London Borough of Merton

Merton’s Whole Life Carbon Assessment Guidance

Planning Guidance to support the Climate Change Policies in Merton’s Local Plan – November 2024

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1. PURPOSE OF THIS WHOLE LIFE CARBON ASSESSMENT GUIDANCE

1.1.1.1 The purpose of this guidance is to outline the approach for assessing the whole life carbon impact of developments in Merton, in accordance with the requirements set out in Policy CC2.5 of Merton's Local Plan (2024) and Policy SI 2 of the Mayor's London Plan (2021)[1].

2. BACKGROUND

2.1.1.1 Following the adoption of the Climate Change Act 2008 (2050 Target Amendment) Order in 2019, the UK has a statutory requirement to reduce its greenhouse gas emissions by 100% by 2050 (based on 1990 levels). Merton's Climate Change policies were reviewed following the Council's declaration of a Climate Emergency in July 2019 to ensure that they are consistent with Merton's carbon reduction commitment of becoming a carbon neutral borough by 2050 as set out in Merton's Climate Strategy & Action Plan[2].

2.1.1.2 Given that the construction industry contributes 49% of the UK's carbon emissions, Merton's New Local Plan focuses on sustainable design and reducing operational and embodied carbon emissions from both new and existing buildings. Whole Life Carbon (WLC) emissions are the carbon emissions resulting from materials, construction and use over a building's entire life, including demolition and disposal. This includes both embodied carbon and operational carbon emissions.

2.1.1.3 As operational carbon emissions reduce in new buildings due to improving standards in Part L of the Building Regulations, the significance of embodied carbon becomes more pronounced.

2.1.1.4 According to the Net Zero Whole Life Carbon Roadmap technical report published by the UK Green Building Council in 2021, 'Embodied carbon emissions contribute to some 40-50 million tonnes of CO2 annually, more than emissions from aviation and shipping combined.'[3] Therefore, addressing embodied carbon through policy is vital to meet local and national climate targets. As embodied carbon relates to materials, it is also important to develop policies that help to transition to a circular economy in which resource intensive linear processes of use and disposal are stopped.

2.1.1.5 Minimising whole life carbon emissions through careful and considered use of natural and renewable resources, promoting sustainable construction and minimising energy use are key considerations in securing a sustainable, low carbon future for Merton. This policy guidance aims to integrate sustainable practices into design, construction and operation of buildings, thereby supporting Merton's commitment of achieving net-zero carbon emissions as a borough by 2050.

[1] London Plan (2021): Chapter 9: Sustainable Infrastructure – https://www.london.gov.uk/what-we-do/planning/london-plan/new-london-plan/london-plan-2021

[2] Merton's Climate Strategy & Action Plan (2020). Available at: https://www.merton.gov.uk/planning-and-buildings/sustainability-and-climate-change/strategy

[3] UK Green Building Council (UKGBC) (2021): Net Zero Whole Life Carbon Roadmap Technical Report - UKGBC-Whole-Life-Carbon-Roadmap-Technical-Report.pdf

3. POLICY CONTEXT

3.1 *Merton's Local Plan 2024*

3.1.1.1 Merton's Local Plan 2024 was adopted on 20th November 2024[4]. In order to drive a reduction in whole life carbon emissions in Merton's building stock, Policy CC2.5 of Merton's Local Plan 2024 requires the following types of development to undertake a Whole Life Carbon Assessment (WLCA) proportionate to the scale of the development:

- Residential developments of 30 or more dwellings,
- Non-residential developments with 1,000sqm or more gross internal area (GIA), and
- All developments proposing the demolition and rebuild of a single dwelling.

3.2 *The London Plan 2021*

3.2.1.1 Policy SI 2 of the London Plan requires development proposals referable to the Mayor of London to calculate whole life carbon emissions through a nationally recognised Whole Life Carbon Assessment and demonstrate actions taken to reduce life-cycle carbon emissions.

4. APPLICATION OF THE POLICY

4.1 *Large-scale developments*

4.1.1.1 In 2022, the Greater London Authority published the *Mayor's Whole Life-Cycle Carbon Assessments (WLCA) Guidance and the Mayor's WLCA template*. This guidance explains how to calculate WLC emissions and provides information on design principles and WLC benchmarks to aid planning applicants in designing buildings that have low operational carbon and low embodied carbon.

4.1.1.2 **Any development in Merton involving the creation of 30 or more dwellings and/ or 1,000sqm or more non-residential GIA** will need to complete and submit the Mayor's WLCA Template in line with the Mayor's WLCA Guidance. The assessment should follow a full WLCA methodology covering all relevant modules from the GLA's guidance (A1-A5, B1-B5, C1-C4, D). These modules encompass emissions from product sourcing, transportation, construction, building use, maintenance and end-of-life processes.

4.1.1.3 The WLCA must be submitted with the planning application and to discharge any pre-occupation conditions related to the WLCA. Failure to submit the WLCA or failure to demonstrate appropriate carbon reduction measures may result in the planning application being refused or conditions being imposed to ensure compliance.

4.2 *Demolition and rebuild of a single dwelling.*

4.2.1.1 Historically, Merton has received a large number of applications for the substantial or total demolition of a single dwelling house and rebuild as a single dwelling. Such proposals are typically driven by design or lifestyle rather than on the grounds of structural instability.

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[4] Applicants should refer to Merton's Explanatory Note on Approaches to Sustainable Design & Construction for guidance on implementing Merton's Climate Change policies CC2.1 - CC2.6.

4.2.1.2 All such proposals outside of structural instability are considered a highly inefficient use of resources and materials and contrary to the principles of sustainable development and the circular economy. Even where proposals are deemed to result in an improvement of 'in use' energy consumption, the embodied carbon footprint of whole scale demolition and rebuild means that any environmental benefits are unlikely to be realised in the long term.

4.2.1.3 The council therefore requires all proposals to demolish and rebuild a single dwelling to submit a WLCA proportionate to the scale of development.

4.2.1.4 The WLCA should cover the entire life cycle of the development, from the sourcing of materials and construction through to demolition, with the goal of reducing total lifecycle carbon emissions.

4.2.1.5 The GLA's WLCA template is built to handle complex, multi-dwelling or non-residential projects and therefore includes highly detailed requirements. For the demolition and rebuild of a single dwelling the applicant can instead use Merton's Demolish & Rebuild WLCA Template and the Methodology set out in Section 5 below.

4.2.1.6 Merton's Demolish & Rebuild WLCA Template[5] ensures the WLCA remains proportionate to the scale of the development, while still providing a thorough evaluation of the carbon impacts associated with the demolition and rebuild of a single dwelling, providing a clear path to reduce emissions throughout the building's life cycle.

4.2.1.7 Applicants are encouraged to engage with the planning department early in the design process to ensure the WLCA is integrated into the project's overall sustainability strategy.

5. DEMOLITION & REBUILD WLCA METHODOLOGY

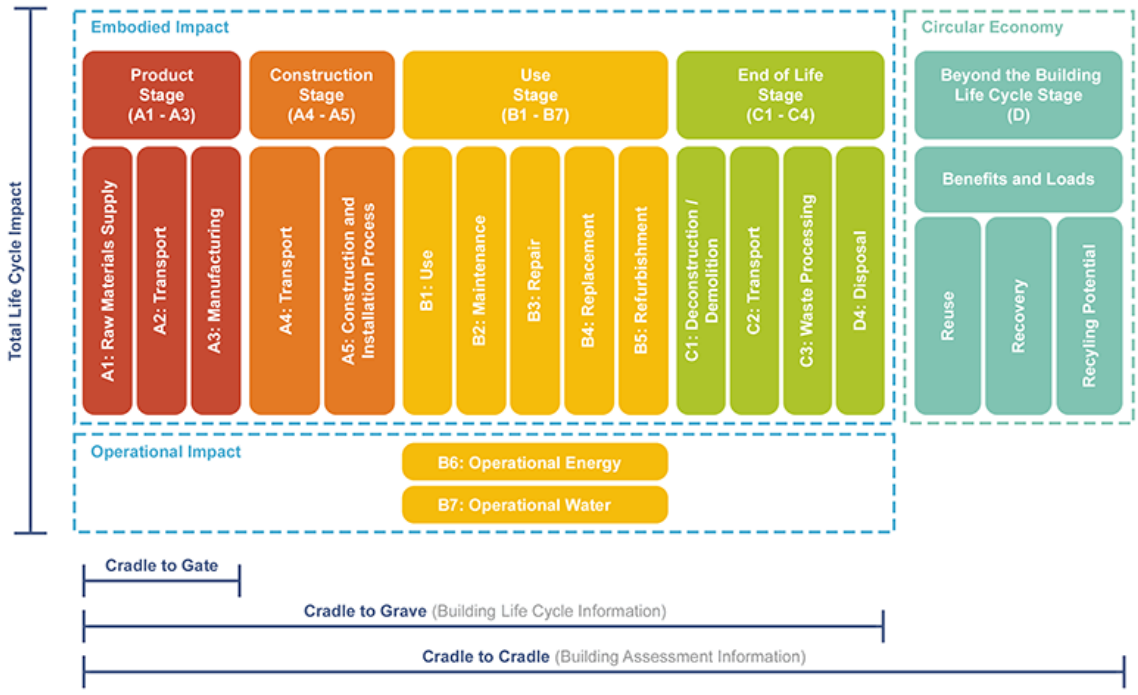

Fig. 5-1. Whole Life Carbon - Building Life Cycle Modules

5.1 *Key Definitions and Scope of the WLCA*

Whole Life Carbon = Operational Carbon + Embodied Carbon	
Greenhouse gases (GHGs) (*often referred to as 'carbon emissions' in general use)*	Constituents of the atmosphere, both natural and anthropogenic (human-created), that absorb and emit radiation at specific wavelengths within the spectrum of infrared radiation emitted by the Earth's surface, the atmosphere and clouds.[6]
Whole Life Carbon	Whole Life Carbon (WLC) emissions are the total greenhouse gas (GHG) emissions and removals associated with an asset over its entire lifecycle. Including operational and embodied carbon emissions across all lifecycle stages, from product manufacturing to end-of-life disposal. This includes the product stage (A1-A3), the construction stage (A4-A5), the use stage (B1–B7), the end-of-life stage (C1–C4), all including biogenic carbon. Overall whole life carbon asset performance also includes separately reporting the potential benefits or loads from future energy or material recovery, reuse, and recycling and from exported utilities (modules D1, D2)[7].
Embodied Carbon	'Embodied Carbon' emissions of an asset are the total GHG emissions and removals associated with materials and construction processes throughout the whole lifecycle of an asset (Modules A1-A5, B1-B5, C1-C4)[6].
Upfront Carbon - *Building*	'Upfront Carbon' emissions are the GHG emissions associated with materials and construction processes up to practical completion (Modules A1-A5). Upfront carbon excludes the biogenic carbon sequestered in the installed products at practical completion.[6]
Operational Carbon – *Energy, Buildings*	'Operational Carbon – Energy' (module B6) refers to GHG emissions arising from all energy consumed by an asset in use, over its lifecycle.
Carbon Sequestration	Is the process by which carbon dioxide is removed from the atmosphere and stored within a material – e.g. stored as 'Biogenic Carbon' in 'Biomass' by plants/trees through photosynthesis and other processes.
Biogenic Carbon	'Biogenic Carbon' refers to the carbon removals associated with carbon sequestration into biomass as well as any emissions associated with this sequestered carbon. Biogenic carbon must be reported separately if reporting only

[5] Merton's WLCA Template for schemes involving the demolition and rebuild of a single dwelling, available via: https://www.merton.gov.uk/planning-and-buildings/planning/local-plan/newlocalplan

[6] For these 'Carbon Definitions', we are only addressing the GHGs with Global Warming Potential assigned by the Intergovernmental Panel on Climate Change (IPCC), e.g. carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), hydrofluorocarbons (HFC's), perfluorocarbons (PFC's), and sulphur hexafluoride (SF6).

[7] Demolition of existing structures or buildings must be separately identified and included within Module A5.

	upfront carbon but should be included in the total if reporting embodied carbon or whole life carbon.
Biomass	'Biomass' is material of biological origin excluding material embedded in geological and/or fossilized formations.

Amended from sources:

RICS Professional Standard, Whole life carbon assessment for the built environment. Global. 2nd edition, September 2023. Version 3, August 2024. Effective from 1 July 2024.

Improving Consistency in Whole Life Carbon Assessment and Reporting: Carbon Definitions for the Built Environment, Buildings & Infrastructure. January 2023.

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5.1.1.1 The WLCA for developments involving the **demolition and rebuild of a single dwelling** should focus on the following elements[8]:

- Embodied carbon in construction materials (A1-A3)
- Emissions associated with transportation and construction activities (A4-A5)
- Operational energy and carbon (B6-B7) (this should be based on the Energy Assessment carried out for the proposed development – see section 5.8 of this guidance for more details)
- End-of-life scenarios (C1-C4) but simplified in approach.
- Beyond the Building Lifecycle Stage (D) this module is dependent on whether the applicant has considered the reuse, recovery, and recycling potential of the materials.

5.2 *Pre-application considerations*

5.2.1.1 Before submitting a WLCA, all new developments involving the demolition and rebuild of a single dwelling should consider the 16 Whole Life Carbon Principles set out in Table 2.1 WLC Principles of the Mayor's WLCA Guidance[9]. These principles are included in the Pre-app tab of the Demolish & Rebuild WLCA Template and provide a framework to inform the design of the development from the earliest stages. A pre-application submission is not mandatory but can help inform the early design stages.

5.2.1.2 These principles provide a framework for applicants to:

- Prioritise carbon reduction at every stage of the building lifecycle.
- Focus on both embodied carbon (e.g. materials and construction) and operational carbon (e.g. energy use during the building's lifetime).
    - Prioritise materials with lower embodied carbon such as locally sourced materials, sustainably sourced timber, recycled concrete or low-carbon cement.
    - Ensure the building is highly energy efficient with considerations for insulation, airtightness and renewable energy systems (e.g. heat pumps, solar PV, etc.)
- Consider circular economy principles to maximise material reuse and minimise waste.
    - Retain and reuse existing structures and/or materials where feasible to minimise embodied carbon from demolition, e.g. foundations or structural components.
    - Design for deconstruction and material recovery, and consider opportunities for recycling, material reuse or disposal at the building's end of life.
    - Design for longevity with flexibility for future adaptation.

5.2.1.3 For further advice on what to consider prior to undertaking a WLC assessment, including roles and responsibilities within the project team, the Royal Institute of British Architects (RIBA) have produced a guide for architects[10], and LETI (The London Energy Transformation Initiative) has produced an Embodied Carbon Primer[11] for anyone working in the construction industry. The LETI principles emphasise the importance of designing for deconstruction and what to consider at the start of a project, which allows future buildings to be dismantled efficiently, therefore reducing end-of-life carbon emissions.

5.3 *Planning Application Stage*

5.3.1.1 The Demolish & Rebuild WLCA Template follows three key parameters:

- Simplify and Focus – given the scale of the project, focus on the most impactful aspects rather than detailed accounting of every minor component.

- Use available tools – Utilise online carbon assessment tools and benchmarks to streamline the process.

- Engage stakeholders – Throughout the RIBA Work Stages, the applicant should collaborate with their architect(s), builder(s) and material suppliers to obtain accurate data and implement carbon reduction strategies effectively, starting as early as possible in the design process.

Key Sections to the WLCA at the Planning Stage

This section outlines the key components and information required for submitting a Planning Stage Whole Life Carbon Assessment for schemes involving the demolition and rebuild of a single dwelling. The sections below correspond with those on the Planning Stage tab of Merton's Demolish & Rebuild WLCA Template[12], and provide step-by-step guidance on completing the template.

Section 1: Development Details

- **Project Name**
- **Input Basic information.**
- **Gross Internal Area**: Provide the GIA for both the existing building and the proposed new building.

Section 2: Assessment Details

- **Scope:** The assessment should cover all relevant life-cycle stages (Modules A, B, C and D)
- **Tools and Data:** The assessment should use the latest carbon data, approved tools and methodologies. The carbon factors and assumptions should be transparent and aligned with industry standards. This could include using tools such as, LCA One Click, Carbon Designer 2.0

[8] Please refer to the Whole Life Carbon diagram above. [Fig. 5.1]

[9] London Plan Guidance, Whole Life-Cycle Carbon Assessments. (March 2022). Available at: https://www.london.gov.uk/programmes-strategies/planning/implementing-london-plan/london-plan-guidance/whole-life-cycle-carbon-assessments-guidance

[10] RIBA. Embodied and whole life carbon assessment for architects (2017). Available at: https://www.architecture.com/-/media/gathercontent/whole-life-carbon-assessment-for-architects/additional-documents/11241wholelifecarbonguidancev7pdf.pdf

[11] LETI. Embodied Carbon Primer (2020). Available at: https://www.leti.london/ecp

[12] Merton's WLCA Template for schemes involving the demolition and rebuild of a single dwelling, available via: https://www.merton.gov.uk/planning-and-buildings/planning/local-plan/newlocalplan

(by One Click LCA), EC3, RICS Whole life Carbon Assessment for the built environment, IES VE-IMPACT Compliant Embodied Carbon Calculator[13] or similar software for calculations.

- **Reference study period:** set to 60 years[14] unless another period is deemed more appropriate for a single dwelling.
- **Environmental Product Declarations (EPDs):** The applicant must refer to EPDs and the carbon database they are sourced from. Applicants can utilise industry average data and use freely accessed online databases to source the EPDs. While requesting project-specific EPDs can significantly enhance the accuracy and credibility of a WLCA, it's important to consider the practicality and proportionality of this approach for a small-scale development like a single dwelling demolition and rebuild. Focusing on key materials and using industry average for the rest can strike a balance between thoroughness and feasibility, ensuring that the assessment remains manageable and cost-effective. See section 3.1 below for further details.
- **95% cost allocated to each building element category:** In a WLCA confirming that at least 95% of the costs associated with each building element category have been included in the assessment helps to ensure comprehensive accounting and accurate evaluation of carbon impacts throughout the building's life cycle.
- **Third-party assurance:**[15] This is essential in the WLCA to ensure compliance and verify the accuracy of carbon calculations.

Section 3: Estimated Whole Life Carbon Emissions Breakdown

- This section is essential for understanding the total carbon impact of the project at the planning stage. The automated calculation of whole life carbon emissions in this section includes the demolition, construction, end-of-life emissions, and if applicable, carbon sequestration associated with the development based on the applicant's inputs in Section 5 and 6 of the Planning Stage tab.
- This section enables a comparison between the expected Upfront Carbon of the development against industry benchmarks.[16]
- For the Upfront Carbon emissions (Modules A1-A5), the applicant should use the template's built-in comparison which refers to the UK Net Zero Carbon Buildings Standard Annex A for a single-family home.
- For single-dwelling projects, the scope of the WLCA can be limited to focus on key lifecycle stages with the highest impact:
    - Demolition Impacts: Inclusion of carbon emissions from the demolition process, this should be proportionate to the size of the dwelling and focus on significant materials (e.g. concrete and steel disposal).
    - Construction Impacts (A1-A5): Focus on the embodied carbon of materials for the new build. Emphasis on high-impact materials like concrete, steel and insulation.
    - Operational Impacts (B1-B7): This will be assessed via the Energy Assessment submitted as part of the application (see Merton's Energy Assessment Template for Minor Residential Schemes and accompanying guidance[17]). Please refer to paragraph

[13] Further details on each tool can be found in paragraph 5.6.

[14] The expected lifespan of 60 years is the automated reference study period. If reference study period differs, please amend accordingly.

[15] Refer to paragraph 5.9 Third-party quality assurance mechanisms.

[16] Refer to paragraph 5.4 Benchmarking.

[17] Available via https://www.merton.gov.uk/planning-and-buildings/planning/local-plan/newlocalplan

5.8 *Operational Energy,* for how to source the information from the Energy Assessment Template and calculate the Operational Energy impacts.
    - End of Life (C1-C4): If applicable, predict the end-of-life carbon emissions based on demolition, recycling potential and disposal of the new dwelling in the future.
    - Beyond the Building Lifecycle Stage (D): If applicable, predict the reuse, recovery and recycling potential of the materials.

Section 4: Retention of Existing Structures:

- **Evaluate retention options:** Within the WLCA the applicant will need to document any exploration of retaining parts of the existing structure to reduce carbon impacts, such as reusing foundations or walls. If retention of the existing structures is not feasible the applicant will need to provide a rationale for this.
- **Estimate of carbon emissions from demolition:** Provide a simplified estimation of demolition emissions focusing on the removal of existing building materials and their treatments (landfill, recycling, etc.) Carbon emissions associated with pre-construction demolition can apply a standard assumption of 50kg CO2e/m2 of the existing building.[18] This will form the baseline for the development.
- **Summary of key actions:** the applicant should set out the key actions proposed to minimise whole life carbon emissions **and** how they relate to the 16 WLC principles identified on the Pre-application tab. This includes sustainable material choices, energy efficiency design measures, circular economy principles, minimising demolition and promoting re-use, designing for longevity and adaptability, designing for deconstruction and material recovery. The assessment should focus on the actions with the biggest impacts.
- The applicant should also identify what further opportunities to reduce whole life carbon emissions will be explored as part of detailed design, and how they relate to the 16 WLC principles. For example, this could include opportunities in a material's end-of-life scenarios e.g**.** recycling, reuse, downcycling, composting, etc.

Section 5: Material Quantities and End-of-Life scenarios:

- **Material Breakdown:** Provide detailed material quantities and the estimated reuseable or recyclable materials at end of use. Quantities are to be focused on major components like the superstructure, roof and external walls. This should be aligned with the Bill of Materials that would typically be provided by the Contractor for construction.
- **Recycling and Reusability:** Include estimates of materials that can be reused or recycled to reduce the development's WLC emissions further.

Section 6: GWP Potential for All Life-Cycle Modules (kgCO2e)

- To quantify the Global Warming Potential (GWP) for all life-cycle modules, an applicant will need:
    - **Material Quantity:** Use the quantities of materials and processes included in section 5**.**

[18] Mayor of London. London Plan Guidance: Whole Life-Cycle Carbon Assessments (2022). Section 3.1.4.

  - **Impacts:** Use data on the environmental impact of each material and process from the products Environmental Performance Declaration.[19] The applicant must provide within Section 6: Columns U to V, details of the EPD value, and which modules the EPD value accounts for.
- In each cell the applicant will need to do the following formula to calculate the GWP for each material, at each stage (if available):

  Inventory (Section 5: Material Quantity: Column D) x Impacts (Environmental Performance Declaration: Column U) = GWP (Estimate of total environmental impacts of a material)

- This will automatically update the purple-coloured cells in Section 3, giving a complete estimate of the building's environmental impact across its lifecycle at the planning stage.
- Not all material Environmental Product Declarations (EPDs) will provide information for all life-cycle modules. If this occurs for a given material, please include a note as part of the Additional Information supplied by the applicant on the template (Column U).

[Note] Applicants should ensure the information they submit is as accurate as possible at the time of reporting. Any changes in design following the submission of the planning application stage submission should be accounted for in the post-construction assessment.

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[19] Please refer to Section 5.5 on Environmental Performance Declarations.

5.4 *Benchmarking*

5.4.1.1 Applicants are encouraged to benchmark their project's emissions against industry standards. Schemes involving the demolition and rebuild of a single dwelling should compare their Upfront Carbon emissions against the UK Net Zero Carbon Buildings Standard for a single-family home as set out in tabs 3 and 4 of Merton's Demolish & Rebuild WLCA Template. Please note, this Upfront Carbon Benchmark is expected to decrease annually as shown on Tab 6 of the Merton's Demolish & Rebuild WLCA Template.

5.4.1.2 The UK Net Zero Carbon Building Standard does not have a recognised benchmark for Whole Life Carbon emissions for this type of development. Applicants are expected to confirm their WLC emissions and achieve the maximum reductions in Upfront Carbon emissions against the benchmark set out in paragraph 5.4.1.1. This guidance document will be reviewed if new relevant industry benchmarks become available.

5.4.1.3 If the Upfront Carbon emissions of a development falls outside the range of the benchmark (whether they are higher or lower), applicants should explain why in the relevant text box of the template.

5.4.1.4 It is good practice to track progress against the Upfront Carbon benchmark throughout the project. Applicants are expected to go beyond the benchmark wherever possible.

5.5 *Environmental Product Declarations (EPDs)*

5.5.1.1 Environmental Product Declarations (EPDs) are standardised documents providing detailed information about the environmental impacts of a product, including the carbon emissions across the product's life cycle.

5.5.1.2 Given the scale of the project, it may be more practical to:

- Use Industry Averages: Utilise industry-average data for common materials where specific EPDs are not available or feasible to obtain. Many databases offer generic impact data that can provide a reasonable estimate.

- Focus on Key Materials: Request EPDs for high-impact materials (e.g. concrete, steel, insulation) where the environmental impact is likely to be significant. This can provide a good balance between accuracy and practicality.

- Simplify the Assessment: Adopt a simplified WLCA approach that relies on readily available data and benchmarks, reducing the need for extensive EPDs whilst still providing valuable insights.

5.6 *Databases & Online free calculators*

5.6.1.1 There are many databases that can be freely accessed online and offer a variety of EPDs suitable for the UK market. This list is not exhaustive as software tools are regularly updated:

- Carbon Designer 2.0 (by One Click LCA): Free version for early stage embodied carbon assessments. Designed for quick estimates based on generic building types and material options. LCA & EPDs for construction & manufacturing | One Click LCA

- EC3 (Embodied carbon in construction calculator): free, web-based tool that allows users to calculate and compare the embodied carbon of building materials. Linked with Building Transparency.org.

- RICS Whole life Carbon assessment for the built environment: RICS online calculator tool is only free for members.

- IES VE-IMPACT Compliant Embodied Carbon Calculator: Allows applicants to assess the carbon impact of building materials and design. Integrated within the IES VE software.

5.6.1.2 Applicants wishing to use an alternative tool to those listed should ensure that it meets the requirements of this guidance and that:

- It covers the assessment scope from BS EN 15978

- The scope covers modules A-C.

- The database from which the life-cycle assessment information is sourced is based on data sources that reflect the country of origin of the material selected.

5.7 *Calculating module D*

5.7.1.1 Module D: Beyond the Building Lifecycle Stage is not mandatory. It should only be calculated if the applicant is able to predict the reuse, recovering and recycling potential of the materials beyond the proposed development's lifecycle.

5.7.1.2 If the applicant's selected software does not automatically calculate figures for module D, the applicant can refer to section 3.5.5 of RICS Professional Standards and Guidance - Whole Life Carbon Assessment for the Built Environment for guidance and examples on how to calculate these figures. For example, where there is the expectation that a particular component would be re-used on a new site beyond the development's lifecycle (e.g. a steel beam), the figures for modules A1-A3 should be used including an allowance for transport to the future site to calculate the savings under module D. The figures under Module D should be reported as potential savings in kgCO2e/m2.

5.8 *Operational Carbon*

5.8.1.1 Operational energy will need to be included in the Demolish & Rebuild WLCA Template at the planning and post-construction stage.

5.8.1.2 At the Planning stage, along with the Demolish & Rebuild WLCA Template, the applicant will also need to submit Merton's Energy Assessment Template for Minor Residential Schemes and supplementary documentation (SAP 'As Designed' Outputs).

5.8.1.3 At the post-construction stage, along with the Demolish & Rebuild WLCA Template, the applicant will also need to submit Merton's Energy Assessment Template for Minor Residential Schemes and supplementary documentation (SAP 'As Built' Outputs).

5.8.1.4 The guidance below provides a method of integrating the Dwelling Emission Rate (DER) into operational energy calculations for the WLCA. The DER is a key metric representing the carbon dioxide (CO2) emissions associated with the energy use of the dwelling and focuses on regulated emissions. Using the DER aligns with regulatory frameworks and helps demonstrate compliance with sustainability standards and energy performance regulations.

1. *Obtain the DER from the SAP output.*

- The DER measures the annual CO2 emissions per square meter of a dwelling, typically expressed in kg CO2/m2/year.

- The DER is derived from the building's energy consumption profile.

2. Obtain the Floor area.

- Determine the GIA of the dwelling.

3. Calculate Annual Operational Energy Emissions

- Multiply the DER by the floor area to estimate the total annual operational energy emissions.

Total Annual Operational Energy Emissions = DER (kg CO2/m2/year) x Floor Area (m2)

4. Estimate Lifecycle Operational Energy Emissions

- To project the operational energy emissions over the building's life span, multiply the total annual operational emissions by the expected lifespan (e.g. 60 years)

Lifecycle Operational Energy Emissions = Total Annual Operational Energy Emissions X Building Lifespan (e.g. 60 years)

Example Calculation:

From the SAP 'As Designed' Output the DER is 38.09 kg CO2/m2/year and the GIA is 100m2.

Total Annual Operational Energy Emissions = 38.09 x 100 = **3,809 kg CO2/year**

The expected lifespan is 60 years[20].

Lifecycle Operational Energy Emissions = 3,809 kg CO2/year x 60 = 228,540 kg CO2e

The 228,540 kg CO2e should then be included in the WLCA Template in Section 6, under Module [B6] Column L.

[20] The expected lifespan of 60 years is the automated reference study period. If reference study period differs, please amend accordingly.

5.9 *Operational Water Emissions*

5.9.1.1 At the Planning stage, along with the Demolish & Rebuild WLCA Template, the applicant will also need to submit a water use calculation and specifications for any proposed water fittings to demonstrate that the development achieves internal water usage rates of less than 105 litres per person per day.

5.9.1.2 Calculating Operational Water Emissions

1. Obtain Annual Water Use from Part G calculations:

- Use the water use in litres per person per day (L/p/d) or litres per dwelling per day.
- Multiply the daily water use by the number of days in the year (365).
- If water use is given per person, please multiply by total number of occupancy.
- Then calculate to cubic meters:

Annual Water Use (m3) = (Daily Water Use (L) x 365 x Occupancy) / 1,000

2. Apply UK standard Carbon emission factors:

- Use the standard DEFRA emission factors; Water Supply: 0.344 kg CO2e per m3 and Wastewater Treatment: 0.708 kg CO2e per m3.

3. Calculate Total Annual Emissions:

Total Annual Water Emissions = Annual Water Use (m3) x (0.344 + 0.708)

4. Calculate Lifecycle Water Emissions

- Estimate Lifecycle water emissions standard lifespan can be set at 60 years.

Lifecycle Water Emissions = Total Annual Water Emissions X Operational Life (e.g. 60 years)

5. Incorporate Lifecycle Water Emissions into the WLCA Template

- The figure should be included in the WLCA Template in Section 6 under Module [B7] Column N.

5.10 *Third-party quality assurance mechanisms*

5.10.1.1 Applicants and developers should adopt third-party quality assurance mechanisms to ensure accuracy in their submissions. The mechanisms used should be reported at the planning application and post-construction stages using the Demolish & Rebuild WLCA Template. Allocating the same person, team or organisation to oversee the WLCA process from design to post-construction, where possible, would provide consistency in reporting.

5.10.1.2 Third-party quality assurance for a Whole Life Carbon Assessment (WLCA) can be conducted by certified WLCA assessors or sustainability consultants with credentials from organizations such as, the Royal Institution of Chartered Surveyors (RICS) or through programs recognized by the UK Green Building Council (UKGBC). Please note this is not an exhaustive list.

6. POST-CONSTRUCTION STAGE

6.1 *Monitoring and Reporting*

6.1.1.1 Applicants must complete the As-Built Stage tab of the Demolish & Rebuild WLCA Template to verify the carbon performance of the development as compared to the WLCA submitted at the Planning stage, prior to occupation of the development. This report should highlight any deviations from the original assessment and explain the reasons for these changes.

6.1.1.2 Post Construction stage information requirements:

1. Applicants are required to provide an updated WLCA reflecting the actual materials, products and systems used in the demolition and rebuild of a single dwelling. An update of the information provided at the planning stage (see paragraph 5.3.1.1) using the actual WLC emission figures.
2. A comparison of the post-construction results with the WLC emissions baseline reported at the planning stage and an explanation for any differences between the two, including any design changes that may have impacted the results. A text box has been provided in the excel template for this purpose.
3. A comparison of the post-construction results with the WLC benchmarks with an explanation for the difference. A text box has been provided in the excel template for this purpose.
4. A summary of the lessons learned that will inform future projects. This should include what went well and what could be improved next time to achieve WLC reductions. For example, early engagement with the client on WLC objectives of the scheme went well and an improvement could be agreeing across project teams a set of WLC targets for the biggest carbon impacts of the scheme.
5. To support the results provided in the template, the following minimum evidence requirements should be submitted at the same time:
    - Contract confirmation of as-built material quantities and specifications
    - If available, a record of material delivery including estimated distance travelled and transportation mode (including materials for temporary works)
    - If available, a record of waste transportation including waste quantity, distance travelled, and transportation mode broken down into material categories used in the assessment.
    - A list of product-specific EPDs for the products that have been installed.

Note: The data collected at this stage will provide an evidence base that could help inform future industry-wide benchmarks or performance ratings for building typologies.

End of Guidance.