

A comprehensive framework for selecting building energy modelling tools to support sustainable design

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Abstract

Building energy modeling (BEM) tools are essential for achieving sustainable building design by enabling the simulation and analysis of building energy performance. While Building Energy Modeling (BEM) tools have achieved widespread adoption, a systematic framework for their selection, grounded in project objectives and a comprehensive understanding of tool capabilities and applicability, is still lacking. This research addresses this gap by developing a framework to guide architects and other stakeholders in selecting appropriate BEM tools for sustainable building projects. This study identifies common sustainable design strategies from a comparative analysis of certified sustainable buildings. It evaluates capabilities and applicability of available tools from a comprehensive evaluation of BEM tools listed in the Building Energy Software Tools Directory. The resulting framework provides a structured approach, describing key input/output features and assessing the suitability of different tools for different types of project and analysis objectives. The results of this research can support a more efficient use of BEM tools in sustainable design, enabling professionals and policymakers to make informed decisions and to promote the transition toward a more sustainable built environment.

Keywords: Building Energy Modeling; Energy Efficiency; Framework; Simulation; Sustainable Design