teri | Mahindra LIFESPACES

Building A Greener Urban Future

Centre of Excellence

FOR SUSTAINABLE HABITATS

BACKGROUND

India is accelerating on its development path and is at present one of the fastest growing economies in the world. This fast paced growth is resulting in rapid urbanisation, high demand for infrastructure and buildings and thus an increasing demand for energy. The building sector's share in the overall electricity consumption (from utilities) has grown from 15% in the year 1970-71 to 34% in the year 2010-11.

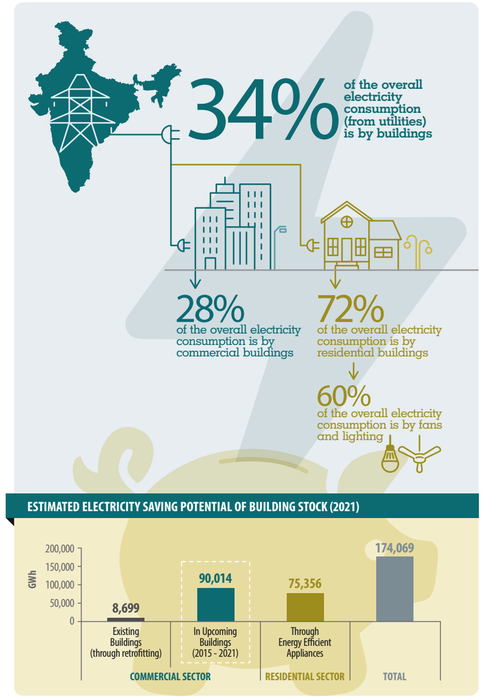
The estimated building stock of India stood at 11,627 mn sqm as of 2011 and is projected to reach 15,374 mn sqm by 2020. This fast paced growth is likely to result in an enormous demand for energy in the future.

The current stock of energy efficient buildings in India is less than 5% of the total building stock.

The real estate sector in India offers a significant opportunity for energy efficiency through the way it designs its buildings and systems, the materials it uses, and the appliances it chooses. The significance of energy efficiency in the built environment has been well established in the last few years. However, adoption continues to be a challenge area.

A majority of the buildings constructed in the country are not responsive to the climate. This insensitivity towards climatic requirements while constructing buildings is resulting in buildings that are guzzlers of energy. The Indian building sector offers a huge potential for energy efficiency and unless this potential is realised, the building sector will emerge as a large energy consumer, posing a serious threat to India's future energy scenario.

It is well established that energy efficiency starts with the building envelope - the physical separator between the interior and the exterior environments of a building. It serves as the outer shell to help maintain the indoor environment (together with mechanical conditioning systems) and facilitates its climate control.



Sources:
(1) RICS Research, Real Estate and Construction Professionals in India by 2020-A demand and supply assessment of specialized skill-sets in built environment, Report November 2011 (2) Residential Consumption of Electricity in India, Background Paper for India: Strategies for Low Carbon Growth, July 2008, The World Bank

The two primary components of energy efficient envelope for buildings are:

1 PENETRATION OF GLARE FREE NATURAL LIGHT

2 EFFECTIVE THERMAL BARRIER BETWEEN INDOOR AND OUTDOOR CONDITIONS

Of various building components, the Building Envelope - walls, roofs, windows and skylight - is responsible for about 25% of all energy use in a building, but can impact up to 42% of Residential use and 57% of Commercial use.

Given the fact that a large quantum of the built environment is yet to be developed in India, it is imperative that rapid advances be made in creating efficient building envelopes. Better fenestration design for glare free daylight, adequate shading to block heat ingress from solar radiation and energy efficient materials and construction technologies for an effective thermal barrier are just some of the areas that research needs to be focussed on.

The CoE has been established at TERI's Gwal Pahari campus in Gurgaon and will be operational from June 2018.

The CoE will focus on providing coherent databases for market ready, scalable and viable materials and technologies through a systems approach. The use of state-of-the-art research techniques, tools and performance measurement solutions like the guarded hot box will help generate performance data and metrics that can provide

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guidelines,

e implementation of energy efficient building stock in India. Research be validated on the field prior to the dissemination of the databases, and standards to the real estate and building materials industry.

RESEARCH ACTIVITIES, OUTCOMES AND OUTREACH

RESEARCH	OUTCOMES
Material Testing & Database Building	Online database of thermo-physical properties of various walling and roofing materials
Performance Evaluation of Opaque Construction Materials	• Online database containing measured and derived thermal properties of construction assemblies • Inputs to the existing building codes by evaluating thermal properties of new & emerging technologies in India. • Inputs to Energy Conservation Building Codes (ECBC) implementation cells in the Centre and States
Performance Evaluation of Integrated Daylight Systems	Guidelines based on design parameters of the daylight systems, orientations and seasonal variations for a building facade in Indian climatic conditions
Modelling the Sky	Development of empirical co-relations of various sky models that can improve simulations suiting Indian sky conditions
Thermal Comfort Studies	Guidelines/templates for selecting building materials for envelope in case of non-air-conditioned buildings
Visual Comfort Studies	• Guidelines for glare indices in buildings • Policy brief on visual comfort for residential buildings • Design guidelines for developers, architects and practitioners

Outreach

Policy briefs for State and Central Ministries

Design Guidelines for Developers, Architects and Practitioners

Online database and plug-in software for simulations through the CoE website

CoE FRAMEWORK

The functioning of the CoE is through a tiered approach to implement, review and ensure deliverables.

The Joint Advisory Committee (JAC) and **Joint Implementation Committee (JIC)** have been formed for seamless functioning and constitutes members from TERI and Mahindra Lifespaces.

The **Technical Advisory Committee (TAC)** has been formed by on-boarding industry leaders/ practitioners who will provide a technical oversight to the CoE's research.

The current members of the TAC are:

Mr. Sandeep Shrivastava
Head Corporate Sustainability and Environment,
Ambuja Cements Limited/ Lafarge

Prof. B.S. Murty
Professor - Department of
Materials Engineering, IIT Madras

Mr. Prashant Kapoor
Principal Industry Specialist, Green Buildings,
IFC Climate Business, Climate Change Group

Mr. Yeshwanth Narendar
Director,
Saint-Gobain Research India

Ravi Sarangan
Executive Director
Edifice Architects

Mr. Arun K Tripathi
Director General of
National Institute of Solar Energy

Subhasis Neogi
Professor - Department of Energy Studies,
Jadhavpur University, Kolkata

Scientia Professor Veena Sahajwalla
Director - SMaRT Centre (Centre for Sustainable Materials Research and Technology)
University of New South Wales, Australia

IMPACT

Mainstream sustainable housing by offering a wide range of indigenous materials that are thermally efficient, scalable and affordable

Influence the building materials industry to develop innovative and sustainable solutions thereby enhancing the green supply chain ecosystem

Reduce the energy footprint of the real estate industry

Building A Greener Urban Future

Mahindra Lifespaces is part of the Mahindra Group and has been at the forefront of transforming urban landscapes by creating sustainable communities.

With sustainability deeply engrained in our culture, green design and healthy living form the foundations of all our projects.

One of the first companies in India to launch the green homes movement, we are also pioneers in voluntarily reporting on our performance metrics with respect to the triple bottom line.

We are actively furthering the cause of sustainable urbanisation, through the development of green residential communities in large urban centres; through the creation of new economic centres of Livelihood-Living-Life and by enabling access to quality housing at affordable prices to a larger section of people.

TERI is an independent research institute and innovator in the energy, environment, climate change and sustainability space, having pioneered conversations and action for over four decades.

Our research, and research based solutions have a transformative impact on industry as well as communities. We have fostered international collaboration on sustainability action by creating a number of platforms and forums. We do this by translating our research into technology products, technical services, policy advisory and outreach.

We have been involved in providing technical consultancy for the design and development of sustainable building complexes. Our rating system for green buildings, GRIHA, has been adopted as India's national rating system, and has helped design hundreds of future-ready buildings that use less resources and give more to the environment.

Mahindra TERI Centre of Excellence for Sustainable Habitats
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