Low Energy Cooling and Ventilation for Indian Residences (LECaVIR)

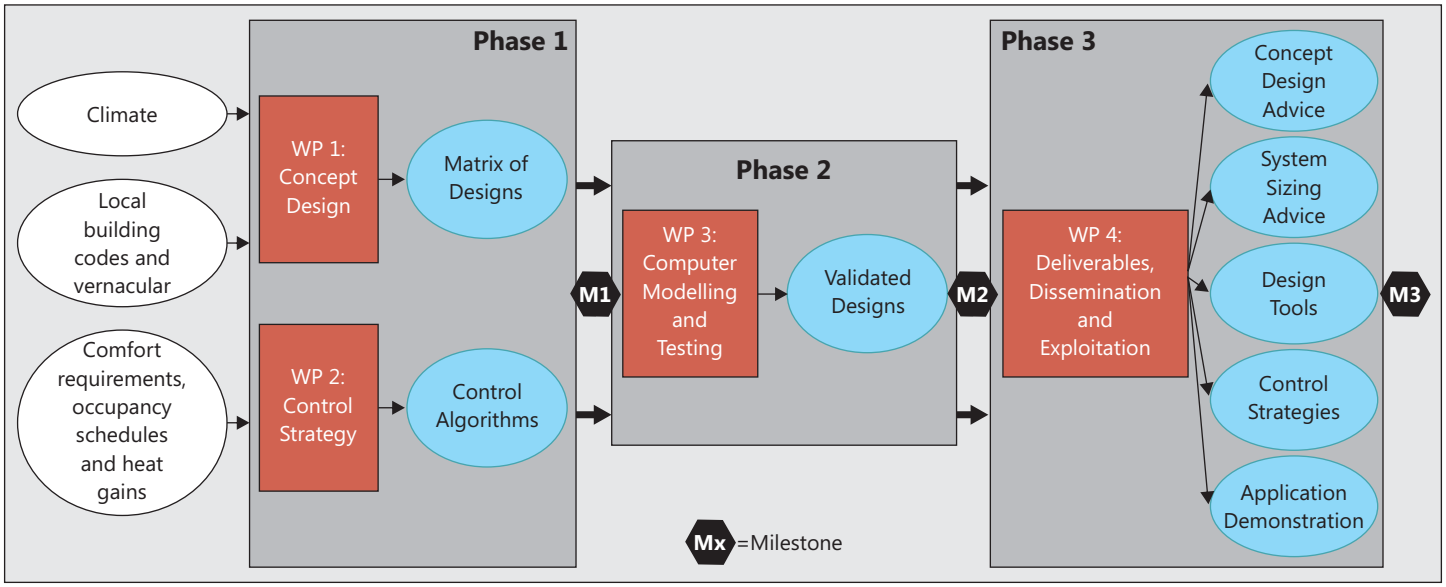
Background

Energy security, climate change and economic growth are matters of international importance which are affecting billions of people globally. One of the most significant global development challenge is how we mitigate against the proliferation of energy intensive air-conditioning (AC) for cooling and ventilation in buildings in response to a globally warming world and the greater expectations for thermal comfort in buildings. This is particularly pertinent in developing countries such as India as disposable income increases, making AC easily accessible. Many of India's most populous metropolises such as Mumbai, Chennai and Calcutta have hot and humid climates, and growth rates in the use of AC is seen at approximately 30% per year. The electricity demand for space cooling comprises up to 60% of the summer peak load in large cities like New Delhi, and most air-conditioners are inefficient and use refrigerants with high GWP (Global Warming Potential). This makes energy efficiency and thermal comfort a priority area for the Indian government which reflects in recent revisions of its National Building and Energy Conservation Building Codes which emphasize the need to design buildings for Natural Ventilation (NV) and Mixed Mode (MM) operation.

About Project

In the next five years (2017-2020) the project focuses towards developing building designs comprising low energy cooling and ventilation technologies that employ smart self-learning control algorithms.

For each climatic zone in India, the project will quantify the period of the year (or day) for which NV is feasible. For other periods such as hot, humid periods, MM solutions, using a combination of NV, low energy cooling and AC systems will



be developed and tested. There is significant scope within this project to work with technologies which are more energy efficient and which use fewer GWP chemicals or eliminate their use altogether. Once the NV and MM strategies are established, the work will focus on developing building energy management systems for controlling these hybrid systems to optimize building energy use. This will involve deciding when to switch between building operation modes, when to start AC systems, and which key variables needs to be controlled. These algorithms will also have self-learning capability which will automatically and continuously improve the operation of a building.

Benefits and Outcomes

There will be three significant outputs from the project:

1) Guidance for developing and sizing low energy cooling and ventilation strategies in residential buildings in India to help architects, engineers and facility managers design and operate buildings.
2) Smart self-learning control algorithms for use in building energy management systems, capable of optimizing energy use in residential buildings
3) Design tools for predicting the likely performance of buildings based on these new strategies which will be used to inform policy directives by encouraging lower energy cooling systems as part of code compliance.

The work undertaken will benefit academics involved in low energy building design, simulation, experimental testing and building physics/controls. The work will also open up new marketing opportunities for manufacturers of control equipment by helping company growth in the residential sector in hot climates, enhancing business revenues and increasing innovation capacity. Energy policy makers will be empowered as a result of the scientific rigor underpinning solutions for low energy cooling and ventilation. This will have a direct impact on society as a result of revised regulations.

R&D Partner

Loughborough University

Funding Agency

EPSRC
Engineering and Physical Sciences Research Council

Project Partners

ASHRAE Western India Chapter

Alliance for an Energy Efficient Economy

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