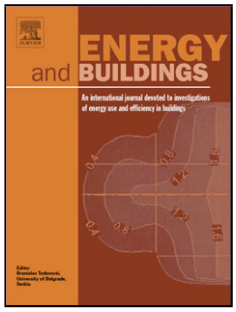

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Sustainability Evaluation of Buildings in Pre-Use Phase Using Figure of Merit as a New Tool

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Abstract

Built Environment has significant impact on natural environment and construction industry plays a vital role. Assessing the overall energy impact during pre-use phases of a building has been largely neglected. The complex interaction phenomena between the Construction Materials, Embodied Energy footprint and Global warming (CO_2e) are simplified as interaction between: I1-Construction Materials and Embodied Energy; I2- Embodied Energy and Global Warming ; I3- Global warming and Construction materials. These three interactions result in the net outcome of a Sustainability Development Index (SDI). A new 'Sustainability Development Index (SDI)' is presented here using the concept of Figure of Merit (FoM), an exclusive non dimensional parameter, accounting for two engineering properties namely modulus of elasticity and density, and two construction industry cost stimulants. The proposed SDI is a comprehensive energy assessment model that integrates FoM with other energy indicators and by applying which, sustainability level of a building is expressed in terms of sustainability percentage during pre-use phases of a building. The proposed Sustainability Development Index Model (SDIM) is a preventive approach rather than curative approach and can be applied to buildings, infrastructure projects or renovation projects. Case study building included possesses a sustainability level of 57% as compared to a benchmark project with low energy and is 10% less sustainable as compared to sustainability level computed using embodied energy values. It is also found that, concrete, steel and formwork contribute significantly to global warming within a building system. This prior knowledge about building's sustainability remarkably helps in mitigating global warming.