

A Life Cycle Assessment-Based Methodological Framework to Evaluate the Environmental Impacts of the Building and Construction Industry in Sri Lanka

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Globally, the building and construction industry is one of the main contributors to adverse environmental impacts (EIs) due to the extensive utilization of resources and energy during the life cycle phases. The building and construction industry in Sri Lanka is significantly accountable for approximately 50% of energy usage, 40% of raw material usage and 30% of the solid waste generation of the country. Therefore, the relationship between the building and construction industry and EIs should be thoroughly examined in a close association in each life cycle stage to mitigate the EIs at the national level. Accordingly, Life Cycle Assessment (LCA) which is globally known as a robust tool for measuring EIs, has emerged and is acknowledged as a significant technique incorporated into the decision-making process of the building and construction industry globally and in Sri Lanka. Even though the LCAs in the building and construction industry have been broadly discussed in the international arena, it is not much considered in the Sri Lankan context due to the lack of country-specific life cycle inventory data sets, data intensity, expensiveness, the requirement of expertise and complexity in conducting LCAs. Accordingly, this study presents a user-friendly LCA-based framework customized to the Sri Lankan context. The data used to develop the methodological framework were collected through the literature review, including international standards and expert interviews. The proposed methodological framework performs as an early design phase decision-making model which predicts and evaluates EIs throughout the life cycle of a building complying with the requirements presented in ISO 14040:2006 and 14044: 2006 Standards. The proposed framework is validated by the industry and academic experts in the fields of LCA to assert its pertinence in evaluating life cycle EIs and supporting environmentally friendly decision-making. The proposed framework will provide provisions for environmentally friendly decision-making with scenario analysis and promote sustainable construction practices by identifying hot spots, the geographical distribution of EIs, and EI footprints in a user-friendly manner.

Keywords: *Building and Construction Sector, Environmental Impacts (EIs), Life Cycle Assessment (LCA), Sri Lanka*