

Assessing the Sustainability of Sugarcane Bagasse Ash Concrete Versus Traditional Concrete: A Life Cycle Approach

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The construction industry has a significant environmental footprint, prompting the exploration of sustainable alternatives to traditional building materials. This paper examines the potential of Sugarcane Bagasse Ash (SCBA) as a substitute for cement in concrete production, comparing it with traditional concrete from a life cycle assessment (LCA) perspective. This study investigates the environmental performance of mortar with 20% cement replacement by sugarcane bagasse ash (SCBA), using a life cycle assessment (LCA) approach in accordance with international ISO 14040/14044 standards. The life cycle of concrete mortar production from raw material extraction is considered using the openLCA software. Ecoinvent 3.5 regionalized database and data from a literature review were employed for the life cycle inventory, and ReCiPe 2016 methodology was used for impact assessment. The environmental impacts were analyzed across 18 midpoint categories. Findings indicate that SCBA mortar has achieved significant reduction in most environmental impact by an average of 15.21% except for water use and ozone depletion which is an increment of 1.6% and 7.4% respectively. These results underscore the potential of SCBA as a viable cement replacement in mortar production, contributing to more sustainable construction practices.

Keywords: Sugarcane Bagasse Ash, Life Cycle Assessment, Sustainable Construction, Environmental Footprint