Comparative Assessment on Embodied Carbon Emissions & Circular Chain Economy of the RC Building, Composite Steel Building and Masonry Building using BIM

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Abstract:
The construction industry is a major contributor to global greenhouse gas emissions, with embodied carbon emissions from material production, transportation, and construction being a significant component.

This project aims to conduct a comparative analysis of embodied carbon emissions for three structural systems: Reinforced Concrete (RC) building, Composite Steel building, and Masonry building to analyse the least carbon emitting structure which helps stakeholders to choose the optimized design with low carbon emission at the concept design phase.

G+1 building model is developed in Autodesk Revit using Building Information Modelling (BIM) to accurately quantify material requirements.

The embodied carbon for each structural system is calculated by integrating Life Cycle Assessment (LCA) data with BIM outputs.

The study considers demolition phase to provide a holistic life cycle perspective and suggest the deconstruction techniques & reuse of the materials to reduce the carbon foot print in the consecutive projects. The results are compared to identify the structural system with the lowest carbon footprint, providing insights into sustainable material selection and design strategies.

This research highlights the potential of BIM as a decision-making tool for reducing embodied carbon in the built environment and supports the transition toward low carbon construction practices which promotes circular chain economy.

Keywords:
Embodied Carbon, BIM analysis, Circular chain economy, BIM Integration, Carbon footprint.