Benchmarking Report: Embodied and Whole Life Carbon of New Homes

November 2025

Future Homes Hub

CONTENTS

CONTRIBUTORS

Our thanks to all of those homebuilders and their consultants who supported this study with their insight and contributed benchmarking data:

1. INTRODUCTION

This Whole Life Carbon (WLC) Benchmarking Report 2025 addresses a clear gap in industry knowledge: the lack of robust embodied carbon data for low-rise housing.

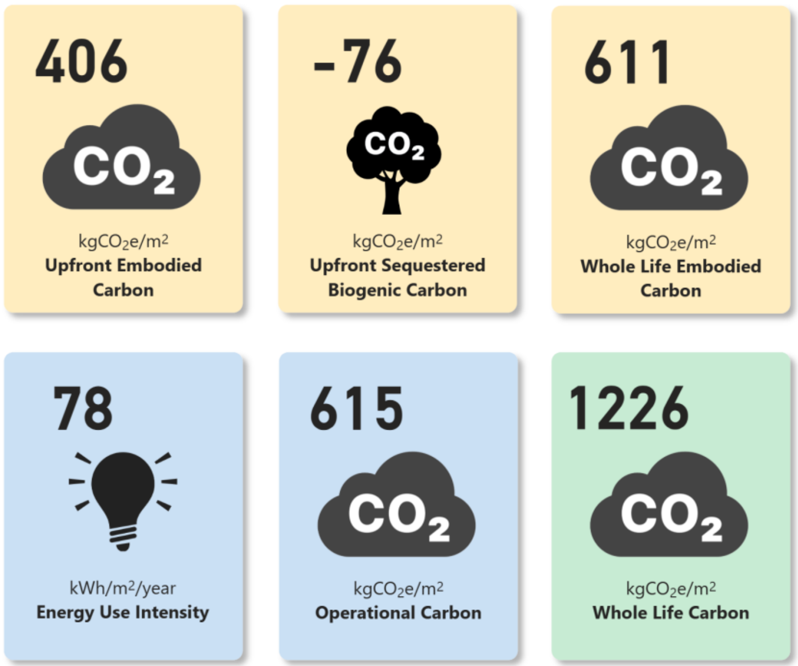
Since the publication of the sector's **WLC Implementation Plan**[1] in 2023, the landscape has evolved significantly. The baseline carbon intensity analysis relied on an older version of the RICS methodology and pre-dated the introduction of the WLC **Conventions for New Homes**[2]. This study brings the evidence base up to date and aligns it with the current agreed standards.

This study provides a summary of embodied carbon trends and distributions derived from 48 WLC assessments submitted to the Hub. By grouping these results according to building archetype and other relevant characteristics, benchmarks offer an empirically grounded picture of current practice across the sector. For homebuilders, these benchmarks are more than just statistics; they provide a critical tool for driving embodied carbon reductions in new housing.

The primary metric used in this study is **Carbon Intensity**, expressed in kilograms of carbon dioxide equivalent per square metre of floor area (**$kgCO_2e/m^2$**). This allows direct comparison between projects of different scales and designs. Because the study draws from the detailed, disaggregated outputs of WLCA software, it is able to report not only the standard scopes defined in the Whole Life Carbon Conventions for New Homes but also explore alternative ways of slicing the data to provide deeper insights.

This benchmarking work sits in the wider context of the sector's transition to net zero, as outlined in the **New Homes Sector Net Zero Transition Plan**[3]. These benchmarks will help us further improve the underlying carbon model and support the sector as it continues on a path to reduce emissions and meet its climate targets.

2. BENCHMARKS



[1] Embodied and whole life carbon 2023-2025 Implementation plan for the homebuilding industy – Future Homes Hub

[2] Whole Life Carbon Conventions for New Homes v1 – Future Homes Hub

[3] New Homes Sector Net Zero Transition Plan – Future Homes Hub

3. DEFINITIONS AND GLOSSARY

Embodied carbon: Carbon dioxide emissions associated with the materials and construction processes of a building throughout its life cycle, excluding operational energy use.

Upfront carbon: The total of embodied carbon emissions prior to practical completion / handover.

Operational carbon: Carbon dioxide emissions associated with fuel combustion and electricity consumption to heat and power a building during the 'in use' operational phase of its life, assumed to be 60 years.

Whole life embodied carbon: The total of all embodied emissions over the whole life cycle of a building, including those associated with a building materials, construction, maintenance and end-of-life demolition and disposal.

Whole life carbon: The total of whole life embodied carbon and operational carbon.

Sequestered biogenic carbon: Carbon captured from the atmosphere during growth of biogenic materials and stored for the life of the relevant building components, being transferred to a new system or released at end-of-life stages.

Energy Use Intensity (EUI): The total operational energy demand per unit floor area over a year (kWh/m²/year). This includes all regulated (heating and cooling, hot water, lighting, pumps and fans) and unregulated (cooking and plug loads) end uses within the building. Following the WLC Conventions, regulated consumption is based on location-specific SAP modelling outputs and unregulated consumption on occupancy / floor area algorithms. EUI does not depend on whether the energy comes from the grid, or from building integrated renewables, such as PV.

Building elements: The main physical parts of a building, such as walls, roofs, floors, and foundations. See *Appendix C* for the full list of RICS element categories.

Carbon intensity: The amount of carbon dioxide equivalent (CO_2e) emitted per unit of floor area ($kgCO_2e/m^2$).

Fugitive emissions: The unintentional release of refrigerant gases into the atmosphere from heat pumps during their operational life. Refrigerants act to warm the climate in the same way as carbon dioxide, but often much more strongly.

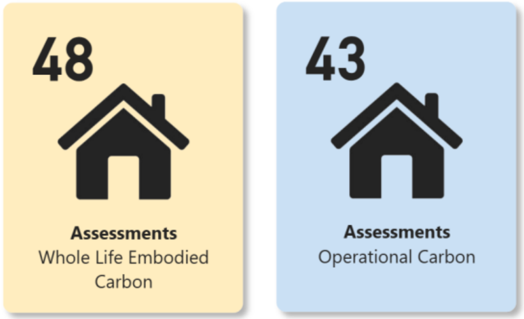
Life cycle stages: The phases in a product or building's life, from raw material extraction through use, maintenance, and end of life. See *Appendix C* for the full list of RICS life cycle stages.

MEP (Mechanical, Electrical, and Plumbing): The systems in a building that provide services like heating, ventilation, power, lighting, water, and waste removal.

RICS PS: The Royal Institute of Chartered Surveyors Professional Standard: Whole life carbon assessment for the built environment, 2nd edition (2023). This is the overarching methodology for life cycle assessment of buildings.

WLC Conventions: The Future Homes Hub Whole Life Carbon Conventions for New Homes (2024). This is a set of material and life cycle defaults and assumptions appropriate for WLC assessments for new homes in the UK.

4. PARTICIPATION AND DATASET OVERVIEW



All 48 of the assessments submitted were carried out following the Hub's WLC Conventions for New Homes and RICS Professional Standard 2nd edition. They included disaggregated data to enable the WLC Conventions standard scopes of '**dwelling level – upfront carbon**' and '**dwelling level – whole life embodied carbon**' to be calculated.

43 assessments also included modelled data for energy consumption to enable the **Energy Use Intensity** and **Operational Carbon** to be calculated. Refer to *Section 13 – Operational Energy and Whole Life Carbon*.

Whilst the benchmarking scope includes apartments, there is a strong emphasis on low-rise houses within the examples submitted, with only a single data point for low-rise apartments.

The key characteristics of the dataset are summarised in figure 1 by dwelling type, primary structural system, heating fuel and assessment software.

Data processing: To ensure like-for-like comparison, specific aspects of certain assessments have been stripped out, as follows:

- Data relating to **photovoltaic (PV) arrays** was included in 6 submitted assessments, but this has been omitted for consistency across the dataset
- Data relating to **external works outside plot boundary** (RICS building element 8) was included in 2 submitted assessments. This has also been omitted.
- The RICS PS **decarbonised scenario** only is assumed for all assessments, both in terms of operational carbon factors for grid electricity (see page 16) and material decarbonisation for replacement materials.

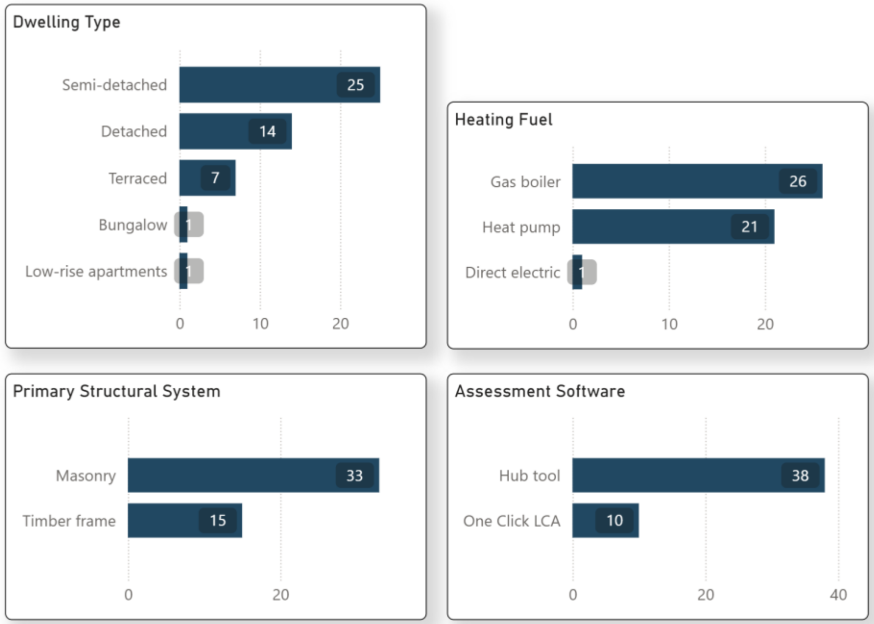
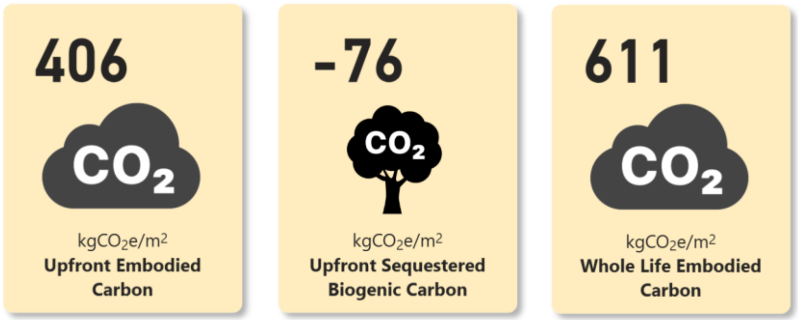


Figure 1 – Dataset overview: number of assessments by key characteristics

5. EMBODIED CARBON BENCHMARKS

At the top level, average embodied carbon metrics for the whole dataset are:



This relates to the scope of plot-only building elements (**site infrastructure and external works are excluded**). These boundaries reflect the available data and ensure that the benchmarks presented are based on robust, consistent information – laying a foundation for future, broader analyses.

Following RICS PS and WLC Conventions, sequestered biogenic carbon is reported separately at upfront stage. Both the storage and end-of-life release from the system are accounted for in whole life embodied carbon.

<u>How to read a boxplot:</u>

This report uses boxplots to show the statistical variation of the data analysed. Here are the key features:

Mean: The average, which is the sum of all values divided by the number of values.

Median: The middle value dividing the upper and lower half of data points (50th percentile).

Quartile 1 (Q1): The 25th percentile value, where 25% of projects fall below this value.

Quartile 3 (Q3): The 75th percentile value, where 75% of projects fall below this value.

Interquartile range (IQR): The middle 50% of data points, from 25th to 75th percentiles. A smaller IQR indicates less variability of the data (more similar values).

Upper and lower whiskers: Indicate high and low outliers, respectively. Length of whiskers is less than or equal to 1.5 times the interquartile range. Outliers are included in mean.

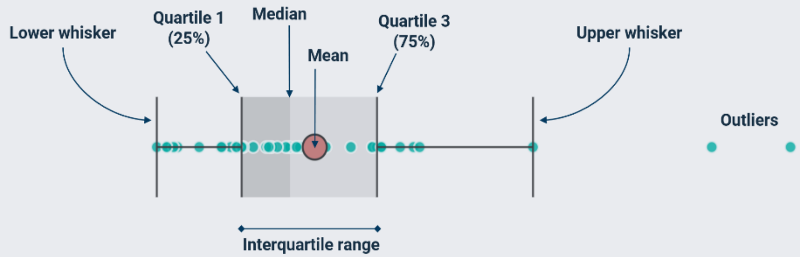


Figure 2 – How to read a boxplot

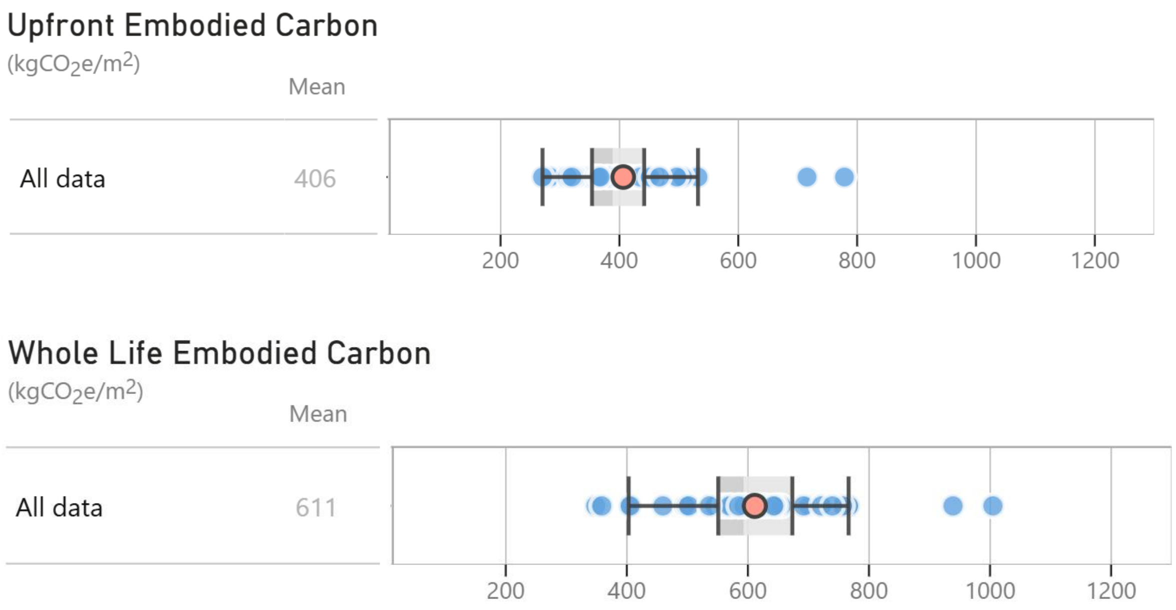


Figure 3 – Embodied carbon boxplots for the overall dataset (WLC Conventions standard scopes)

Note on making comparisons by key characteristics:

- Using the detailed, disaggregated outputs from LCA software, this study goes beyond simply reporting the standard scopes set out in the Whole Life Carbon Conventions for New Homes. *Sections 6–12* in this report break the data down by key characteristics, revealing additional patterns and insights.
- Please note, however, that care should be taken when making such comparisons based on empirical data. **The dataset represents a collection of discreet examples – each varying in numerous different ways** in addition to the key characteristics.

For example, projects may have different ground conditions and therefore foundations, façade types, thermal or comfort specifcations, or other client-specific requirements that may not be apparent. The key point here is that **these differences are not controlled for**.

- Especially due to the relatively small size of the data set, then, this caveat applies to any conclusions drawn. As the data set grows in future, the mean will be less affected by individual examples and any inherent variations.

6. BREAKDOWN BY DWELLING TYPE

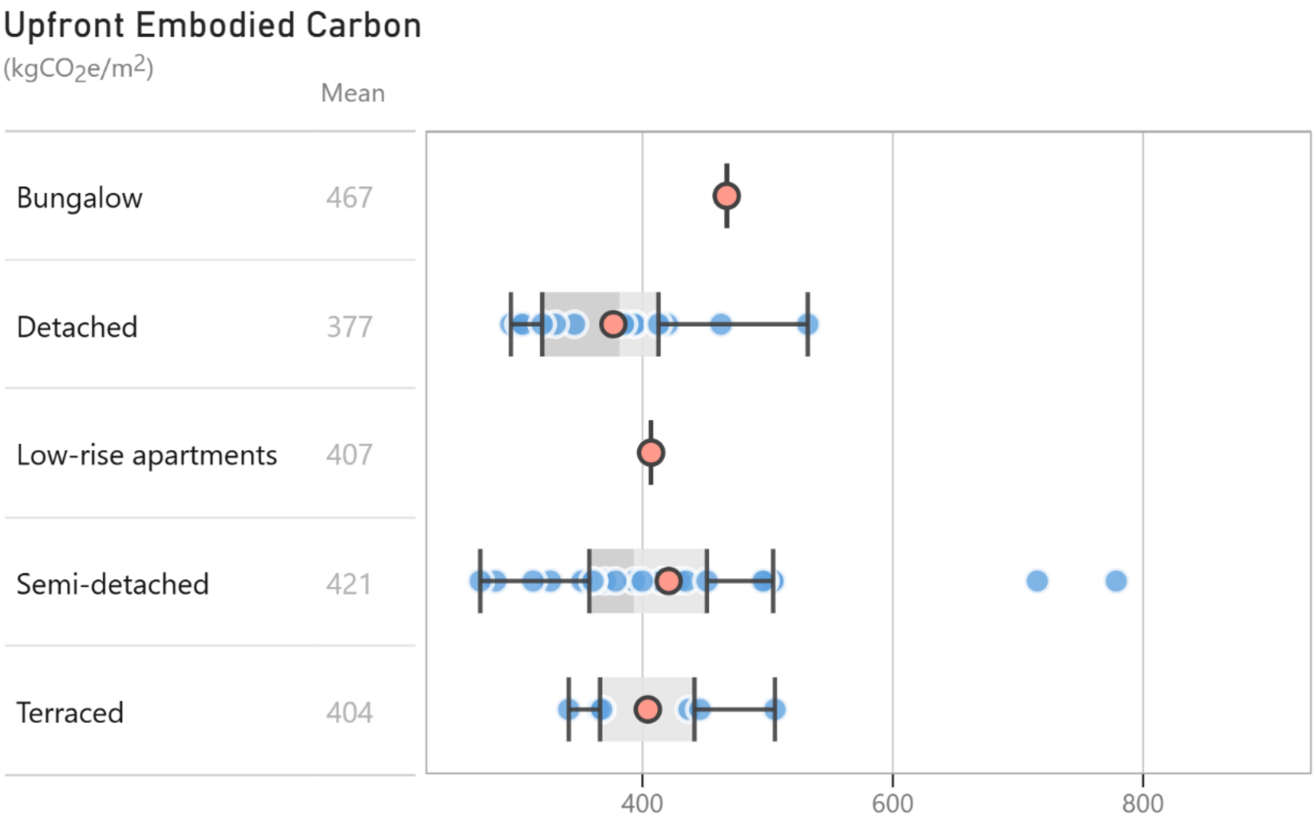


Figure 4A – Upfront embodied carbon by dwelling type

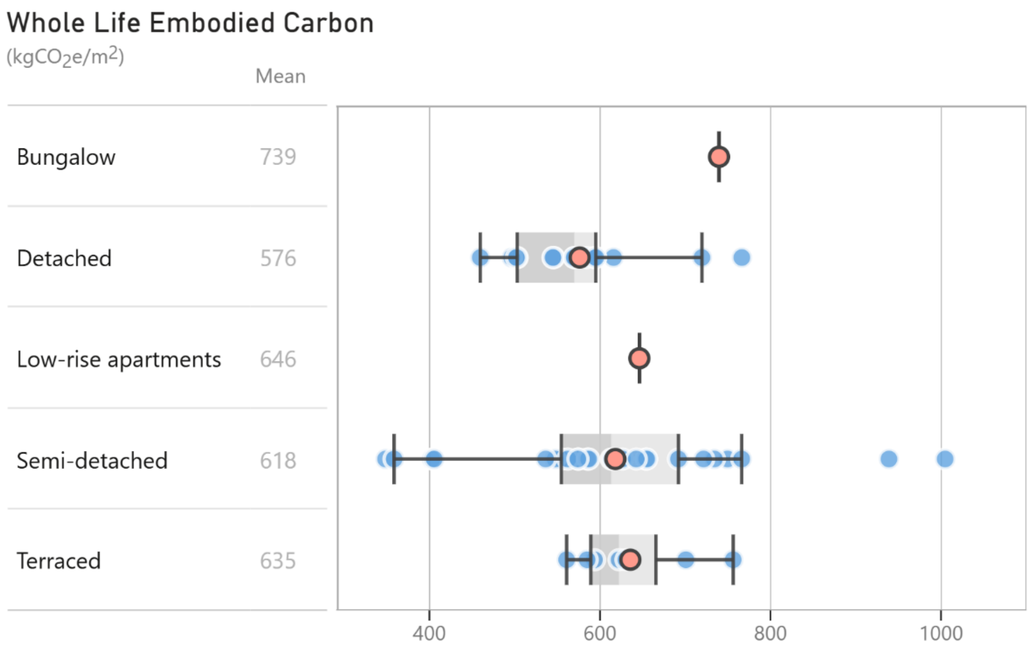


Figure 4B – Whole life embodied carbon by dwelling type

Notes:

- Across all archetypes there is less variation than observed in the Hub's WLC Implementation Plan (data collected in 2022).
- Differences in the mean results for the low-rise archetypes are relatively small. The **WLC of Future Homes Standard Options**[4] report suggested that terraced homes should be more efficient in terms of embodied carbon intensity per unit of floor area.

  Whilst it's clear that large dwellings have a larger absolute impact vs. smaller dwellings and usually fewer occupants per unit of floor area, the empirical data here points, if anything, towards detached homes having a lower embodied carbon intensity per m^2 floor area than terraced and semi-detached homes.
- Note, however, that looking at building fabric only (RICS element codes 1-3), there is much less variation between the dwelling types, so it may be that this observed difference has more to do with different assumptions for building services and FF&E (fixed furniture and equipment) in the discrete examples reviewed.
- A larger dataset will be required to establish to what extent predictable differences exist between dwelling types.

[4] Embodied and Whole Life Carbon of Future Homes Standard Options – Future Homes Hub

7. BREAKDOWN BY BUILDING ELEMENT

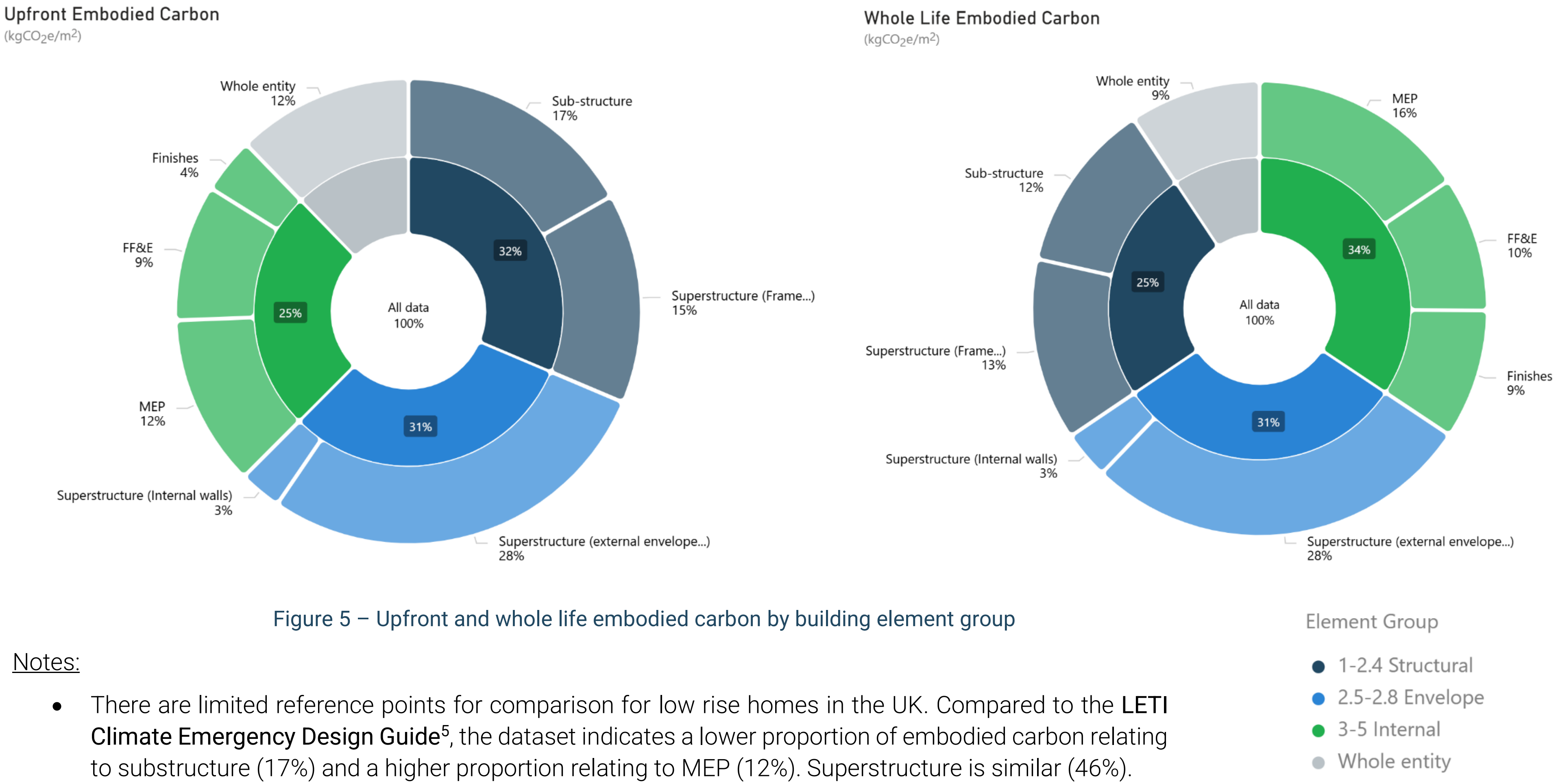


Figure 5 – Upfront and whole life embodied carbon by building element group

Notes:

- There are limited reference points for comparison for low rise homes in the UK. Compared to the **LETI Climate Emergency Design Guide**[5], the dataset indicates a lower proportion of embodied carbon relating to substructure (17%) and a higher proportion relating to MEP (12%). Superstructure is similar (46%).
- MEP and finishes account for a greater proportion of the embodied carbon over the whole life cycle of the building (34%) than they do upfront (25%). This is expected given their relatively frequent replacement periods vs. other elements of the building (see **RICS PS**, Table 20: Indicative component lifespans).
- 'Whole entity' includes construction site impacts (9% of upfront carbon), site preparation (1%) and some materials that were not categorised in the source files.

8. BREAKDOWN BY LIFE CYCLE STAGE

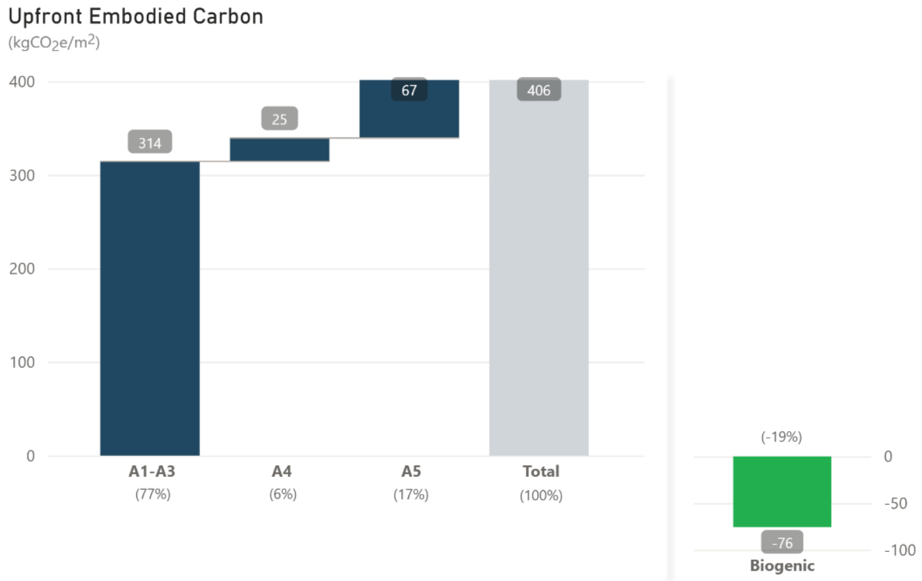


Figure 6A – Upfront embodied carbon by life cycle stage

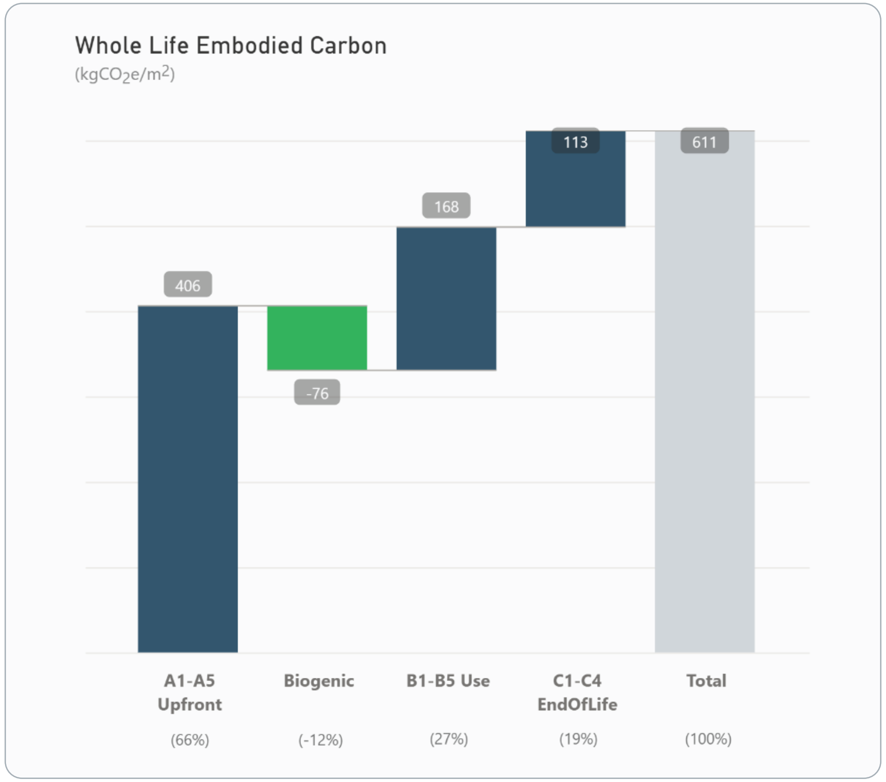


Figure 6B – Whole life carbon by life cycle stage

Notes:

- Product raw material and manufacturing impact [A1-A3] represents 77% of the upfront carbon, with transport [A4] accounting for 6% and construction activities [A5] (including waste materials) accounting for 17% on average.
- Biogenic carbon stored in organic building materials within the fabric of the building is reported separately to upfront embodied carbon. It is included within the whole life embodied carbon, and 'comes out' again in the C1-C4 end-of-life stage, based on the assumed end-of-life scenarios.
- Use stage embodied carbon [B1-B5] includes fugitive GHG emissions in operation, maintenance and replacement of components as required during the 60-year Reference Service Period (RSP).
- End-of-life [C1-C4] stage includes deconstruction and waste disposal or recycling depending on the specific material.

9. BREAKDOWN BY STRUCTURAL SYSTEM

Scope: RICS element codes 1-3 only (substructure, superstructure, envelope and finishes)

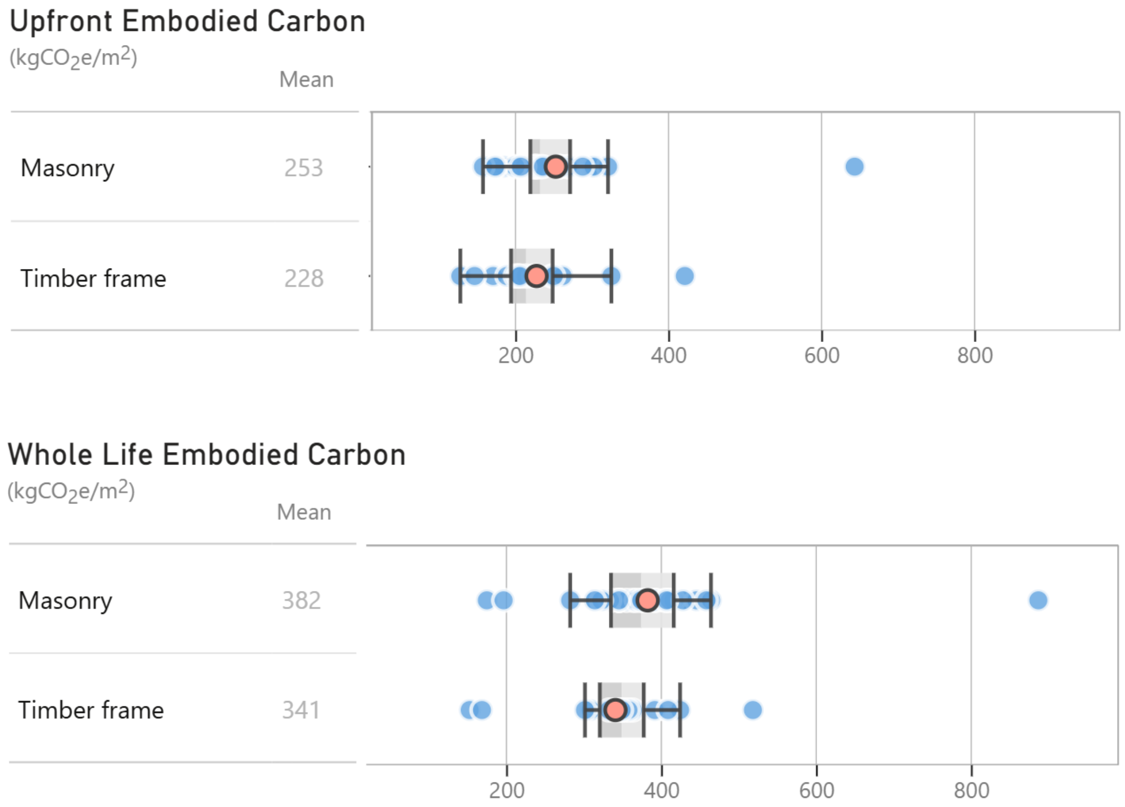


Figure 7 – Upfront and whole life embodied carbon by primary structural system

Notes:

- Filtering the data to look at the building fabric only (**RICS element codes 1-3**), the breakdown shows a lower average upfront and whole life embodied carbon for timber frame examples compared with masonry.
- The difference of 25 $kgCO_2e/m^2$ in upfront carbon or 41 $kgCO_2e/m^2$ in whole life embodied carbon is around 6-7% of the respective benchmark figures for the whole building.
- The scale of this difference broadly aligns with other recent studies, including the Hub's **WLC of Future Homes Standard Options** report and the Arup report for Government, **Improving whole life carbon estimates for buildings constructed out of timber.**[6]
- With reference to *Section 11 – Breakdown by Assessment Software* and *Appendix A*, note that a much greater proportion of masonry assessments were submitted using the Hub tool (30 of 38) compared to One Click LCA (3 of 10). The average uncertainty factor for masonry assessments, included within the mean figures, is therefore greater.
- As noted on page 7, façade type may vary and is independent of structural system.

[6] Improving whole life carbon estimates for buildings constructed out of timber – Arup (2025)

10. BREAKDOWN BY HEATING TYPE

Scope: RICS element code 5 only (MEP)

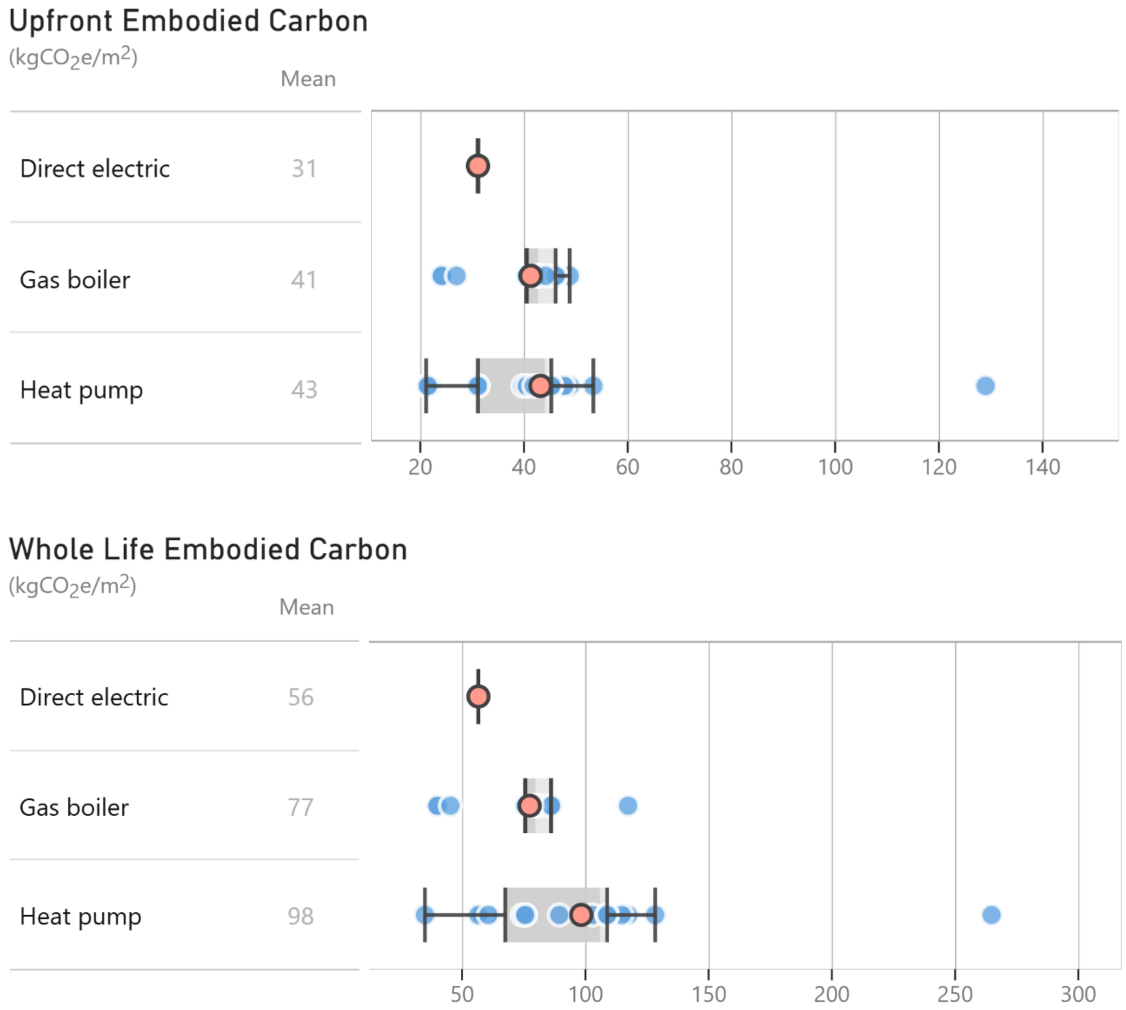


Figure 8 – Upfront and whole life embodied carbon by heating fuel

Notes:

- Filtering the data to look only at the MEP building elements (**RICS element code 5**), the breakdown shows a very similar upfront carbon impact for both gas boiler and heat pump homes, with direct electric lower (based on a single example).
- Over the 60-year lifetime of the home, however, embodied carbon for heat pump systems, is greater than for a gas boiler. The difference of **21 kgCO$_2$e/m^2** in whole life embodied carbon is **3-4%** of the benchmark figure for the whole building. This is driven by the fugitive refrigerant emissions in B1 life cycle stage.

  These results are expected, and align with the **CIBSE TM65.1** study[7], which underpins the benchmarks used for many of the example assessments.
- Heat pump homes, however, have a **much lower operational carbon impact during the use phase**. Refer to *Section 13 – Operational and Whole Life Carbon*.
- Note that **embodied carbon of PV has been omitted** from this data, and the examples submitted may not take all MEP factors for highly serviced homes into account e.g. renewables, batteries, mechanical ventilation and comfort cooling.

[7] CIBSE TM65.1 Embodied carbon in building services: residential heating (2021)

11. BREAKDOWN BY ASSESSMENT SOFTWARE

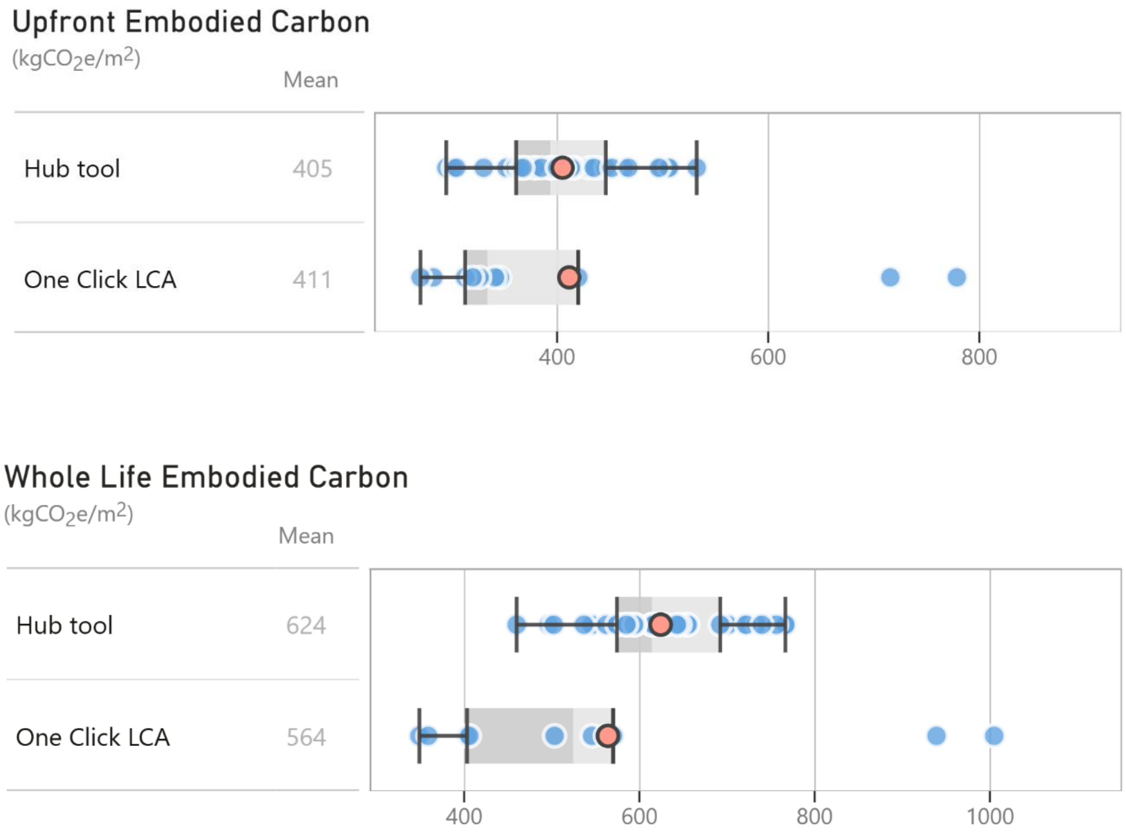


Figure 9 – Upfront and whole life embodied carbon by assessment software

Notes:

- Hub tool assessments received were v2.3.1 to v2.3.4. One Click LCA assessments were all 'RICS - 2nd Edition', versions unspecified.
- The Hub tool data is more tightly clustered, with a lower inter-quartile range. However, note a couple of significantly higher outliers in the One Click LCA data are affecting this.
- Both softwares have a similar mean upfront embodied carbon (1-2% difference). However, note that the median for the One Click LCA data is significantly different from the mean, and lower than the Hub tool median. Further data is needed to reach any conclusion here.
- The whole life embodied carbon for One Click LCA assessments is 10% lower on average.

  Reasons for this are unclear, but WLC uncertainty factor is much greater for the Hub tool (12%) compared with One Click LCA (5%) which could contribute to this.
- In fact, reported WLC uncertainty factors for Hub tool submissions varied widely between assessments. In practice, especially for new users, these factors can be challenging to apply consistently.

  Appendix A discusses a simplified approach that was applied to Hub tool assessments in this study, given that the tool does not currently have the facility to calculate this for the user.

12. BREAKDOWN BY IMPACT DATA TYPE

Scope: RICS life cycle stages A1-A4 only (product and transport to site)

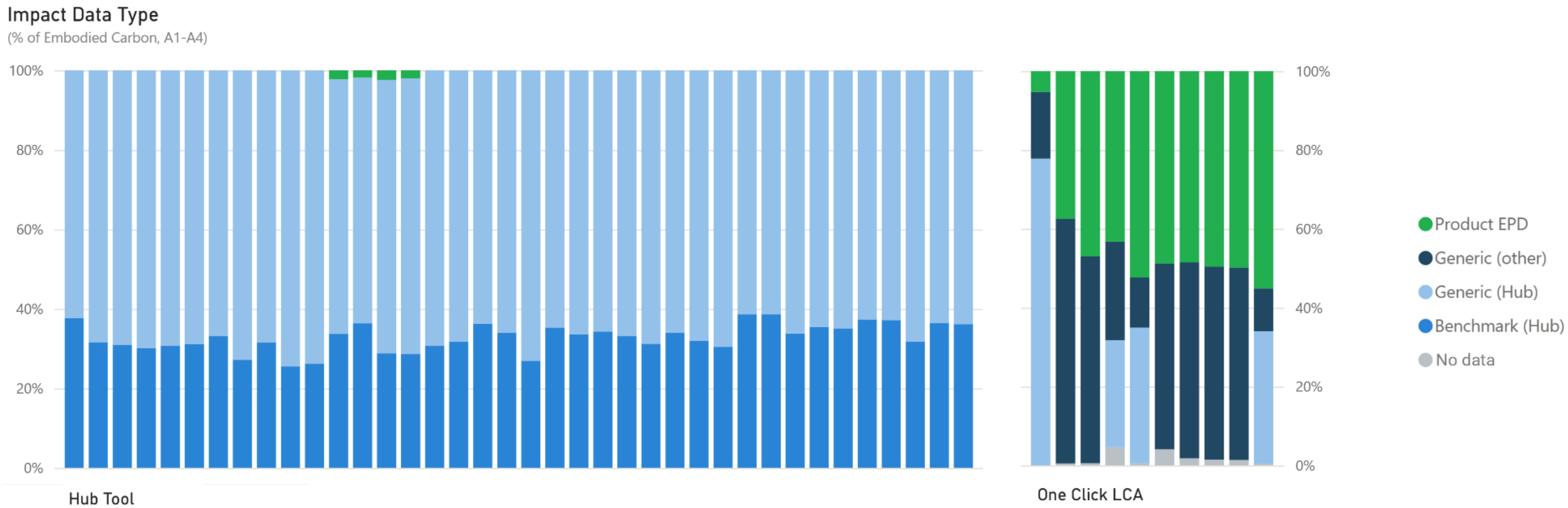


Figure 10 – Proportion of carbon impact covered by material impact data type, per assessment

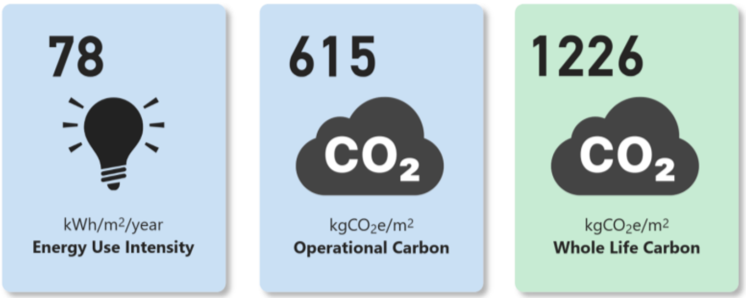
Notes:

- The Hub's **WLC Implementation Plan** proposed that the proportion of materials accounted for by product-specific EPDs within a WLC assessment should be measured, and the sector should aim to increase this over time. This report provides the baseline measurement.
- All assessments submitted with One Click LCA tool included product-specific EPDs to some extent. An average of **43%** of the embodied impact of materials [A1-A4] are accounted for by product-specific EPDs.
- Only 4 assessments submitted with the Hub tool used product-specific EPDs, with these accounting for **<1%** of the embodied impact of materials. Hub 'component benchmarks' accounted for a large (33%) and fairly consistent proportion of the total impact, which is higher than expected. Component benchmarks[8] are considered low accuracy and therefore work is required to develop these further given the proportion of carbon they account for in Hub tool assessments.

[8] Component benchmarks are estimates, per m^2 floor area or similar, used where specific quantities data is not easily available, for example all the individual parts that would go to make up the heating system, electrical system, above ground drainage, etc. See Conventions for New Homes, Appendix C.

13. OPERATIONAL ENERGY AND WHOLE LIFE CARBON

At the top level, average operational energy and carbon metrics for the whole dataset are:



Energy Use Intensity (EUI) and **Operational Carbon** benchmarks are based on 43 assessments that included modelled operational data.

The Energy Use Intensity (EUI) is the total energy demand from all fuels for both regulated and unregulated end uses. Operational Carbon is calculated based on a decarbonised scenario, in line with WLC Conventions for New Homes and RICS PS 2nd edition [9].

The average Operational Carbon benchmark for the dataset, based on a 60-year RSL, is 615 $kgCO_2e/m^2$ – however this average covers a very wide split between different the heating fuels.

Homes with heat pumps have on average **444 $kgCO_2e/m^2$** (56%) lower operational carbon impact over 60 years compared to homes with gas boilers. See figure 10.

Whole Life Carbon (WLC), which includes all upfront, operational and end-of-life impacts for a new home, is Whole Life Embodied Carbon and Operational Carbon benchmarks taken together.

The Whole Life Carbon benchmark for the dataset is 1,226 kgCO2e/m2, but again this covers a wide split between the heating fuels.

Given the breakdown of key characteristics explored here, it may therefore be helpful as we gain more data to develop a dynamic benchmark for homebuilders to compare their projects against; based on dwelling type, structural system and/or heating fuel.

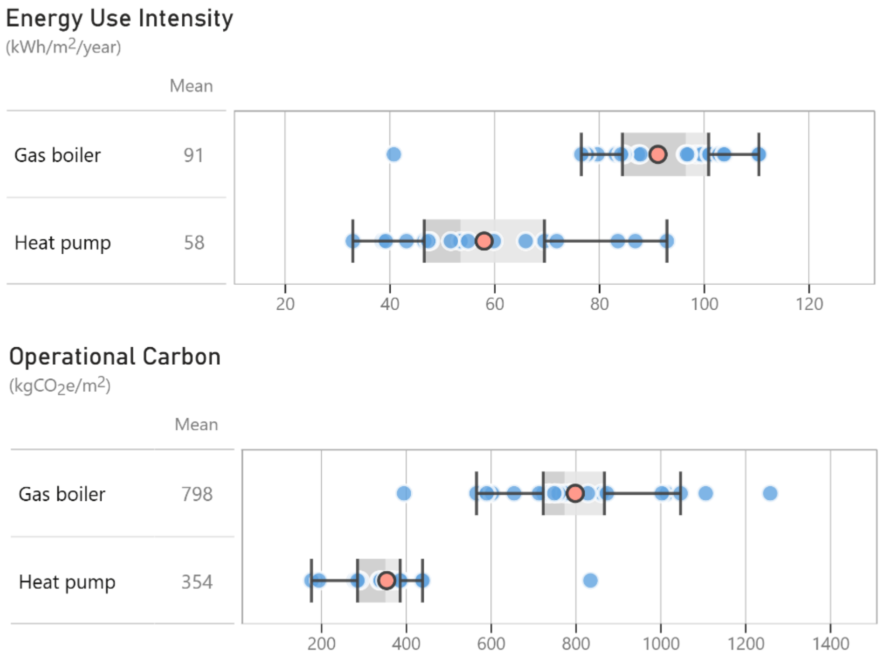


Figure 11 – Energy use intensity and operational carbon by heating fuel

[9] The electricity grid is assumed to decarbonise in line with the most conservative scenario defined by the National Grid's Future Energy Scenario (2023) - 'Falling Short (excluding negative emissions from bioenergy and carbon capture)'

14. NEXT STEPS

This study represents a step on the path. The Hub and the sector will continue to gather data to improve confidence in the benchmarks presented here and look to publish an updated benchmarking report annually. There is also the potential to both make this dynamic dataset easily available within calculation tools and explore deeper drill-down capabilities for homebuilders via an online tool.

Opportunities:

- Site preparation and infrastructure impacts were excluded from the scope. However, anecdotally represent a significant proportion of the total impact of a new homes development. Hub working groups are planned to support the development of benchmarks for site infrastructure also.
- With PV becoming a functional requirement of the Future Homes Standard, it's clear that this cannot be omitted from future Benchmarking reports. Working together with CIBSE and others in the sector, we could gain better data and understanding of the embodied impacts of MEP, renewables and other building services aspects. This could feed into improving the Hub's component benchmarks.
- A key consideration is how to make the application of WLC uncertainty factors more accessible and consistent, especially for those using the Hub tool.
- Raise the awareness of Local Planning Authorities about the WLC Conventions for New Homes and explore to what extent the Hub tool and outputs from this study can support the dialogue with homebuilders. This is especially important for small and micro developers who are resource constrained.
- Now we have begun to measure the extent of product-specific EPDs used in assessments, we need to support manufacturers and homebuilders to move towards our target of full EPD coverage (at detailed design / as-built stages) for the main building components.
- This means helping homebuilders to understand the benefits of specifying the low carbon materials already on the market and encouraging manufacturers to both decarbonise their products to meet the growing demand and develop EPDs to support mainstream disclosure.
- The Hub is bringing together all the stakeholders across government and industry in the forthcoming **Embodied Carbon Implementation Board.** This will identify and address strategic barriers and opportunities as we work to implement the Transition Plan for the homebuilding sector.

APPENDIX A – WLC UNCERTAINTY FACTOR: A SIMPLIFIED APPROACH FOR NEW HOMES

Whole Life Carbon (WLC) Uncertainty Factors were introduced in the 2nd edition of the RICS Professional Standard and are now a mandatory requirement within assessments.

The overall WLC Uncertainty Factor comprises three dimensions:

Uncertainty Factor	*Description*
Contingency (0-15%)	This is based on project phase, with early-stage projects being more uncertain. RICS suggest that at the early stages, a factor of 15% is applied, with no additional uncertainty factors.
Quantities (0-4%)	This reflects the level of certainty in the quantities data used within the assessment. It depends on whether the data are actual / measured, estimated, or based on benchmark information.
Carbon data (0-7%)	This is calculated based on the quality of carbon data sources used for key products (the most impactful products and materials used) and their representativeness to the project. There is a detailed matrix against which each source should be evaluated for geographical, technological and temporal representativeness, and data granularity / verification.

Table A1 – Summary of WLC uncertainty factors

For the full methodology, see **RICS PS**, section 4.10 – Addressing uncertainty in WLCAs (p.55).

In practice, these factors can be challenging to apply. Even experienced assessors report that calculating uncertainty factors can require significant additional effort. For new users, applying credible estimates is particularly difficult, as it requires the assessor to make a judgement on whether the data sources are appropriate for the project's geography, technology, and intended application. This element is inherently subjective. The challenge, then, is how to support assessors to apply WLC uncertainty factors consistently across the sector.

New homes delivery

Unlike one-off construction projects that typically follow the RIBA Plan of Work stages, the delivery model for most new build housing developments does not align neatly with this linear progression. Volume homebuilders typically rely on a library of fully developed group house / apartment type designs that have been refined to comply with current regulations. When a new site is brought forward, a combination of these pre-designed house types is plotted. As a result, the level of design maturity and data certainty at the point of assessment differs significantly from traditional project stages.

Approach taken in this study

Based on analysis of the disaggregated line-by-line carbon and material data and the supporting project information submitted by homebuilders, a consistent but simplified approach has been taken to estimate the relevant factors for Hub tool assessments.

Contingency factor is straightforward to apply consistently:

Project stage	*Contingency factor*
Early design	15%
Technical design and construction	6%
Post-completion	0%

Table A2 – Contingency factor approach

Quantities factor has been estimated based on a combination of impact data type and project stage:

Impact data type	Project stage	*Quantities factor*
Benchmark (Hub or other)	Any	4%
Generic or Product EPD	Pre-completion	1%
Generic or Product EPD	Post-completion	0%

Table A3 – Quantities factor approach

Hub component benchmarks are based on quantities from an example home scaled by floor area, so naturally have the highest level of uncertainty. Assuming a group house / apartment type approach to delivery, any pre-completion project stage is taken to have a quantities factor of 1%, with this reducing to zero at the post-completion stage.

Carbon data factor is simplified here based on the impact data type identified for each line item in the disaggregated data:

Impact data type	*Carbon data factor*
Benchmark (Hub or other)	5%
Generic (Hub or other)	3%
Product EPD	1%

Table A4 – Carbon data factor approach

Given the WLC Conventions for New Homes approach to default impact factors[10], we can be confident that any product EPD data is assigned to the actual product specified. We have taken the lead from examples in RICS PS, Table B2 (p.148) to estimate the relevant carbon data factors for these impact data types.

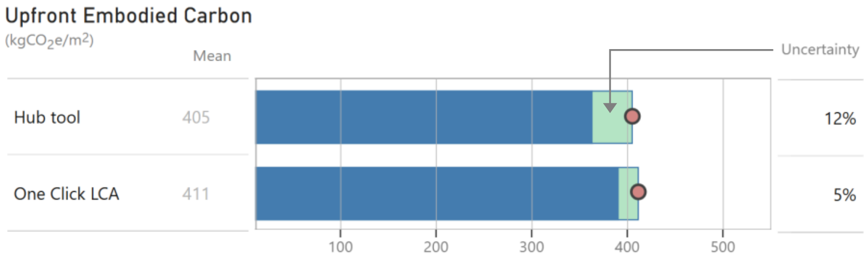


Figure A1 – WLC uncertainty factor for upfront embodied carbon by assessment software

The overall uncertainty factor included within the benchmark figures is shown in figure A1.

The (average) uncertainty factor for Hub tool assessments was **12%**, which contrasts with only **5%** for One Click LCA assessments. This reflects the use of less benchmark data and a greater proportion of product EPDs for most One Click LCA examples submitted.

[10] WLC Conventions for New Homes approach
The WLC Conventions for New Homes includes a set of default reference points for generic materials and products of various types (see the Default Materials and Assumptions table). Each of these defaults has been identified by a Hub working group as being the best generic reference point for the UK new homes sector.

If the as-built installed product has a manufacturer- and product-specific EPD available, then this should be referenced. However, if there is no valid product-specific EPD, then the Hub default should be used, rather than a 'representative EPD' from another manufacturer or product, or an alternative generic source.

APPENDIX B – ILLUSTRATIVE BREAKDOWN BY MATERIAL TYPE

Scope: RICS life cycle stages A1-A4 only (product and transport to site)

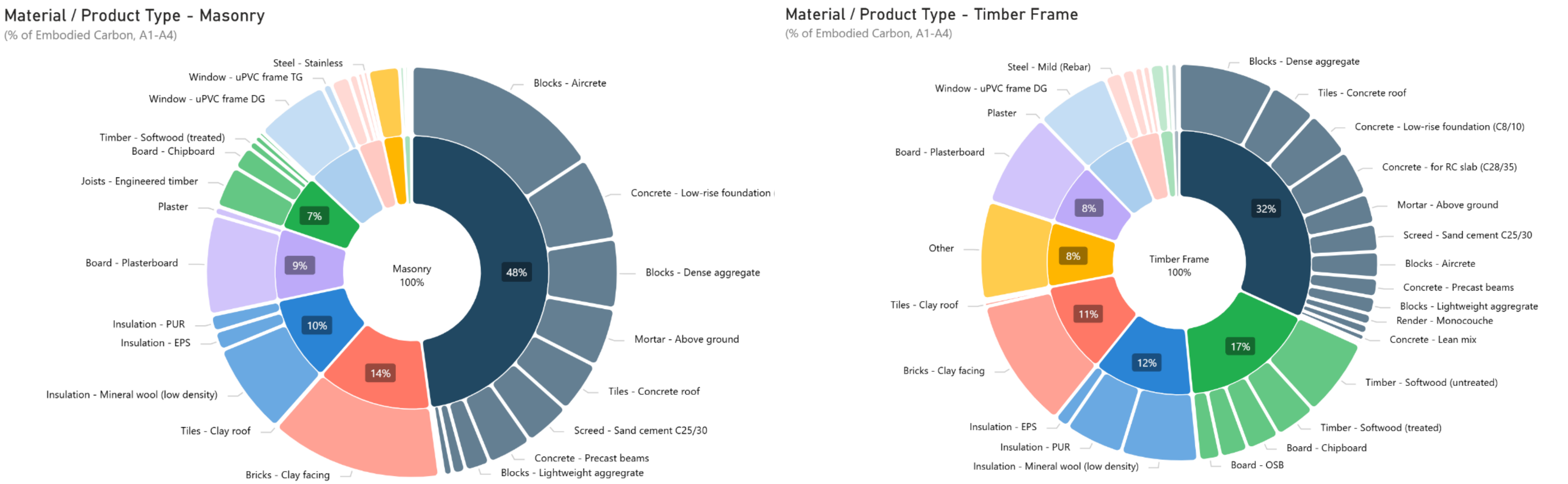


Figure B1 – Proportion of carbon impact contributed by material / product type across the dataset

Notes:

- Figure B1 shows how the dataset can be used to identify specific material types within a sub-set of assessments. Some expected material types surface as key contributors when comparing masonry and timber frame assessments.
- However, this type of analysis is tentative and illustrative only, being very dependent on the quantities of different materials used in the specific examples contributed and not in any way representative of 'the market'. It is likely to be more helpful to homebuilders at the level of an individual home or development site.
- Note that assumed material types within Hub component benchmark figures are not included.

APPENDIX C – RICS BUILDING ELEMENT CODES AND LIFE CYCLE STAGES

Code	RICS Level 1 Category	Code	RICS Level 2 Category
0	Whole entity		
1	Sub-structure	1.1	Foundations and piling
		1.2	Basement retaining walls and lowest slab
2.1-2.4	Superstructure (Frame...)	2.1	Frame
		2.2	Upper floors and roof
		2.4	Stairs, ramps and safety guarding
2.5-2.6	Superstructure (External envelope...)	2.5	External envelope including roof finishes
		2.6	Windows and ext doors
2.7-2.8	Superstructure (Internal walls)	2.7	Internal walls
		2.8	Internal doors
3	Finishes	3.1	Wall finishes
		3.2	Floor finishes
		3.3	Ceiling finishes
4	FF&E		
5	MEP	5.1	Public health
		5.2	Heating, Ventilation and Cooling (HVAC)
		5.3	Electrical installations
		~~5.4~~	~~On site renewable energy generation~~
		5.5	Systems including life safety
~~***6***~~	~~Pre-fabricated buildings~~		
~~***7***~~	~~Work to existing buildings~~		
~~***8***~~	~~External works~~		

Table C1– RICS building element codes and categories

Code	RICS Life Cycle Stage
[A1]	Product stage – Raw material supply
[A2]	Product stage – Transport
[A3]	Product stage – Manufacturing
[A4]	Construction process stage – Transport to site
[A5]	Construction process stage – Construction / installation process
[B1]	Use stage – Use (direct emissions during use)
[B2]	Use stage – Maintenance
[B3]	Use stage – Repair
[B4]	Use stage – Replacement
~~***[B5]***~~	~~Use stage – Refurbishment~~
[B6]	Use stage – Operational energy use
[B7]	Use stage – Operational water use
~~***[B8]***~~	~~Use stage – User activities~~
[C1]	End of life stage – Deconstruction / demolition
[C2]	End of life stage – Transport of waste
[C3]	End of life stage – Waste processing for reuse, recovery, or recycling
[C4]	End of life stage – Disposal
~~***[D]***~~	~~Benefits and loads beyond the system boundary~~

Table C2 – RICS life cycle stage codes

Note: ~~this means~~ building elements and life cycle stages out of scope for this study.