**Title**: Strategies for development of low-carbon built environments

**Duration**: 10 Months

**Deliverables**:

- Life cycle assessment of identified buildings
- Strategies for low carbon developments

**Significant Achievements:**

- Identified low-carbon materials for masonry and reinforced concrete buildings
- Evaluated the upfront carbon of a typical load-bearing building with brick masonry and a reinforced concrete-framed building.
- The study highlights various low-carbon strategies and demonstrates that, with careful selection of materials, the embodied carbon of buildings can be reduced by up to 50%.
- The study also highlights that embodied carbon per unit area of reinforced concrete structures is higher than that of masonry structures.
- Evaluated the embodied carbon of newly developed eco-friendly recycled aggregate concrete bricks and hollow blocks.
- The bricks and hollow blocks developed using recycled materials are cheaper and possess low embodied carbon when compared to burnt clay bricks and fly ash-based hollow blocks, respectively.

**Research report: 2 Nos**

**Team**: Dr A. Kanchanadevi (PI)

Mr. G. Ramesh

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*Date: March 2026*

**Details of work carried out**

- Reviewed codal guidelines and models for life cycle assessment of structures, and collected environmental product declarations documents for different building materials used for construction
- A masonry building with a carpet area of 360ft$^2$ is chosen for assessing life cycle impact.
- The system boundary includes A1-A4, which is restricted only to the completion of civil works, including the construction of the building.
- The reduction in global warming potential of the building with PSC, recycled aggregate brick, and recycled steel is 57% lower than that of a building with OPC, burnt clay brick, and steel reinforcement.

- A two-storied reinforced concrete framed building of area 1953 $ft^2$ constructed is chosen for assessing life cycle impact.
- Embodied carbon of the superstructure is 32% lower than that of the superstructure with OPC cement.

**Research/Technology Leads**

- **Low-carbon, recycled, and circular materials:** The study identifies low-carbon material options, leading to the development of eco-friendly bricks and hollow blocks made from recycled aggregates. This approach supports the circular economy while also providing a low-carbon construction material.

- From the study, it was observed that the use of alternative binders can substantially reduce embodied carbon, while incorporating recycled materials promotes a circular economy. Based on these insights, a project proposal was submitted to ULIP under the title **"Alternate binder-based recycled aggregate concrete for sustainable built environment".**