India: Thermal Comfort for Community Buildings in Informal Settlements

Background

Rapid urbanization and insufficient infrastructure in the past decades have resulted in challenging living conditions in dense, poor settlements in urban areas in India. Measurements of temperatures in housing for the poor often reveal roof temperatures of up to 50°C, even when air temperatures are around 30°C.

This makes these dwelling units uninhabitable, particularly during summers. Residents suffer intense thermal stress, compounded by inadequate rest and sleep, with indoor temperatures bordering 40°C combined with widespread power cuts.

Installation of any artificial cooling system has enormous cost implications on the poor besides emissions and adverse effects on the surrounding micro-climate.

461 million	people are living in urban areas
2030	marks the year, when rural population starts to decline whereas urban population continues to rise rapidly
17	per cent of India's urban population live in informal settlements
45	per cent of Mumbai's population live in slums
40°C	degrees can be reached indoor within summer in informal settlements

Project Intervention

Innovative solutions and appropriate building materials and technology have proven positive results in reducing energy requirements, mitigating potential greenhouse gas emissions besides being cost-effective. This project demonstrated these innovative approaches at community building level and spurred design responses in neighbouring residential structures with the aim to address neglected cooling needs in urban poor settlements. Female residents and entrepreneurs were primary beneficiaries and problem solvers of these co-created design solutions.

Results

In the framework of the Cities CHALLENGE 2.0, five buildings were selected within an Urban Living Labs' approach for transformative action at the local level.

These buildings that benefit from thermal comfort were mainly Integrated Child Development Scheme (ICDS) centres. Three of those ICDS centres were located in the neighbourhoods of Perumbakkam and Kannagi Nagar in Chennai. The other two were situated in the fast-developing residential suburb Vellalore in Coimbatore.

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ICDS centres are facilities run by the government to promote integrated and holistic child development through care of adolescent girls, pregnant women and newborns as well as teaching facilities for children under the age of six years who are not yet attending a formal school.

First and foremost, the temperature in the respective buildings decreased measurably and noticeably regardless of the outside temperature. The ICDS centres therefore have been well equipped to be used for different activities by different groups throughout the day.

Dynamic mechanisms such as the so-called "Chain Sprocket" system acted as a radiant barrier which delay the heat from entering the building. It functions on the principle of blinds, where all panels get opened and closed simultaneously. Another solution is Rooftop Gardening. Alternatively, discarded PET bottles were filled with water and fixed on the rooftop. The bottles increase the thermal mass of the roof and its ability to store heat for a longer period before letting it seep into the house through the day.

Implementation Partner

cBalance is a knowledge solutions hub that specializes in tool building and strategy development in thermal comfort housing. cBalance builds on their ongoing endeavours of promoting thermal comfort and reducing carbon emissions as well as ecological costs by working with local communities. Their work includes formal field engagements, working model design, and academic partnerships. cBalance has also worked to upgrade the SmartEnergy Building Energy Modelling Software, which will form a heat load simulation tool built for city slum-development engineers. In the future, academia, especially architectural schools will be involved to enhance climate responsive design skills through participatory design workshops for cocreating passive design solutions and enhancing academic curricula.

By promoting energy efficient construction in national, state, and local level government's housing programmes, the national and local level will be included.

Financing

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