



# CARBON NEUTRALITY & EMBODIED CARBON

Carbon neutrality is the balance between emitting carbon and absorbing carbon emissions through carbon sinks. While theoretically possible to achieve carbon neutrality by eliminating carbon emissions, it's impractical. Therefore, carbon sinks—systems

that absorb more carbon than they emit, such as forests and oceans—are essential to enabling us to achieve carbon neutrality in the built environment because they offset the inevitable emissions that make constructing and operating buildings possible.

Becoming carbon neutral is the new mantra of sustainable builders all over the world. The first step towards achieving this is calculating the total carbon emissions created. This is done by summing up the two main sources of carbon emissions: operational carbon and embodied carbon.



**OPERATIONAL CARBON** refers to the total emissions from all energy sources used to keep our buildings warm, cool, ventilated, lighted and powered (think electricity and natural gas).



**EMBODIED CARBON** refers to the total emissions generated by harvesting, manufacturing, transporting, and installing the materials that create the building itself.



## Carbon in Construction

The breakdown of embodied carbon on a project can vary, but most of the contributions are from the structure alone (about 50%), particularly steel framing and concrete (more specifically: cement)\*. Unlike operational impacts that can be reduced after the project is built, there is no way to reduce embodied carbon after the project is built.

## Measuring Embodied Carbon

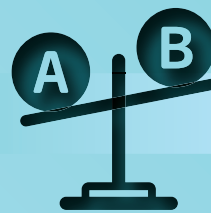
Historically, operational-related emissions have been the focus because they are more straightforward to measure. Recent breakthroughs have made measuring embodied carbon much easier, and the result is a shifted focus towards embodied carbon.

As a result, building designers can measure, compare, and reduce the embodied carbon in new buildings with clarity that was previously unattainable. It has also enabled sophisticated owners to set baselines on their projects for embodied carbon emissions that further challenge designers to seek low-carbon solutions.

There are free **EMBODIED CARBON CALCULATORS**—such as the Embodied Carbon in Construction calculator (EC3) created by Building Transparency—that use building material quantities from construction estimates (or BIM models) and a robust database of digital, third-party verified Environmental Product Declarations (EPDs) to calculate a project's embodied carbon during the design phase.



Measure



Compare



Reduce

\*Note: embodied carbon is measured more broadly than just CO2 emissions generated in the process of constructing a building, because carbon dioxide is not the only harmful greenhouse gas that we aim to reduce emissions of.

Therefore, embodied carbon is measured in CO2-equivalent (or CO2-e) which is a unit of measurement based on the relative impact of a given greenhouse gas on global warming or its Global Warming Potential (GWP). For this reason, CO2-e and GWP are often used interchangeably.

