Advancing Buildings Energy Efficiency in India

Background

Shakti Sustainable Energy Foundation (SSEF) was established in 2009 to facilitate India's transition to a sustainable energy future by promoting policies that encourage energy efficiency as well as the increased generation of renewable energy. Energy efficiency is a key component of Shakti's strategy. With support received from SSEF, CEPT University has worked on various projects in the field of energy efficiency.

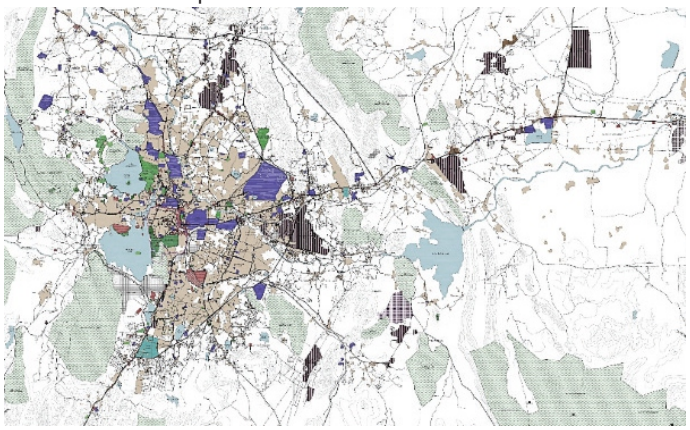
About Projects

Under SSEF, since 2012 following projects have been completed:

1) Impact of ECBC on building energy consumption at city level

CARBSE worked on Impact of Energy Conservation Building Code (ECBC) at city level and quantified energy savings by examining available floor space within the city for six cities i.e. Ahmedabad, Jaipur, Udaipur, Kakinada, Pune and Pimpri Chichwad. CARBSE created prototype model for city level energy conservation prediction by correlating existing building stock, their spatial distribution and land use.

Study aimed to identify future stock of buildings in Ahmedabad and helped the city to better manage their energy supply scenario in a city. It helped the utility company supplying electricity to city of Ahmedabad to co-relate seasonal load variations and causes of peak demand, city level administration to understand impact of ECBC on commercial and residential sectors. Since this study relied more on spatial configurations, it envisaged to help identify opportunities to reduce peak energy demand and also helped to evaluate potential of roof top SPV integration potential. This study became the precursor to city level stock modelling which can be replicated in other cities specially aiming to work towards Smart City title.



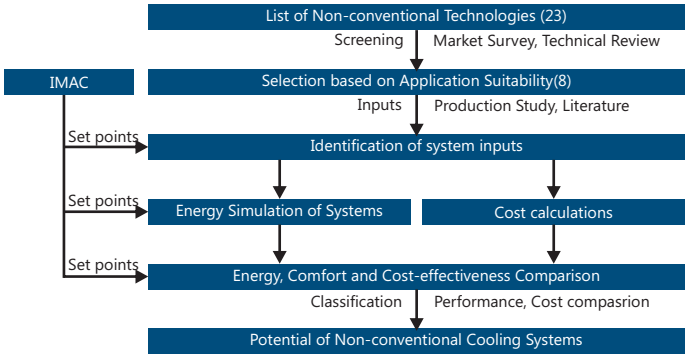
2) Energy Conservation Building Code Road map at state level

CARBSE experts have assisted Urban Management Centre (UMC) to develop road map for Madhya Pradesh. CARBSE have engaged itself in following activities.

- Helped UMC to understand ECBC and its features, shared CARBSE's experience in Gujarat and Maharashtra
- Participated in one to one meetings with Madhya Pradesh State designated agency, local UDDs, Town, and Country planning offices and local academic institutes.
- Supported stake holder workshops in Indore and Bhopal. Assisted in developing state specific road map.

3) Potential Energy Savings using Low Energy Cooling Technologies

The space conditioning systems for buildings were designed based on ISO and ASHRAE thermal comfort standards. These systems often operate at 22.5 ± 1°C (72.5°F ± 1.8°F) around the year without adjusting to comfort needs of the occupants. CEPT thermal comfort model addressed comfort expectations of



Overview of Study Methodology

office workers in naturally ventilated and mixed mode buildings. Deployment of adaptive thermal comfort standard allowed non-conventional, low energy cooling technology. This project identified barriers and challenges on widespread deployment of low energy cooling systems.

4) Floor space and energy savings potential for building sector- case of Ahmedabad

Energy savings by implementation of Energy Conservation Building Code (ECBC) with regards to estimation of floor space at city level had been a challenge. The study attempted to evaluate present floor stock at city level with the help of tax data base. Tax database is a widely used instrument to collect annual property tax within city, which is a reliable source to understand amount of floor space, its associated use, building characteristics and age relying on vintage value of floor space. All Urban Local bodies (ULB's) across India have this mandate of collecting and maintaining property tax database. This methodology was scalable and replicable to other cities in India with accuracy. Implementation of ECBC at State level will save energy, help reduce peak demand and expand market for building energy efficiency related technologies and products.

5) Developing a Tiered approach for ECBC compliance

The objective of this project was to develop a tiered approach to facilitate compliance with the ECBC. In order to achieve this objective, individual ECBC measures were evaluated for energy savings, incremental cost, and ease of enforcement. The findings were peer reviewed and measures were bundled into tiers. Lower tiers- Tier 1 included ECBC measures that were easier for the market to adopted, and were enforced through the current building permit process with high return on investment. This helped to build capacity over time and allowed developers to get experience on the subject matter of building energy efficiency, without reducing stringency of the code. This approach can be enforced more effectively given the current construction and real estate practices. Tier 2 and Tier 3 included additional measures that were more difficult to implement or enforce. As the market gained momentum in these areas, focus was on updating ECBC to achieve higher levels of energy efficiency amongst buildings in India.

6) The Third-party assessor model for ECBC compliance and enforcement

The objective of this project for the period between 2011 to 2013 was to develop a framework for Third Party Assessor (TPA) model to facilitate ECBC compliance and enforcement. In order to develop this framework, various successful TPA models in India and worldwide were studied. Some of these TPA models were related to building energy codes or ratings systems, while others were from the non-building sector, but offered valuable insights towards developing a TPA model for ECBC implementation and enforcement in India.

The proposed framework was based on issues of capacity, finance and administration of a TPA scheme and included roles, scope of work, deliverables, eligibility, examinations and qualifications, quality assurance and financing mechanisms. It defined the relationships between the project teams, TPAs, ULBs, SDAs and BEE, for ECBC compliance and enforcement.

A large stakeholder engagement provided useful feedback for the development of the TPA's role and organizational framework. Some of the benefits of the TPA model are:

- Increasingly popular mode of enforcement of building codes around the world
- Allows easier scale up and down of capacity to handle growth
- Market driven model ensuring availability of TPAs across India
- Adopted in China with substantial success – 80% compliance reported
- Offers a good resolution to challenges related to municipal level regulatory enforcement – used in Canada in similar context
- Over 90% of the US State of Pennsylvania's 2,562 municipalities have enforced the code locally, via employees or certified TPAs
- Building Performance Rating systems with TPAs used in Australia (NABERS) and USA (HERS)
- Proposed cost of the TPA work for ECBC compliance could be less than INR 0.002/kWh of energy saved

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