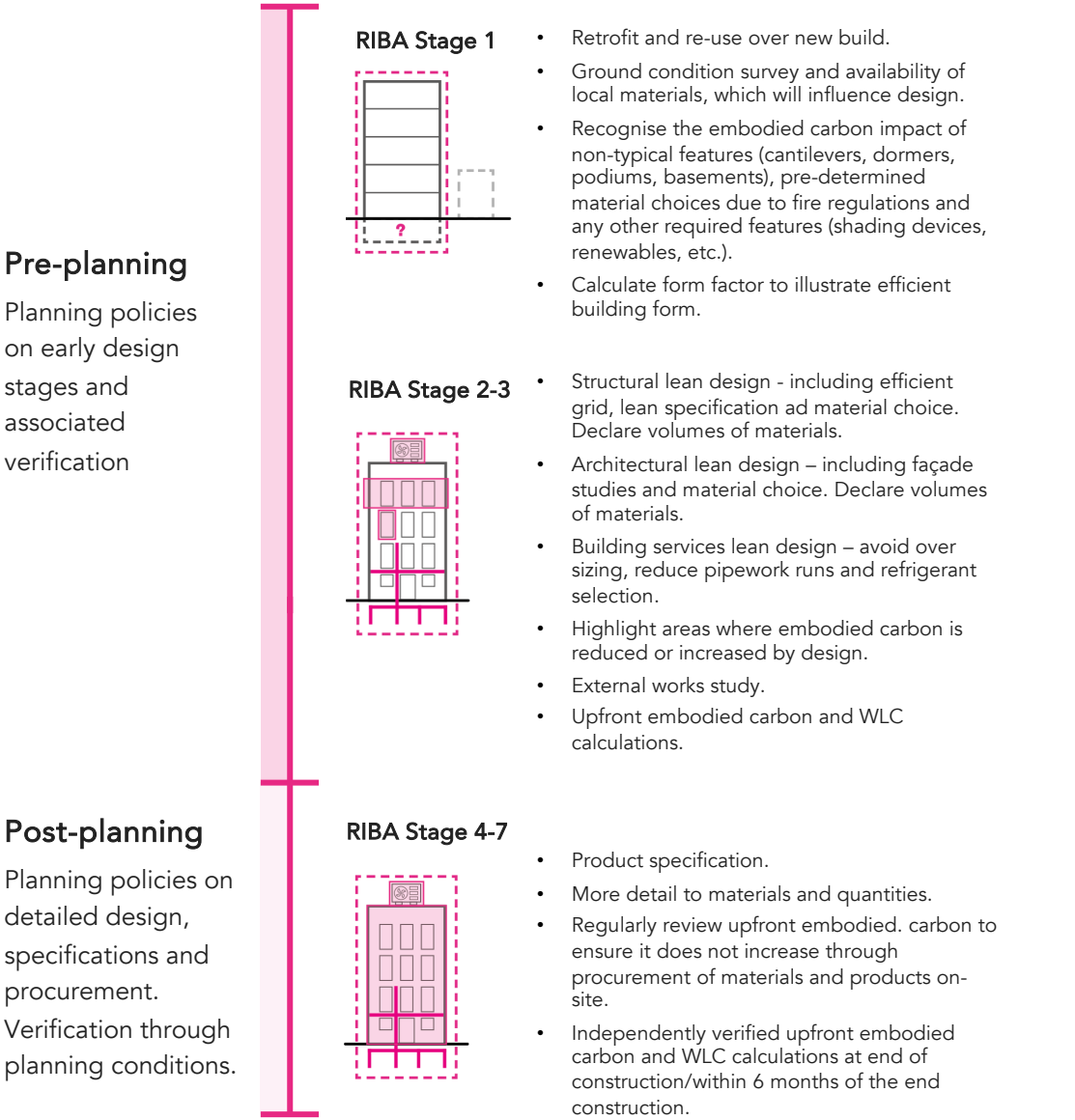
The diagram on the right illustrates how upfront embodied carbon processes run alongside the planning process. This gives an indication of the types of activities that could be influenced by and checked during the planning process through policy, and the activities that will have to be encouraged and verified through planning conditions.

Pre-planning

Through the Local Plan, planning policies could be set encouraging design decisions that would reduce the embodied carbon of the buildings. There is a significant opportunity to reduce upfront embodied carbon through good design choices. For example, lean design strategies (where buildings are carefully designed to use less material) are key in reducing the amount of high embodied carbon materials needed in a building, e.g. optimised structure and foundations, less use of metal components in façades and plastics and refrigerants in building services. These design decisions may also be best influenced through the design code. Direct references to embodied carbon could be included and the applicant encouraged to consider the impact of their design.

Post-planning

Assuming the design of the building has been improved to reduce embodied carbon pre-planning, the focus on policies and conditions should be on verifying that the planning commitments are being delivered and on those which encourage the reduction of embodied carbon during detailed design, specification and procurement.



Planning process alongside upfront embodied carbon processes.

Viability of reduced embodied carbon buildings

Reducing the upfront and life cycle embodied carbon of a building does not necessarily mean higher total costs. Contrary to this, adopting strategies such us lean and circular economy design can also reduce total costs. This is due to reducing the volume of materials needed in a building and the frequency of maintenance, or allowing the building to be used for multiple purposes.

Where embodied carbon targets are set in planning policy, this has the ability to restrict material selection. Therefore, for viability reasons targets should be fully reviewed to check they are stretching but not unintendingly limiting.

Structural lean design

The sub and super-structure often represents >50% of upfront embodied carbon emissions in a building. Designing leaner structure can reduce the volume of overall material used in the building, including less foundations where the building becomes lighter. Considerations for reduction include: grid spacing, location of the core, structural depth, amount of cantilevers.

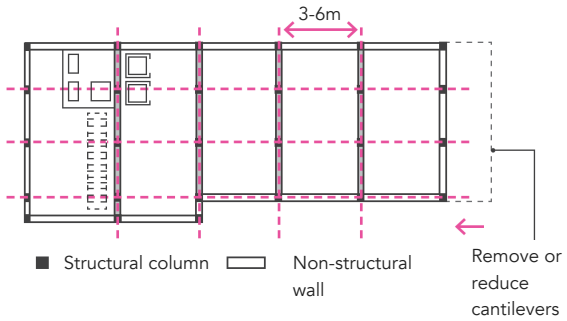
Architectural lean design

Façades often represent 15-20% of the upfront embodied carbon emissions in a building. Considerations for leaner façade designs include: amount of metal components, glazing-to-wall ratio, multi-purpose façade components.

Building services lean design

Building services have the least known overall impact on upfront embodied carbon but are made from high carbon materials (metals, plastics, refrigerants) which are replaced multiple times during a building's lifetime. Considerations to reduce these high carbon materials include: passive measures, ducts design, refrigerant specifications.

Structural lean design



- Optimisation of column grid to decrease slab thickness and beam depths, e.g. 3-6m column grid is a good starting point.
- Rules of thumbs and unnecessary tolerances on loading assumptions should be avoided.
- Design of structure for 100% utilisation.
- Reduction of spans and overhangs which require more materials, e.g. encouragement of columns to support balconies and walkways externally.

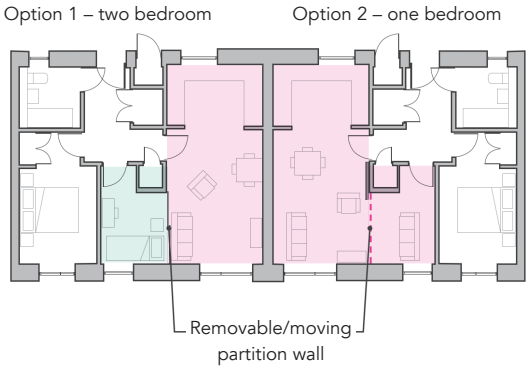
Architectural lean design

- Selection of elements with multiple benefits, e.g. embellishments of the façade also used as shading elements.
- Reduction of quantity of metal components: shelf angles, metal studs and frames.
- Balance between glazing-to-wall ration, between upfront embodied carbon and operational carbon.

Building services lean design

- Prioritisation of passive measures to reduce the need for building services equipment, e.g. optimised glazing ratios, natural ventilation and shading devices.
- Reduction of the need for long pipes and duct runs.
- Specification of low global warming potential refrigerants and reduction of leakage rate.

Circular economy design



- Designing for disassembly and adaptability for easy change of use of the building and re-use or sell materials at the end of its as an alternative to non-profitable, wasteful demolition.
- Selection of durable and easily-maintain materials to reduce maintenance cost and replacement cycles.
- Exploration of modularity and pre-assembly methods for faster and error-reduced construction time.

Key lean and circular economy design considerations for the reduction of upfront and life-cycle embodied carbon.

2.0

Current guidance and targets

Current available guidance for assessments

RICS - Whole Life Carbon Assessment for the Built Environment

The Royal Institute of Chartered Surveyors (RICS) published the 'Professional Statement: Whole Life Carbon (WLC) assessment for the built environment' in 2017. It is the industry standard methodology for WLC assessments and provides supporting guidance in line with BS EN 15978 principles. The document outlines the minimum scope required for a WLC assessment, including demolition, facilitating works, substructure, superstructure (structural element, building envelope, internal elements), finishes, fittings, furnishing and equipment (FF&E), services (MEP) and external works within the building's boundary. RICS accounts for sequestered carbon in materials separately but does not account for biogenic carbon losses from the existing site (existing plants, habitats, etc).

A second edition of RICS professional statement has been published in September 2023 and is due to take effect in July 2024. Key changes include:

- the introduction of new life-cycle stages, some of which are mandatory to report (e.g. A5.1, demolition)
- the inclusion of return trips in transport emissions
- the alignment of carbon data with the cost plan of the projects
- the separate reporting of carbon offsets and biogenic carbon (biogenic carbon can only be claimed for sustainably sourced materials)
- the separate reporting of buildings within a site
- the rating of quality of data for carbon emissions.

Other useful guidance and targets

Additional useful embodied carbon guidance and information can be found from the RIBA, LETI, BREEAM, UKGBC, IStructE, the Centre for Windows and Cladding Technology (CWCT) , the Concrete Centre, Proposed Building regulations Part Z and the UK Net Zero Carbon Building Standard currently under development.

Professional standard for assessment:

RICS 2017 (left) and 2023 (right) professional statements: Whole Life Carbon assessment for the built environment.

Industry guidance and targets:

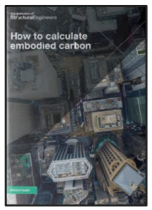
RIBA 2030 climate challenge

LETI embodied carbon primer

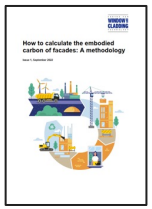
UKGBC – Net zero whole life carbon roadmap

UK Net Zero Carbon Building Standard

Other useful guidance:

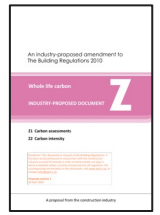


IStructE – How to calculate embodied carbon



CWCT– How to calculate embodied carbon of facades

The concrete centre– Sustainable concrete



Part Z proposed amendment to building regulations

Current industry targets and benchmarks

LETI

In 2021 LETI reviewed how targets from different organisations could be reconciled with each other. To do so they consulted other industry groups including CIBSE, RIBA, IStructE, the GLA, and the Whole Life Carbon Network. The Whole Life Carbon Alignment paper set targets for upfront and life cycle embodied carbon and provided a set of reporting templates to help with consistency. The targets from all these organisations represent different life stages, building typologies, building elements and pathways to net zero.

RIBA

RIBA developed voluntary performance targets for embodied carbon, operational energy use and water use which form the basis of the RIBA 2030 Climate Challenge published in 2021. The targets were set after consultations with experts across the industry. The RIBA targets are aligned with LETI's Whole Life Carbon Alignment targets summarised on the right. The targets are based on a growing database of projects submitted by signatories who have committed to participate the data collection for the initiative.

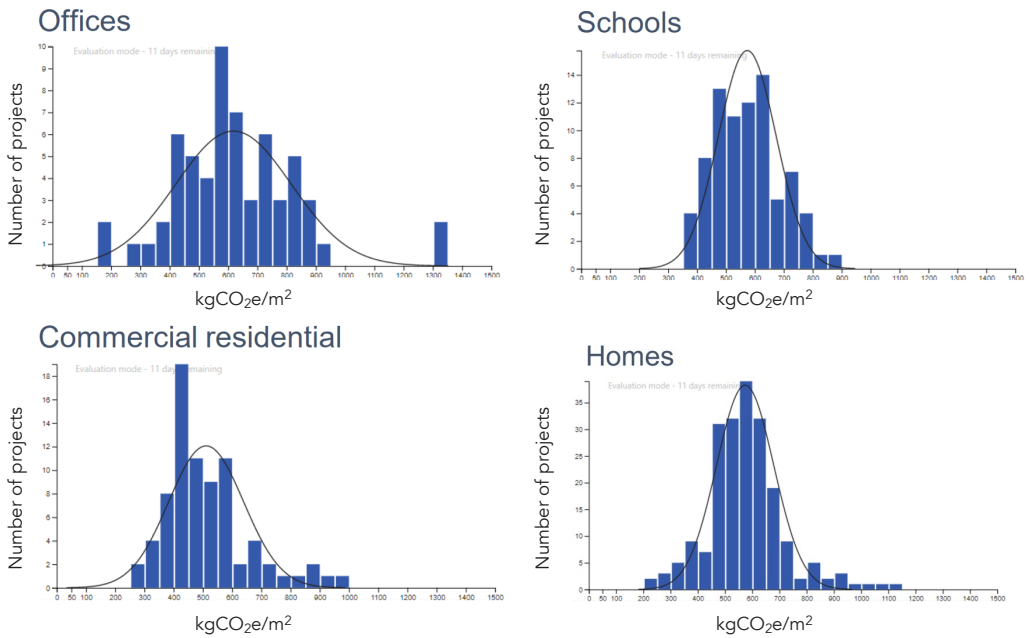
Further work in the industry

The UK Net Zero Carbon Building Standard (NZCBS) is a science-based research project aimed at developing a unified methodology for achieving net zero carbon buildings in the UK. The standard is in development and is in the process of reviewing upfront embodied carbon targets. In a recent technical study focused on assessing the upfront embodied carbon of new builds, performance levels of recent schemes were reviewed.

It is currently unknown when the standard will be released, whether it will stay as an industry standard or be adopted by local authorities and/or Government. Cotswold embodied carbon policy report is exploring the best approach to set its own standard and will be looking to review NZCBS targets when the standard is released.

Upfront embodied carbon, $kgCO_2e/m^2$ (modules A1-A5, excluding sequestration)				
Band	Office	Residential (6+ storeys)	Education	Retail
A++	<100	<100	<100	<100
A+	<225	<200	<200	<200
A (LETI 2030)	<350	<300	<300	<300
B	<475	<400	<400	<425
C (LETI 2020)	<600	<500	<500	<550
D	<775	<675	<625	<700
E	<950	<850	<750	<850
F	<1100	<1000	<875	<1000
G	<1300	<1200	<1100	<1200

Upfront embodied carbon targets for various building typologies.
The residential targets have been set based on data from 6+ storey developments, therefore the applicability to low-rise housing is unknown (Source: LETI)



Upfront embodied carbon case study analysis (Source: Net Zero Carbon NZCBS)

3.0

Review of current policies

Existing policies and approaches adopted by other Local Authorities (1/3)

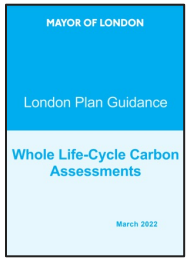
Embodied carbon is beginning to feature in planning policy with a handful of local authorities having introduced or in the process of introducing embodied carbon policies in their Local Plans. Key examples have been set out and explored below and on the following pages.

Greater London Authority

The Greater London Authority (GLA) uses policy SI 2 in the London Plan to require referable schemes to calculate whole life-cycle carbon emissions. The GLA published the associated Whole-Life Carbon (WLC) assessment guidance which includes WLC benchmarks to compare against. It is important to note that they are just benchmarks, not targets to be met. A template is provided to aid submission of WLC data. The aim is to collect enough data to allow future policy to set targets.

Bath and North East Somerset Council (B&NS)

The UK's first Net Zero Carbon policy was introduced in January 2023 and covers both operational and embodied carbon. Policy SCR8 on embodied carbon states that all major developments must submit an upfront embodied carbon assessment, demonstrating that less than 900 $kgCO_2e/m^2$ can be achieved. No offsetting is permitted and if the development is not compliant with the policy, a valid justification must be provided with the appropriate reasons and evidences.



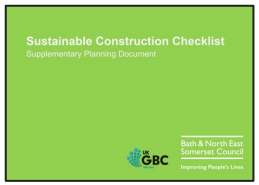
Whole Life-cycle carbon assessment guidance - GLA

GLA - SI 2 - Minimising greenhouse gas emissions – F

"Development proposals referable 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."

GLA upfront embodied carbon benchmarks:

- Residential <850 $kgCO_2e/m^2$ (<500 $kgCO_2e/m^2$ aspirational)
- Offices <950 $kgCO_2e/m^2$ (<600 $kgCO_2e/m^2$ aspirational)
- Schools <750 $kgCO_2e/m^2$ (<500 $kgCO_2e/m^2$ aspirational).



Sustainable Construction checklist SPD – B&NES

B&NES - SCR8 - Embodied Carbon

"Large scale new-build developments (a minimum of 50 dwellings or a minimum of 5,000m^2 of commercial floor space) are required to submit an Embodied Carbon Assessment that demonstrates a score of less than 900$kgCO_2e/m^2$ can be achieved within the development for the substructure, superstructure and finishes."

Existing policies and approaches adopted by other Local Authorities (2/3)

Bristol City Council

The draft Bristol Local Plan sets an embodied carbon, materials and waste policy. Major developments will be required to undertake an upfront embodied carbon assessment and are expected to achieve a set of minimum targets. Where policy is not met, carbon offsetting is used. It also provides general principles and guidance for reducing embodied carbon.

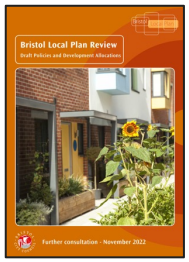
This policy has been based on the findings of the West of England Embodied Carbon Evidence Base.

West of England Evidence Base

This document was commissioned by four local authorities in the West of England (i.e. Bath and North East Somerset Council, Bristol City Council, North Somerset Council and South Gloucestershire Council), and the Combined Authority.

The West of England Combined Authority conducted an evidence-based study in 2021 to inform their Spatial Development Strategy (SDS) on embodied carbon. This document reviews a series of embodied carbon targets across different building types (office, school, apartment block and semi detached house) and considers the cost uplift of different scenarios. This supports policy makers to explore options for setting embodied carbon targets.

They are working towards updating this to explore the possibility of introducing WLCA as part of future policy.



Bristol City Council draft Local Plan

Bristol City Council – Draft policy

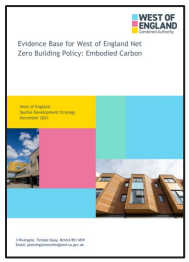
"Embodied carbon – major applications

Major development will be required to undertake an embodied carbon assessment, submitted as part of the Sustainability Statement using a nationally recognised embodied carbon assessment methodology, and demonstrate actions taken to reduce life-cycle carbon emissions. New development will be expected to achieve the following targets as a minimum:

- *Residential (4 storeys or fewer) - <625 kgCO_2e/m^2*
- *Residential (5 storeys or greater) - <800 kgCO_2e/m^2*
- *Major non-residential schemes - <970 kgCO_2e/m^2*

Where these targets for embodied carbon cannot feasibly be met, a full justification will be required as part of the embodied carbon assessment.

Any shortfall against the embodied carbon targets will be offset through a financial contribution towards council approved renewable energy, low-carbon energy and energy efficiency schemes elsewhere in the Bristol area. The value of a tonne of CO_2e is tied to the high scenario in the Valuation of Energy Use and Greenhouse Gas supplementary guidance to the Treasury's Green Book (currently £373)."



West of England evidence-based study for a future embodied carbon policy

West of England Evidence Base

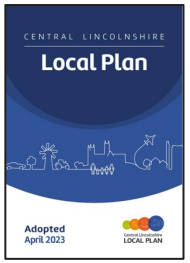
The evidence base provides targets in line with those proposed by Bristol City Council in its draft Local Plan. B&NES plan to update their policy using this evidence base.

Existing policies and approaches adopted by other Local Authorities (3/3)

Central Lincolnshire Council

Central Lincolnshire updated their Local Plan in 2023 to include a policy on Embodied carbon. The policy encourages the reduction of embodied carbon, with no targets set, but instead requires a more qualitive assessment. The policy requirements are set now and in the future. To begin with applicants are not required to use any specific lower embodied carbon materials, but they are asked to demonstrate consideration of opportunities and options available. However, in 2025 applicants are required to go further and demonstrate how the design and building materials respond to embodied carbon.

Central Lincolnshire also include a clause on 'presumption against demolition' with full justification required where demolition is proposed.



Central Lincolnshire updated local plan

Central Lincolnshire – S11 – Embodied Carbon

"All development should, where practical and viable, take opportunities to reduce the development's embodied carbon content, through the careful choice, use and sourcing of materials."

"Presumption against demolition:
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 (i.e. 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.*

"Major development proposals:
All major development proposals should explicitly set out what opportunities to lower a building's embodied carbon content have been considered, and which opportunities, if any, are to be taken forward… From 1 January 2025, there will be a requirement for a development proposal to demonstrate how the design and building materials to be used have been informed by a consideration of embodied carbon, and that reasonable opportunities to minimise embodied carbon have been taken."

Considerations for the development of Cotswold's embodied carbon policy

Current policy and industry guidance on embodied and whole life carbon have been successful at putting embodied carbon on the radar of project teams. Reporting is now becoming standard practice on major applications in London, and other cities such as Bath and Bristol now bringing target-based policies.

Analysis of planning submissions in London suggests, however, that project teams make limited efforts to reduce upfront embodied carbon: the focus appears to be mainly on reporting. Reporting also appears to be affected by the lack of transparency about the underlying data being used for the assessment.

Cotswold District Council's potential policy on embodied carbon should be developed based on an analysis of the advantages and limitations of current policy and guidance.

Embodied carbon in demolition and retrofit

Embodied carbon can be used positively as a justification against demolition and a reason to retain and retrofit a building. Central Lincolnshire Council uses this in in their policy.

Should benchmarks and targets be used?

Reporting against targets and benchmarks plays a pivotal role in keeping the industry on track towards decarbonisation. It is clear that they will be necessary in the medium to long term. However, taking pressure off of meeting targets in the short term may allow the focus to return to the efforts towards reducing embodied carbon through design, specification and procurement. In the meantime design indicators exist that can be outputted and compared, such as type and volume of structure or comparisons of façade options. This will help the industry learn together what good looks like and how best to achieve it. However, this approach relies on officers assessing the information submitted rather than compliance with a quantitative target.

Collecting data now for policy later

The GLA have taken the approach of requiring WLC assessments for referable schemes to collect data, with the intention to use this data to set targets in policy later. This has been very useful to gather data for the industry too. However, it has a limited impact on influencing the design of buildings in the interim.

Determine the boundary of embodied carbon

Some policies seek to reduce upfront embodied carbon and others life cycle or whole life carbon. Each has their advantages, but as designers have the greatest impact on upfront embodied carbon, our recommendation is to focus on upfront embodied carbon.

Links between operational and embodied carbon

Decisions taken to reduce embodied carbon should be considered in tandem with decisions taken to reduce operational energy consumption. The focus should be on reducing embodied carbon alongside and in support of ultra-low energy buildings, as opposed to trading one off of another.

The role of offsets in embodied carbon

Offset payments should be considered as a last resort. They are sometimes used for operational carbon to make up for the shortfall of emissions reductions on-site. Offsetting should be used cautiously, to avoid moving an on-site issue elsewhere in the area. It would be more constructive to set policy in a way that ensures emission are reduced as far as possible on-site.

4.0

Embodied carbon and the design code

Embodied carbon and the Cotswold Design Code

No direct reference to embodied carbon

The current Cotswold Design Code does not make any direct reference to embodied carbon. It does not highlight it as a key consideration when selecting a material nor does it include any specific requirement.

Direct references to materials

The current Cotswold Design Code refers directly to a significant number of materials, including those currently being used in the Cotswold vernacular and those being used for new buildings, retrofit and conversions. These include:

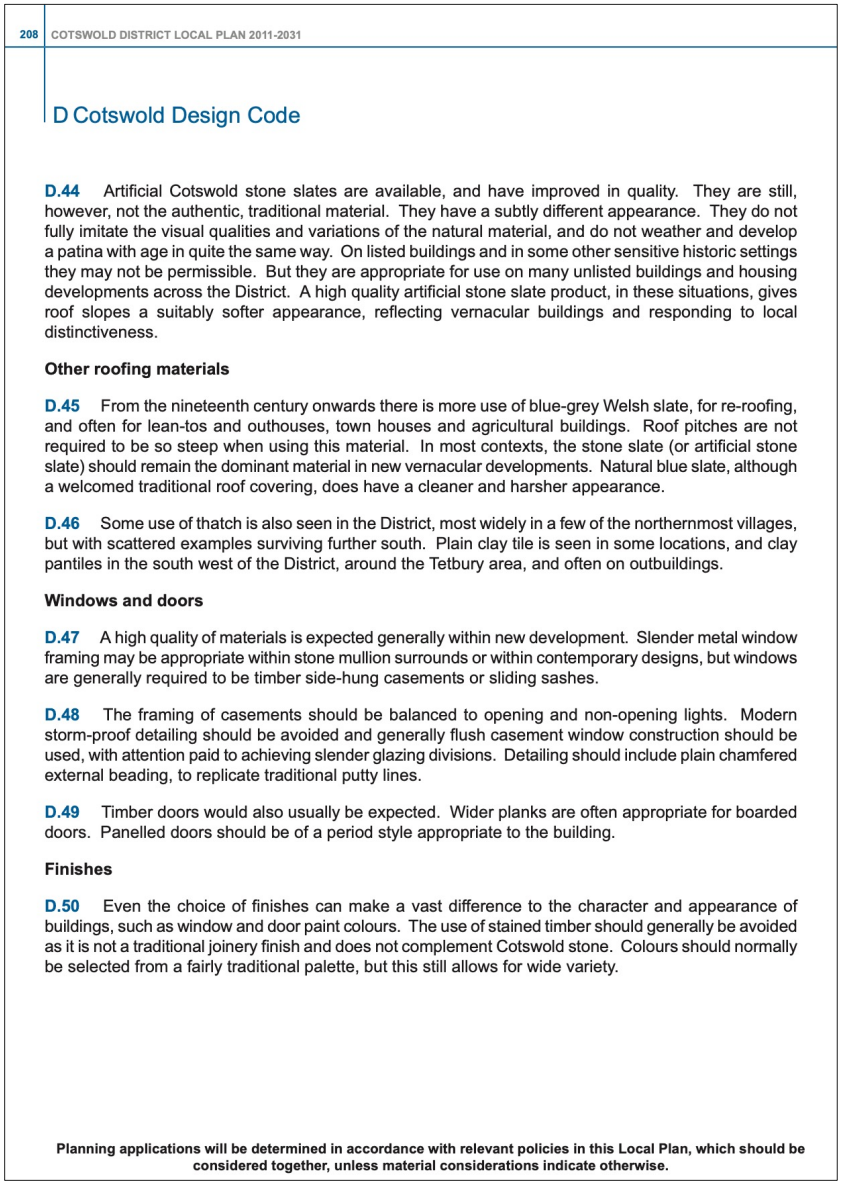
- Local limestone, ashlar stonework, rubble stone, lime-based mortar and roughcast render for walls
- Stone mullions window surrounds
- Metal and timber windows
- Timber doors
- Split limestone slates, blue-grey Welsh slates, stone tiles, clay tiles and thatch for roofs
- Drystone walling for boundary treatment
- Limestone, or Yorkshire, flags for paving and stone cobbles

It also refers to modern and non-local materials (e.g. zinc or copper roofs, timber cladding, artificial stone slates, blue engineering bricks for paving).

Recommendations

Direct references to upfront embodied carbon should be included in the design code and the applicant should be encouraged to consider whether their proposal uses low, medium or high upfront embodied carbon materials.

It could go further by proving a commentary on whether any of the materials referred to in the Design Code should be avoided on embodied carbon grounds.



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D Cotswold Design Code

D.44 Artificial Cotswold stone slates are available, and have improved in quality. They are still, however, not the authentic, traditional material. They have a subtly different appearance. They do not fully imitate the visual qualities and variations of the natural material, and do not weather and develop a patina with age in quite the same way. On listed buildings and in some other sensitive historic settings they may not be permissible. But they are appropriate for use on many unlisted buildings and housing developments across the District. A high quality artificial stone slate product, in these situations, gives roof slopes a suitably softer appearance, reflecting vernacular buildings and responding to local distinctiveness.

Other roofing materials

D.45 From the nineteenth century onwards there is more use of blue-grey Welsh slate, for re-roofing, and often for lean-tos and outhouses, town houses and agricultural buildings. Roof pitches are not required to be so steep when using this material. In most contexts, the stone slate (or artificial stone slate) should remain the dominant material in new vernacular developments. Natural blue slate, although a welcomed traditional roof covering, does have a cleaner and harsher appearance.

D.46 Some use of thatch is also seen in the District, most widely in a few of the northernmost villages, but with scattered examples surviving further south. Plain clay tile is seen in some locations, and clay pantiles in the south west of the District, around the Tetbury area, and often on outbuildings.

Windows and doors

D.47 A high quality of materials is expected generally within new development. Slender metal window framing may be appropriate within stone mullion surrounds or within contemporary designs, but windows are generally required to be timber side-hung casements or sliding sashes.

D.48 The framing of casements should be balanced to opening and non-opening lights. Modern storm-proof detailing should be avoided and generally flush casement window construction should be used, with attention paid to achieving slender glazing divisions. Detailing should include plain chamfered external beading, to replicate traditional putty lines.

D.49 Timber doors would also usually be expected. Wider planks are often appropriate for boarded doors. Panelled doors should be of a period style appropriate to the building.

Finishes

D.50 Even the choice of finishes can make a vast difference to the character and appearance of buildings, such as window and door paint colours. The use of stained timber should generally be avoided as it is not a traditional joinery finish and does not complement Cotswold stone. Colours should normally be selected from a fairly traditional palette, but this still allows for wide variety.

Planning applications will be determined in accordance with relevant policies in this Local Plan, which should be considered together, unless material considerations indicate otherwise.

Extract of the current Cotswold Design Code

5.0

Proposed embodied carbon policies for the Cotswold District Council's new Local Plan

Summary of possible requirements for an embodied carbon policy

Recommendations

The adjacent table is a 'long list' of requirements that could be used in various combinations to form a policy aimed at reducing upfront embodied and/or whole life carbon.

Thought should be given to which and how recommendations are applied to differing scales of development (e.g. minor or major applications). This is to reduce the time and cost burden of full embodied carbon calculations on individual homes or extensions.

Ref	Type	Proposed requirement wording	Evidence
EC.01	Process	The Council has a presumption against demolition and in favour of the re-use of existing buildings, unless a full justification for demolition is provided.	Application
EC.02	Process	If there are any buildings on site, and in order to prioritise retrofit and re-use, a comparison of different genuine retrofit and new build scenarios should be submitted.	Application
EC.03	Process	If there are any buildings on site, a material analysis of the existing building should be submitted and include recommendations for re-use of building materials	Application
EC.04	Process	A summary of the efforts made to reduce embodied carbon should be submitted with the planning application.	Application
EC.05	Process	A summary of the efforts made to design a lean, low carbon structure should be submitted with the planning application.	Application
EC.06	Process	A calculation of the building form factor should be submitted.	Application
EC.07	Process	A summary of materials proposed, highlighting which ones will be sourced locally, should be submitted with the planning application.	Application
EC.08	Process	An estimate of the quantities of concrete, steel and timber likely to be used by each building should be submitted with the planning application: Concrete: m^3 and m^3/m^2_{GIA} Steel: kg and kg/m^2_{GIA} Timber: kg and kg/m^2_{GIA}	Application & Condition
EC.09	Process	An elemental analysis of the embodied carbon ($kg/m^2_{external\ wall}$) associated with the external wall build up proposed should be submitted and include a comparison with two likely alternatives.	Application
EC.10	Process	An elemental analysis of the proposed heating system's embodied carbon should be submitted and include a comparison with one potential (and genuine) alternative.	Application
EC.11	Target	New developments should strive to achieve a maximum level of upfront embodied carbon (A1-A5) of 500 gCO_2e/m^2 *	Application & Condition
EC.12	Process	New developments should submit WLCA in line with RICS methodology (to be submitted to allow policy to be formed later from the findings)	Application & Condition
EC.13	Process	The Environmental Product Declarations (EPD) of a key materials should be submitted prior to occupation.	Condition
EC.14	Limit	Excessive use of high embodied carbon materials is prohibited, with a right to refuse applications on this basis.	Application

** This target is subject to change as more data and industry guidance becomes available. A target for low density housing would require a dedicated evidence base.*