Climate Smart Buildings: Replicable Design options for Thermally Comfortable Affordable Housing

Situation

India has a rich tradition of climate responsive architecture with varied passive design strategies, from the beginning of the civilization, to achieve comfortable indoor living conditions for the inhabitants which were responsive to the local climatic conditions and geography. However, building houses has changed dramatically in the recent past.

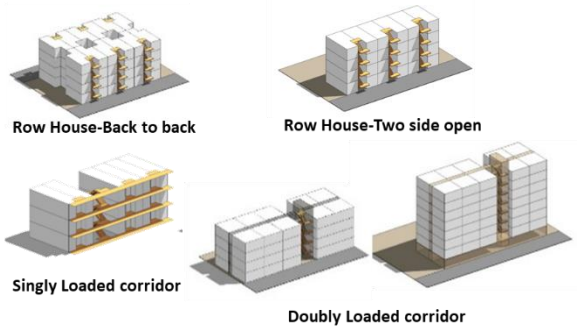
The residential sector will become the largest consumer of electricity in the country with 36.5% share of the total electricity consumed in 2032. India is at a unique crossroads where two-thirds of the commercial and high-rise residential structures that will exist in 2030, are yet to be built. Thus, implementing energy efficiency in buildings that are being constructed in the next ten years, highlights a singular opportunity to reduce the locked in energy, alter future consumption patterns and enhance cost savings for the several decades.

The Government of India has been implementing its flagship programme- Pradhan Mantri Awas Yojana- Urban (PMAY-U) since 2015 to fulfil the vision of Hon'ble Prime Minister of India to provide 'Housing for All' by 2022. The houses built under the Mission will last at least 50-60 years. The decisions taken during implementation have an impact on the level of comfort that these dwellings provide to its occupants, thus impacting their energy use and costs and the associated carbon emissions over the lifetime of the buildings.

Architectural and engineering design services that will be available to the developers and home buyers for the vast majority are yet to develop the knowledge and skills for integrating energy efficiency into building design as a standard practice. This project provides integrated energy efficient & affordable design solutions suitable for a range of sizes, typologies and regional locations across the country.

Objective

For over 60 years, the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH has been working jointly with partners in India for sustainable economic, ecological, and social development. To accelerate adoption of climate resilience and thermal comfort in buildings, Indo-German Energy Programme" (IGEN) has launched the project titled 'Climate Smart Buildings: Replicable Design options for Thermally comfortable Affordable housing' and has appointed a consortium led by Ashok B Lall Architects (ABLA) as knowledge partner.



The project aims to:

- Develop a catalog of replicable design options for thermally comfortable affordable housing demonstrating integration & impact of passive design measures.
- Promote use of Local, innovative & sustainable building materials. Explore best available technologies in construction of affordable housing.
- Enhance awareness among various stakeholders to mainstream Thermal comfort in Affordable housing & promote market transformation.

Documentation

Documentation of affordable housing: technologies, material, cost & thermal performance

Ready to use Design Catalogue

Develop 1000 Architectural Design & Specs for TCAH

Assessment

Energy performance & Thermal comfort assessment through simulations. Techno-commercial feasibility through BIM & costing.

Training Modules

Workshops & trainings for various stakeholders in 5 climatic zones

The project will provide ready-to-use design packages using passive measures and cost-effective technology. The proposed designs will be amenable to the latest innovative systems of construction for enabling repeatability and fast track construction that is resource efficient.

Approach

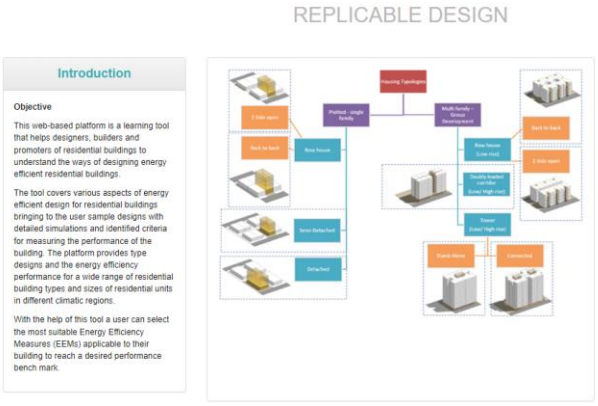
80% of the current unmet need for homes is for the EWS and LIG categories. With the current and anticipated high rate of urbanisation the urgency for provision of suitable housing is most acute in growing cities and towns. The thermally comfortable replicable design solution sets will therefore focus on urban house types that are suitable for EWS and LIG categories. Economy and simplicity of construction while optimising thermal comfort is to be prioritised to enable wide affordability. A techno-commercial construction technology alternatives that would be matrix will enable objective evaluation of the material and considered for design. The matrix would evaluate the designs relatively vis-à-vis the SDGs, affordability/economy, Climate mitigation potential considering embodied energy and potential operational energy, and thermal comfort. The PMAY envisages different modes of housing provision ranging from self-build beneficiary led mode to cooperative/local authority/institutional group housing, to

developer built mass housing. The construction technologies and the materials of construction that can be deployed depend on the resources of developers and builders and the scale of projects. The solution sets will respond to each of these modes of housing provision. While the project addresses the urgent need of affordable and sustainable housing today, the project is also future-oriented, proposing to introduce new materials and innovative methods of construction that enhance comfort, reduce Co2 emissions of construction and remain economical and affordable.

Expected Outcomes

The program is expected to provide a ready to use data base with a catalogue of replicable designs for thermally comfortable affordable housing suitable for different typologies and climate zones across India. Outcomes envisioned from the program are outlined below.

Component 1: 1000 ready to use, simple, easy to adopt layouts with increased Thermal Comfort developed across climate zones that will act as a guide to fast-track adoption of passive design measures.
Component 2: Demonstration of thermal comfort, energy performance and cost savings across all design types through simulations.
Component 3: Wider outreach through Web-tool platform with ready to use design solution sets complete with drawings, 3D model and BOQ.



Component 4: Workshops & capacity building for widespread dissemination of replicable designs for fast adoption.

Transformation to climate responsive design and effective use of efficient building materials will contribute to major energy, cost savings and reduction of Carbon emissions.

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