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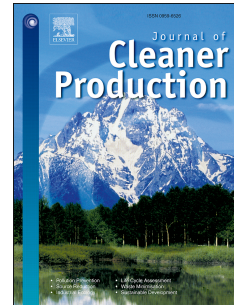
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Beyond Boundaries: A Global Use of Life Cycle Inventories for Construction Materials

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Abstract: Life Cycle Assessment (LCA) as a comprehensive environmental assessment approach has been widely adopted to evaluate the environmental impacts of many building materials. However, only a few life cycle inventories (LCIs) have been developed in certain countries with prevailing boundaries and scopes which prevent them from being applied directly to a different location. Therefore utilizations of overseas LCI with valid modification have become an effective way to expand the usage of existing LCI as well as to quickly establish a localized inventory. This study aims to develop a framework which makes use of non-local LCI data and Building Information Modelling (BIM) to evaluate the environmental impact of local construction materials—specifically, total carbon emissions from the “cradle to site” process of construction materials. Framework inputs, outputs and data conversion methods are analysed in a detailed manner. A case study in Singapore which focuses on carbon emissions generated from cement production and transportation is employed to showcase the application of the proposed framework in LCA practice. The result obtained was compared with the actual benchmark to validate the framework’s performance. The estimated percentage of error was 2%, which is much smaller than the one from raw LCI of 14%. Discussion and sensitivity analysis regarding to the robustness of the results in the presence of uncertainty have also been discussed. The result can expand the existing knowledge of cross-boundary LCI usage for construction materials.

Key words: Life Cycle Assessment (LCA); Life Cycle Inventories (LCI); Carbon Emissions; Construction Materials; Building information modelling (BIM).

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