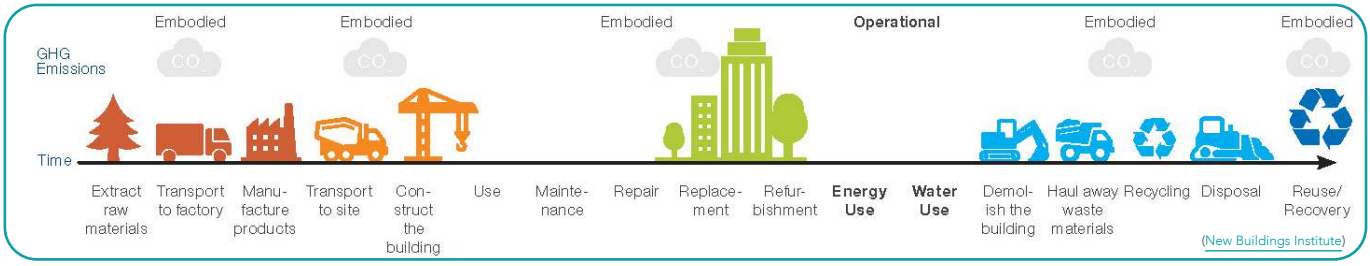
Operational & Embodied Carbon

Explainer Guide

This Explainer Guide covers key principles of operational & embodied carbon* in the built environment

KEEP IN MIND...

Scope 1, 2 & 3 emissions are similar to - but not the same as - operational and embodied carbon. Scope 1, 2 & 3 emissions relate to an **organisation's** emissions, whilst operational and embodied carbon refer to a **building's** emissions. Operational and embodied carbon can therefore contribute to an organisation's Scope 1, 2 & 3 emisssions.



(New Buildings Institute)

WHAT IS OPERATIONAL AND EMBODIED CARBON IN THE BUILT ENVIRONMENT?

Operational carbon refers to 'the emissions associated with energy used to operate the building or in the operation of infrastructure', including heating, hot water, cooling, ventilation, lighting systems, equipment and lifts. This is often what people will focus on when thinking about how to make a building more sustainable. However, operational carbon only makes up a certain percentage of a building's total emissions…

Embodied carbon refers to the remaining 'emissions associated with materials and construction processes throughout the whole lifecycle of a building or infrastructure'. This is typically associated with any processes, materials or products used to construct, maintain, repair, refurbish and demolish a building.

Embodied carbon can be further broken down into 'upfront', 'in-use' and 'end-of-life' emissions. **Upfront embodied carbon** refers to 'the emissions caused in the materials production and construction phases of the lifecycle before the building or infrastructure begins to be used'. **In-use embodied carbon** refers to 'emissions associated with materials and processes needed to maintain the building orinfrastructure during use such as for refurbishments'. **End-of-life embodied carbon** refers to 'the carbon emissions associated with deconstruction/demolition, transport from site , waste processing and disposal phases of a building or infrastructure's lifecycle which occur after its use'.

WHY IS IT IMPORTANT?

If the built environment is to reach net zero by 2050 it drastically needs to reduce its carbon emissions. A deep understanding of the types of carbon that make up the built environment is therefore imperative. By understanding the makeup of an organisation or building's emissions, more effective carbon reduction solutions can be enabled.

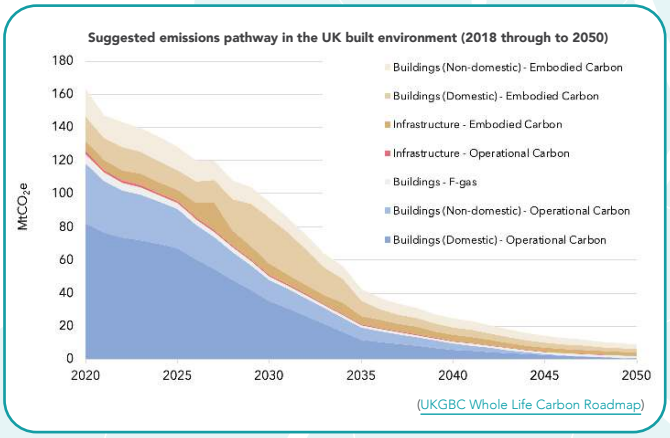
FURTHER RESOURCES

- UKGBC: Whole Life Carbon Roadmap
- UKGBC: Advancing Net Zero
- WorldGBC: Bringing Embodied Carbon Upfront

WHAT IS THE ROLE OF THE BUILT ENVIRONMENT?

The built environment currently contributes to 25% of the UK's carbon emissions. That 25% is made up of both operational & embodied carbon.

The UKGBC Net Zero Whole Life Carbon Roadmap for the Built Environment 'The Roadmap' (a carbon footprint for the UK built environment and a Net Zero Carbon trajectory to 2050), highlights the current and predicted rates of operational and embodied carbon emissions in the UK built environment, and offers a set of recommendations for achieving net zero carbon.



(UKGBC Whole Life Carbon Roadmap)

The Roadmap demonstrates that as operational emissions decrease, mainly due to building improvements and grid decarbonisation, then embodied carbon will form over half of built environment emissions by 2035. Alongside measuring the operational energy consumption, we therefore must consider the embodied carbon of building projects if we wish to successfully achieve lower carbon buildings.

The WorldGBC has a report to help bring greater awareness to the embodied carbon in buildings, titled Bringing Embodied Carbon Upfront. Check out this animated summary video of the report here.

*Unless stated otherwise, "carbon" is used within these explainer guides to refer to multiple greenhouse gases, as a shorthand proxy for "carbon dioxide equivalent" (CO_2e).