

Whole Life Carbon

Importance

This one pager introduces the concept of Whole Life Carbon (WLC). We must urgently reduce carbon emissions, but WLC analysis is the only approach that allows the emissions of a project to be considered holistically over its lifespan.

Definition

Whole Life Carbon emissions are the sum total of all asset related GHG emissions and removals, both operational and embodied over the life cycle of an asset including its disposal (Modules: A1-A5 Upfront; B1-B7 In Use; C1-C4 End of Life). Overall Whole Life Carbon asset performance includes separately reporting the potential benefit from future energy recovery, reuse, and recycling (Module D). (LETI/WLCN 2021)



Whole Life Carbon = Operational Carbon + Embodied Carbon

SIGNPOST Embodied carbon and operational energy one pagers

Module D

Module D is reported separately as it is considered to be outside the project system boundaries. However, it can be thought of - in combination with modules C1 & C3 - as the Circular Economy module. It quantifies the potential future carbon benefit of a design decision made today. Multiple scenarios may be produced.

Sequestered carbon

Sequestration is the process by which CO₂ is removed from the atmosphere and stored within some materials. Currently, for timber and biobased systems, the process is called carbonation. Sequestered carbon within bio-based materials is excluded if measuring only upfront carbon (Module A) but can be included if reporting end of life emissions for WLC (Modules A-C) or Embodied Carbon (Modules A-C exc B6 and B7). Currently, for processes involving other building materials emissions and removals are included across the life cycle (Modules A-C and D).

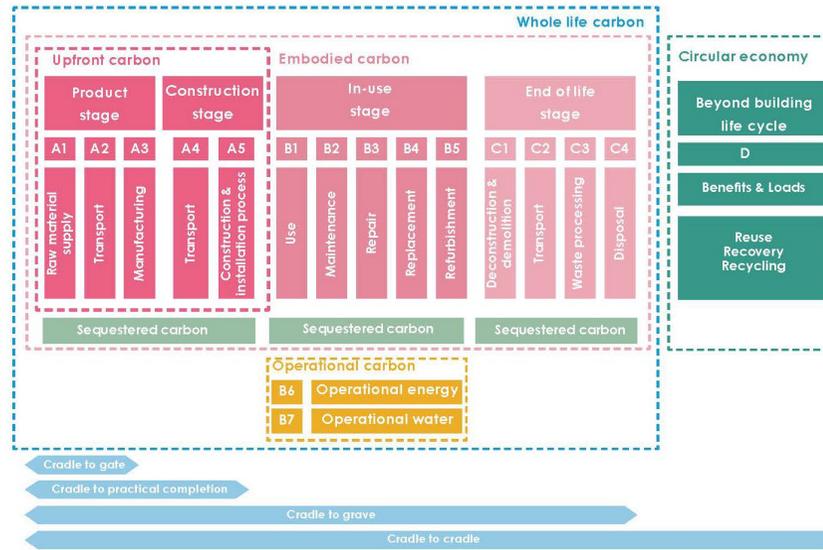


Diagram: Life cycle stages defined by BS EN 15978:2011

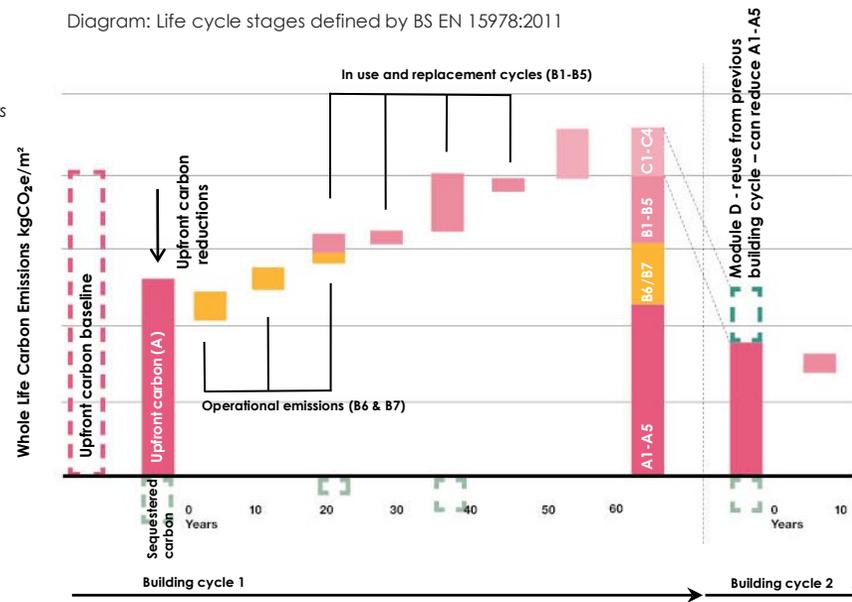


Diagram: Example WLC emissions over time for a building cycle with ultra low energy use, a decarbonised grid and some sequestered carbon benefit. Building cycle 2 shows the benefit of Module D from building cycle 1. Indicative only: distribution will vary according to project specifics.

Guidance

This summary document should be read with the EN 15978: 2011, EN 15804: 2019, CIBSE TM65: 2021, RICS Professional Statement, GLA WLC guidance and LETI Embodied Carbon Primer.

Reducing Whole Life Carbon (WLC)

- 1 Define the energy and embodied carbon targets, as well as WLC measurement and verification process at project conception and track throughout. Formal disclosure should be made at post-completion and then annually.
- 2 Use WLC analysis during design to optimise embodied carbon, reduce operational energy and integrate Circular Economy principles. For example, testing energy reductions, increased envelope specification or calculating carbon payback periods for MEP equipment or renewables.
- 3 Address upfront embodied carbon emissions (A1-5) by using minimal material.
- 4 Consider the carbon cost/ benefit between upfront carbon, operational carbon and life cycle carbon due to replacement cycles.
- 5 At each replacement cycle, prioritise low carbon materials and Circular Economy principles to reduce WLC emissions.
- 6 Operational energy loads must be minimised and meet local energy targets; for example LETI EUI targets. A future decarbonised grid depends on reducing overall energy requirements. A further effect of grid decarbonisation is to make embodied carbon an even larger proportion of WLC.
- 7 Utilise Circular Economy principles at the beginning and end of the building and component life cycle. This includes retrofit, re-use of materials, recycled materials and design for future adaptability. Document end of life scenarios and quantify the potential future carbon benefits.

