Multi-Criteria Selection of Façade Systems Based on Sustainability Criteria

Abstract

The environmental and economic impacts of alternative façade systems have been widely investigated in previous studies. However, sustainable design requires reconciliation between economic, environmental and social impacts; the three pillars of a sustainable system, and selection of façade only based on environmental impacts may not always provide a sustainable solution. Through a case study, this paper presents a systematic methodology for selection of the façade system for a building by accounting the social, economic, and environmental impacts of the decision. A comprehensive list of sustainability criteria for selection of façade systems is presented and discussed in detail. The selected sustainability criteria are then applied to identify the most sustainable facade system, among five different alternatives including double brickwork, aluminium composite panel, ceramic cladding, Autoclaved Aerated Concrete (AAC) panels and concrete blocks, to replace the existing worn façade of an actual building. Delphi technique, a method of eliciting and refining group judgments, is used to identify applicable sustainability criteria and their relative pair-wise importance scores, while AHP is used to identify the global relative importance weights for different sustainability criteria and rank different alternative façade systems.

Keywords: Façade material selection, Analytic Hierarchy Process (AHP), Sustainability, Decision-making
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