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TITLE:

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ABSTRACT (244 words)
In the last decade, the study of environmental impacts of buildings was primarily focused on energy efficiency and operational carbon emissions associated with heating, cooling, ventilation, and lighting. International standards and regulations advocate the reduction of operational energy loads without considering embodied emissions. The construction sector consumes a significant proportion of the world’s resources, mostly in the form of material usage and energy resources required for raw material extraction, transportation, and manufacturing. Embodied carbon represents the global warning potential of the construction materials, namely, the emissions of CO\textsubscript{2} produced during the manufacturing process of building materials, and construction, material replacements, and end-of-life treatment. However, there is a lack of agreement on a standardized embodied carbon calculation method, associated boundaries, and the Embodied Carbon Coefficient (ECC) and databases used for these calculations. This study investigates the sensitivity of embodied carbon assessment to different assumptions. It identifies a practical approach that considers a project’s material specifications and their environmental impact. The regional variabilities of the recycled contents of steel and aluminum, product wastage, transportation of material to the site, and expected repair and replacement are studied for a LEED-certified public library in Chicago (USA). The sensitivity analysis identifies aspects that impact the embodied carbon for an entire steel-frame building with aluminum curtain walling. The proposed method describes how data collected during the LEED certification are a viable and representative description of the project as a whole, and may thus be used to perform more detailed analyses.

KEYWORDS (max 6): Embodied carbon, building materials, energy efficiency, climate change, LEED, recycling content
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