Reduce the Construction Industry's Greenhouse Gas Emissions & Support Local Economies

Buildings and construction account for about 40% of global greenhouse gas (GHG) emissions. Total carbon is the sum of GHG impact over the lifecycle of a built asset, such as a building or road. Total carbon includes two primary components, which are equally important to address in order to meet emission reduction goals.

- **Embodied carbon** emitted during construction, includes emissions from the manufacture and transport of building materials
- **Operational carbon** from energy use and continued maintenance

Operational carbon management practices, like energy efficiency regulations and incentives are already well-established; but we must now focus on similar efforts to tackle **embodied carbon**, which will account for **more than half of building related GHGs through 2050.**

While climate benefits from operational savings accrue over decades, **reducing embodied carbon from building materials delivers immediate climate benefits.** It could also support a number of additional economic and environmental priorities, such as:

- Minimize waste and support markets for recycled materials
- Promote sustainable wood products to help improve forest management
- Capture and store carbon emissions from power plants and industry

Autodesk's Software Helps Architecture, Engineering, and Construction Professionals Easily Reduce Total Carbon Emissions
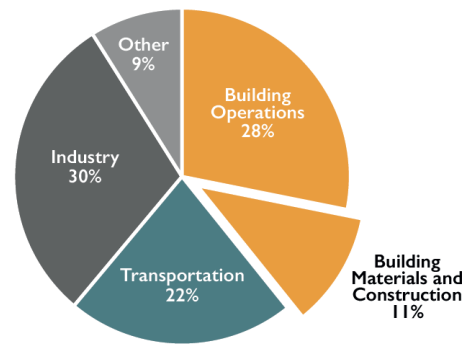
Success Addressing Operational Carbon

The building industry has made great strides understanding and reducing operational carbon. Building energy analysis is a standard practice for many projects, voluntary initiatives like the American Institute of Architects' 2030 Commitment are growing, and government policies continue to drive energy efficiency. **Autodesk is a leader in helping companies manage operational carbon.** Autodesk created the open source Green Building XML (gbXML) file format, which allows for Building Information Model (BIM) design data to be quickly used for operational building performance analysis. This removes a significant cost barrier to designing sustainable and energy efficient buildings.

Next Up: Addressing Embodied Carbon

Now the industry is developing software tools for managing embodied carbon in design and construction. The Embodied Carbon in Construction Calculator (EC3) is a free, open source tool to analyze available materials and suppliers to help designers and builders reduce embodied carbon, often without significant impact to project budgets. **Autodesk is a lead sponsor of EC3 and has made it easily accessible to construction professionals through an integration with its construction software tools.** Leading green building certification standards are also adding embodied carbon criteria into their frameworks. The US Green Building Council has introduced a pilot credit in LEED 4.1 for procurement of low carbon construction materials.

Global CO$_2$ Emissions by Sector

- Other 9%
- Building Operations 28%
- Industry 30%
- Transportation 22%
- Building Materials and Construction 11%

Source: https://architecture2030.org/buildings_problem_why/

Technology allows easier and more accurate accounting of embodied carbon during design and construction, enabling better management of a significant source of emissions.

Embodied Carbon in Roadways

Another example of embodied carbon management software is ORIS, which supports civil engineers and transportation departments in decarbonizing roads and highways. ORIS provides a true win-win by enabling better materials choices that reduce project costs and even extend project lifespans. **Autodesk has partnered with the tool's creator and leading producer of roadway materials, LafargeHolcim, to integrate ORIS with Autodesk's design software for civil engineers, making it easier for public agencies to address the climate impacts of their projects.**

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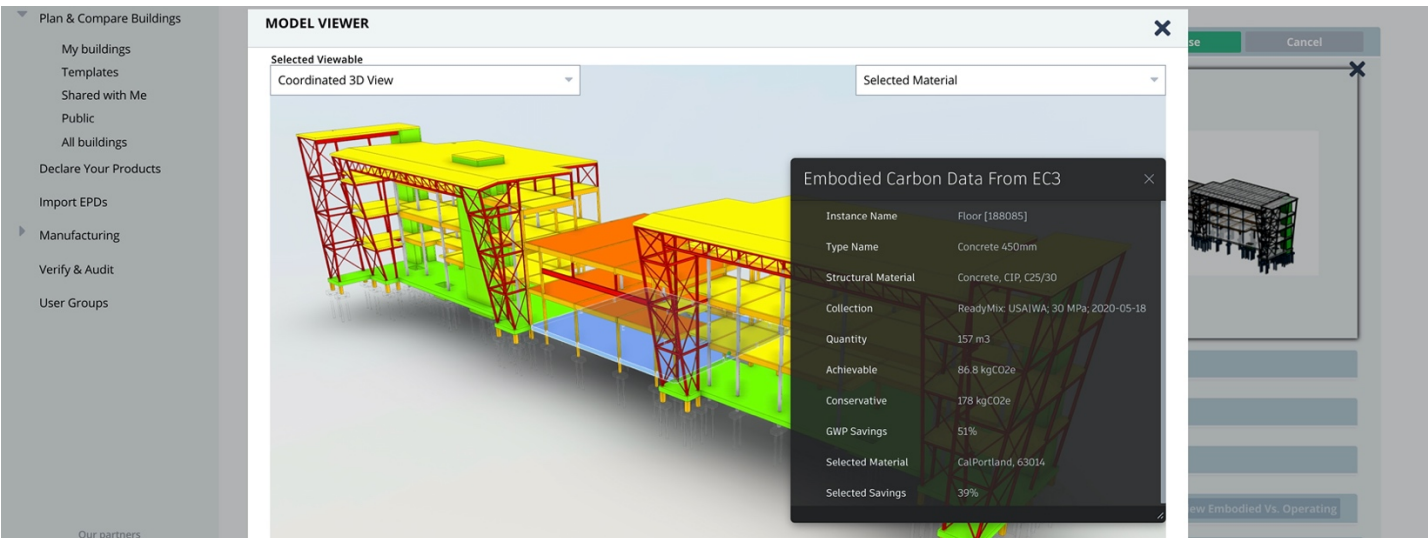
Policy Actions to Accelerate Embodied & Total Carbon Management

There are many tools, programs, and policy incentives to calculate, track, and reduce operational carbon. As a result, operational carbon emissions from the building sector have declined over the past two decades. Only recently have similar tools become available to easily and accurately calculate and track embodied carbon. This new technology provides policymakers an important opportunity to further decarbonize buildings and infrastructure.

While this is a relatively new policy area for some jurisdictions, several governments have taken action to reduce embodied carbon. Policymakers can consider these templates and adopt policies to reduce embodied carbon and accelerate total carbon emission reductions.

- **Encourage or require greater transparency around embodied and/or total carbon in constructing public buildings & infrastructure**

  - Sweden Transport Authority requires large infrastructure projects to calculate and report embodied carbon during planing, design, and construction

  - Canadian Public Services & Procurement Department requires major projects to perform a whole building life-cycle analysis; the City of Vancouver requires developers seeking rezoning to report whole building embodied carbon

- **Leverage procurement & permitting processes to address embodied and/or total carbon**

  - In 2014, the U.S. General Services Administration supported low-carbon manufacturing by calling on vendors to adopt efficiency practices, requiring emissions reporting, and comparing bidders' emissions for similar services

  - The French government launched a program offering incentives, such as additional density or financial assistance, for meeting certain carbon-performance benchmarks, including embodied carbon reduction.

- **Create specific total carbon goals or limits on embodied carbon for materials**

  - Starting in 2021, the Buy Clean California Act (BCCA) will begin to set progressively more stringent limits on the allowable global warming potential of traditionally carbon-intensive products like steel, glass, and insulation in state funded construction projects.

Bolstering Local Manufacturing & Suppliers

Embodied carbon management tools will help to grow the market for low-carbon materials manufacturing. Since lower-carbon material substitutions are often cost neutral or even less expensive, this approach will spark a race to ever cleaner solutions, incentivizing regional supply chains to adopt greener manufacturing methods, catalyzing low-carbon materials innovation, and supporting new local businesses in this field.

As governments seek to restart economic growth through building and infrastructure programs, leveraging technology will allow them to fully address the total carbon impact of buildings and infrastructure.

About Autodesk

Founded in 1982, Autodesk makes software for people who make things. If you've ever driven a high-performance car, admired a towering skyscraper, used a smartphone, or watched a great film, chances are you've experienced what millions of Autodesk customers are doing with our software. Autodesk gives you the power to make anything.

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