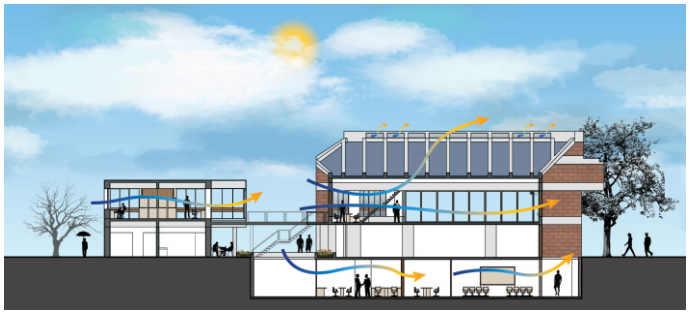
Global Innovation Initiative

Reducing Global Energy Use in Buildings While Improving Occupant Comfort and Well-Being:

Reversing the growing trend toward energy-intensive air-conditioning

The Global Innovation Initiative (GII) was a commitment between the United Kingdom and the United States of America to strengthen research collaboration between universities in the UK, USA, and emerging economies of Brazil, China, India and Indonesia. In consistent with the vision set by the UK Prime Minister David Cameron and USA President Barak Obama in joint statements signed in 2011 and 2012, GII was initially announced in 2013. The two year project (2014-2016) was created to support multilateral higher education research collaborations to address global challenges.

Under GII, grants were awarded to consortia of Universities focusing on interdisciplinary research activities in science, technology, engineering, mathematics and issues of global significance fostering pioneering research and strengthening international partnerships. CEPT University (India) was one of the recipients under this project funded by the British Council along with Loughborough University (UK), UC Berkeley (USA) and De Montfort University (UK). This award presented a prospect to create a difference in global energy demand by influencing international standards and therefore, the national policies, building design and operational practices in various countries.



Overview

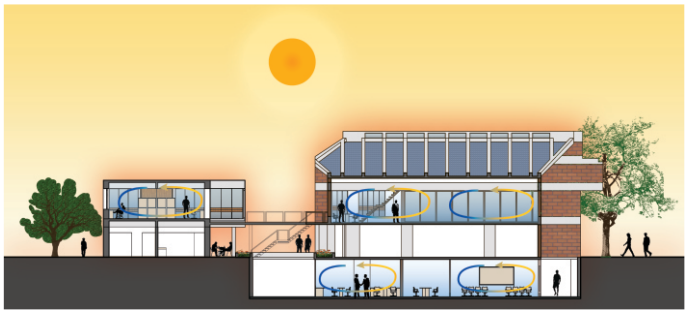
Buildings contribute to greenhouse gas emissions more than the industrial or transportation sectors, primarily due to high energy demand and usage in air conditioning, heating and ventilation, driven by the basic human need for thermal comfort and good indoor air quality.

Aims

- To achieve a better understanding of human thermal comfort in residential and commercial buildings
- To explore opportunities for reducing energy demand through natural ventilation, mixed mode practices and other low energy techniques that provide air movement.

Objectives

- Gather data on thermal conditions, thermal comfort and occupant responses in residential and commercial buildings (mixed mode: where both natural ventilation and air conditioning is used) in UK, US and India, and compile a database.
- Use gathered data and simulated models on thermal comfort/airflow to assess a range of low energy techniques that deliver comfort and energy savings.



- Utilize research outcomes to propose revision of standards on conditions for thermal comfort to reduce the use of energy-intensive cooling, heating and ventilation.

Task Schedule

Task 1 – Data gathering:

- Literature review of existing field studies of mixed-mode residential and commercial buildings was undertaken
- Collected data, identified gaps in surveyed building types and selection of further buildings for survey.

Task 2 – Field work:

- Performed surveys in selected buildings in UK, US, India as required and filled identified gaps
- Shared experience and knowledge on techniques for doing this.

Task 3 – Construct an international database:

- Construct a database using data gathered from tasks 1 and 2 for mixed mode residential and commercial buildings
- Conduct surveys, both quantitative (physical measurements: air and mean radiant temp, % relative humidity, etc) and qualitative (subjective: sensation, comfort, etc.)
- Established thresholds for quality control of data.

Task 4 – Analysis of comfort and adaptation:

- Performed analysis using database to obtain trends in thermal comfort, behavior
- Evaluated current prediction tools (PMV, etc.)
- Convened discussion groups regarding analysis and representation and provided evidence for standards revision.

Task 5 – Modelling and validation:

- Validated by using simulations that predicted comfort, air flows, indoor air quality of existing model for mixed mode residential and commercial buildings surveyed in Task 2
- Assessed low energy techniques for maintaining comfort in UK buildings regarding current and future summer overheating
- Estimated energy savings compared with standard air-conditioning.

Task 6 – Model application:

- Scheduled training course in model usage for team
- Predicted comfort, indoor air quality and energy saving in typical residential and commercial mixed-mode buildings in Indian context
- Quantification of low energy techniques to maintain comfort in India, including energy saving with respect to air-conditioning and identifying techniques with maximum potential.

Task 7 – Scale up:

- Determined building stock composition of a selected Indian region
- Used results of Task 6 to estimate potential energy savings for that region
- Informed local (regional) policy as required.

Task 8 – Informing international standards:

- Combined outcomes from Tasks 1-7 and informed revision of relevant standards with respect to potential of low energy techniques to deliver comfort.

Funding Agency

British Council 'Global Innovation Initiative' Programme

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