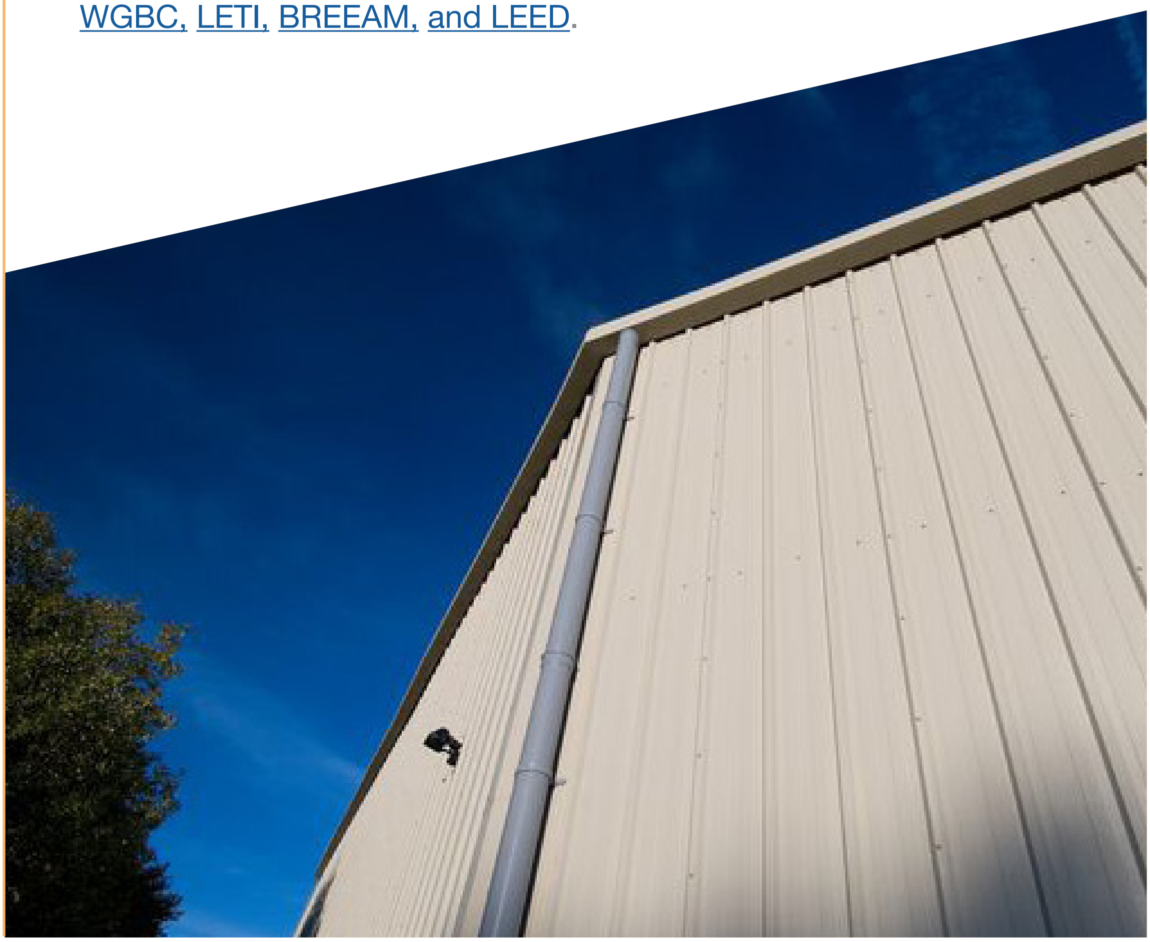
# Circularity in the Construction Sector

EPIC
ENGINEERED PANELS IN CONSTRUCTION

As the full impacts of our 'take, make, waste' society are being realised there is an increasing recognition of the importance of adopting a circular economy approach. Defined by the Ellen MacArthur Foundation as "a systems solution framework that tackles global challenges like climate change, biodiversity loss, waste, and pollution", the benefits of a circular economy are clear, but how feasible is it to apply the principles in practice to the construction industry?

The World Green Building Council (WGBC) Framework for circular building has been described as when "each stage of the lifecycle is considered to create a continuous, closed loop of resources where resource is not lost or wasted" (Drinkwater, J.). For many construction products this can represent a real challenge, as very few materials can be returned to their virgin state without loss of quality. Circularity therefore needs to be considered in light of what is technically and economically feasible, and in the context of the environmental benefits delivered over the life of a building.

Many organisations have been developing frameworks to support architects and specifiers in making the best possible decisions about which materials to use when designing and delivering buildings that are as close to circular as possible. Examples of these programmes and certification tools can be found at the UKGBC, the Construction Leadership Council's (CLC) CO2nstructZero, WGBC, LETI, BREEAM, and LEED.

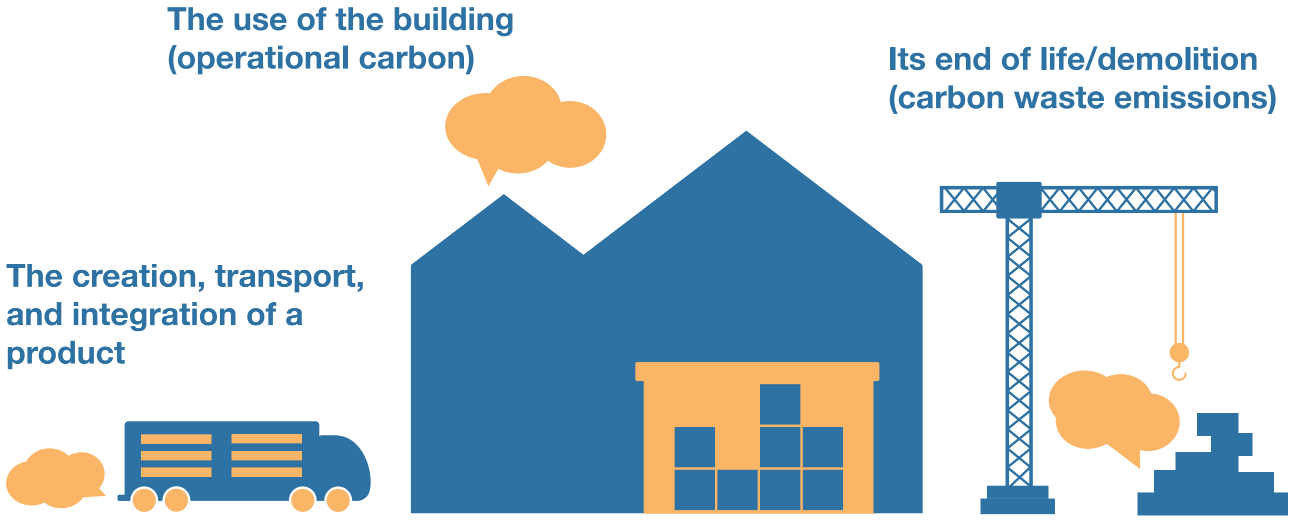


# Whole life cycle of buildings

When assessing the environmental impact of a construction, it is important to look at the carbon emissions across its lifespan. The focus is often on ‘upfront’ or ‘embodied’ carbon’ because as buildings become more energy (and therefore carbon) efficient this becomes a more significant factor. However, it still needs to be considered in the context of operational carbon and the contribution made by specific products towards reducing that, as well as impacts at end of life. In other words, whole life carbon.

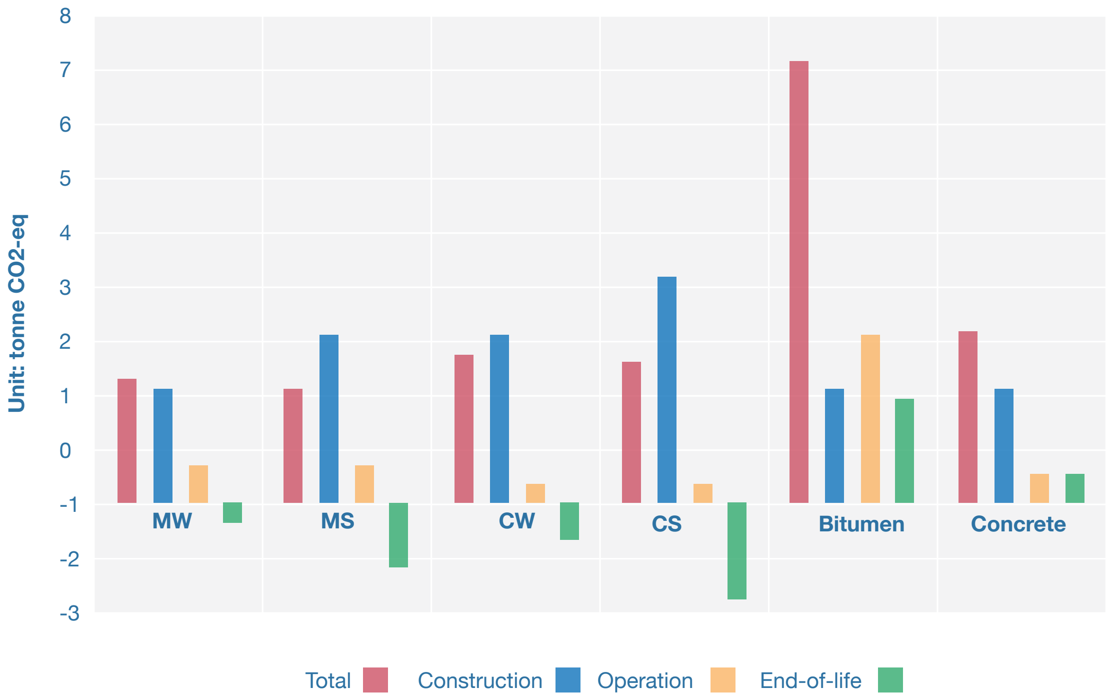
The main stages of a building’s life cycle are:

- The creation, transport, and integration of a product into a construction (upfront or embodied carbon)
- The use of the building (operational carbon)
- Its end of life/demolition (carbon waste emissions)



When we don't consider the whole life of a building, but only look at the upfront carbon there is the potential for a distorted view of the overall impacts beyond operational carbon. Some products have higher levels of carbon in the beginning, but this is offset both by the benefits of the product over its lifetime, and its potential for reuse or recycling at end of life. One such example is steel. The upfront carbon of steel is higher than timber and concrete, but its use supports a more circular economy, as it still holds its value at end of life. It can readily be removed from the construction and recycled to create new products. By comparison, many other materials do not hold that intrinsic value and go straight into landfill either due to issues with contamination during the demolition process, or because it is not technically or economically feasible to recycle or even downcycle them.

## A focus on embodied carbon can lead to unintended consequences through the whole life cycle




**MW** Monterrey steel solution with wood batten
**MS** Monterrey steel solution with steel batten
**CW** Classic steel solution with wood batten
**CS** Classic steel solution with steel batten

This graph is extracted from [World Steel Association's Life Cycle Assessment report on roofing systems (Aug 2020)]

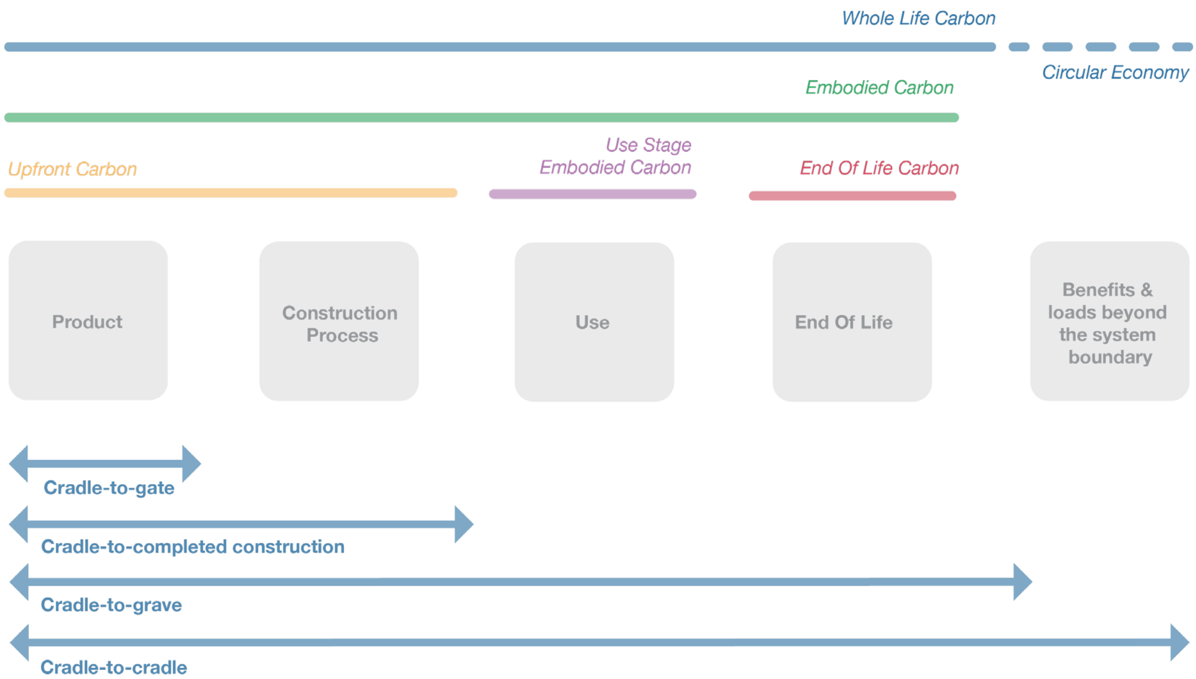
# Life Cycle Assessment

As part of 'circular economy' reporting therefore, we need to look at the total carbon based on the whole life of the building. Resource efficiency benefits are most clearly identified with Life Cycle Assessment (LCA), although these can vary in terms of the information that they capture.

Often it is an Environmental Product Declaration (EPD) that is used to compare product performance, but there is currently a lack of consistency in the data that are presented, with widely different approaches and assumptions making it difficult to compare products on a like for like basis. There is some standardisation of the process, but not all elements are tracked in every case or in the same way. Finally, there is a lack of understanding about how to use the information in an EPD to make an informed choice.

One of our EPIC members surveyed 28 EPDs to illustrate this point. Each EPD has the option to report on 17 modules. Of those surveyed:

- Modules reported on range from 3 to 17
- 5 ignored end-of-life and disposal
- 5 ignored circular economic considerations
- 5 only reported on products in the raw and manufacturing process



# Material supply chain risk

To achieve sustainability goals, specifiers may request product characteristics or processes that don't currently exist or are difficult to source, which means that installers may try to find alternative solutions as the project heads down the supply chain, based on inadequate information. This could potentially result in the products selected not complying with original specification. Architects and specifiers should look at performance and functional requirements, and should be able to rely on manufacturers to provide accurate information and have the technical data to hand.

# EPIC-member panels and sustainable construction

EPIC-member insulated panels comprise a highly thermally efficient polyisocyanurate (PIR) core and steel-facing, with 60% of their embodied carbon being the result of the steel. These panels offer a minimum of a 25-year guarantee for thermal and structural performance. They are also easy to remove and replace at the end of a building's life, with increasing instances of used but undamaged panels being re-used in appropriate applications (e.g. agricultural buildings). The potential for reuse is largely dependent on the age of the panel, thickness, and compliance with Building Regulations and Standards based on the requirements of the application.

Whilst there are technical solutions for the PIR core to be recycled, at this time it is not considered financially viable. If re-use of the whole panel is not possible, they are typically sent into a shredder, where the steel is recovered and the PIR core rendered suitable for energy from waste schemes. You can read more about this process in our 'Identification and Disposal of metal faced insulated panels' (End of Life) guide.

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