

Reassessing the Low-Carbon Potential of Contemporary Earthen Construction: A Critical Evaluation of Environmental Performance, Technological Innovation, and Scalability within the Framework of Earthen Architectural Heritage.



Authors: Rasha Elborgy
Address: rasha.borgy@gmail.com

ABSTRACT

This study reassesses the low-carbon potential of contemporary earthen construction through a critical analysis that bridges earthen architectural heritage, technological innovation, and climate-responsive sustainability goals. Despite growing global interest in earthen construction as a sustainable alternative to carbon-intensive building materials, the relationship between technological advancement and actual environmental performance remains insufficiently examined. The paper develops a comparative analytical framework to evaluate traditional, contemporary, and hybrid earthen construction techniques in terms of environmental performance, carbon footprint, scalability, and practical applicability. It further draws upon selected international case studies, including rammed earth, compressed earth blocks, and 3D-printed earth construction. The study tests the hypothesis that technological innovation does not necessarily guarantee superior environmental outcomes. Ultimately, it proposes an integrated evaluative framework that positions earthen construction as a contemporary low-carbon strategy capable of reconciling heritage continuity with the imperatives of sustainable development and climate resilience.

KEY WORDS:

Earthen construction LCA, Low carbon building materials, CEB environmental performance, 3D printed earth architecture.