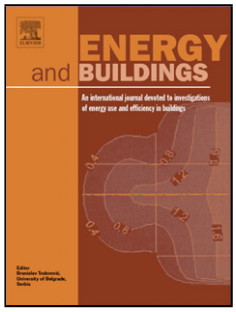

Title: An Integrated BIM-based framework for the optimization of the trade-off between embodied and operational energy

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An Integrated BIM-based framework for the optimization of the trade-off between embodied and operational energy

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Highlights

- A framework is proposed for reducing the building's LCE use during the design phase.
- The framework optimizes the trade-off between embodied and operational energy.
- Multi-objective optimization is integrated with BIM to facilitate the optimization.
- A prototype of the proposed framework is developed.
- The prototype is then used to test the framework's applicability in a case study.

Abstract

Design choices with a unilateral focus on the reduction of operational energy for developing energy-efficient and near-zero energy building practices can increase the impact of the embodied energy, as there is a trade-off between embodied and operational energy. Multi-objective optimization approaches enable exploration of the trade-off problems to find sustainable design strategies, but there has been limited research in applying it to find optimal design solution(s) considering the embodied versus operational energy trade-off. Additionally, integration of this approach into a Building Information Modeling (BIM) for facilitating set up of the building model toward optimization and utilizing the benefits of BIM for sharing information in an interoperable and reusable manner, has been mostly overlooked. To address these issues, this paper presents a framework that supports the making of appropriate design decisions by solving the trade-off problem between embodied and