

Towering Possibilities in India

SCALING UP THE IMPLEMENTATION OF ENERGY CONSERVATION BUILDING CODE ACROSS STATES

How-To-Manual

Contributing Partners

About This Issue Brief

The purpose of this issue brief is to spur action to save climate energy through state-wide ECBC implementation across India as part of the country's domestic goals and international climate targets. The first section of the report provides an overview of ECBC implementation across states with key findings and recommendations. The second section is a "How to Manual" designed for states to implement the ECBC. The issue brief also provides a brief resource guide for stakeholders based on the extensive experience across India in advancing energy efficient buildings.

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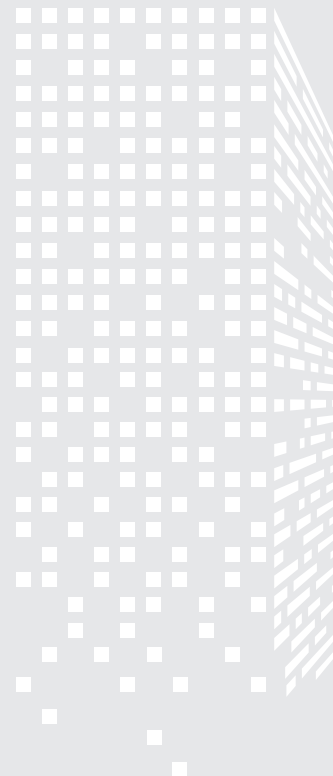
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Executive Summary

Buildings, in India are developing at a rapid pace and are already a major energy consumer. Residential and commercial buildings account for nearly 30% of total electricity consumption today. This share is expected to increase to 48% – nearly half of electricity consumption – by 2042.¹ Advancing energy efficiency in buildings across India's cities is critical to saving energy, increasing energy access, combating pollution, and strengthening prosperity. Constructing more efficient buildings is also a central strategy to achieve India's climate target and is important for the country to meet its targets on reducing cooling loads, a main focus of the India Cooling Action Plan (ICAP) released in March 2019.

Building energy codes are effective tools for achieving energy efficiency in construction and operation of buildings. Working with the state and national government agencies as well as local and international experts, the Ministry of Power's Bureau of Energy Efficiency (BEE) developed the Energy Conservation Building Code (ECBC) for the commercial buildings in 2007 and amended in 2017. Several states and cities have made strong progress in adopting the ECBC, working with leading real estate developers and other stakeholders.

The states of Telangana and Andhra Pradesh, for example, have implemented mandatory codes with an online compliance system. Other states that have notified the code (as of June 2019) include Haryana, Himachal Pradesh, Karnataka, Kerala, Odisha, Puducherry UT, Punjab, Rajasthan, Telangana, Uttar Pradesh, Uttarakhand, West Bengal (Figure 1). Uttar Pradesh and Himachal Pradesh are the only two states that have amended, revised and notified the state code to adopt ECBC 2017. The state of Uttar Pradesh notified the ECBC 2017 version and is enforcing the code by incorporating it in the building bylaws. Himachal Pradesh has become the first state in the country to amend and notify ECBC 2017 & ECBC Rules together and is currently in the process of revising the state by laws to incorporate ECBC Provisions. Most other states are working towards ECBC 2017 adoption and awaiting final approval.

Given India's goals to advance clean energy and achieve its Paris climate targets, it is critical to fast-track construction of energy efficient buildings across the country – an

especially at the state level. Several state-level examples provide a path to expanding ECBC implementation. These examples highlight key steps that a state can take to amend, adopt and ensure compliance with the code. Several agencies and experts have conducted extensive

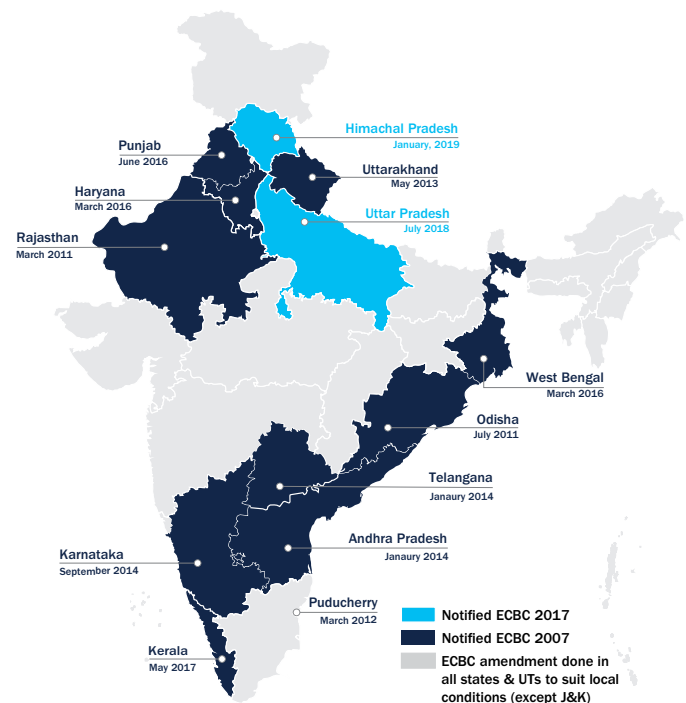


Figure 1 Status of ECBC Notification Across India

Source: BEE and NRDC Analysis

research and documentation of both technical and policy analysis of ECBC.

This issue brief aims to spur action to save energy through state-wide ECBC implementation across India as a part of the country's domestic goals and international targets. The first section of the report provides an overview of ECBC implementation across states with key findings and recommendations. The second section is a "How-to-Manual" designed for states to implement the ECBC. The issue brief also provides a brief resource guide for stakeholders based on the extensive experience across India in advancing energy efficient buildings. The Administrative Staff College of India (ASCI) and the

Natural Resources Defense Council (NRDC) have worked on increasing energy efficiency in India as well as sharing international best practices with real estate developers and the market stakeholders. ASCI and NRDC are knowledge partners to the states of Telangana and Andhra Pradesh in implementing policy while working with business and stakeholder towards market transformation. To determine state progress on ECBC as highlighted in section 2 of the report, ASCI and NRDC used a series of tools including discussions with state leaders and key stakeholders in the region. The research involved detailed discussions with key knowledge partners in several states. In-person meetings where possible, were also conducted with state officials, to gain an in-depth overview of progress and challenges. In addition, online research was conducted to supplement the discussions and meetings.

BOX 1

Steps to Adopt and Implement the Energy Conservation Building Code (ECBC)

- Stakeholder Engagement and Evidence Base
- Mandatory Code Adoption and Technical Steering Committee
- Revision of Building Bylaws and Online Code Compliance Framework
- Local Third-Party Assessors and Capacity Building Resources
- Evaluation

KEY RECOMMENDATIONS

Based on discussions with key state officials, experts and stakeholders, there are five key recommendations for fast-tracking ECBC implementation at the state level in India.

- 1 Timely notification with high-level steering committees.** States that have high levels of political support, such as from the chief secretary, have streamlined ECBC notification and amendment. Steering and technical committees at the state level are effective in guiding the process and ensuring strong decision making, such as in Andhra Pradesh, Telangana, and Uttar Pradesh. *To advance code notification, stakeholders should engage government officials at the highest levels and create steering and technical committees to champion energy efficient buildings and a clean energy future.*
- 2 Clear government agency roles.** States that have clearly identified roles for government agency responsibilities, such as code notification, adoption, implementation, and compliance, have been more successful in advancing energy efficiency. *For each state, stakeholders should map and clearly identify the responsibilities of key government agencies, including state and city level divisions of urban development department, the energy department, and the municipal corporations.*
- 3 Strengthen real estate developer engagement.** States with deep involvement with real estate developers have been the most successful in advancing energy efficient buildings. Stakeholders should strengthen engagement with real estate developers at each step, including formal consultations, steering committees, peer-to-peer education, case studies, and more. *To accelerate code adoption, stakeholders should deepen engagement with real estate developers by coordinating with the national, state and local real estate developer associations to develop a set of state-specific activities towards advancing energy efficient buildings.*
- 4 Deepen capacity building for local experts.** States that have effectively developed supportive ecosystems have created customized training programs on building energy efficiency with local architects, engineers and other experts. Specifically, training and materials to support code implementation and enforcement systems are critical to the compliance infrastructure. *Working with BEE and others, stakeholders should develop programs to increase capacity among local architects, engineers and builders to support energy efficient buildings in their state.*
- 5 Expand online compliance tools for building permissions.** Several states, such as Gujarat, Haryana, Madhya Pradesh, Kerala, Jharkhand, Uttar Pradesh, Maharashtra and Rajasthan, are in the process of adopting online building compliance tools. Including energy efficiency certification as a requirement of the online application prior to receiving building permissions is an effective method to ensuring compliance. Online compliance systems also make it simpler for developers to complete building applications and for local governments to track project development. Hyderabad is an example of a city that has fully implemented an online compliance system and the states of Telangana and Andhra Pradesh are working toward expanding online systems throughout the state. *To advance efficient buildings, stakeholders should work with the states and software companies developing the online government platforms for building permissions to integrate energy efficiency as a required component.*

Introduction

With rapid urbanization, India's real estate market is growing exponentially. Residential and commercial buildings account for nearly 30% of total electricity consumption today. This share is expected to increase to 48% – nearly half of electricity consumption – by 2042.² By 2025, nearly half of India's population, an estimated 543 million people, will live in cities.³ India's power demand is also projected to quadruple by 2050 due to economic growth, rising population, and increasing air conditioning use.⁴ Investing in energy efficiency across India's urban areas is thus, essential to saving energy while meeting the demands of the growing building market, reducing air pollution, and combating climate change.

India's gross electricity demand is projected to reach 5,271 terawatt-hour (TWh) by 2050, from 1,369 TWh in 2018.⁵ Energy efficiency is also one of the fastest, cleanest, and cheapest ways, to not only address India's energy demand, but to also save costs, improve thermal comfort, and spur economic growth in the Indian context. Energy efficiency is also a key part of India's efforts to combat climate change.

Constructing more efficient buildings is a good way to meet one of India's climate targets under the Paris agreement – to reduce emissions of its gross domestic product by 33% to 35% from 2005 levels by the year 2030. Buildings that comply with the Energy Conservation

Building Code (ECBC) are also important to achieve the goals of reducing cooling demand in the India Cooling Action Plan (ICAP).⁶

With this rising need for energy efficiency, building energy codes are effective tools for ensuring energy efficiency in construction and operation of buildings. In 2001, the Indian Parliament passed the Energy Conservation Act, establishing India's Bureau of Energy Efficiency (BEE) as the nodal institution to spearhead energy conservation policies.

BEE developed the ECBC for commercial buildings in 2007 and amended it later in 2017 in consultation with the state and national government agencies, as well as, local and international experts. The ECBC sets minimum efficiency standards for new commercial buildings and is a model for the states to modify, adopt, and implement the code as a state law. The ECBC has the potential to transform the way buildings are constructed and to unleash significant energy savings, if effectively implemented by the states working with state SDAs, ULBs, real estate developers and other stakeholders.

Several states and cities have made strong progress in adopting the ECBC, working with state SDAs, ULBs, real estate developers and other stakeholders. There is now an opportunity to fast track the progress made so far and

BOX 2

India Cooling Action Plan and Building Energy Efficiency

Keeping it cool is a priority with India's fast and rapidly urbanizing economy and growing cooling demand. Recognizing this growth trend, the Government of India launched the India Cooling Action Plan in March 2019 as a bold response to addressing future cooling needs while reducing climate impacts.⁷

Led by the Ministry of Environment, Forests and Climate Change (MOEFCC), the ICAP aims to meet India's rapidly growing cooling needs across sectors while addressing climate action needs. The ICAP looks at the cooling demand comprehensively, both from end-use sectors perspective, such as space cooling, transport, and cold chain. It also includes the perspective of managing this demand through better cooling equipment, servicing, and R&D. The ICAP aims to reduce cooling demand across sectors by 20% to 25% by 2038, reduce refrigerant demand by 25% to 30% by 2038, and reduce cooling energy requirements by 25% to 40% by 2038.

Among the sectors highlighted in the ICAP, the Indian government expects that space cooling will make up 70-80% of India's cooling energy demand by mid-century. The ICAP emphasizes the potential of achieving additional reductions in cooling energy demand through climate-appropriate building envelopes driven by a higher adoption of ECBC in the upcoming commercial buildings.

Among other strategies highlighted in the ICAP, reducing cooling energy demand is key to implementing the ICAP. The ICAP proposes an approach that first reduces the cooling energy demand through climate appropriate and energy efficient building design, and low-cost strategies such as cool roofs. The ICAP further recommends that the energy demand should be met by energy efficient appliances; and finally, through appropriate building controls that optimizes this demand through demand-side and user adaptation strategies, such as adaptive thermal comfort. Thus, a nationwide implementation of ECBC would ensure cooling demand reduction and create a stock of climate friendly buildings.

scale up the implementation of the ECBC. This can be done by addressing the barriers and tapping on the lessons offered by successful implementation of the code by states in the country.

SECTION 1: **Progress on ECBC Implementation in India**

1.1 INDIA'S ENERGY CONSERVATION BUILDING CODE

The ECBC incorporates minimum requirements for energy efficient design and construction of commercial buildings and their systems. BEE enacted the ECBC in 2007 with a set of minimum energy standards for commercial buildings with a connected load of 100-kilowatt (kW) or greater, or a contract demand of 120 kilovolt amps (kVA) or higher.⁸ As per BEE estimates ECBC 2007 compliant buildings could potentially use 40% less energy than a conventional building.⁹ Based on scenarios (high, medium, and low) for code compliance, NRDC and ASCI analysis highlights that with a combination of ECBC compliance and voluntary

rating programs, India can potentially save more than 3,000 TWh of cumulative electricity by 2030.¹⁰ In 2017, BEE updated the ECBC in order to revise and incorporate advancements in building technology, market changes, and energy demand scenario of the country.¹¹ The ECBC 2017 set the minimum energy standards for commercial buildings with a connected load of 100-kilowatt (kW) or greater, or a contract demand of 120 kilovolt amps (kVA) or higher. There are three levels of energy efficiency levels associated with the 2017 code – ECBC, ECBC+, and SuperECBC. ECBC is intended to be the mandatory performance level, whereas the latter two are voluntary. The mandatory ECBC level uses 25% less energy than a non-compliant building, ECBC+ uses 35% less energy, and SuperECBC uses half the energy of a typical building.

The code is structured to encourage states to achieve more than the minimum ECBC standard. There are two approaches for compliance – the prescriptive method and the whole building performance method – that have remained relatively similar between the 2007 and 2017 versions. The state and local agencies, Urban Development Departments (UDDs), and Urban Local Bodies (ULBs) are responsible for implementing and enforcing the code.

BOX 3

Energy Efficiency and Building Rating Programs

Energy Efficiency Programs

Several government and private programs exist to advance building efficiency in India. Yet, as India's real estate market continues to grow, the current policy needs to be further developed and implemented by all efficiency stakeholders, in a coordinated way.

National Building Code

The National Building Code (NBC) of India is a comprehensive building code that provides guidelines for regulating construction activities. It serves as a model code for adoption by all agencies involved in building construction. The NBC contains administrative regulations and general building requirements as well as requirements for materials, structural design and construction, and building and plumbing services. Bureau of Indian Standards (BIS) has been working to release Amendment No 1 to the National Building Code of India 2005 (NBC 2005) that introduces a new Part 11 – Approach to Sustainability in the National Building Code. The objective of the new addition, released in 2017, to NBC 2005 is to create buildings and a built environment which advance sustainability as a way of life and necessary tool for all buildings.¹²

National Mission for Sustainable Habitat

The National Mission for Sustainable Habitat is one of the eight missions under the National Action Plan on Climate Change. The mission promotes sustainable cities including energy-efficient buildings and local government adoption of ECBC, and other efficiency measures. The program has been working to transform the design of new construction and major retrofits of commercial and high-rise residential buildings to optimize their energy efficiency.¹³

Building Rating Programs

Leadership in Energy and Environmental Design (LEED)

LEED is an internationally recognized green building rating system.¹⁴ LEED verifies that a building was designed and built using improved performance strategies, including energy savings, water efficiency, and carbon dioxide emissions reduction. LEED India is the localized version of the international rating system and was administered by the Indian Green Building Council (IGBC). Since July 2014, the Green Business Certification Inc (GBCI) administers the LEED certifications in India. A 2018 survey by the US Green Building Council of the top 10 countries for LEED certified buildings highlights that India ranks third for the most

number of LEED buildings. India has more than 899 LEED-certified projects totaling over 24.82 million gross square meters of space, ranks third.¹⁵

Indian Green Building Council (IGBC)'s Green Building Rating Systems

The IGBC, part of the Confederation of Indian Industry (CII) was formed in the year 2001. The vision of the council is, "To enable a sustainable built environment for all and facilitate India to be one of the global leaders in the sustainable built environment by 2025."

The council offers a wide array of services which include developing new green building rating programmes, certification services and green building training programmes. With a modest beginning of 20,000 sq.ft. green built-up area in the country in the year 2003, today (as on 31 July 2019) more than 5,409 Green Buildings projects coming up with a footprint of over 6.92 Billion sq.ft are registered with the Indian Green Building Council (IGBC), out of which 1797 Green Building projects are certified and fully functional in India. Today all types of buildings are going the Green way- Government, IT Parks, Offices, Residential, Banks, Airports, Convention Centre, Institutions, Hospitals, Hotels, Factories, SEZs, Townships, Schools, Metros etc. And IGBC offers specific rating systems for almost all of these.¹⁶

Green Rating for Integrated Habitat Assessment (GRIHA)

Green Rating for Integrated Habitat Assessment (GRIHA) Council is an independent, not-for-profit society jointly setup by The Energy and Resources Institute (TERI) and the Ministry of New and Renewable Energy (MNRE), Government of India to promote and administer green buildings in India. GRIHA was adopted as the National Rating System for Green Buildings in India by the Ministry of New and

Renewable Energy (MNRE), Government of India in 2007. GRIHA has been acknowledged as the tool to evaluate reduction in emission intensity through habitats, as part of mitigation strategy for combating climate change in INDIA's "Nationally Determined Contributions" (NDCs) submitted to UNFCCC. GRIHA rating works on the underlying principle of "What gets measured gets managed"

ECBC compliance is mandatory for all GRIHA compliant building since 2007. GRIHA offers rating for all types of building including existing as well as new building. It unifies multiple national and state level codes & norms such as NBC, ECBC, CPCB, CGWB into a simple set of criteria. In 2009, GRIHA 3 star rating was made mandatory for all central government buildings. Many state governments have announced benefits such as FAR, premium rebate, property tax rebate, fast track Environment Clearance (EC) etc. for adopting the GRIHA rating.

BEE Buildings Star Rating System

BEE has a star rating program based on the performance of a building in terms of its specific energy usage in kWh/sq m/year.¹⁹ The program rates buildings (office buildings, shopping malls, hotels, hospitals, and IT parks) on a one-to-five-star scale, with five stars indicating the highest efficiency. The rating considers operational characteristics that define building use, hours of operation, climatic zone, and conditioned space. It allows comparison to a peer group representing buildings with similar primary function and operating characteristics.

With growing adoption of green building movement in India. Streamlining ECBC adoption through these rating implementation agencies provides a wider scope of implementation. Also rating bodies can act as an evaluation bodies for ECBC implementation.

BOX 4

Role of Real Estate Developers

Real estate developers are critical to achieving energy efficiency in the Indian market. Adopting and implementing codes in partnership with leading real estate developer groups is essential to the success of ECBC implementation. Key actions can be taken to incentivize and support widespread adoption of energy efficiency measures that will save energy costs and reduce emissions for decades. The figure below shows the spectrum of real estate developers in the market who require unique incentives.

Some builders are "champions" and have taken advantage of energy efficiency benefits, while others are part of the "unorganized sector" and lack the resources and financial incentives to adopt efficient building practices on their own. Implementing building energy codes and programs along with suitable incentives can potentially encourage developers to adopt energy saving practices.

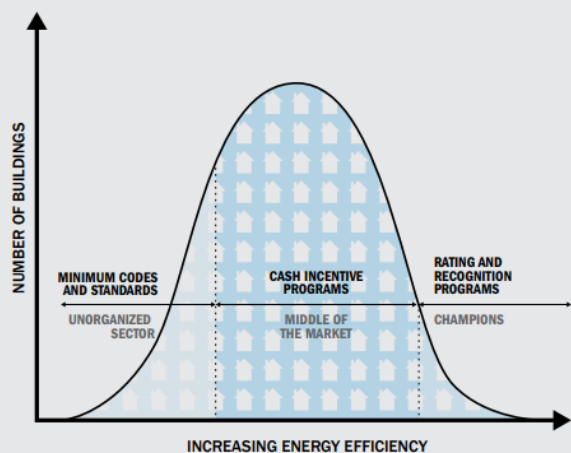


Figure 2 Indian Buildings Market Sectors: Segments of the Real Estate and Example Strategies to Motivate Each Towards Greater Adoption of Energy Efficiency

Source: NRDC (2014), *Building Efficient Cities: Strengthening the Indian Real Estate Market Through Codes and Incentives* and P Vaidya et al. (2010).²⁰

Roles and Responsibilities: ECBC Adoption, Implementation, and Enforcement

National Level

- **ECBC Development & Update:** The national government is responsible for developing the code with BEE as the lead agency.
- **Integration of ECBC provision in building bylaws:** Ministry of Housing & Urban Affairs is responsible for integrating ECBC provisions into model building bye laws.

State and City Level

- **Code Notification:** The Department of Energy or Urban Development Department facilitates the code notification.
- **Code Amendment:** The state energy department is responsible for amending codes into state law.
- **Inclusion in Building Bylaws:** The Urban Development Department is responsible for amending Town and Country Planning (TCP) rules and regulation and building bylaws to incorporate ECBC provisions.
- **Code enforcement:** The local city government, including the municipal corporations, is responsible for implementation and leads the revision of the city level building bylaws.

Supportive Stakeholders

- **State Designated Agency (SDA):** Constituted at every state by BEE under the provisions of the EC Act, SDAs support in code amendment and notification. SDAs have been set up under the energy department in most states.
- **ECBC Cells:** Created in each SDA by BEE, ECBC cells function as knowledge partners to the state government and provide technical training and capacity building, and communication support.
- **Architect, MEP (Mechanical, Electrical, and Plumbing) Consultant, Energy Consultants:** They provide services to developers on building design and construction as per the ECBC.
- **Real Estate Developers:** They undertake the actual adoption and implementation of the code while constructing the building. ECBC implementation has been progressive in states with greater buy in from developers such as Telangana.

1.2 PROGRESS ON ECBC IMPLEMENTATION

Many states are working with stakeholders to implement the ECBC and to scale building efficiency measures for new construction and major retrofits. Yet, more action is needed at the state level, especially in updating state laws with the ECBC 2017 and compliance systems.

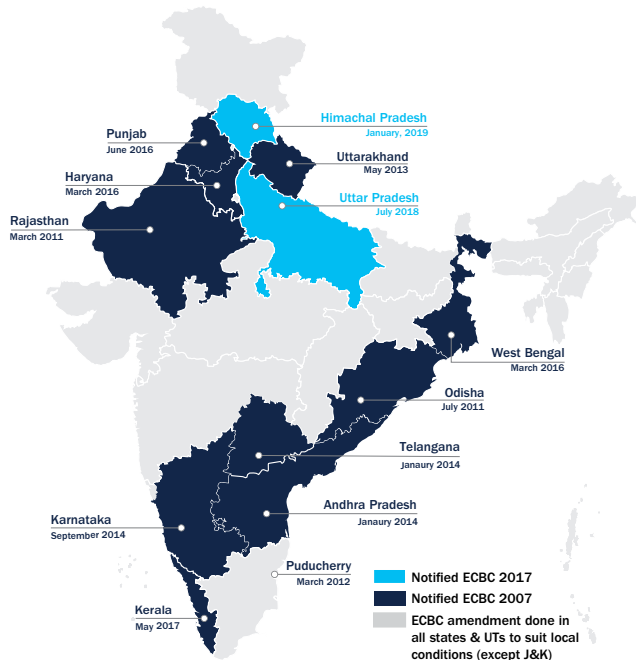


Figure 3 Status of ECBC Notification Across India
Source: BEE and NRDC Analysis

→ Andaman & Nicobar Islands

Andaman & Nicobar is in the final stages of notifying ECBC 2017 (to be notified by September 2019). The UT of Andaman & Nicobar Islands is partnering with BEE on workshops for state officials, architects and real estate developers. The NRSE division of Electricity Department is the SDA working with All India Institute of Local Self Government (AIIISG) as the main knowledge partner in the ECBC cell

→ Andhra Pradesh

Andhra Pradesh has notified and implemented the ECBC 2007 and is in the process of updating the state code to the ECBC 2017 version. Andhra Pradesh included the ECBC 2007 in the state bylaws through the building rules. The state also has a robust training program with BEE and state agencies conducting training and awareness programs. The state has also empaneled 34 third party assessors (TPAs) for the code compliance system.

Andhra Pradesh is also one of the leading states with a full code compliant. This system was developed with real estate developers and other stakeholders and incorporates ECBC compliance as part of the overall building permission system through either online or paper applications. With the new compliance systems, three buildings have been approved as ECBC design compliant.

Led by the Principal Secretary, the Department of Urban Development and the Department of Energy along with ASCI as member formed a formal technical committee to guide implementation of ECBC in the state. The SDA for the state is the State Energy Conservation Mission (SECM). ASCI and NRDC are the main knowledge partners working on policy development and implementation with the state. The ECBC cell is established by ASCI.

→ Assam

Assam is moving towards adoption of the ECBC 2017 with code amendments and plans for its notification. The Assam draft code is currently under public review and comment. While the state adopted some energy efficiency measures from the ECBC 2007, the state did not formally notify the code.

To promote wider adoption of ECBC, Assam is conducting training and awareness programs with BEE. The state is yet to incorporate the code into the state bylaws or develop a compliance system.

The state plans to form technical and policy committees with urban local bodies. These committees will decide the roles and responsibilities of different stakeholders, as well as, discuss how the code is integrated into the building bylaws. The Assam State Designated Authority is the Assam Energy Development Agency. The AIILSG is the main knowledge partner working in the ECBC cell on policy development and implementation with the state.

→ Bihar

Bihar is moving toward adoption of the ECBC 2017 with a draft amended building code that is awaiting approval by the Bihar State Energy Department. While the state adopted some energy efficiency measures, the state did not formally notify ECBC 2007.

Bihar is working with BEE's building energy auditor program to develop a statewide program. The state is currently piloting the system in Patna and is planning to expand it to other cities in the state. Bihar also has training and awareness building programs focusing on the government departments. The SDA is also working on programs with academic institutions to include ECBC in architectural courses.

The Bihar Renewable Energy Development Agency (BREDA) is the SDA, with the Global Evolutionary Energy Design (GEED) as the main knowledge partner in the ECBC cell working with the state.

→ Chhattisgarh

Chhattisgarh has taken steps towards ECBC 2017 notification with a draft code under public review

and comment. While the state adopted some energy efficiency measures, the state did not formally notify ECBC 2007.

Chhattisgarh expects to notify ECBC 2017 by the end of 2019. The state is partnering with BEE on workshops for state officials, architects and real estate developers. The state has yet to incorporate the code into the state bylaws or develop a compliance system. The Chhattisgarh State Renewable Energy Development Agency is the SDA working with All India Institute of Local Self Government (AIILSG) as the main knowledge partner in the ECBC cell.

→ New Delhi

New Delhi has an amended building code, based on ECBC 2017, that is currently under public review and comment. While the state adopted some energy efficiency measures, the state did not formally notify ECBC 2007.

The SDA is the Energy Efficiency & Renewable Energy Management Centre (EEREMC) with Ela Green Consultants as the main knowledge partner. The state is also working with an IT partner to introduce the online building compliance system.

→ Gujarat

Gujarat is moving towards the adoption of ECBC 2017 with an amended building code that is awaiting approval from the Gujarat Urban Development Department. While the state adopted some energy efficiency measures, the state did not formally notify ECBC 2007.

Working with BEE, Gujarat has conducted extensive training and awareness programs on the ECBC. Leading academic institutions, including CEPT University and Mahila SEWA Housing Trust, have robust programs on energy efficiency technologies and cool roofs. Leading cities, such as Ahmedabad and Surat, have active real estate developer groups championing building energy efficiency.

The Gujarat Energy Development Agency (GEDA) is the SDA with PriceWaterhouse Coopers (PwC), CEPT University and others as knowledge partners. The state is also working with an IT partner to introduce the online building compliance system in the state, which can potentially incorporate ECBC, once it is notified.

→ Haryana

Haryana notified the ECBC 2007 and is in the process of updating the state code to incorporate ECBC 2017. The state is moving towards adoption of ECBC 2017, with a draft amended to the building code awaiting approval. Until the new approval is passed, the state will continue to implement the existing code.

The SDA is the Haryana Department of New & Renewable Energy with GreenTree Global as the main knowledge partner in the ECBC cell.

→ Himachal Pradesh

Himachal Pradesh is the leading state in the country that has notified the ECBC 2017 as well as ECBC rules and is working towards its implementation in the state.

In terms of inclusion in the bylaws, Himachal Pradesh's Town and Country Planning Department is planning to incorporate the ECBC into the Town and Country Planning Rules. The Directorate of Energy (DoE) is the SDA with Global Evolutionary Energy Design (New Delhi) as the knowledge partner. The SDA has conducted more than 25 workshops on ECBC awareness and trainings across the State. Additional programs are also planned for 2019-2020.

The Himachal Pradesh Town & Country Planning Department is also working to incorporate ECBC provisions in their Online building approval system in the state along with intensive capacity building of stakeholders on HPECBC& Rules 2018 once it is incorporated in the TCP Bylaws.

In addition, the state level ECBC implementation committee has also been notified, which is chaired by Hon'ble Chief Secretary to Government of Himachal Pradesh to look after the effective implementation of the code in the state.

→ Karnataka

Karnataka adopted and worked to implement the ECBC 2007. The state has amended the building code with ECBC 2017 and is working to notify the revised code.

In 2016, the state revised the Schedule of Rates (SoR) to include energy and efficient materials and technologies. In the same year, ULB's building bylaws incorporated ECBC provisions. Since 2017, the state has been undertaking awareness and training programs conducted by BEE for implementation of the code.

The state has formed an implementation committee for the code. The Karnataka Renewable Energy Development Limited (KREDL) is the SDA and The Energy and Resources Institute (TERI) is the main knowledge partner.

→ Kerala

Kerala notified the ECBC 2007 and has amended its building code to the ECBC 2017 with plans to notify the revised code by the end of 2019.

The state is developing an online compliance system with an IT partner, building the entire online building permission system, and replicating the Telangana model of third-party assessors. The state also has ongoing training and awareness building workshops through ECBC cells (knowledge partners). Kerala has formed committees focused on ECBC implementation.

The Energy Management Center is the SDA with Ela Green Consultants as the main knowledge partner in the ECBC cell. The state also working with an IT partner on designing an online building compliance system for the state.

→ Maharashtra

Maharashtra is moving toward adoption of ECBC 2017 with a draft amended building code that is undergoing public comment and review. While the state adopted some energy efficiency measures, the state did not formally notify ECBC 2007.

The state is developing an implementation strategy with key real estate developers. BEE and other state level agencies are conducting training and awareness programs.

Maharashtra Energy Development Agency (MEDA) is the SDA with PWC as the main knowledge partner.

→ Punjab

Punjab is moving towards adoption of ECBC 2017 with a draft amended building code awaiting approval by inter-department committee set up in the state for code adoption and notification. While the state adopted some energy efficiency measures, the state did not formally notify ECBC 2007.

To develop a compliance system, the state has issued a tender to empanel third party assessors and has a program for capacity building on energy efficiency among stakeholders. Punjab has formed state level committees to advance implementation of the ECBC. The Punjab Energy Development Agency (PEDA) is the SDA with Ela Green as the main knowledge partner.

→ Rajasthan

Rajasthan notified the ECBC 2007 and has amended its building code to the ECBC 2017 with plans to notify it in 2019. Rajasthan has a compliance system for the state accounting for the majority of the buildings in the state. BEE is conducting training and awareness programs to implement the ECBC. The state has also created implementation committee to drive ECBC implementation.

The Rajasthan Renewable Energy Corporation Limited (RRECL) is the SDA with Ela Green as the main knowledge partners and MNIT as a research partner. The state also working with an IT partner on designing an online building compliance system for the state.

→ Tamil Nadu

Tamil Nadu is moving toward adoption of ECBC 2017 with a draft amended building code that is awaiting approval from the Empowered and Technical Committees. While the state adopted some energy efficiency measures, the state did not formally notify ECBC 2007.

The state is working with BEE to conduct training and awareness programs to implement the ECBC. Leading real estate developers in the state, especially in Chennai, are championing energy efficiency measures.

Tamil Nadu formed a Technical and Empowered Committee to implement the ECBC. The Electrical Inspectorate Department is the SDA with Ela Green as the main knowledge partner. The state also working with an IT partner on designing an online building compliance system for the state.

→ Telangana

Telangana was one of the first states to notify and implement the ECBC 2007. The state has a revised draft of the code as per ECBC 2017 and plans to notify an amended version of the ECBC 2017 by the end of 2019.

Led by the Principal Secretary, the Municipal Administration and Urban Development Department in the state launched a statewide compliance system piloted in Hyderabad in 2016, including incorporation into the online building permission system developed by Softech. BEE and state agencies, with ASCI, conducted training and awareness programs with over 90 TPAs empaneled under the state program.

Leading real estate developers are active in advancing energy efficiency in the state. The state is working with ASCI and NRDC to build awareness and buy-in among the real estate developers and strengthen the case for compliance. The state, working with ASCI supported by BEE and UNDP, has also trained and certified more than 400 MEP consultants, architects, and civil, electrical, and mechanical engineers to support ECBC compliance and implementation.

The state has a steering and technical committee to guide implementation. The Telangana State Renewable Energy Development Corporation (TSREDCO) is the SDA with ASCI, NRDC, and IIIT as the main knowledge partners. It also has key programs

with the CII-IGBC. The ECBC Cell is established by ASCI with BEE's support. More than 100 buildings in the state are ECBC design compliant, according to state officials.

→ Uttarakhand

Uttarakhand is one of the pioneer states which has notified and implemented the ECBC 2007. The state has prepared the code as per ECBC 2017 and has circulated the same for stakeholders' feedback. The notification of new code through cabinet is expected to complete by end of 2019.

The proper compliance system with issuance of NOC by SDA is in place since July 2018. Uttarakhand Renewable Energy Development Agency (UREDA) as a nodal agency of the state is verifying the applications with respect to ECBC compliances and issuing the NOC to building projects. Till now 7 building projects have been issued preliminary NOC to projects coming from Haridwar-Roorkee Development Authority (HRDA). ULBs like Mussoorie Dehradun Development Authority (MDDA) and others are also in process of incorporating the ECBC compliance in their formats.

The state has technical committee for code development and modifications. UREDA is the SDA and ECBC Cell is established by GreenTree Global with BEE's support.

→ Uttar Pradesh

Uttar Pradesh is moving toward adoption of ECBC 2017 with the amended UPECBC 2017 notified in July 2018. The state is actively pursuing the implementation of the ECBC and incorporated the code in building bylaws in October 2018.

In UP, the code is being implemented through the state development authorities. With BEE, the state has trained all 27 development authorities on ECBC.



U.P. Electricity Regulatory Commission Building in Lucknow, ECBC Compliant and GRIHA 5 star rated

In addition, the real estate developers and architects were also sensitized through workshops. ECBC has also been incorporated in the online building compliance system. More than 120 buildings under construction in the state are design compliant.

The implementation process consists of the developer submitting a self-declaration of the building to be constructed as per ECBC rules, while submitting the building map for approval to the development authority. This is also accompanied by a declaration by the building architect that the building map incorporates ECBC and will be constructed as per the ECBC rules. Post this, when the building is completed, ECBC consultants empaneled by BEE undertake a site visit for inspection of the building to check for ECBC compliance. If the building is compliant, an ECBC certificate is then issued. A model ECBC compliant building – the UP Regulatory Commission building which is ECBC-Super compliant, was also developed in the state.

The Uttar Pradesh New & Renewable Energy Development Agency (UPNEDA) is the SDA with GreenTree Global as the main knowledge partner.

1.3 KEY FINDINGS AND RECOMMENDATIONS

Based on discussions with key state officials, experts, and stakeholders on the experience of implementing the ECBC across states, there are several important findings and recommendations. These mostly relate to notification, implementation and compliance, and available capacities in terms of knowledge and staffing.

Timely notification of the code is important to fast track ECBC implementation: Notification of the ECBC was highlighted as the most important and primary step in implementation of the code. Many states held back on implementation plans and discussions because of delayed notification. One of the main barriers to code notification is lack of awareness on the code among the government departments. Complex requirements of inter-departmental coordination with government bodies (confusion on primary responsibility of code compliance on state urban department or energy department) is also challenging. States where there was timely notification of the code, witnessed fast tracked amendment and implementation such as Andhra Pradesh, Telangana and Uttar Pradesh.

States highlighted that one of the ways of overcoming this primary barrier is to undertake steps to raise the political will. Showcasing successful examples of code implementation and energy savings can influence the higher authorities in the state.

Identifying clear roles for compliance and enforcement: Most states have now amended the code and have drafts of state ECBC ready as per the ECBC 2017. The ECBC cells set up by BEE in each state played an important role in bringing the technical knowledge and support for having the code amended. However, there still seems to be confusion in some states as to which agencies or departments are responsible for implementation and to what extent the code will be implemented. In some states, engaging the ULBs has been challenging and they haven't been proactive about ECBC. A way of overcoming this barrier, highlighted by the stakeholders was listing of clear roles and responsibilities of key government stakeholders including various state and city level divisions of urban development department (UDD), the energy department, among others.

Limited resources and capacity of the SDAs, and their lack of focus on energy efficiency have been continuing challenges slowing the implementation of ECBC. It is important to strengthen the SDAs and in parallel, look for other models of implementation to support the SDAs, such as the third-party assessors' model for larger scale implementation. Strengthening the ECBC cells and ensuring representation from both the SDA and UDD divisions is another way of complementing the institutional structures for ensuring compliance and enforcement.

Ensuring real estate developer buy-in: Concerns about cost escalations for complying with even the most basic requirements of ECBC, continued to be a barrier from real estate developer's perspective. Hence, there is some resistance and lobbying against the notification of the code by the developers. Developers prefer locally sourced material because it helps reduce their costs. At the same time, these are also seen as a barrier, since their availability is at times constrained. However, the availability of locally sourced materials is increasingly improving. Developers also want better incentives because energy efficiency measures mainly benefit the end users/ building occupants. Some of the recommended ways of ensuring developer buy-in include:

- *Create a state/city level real estate developer network that initiates peer-to-peer education; collaborates with state and local governments to develop code adoption; engages with financial institutions to design products for energy-efficient building construction; and works with civil society groups and academic institutions to build awareness within the developer community to simplify ECBC compliance and rating systems.*
- *Produce case studies to promote the benefits of energy efficiency for businesses. By understanding the business case and best practices, real estate networks can identify and then publicize through their member base the top five cost-effective efficiency measures*

that are both simple and workable for building owners. Similarly, working with suppliers to show the huge market opportunity which an enforced ECBC would bring in.

- *Create regulatory incentives and recognition programs* to promote efficiency measures adoption by developers. Developers can work with the government to introduce such beneficial incentives as expedited and transparent clearance of energy-efficient projects
- *Work with efficiency equipment vendors and manufacturer* associations to increase access and awareness of efficiency products as a part of the energy efficiency supply chain. Increased vendor activity can further incentivize real estate investment in green buildings.

Creating a resource pool of experts and building local capacity: The need for training and capacity building on implementation of ECBC in states is two-fold. The first is related to creation of a resource pool of local experts to support the SDAs in verifying and monitoring compliance (these are the pool of ECBC trained architects, building experts etc.). The second need is related to training and capacity building of representatives of government departments and real estate developers to facilitate understanding of ECBC and ensure buy-in.

Customized capacity building programs for different stakeholders such as senior bureaucrats, government officials representing different departments of UDD and energy, as well as those for real estate developers (through real estate developers associations) need to be developed and undertaken on a continuous basis.

For creation of a robust local-level pool of experts, certification programs for practicing architects and engineers need to be designed. Given the expected real estate growth, the demand for such professionals will grow manifold. It is thus important to think of ways of bringing such programs to scale and develop, for example, regional level certification program. Inclusion of ECBC in the curriculum of architectural and engineering courses (already being done in some states, for example in Telangana and Bihar) is yet another way of creating the resource pool of experts. BEE's upcoming certification program on building energy auditor will also address large part of this need, especially in smaller states.

Promoting a greater adoption of online compliance tools: Several states such as Gujarat, Haryana, Madhya Pradesh, Jharkhand, Uttar Pradesh, Maharashtra and Rajasthan are in the process of adoption of online building compliance tools. Inclusion of ECBC in these tools will go a long way streamlining and fast-tracking enforcement and compliance as online compliance infrastructure makes it easier for developers to complete the relevant forms and helps the government office track the status of

development projects. Most states expressed a clear need for such a mechanism and cited the example of the Greater Hyderabad Municipal Corporation (GHMC) success of adoption and implementation of ECBC through the online compliance tool. Working with agencies responsible for development and adoption of these tools will be important to ensure enhanced compliance.

Addressing some of the above-mentioned key challenges highlighted by the state level stakeholders will ensure fast tracking the ECBC implementation in the country. States have made a progressive head way since the introduction of the code in 2007, with deep efforts from BEE and other agencies working at the state level. There is now a need to bring to scale some of these efforts and ensure construction of energy efficient, sustainable buildings in the country. There are successful examples available within the county, which need to be drawn upon in this last mile support for scale-up of ECBC for commercial buildings in India.

Based on the success of implementation of the code in some states, particularly Telangana and Andhra Pradesh, the next section of the report highlights, five key steps, which states can take to amend, notify, comply and enforce the code.

SECTION 2: How-to-Manual

Steps to Effectively Adopt and Implement the Energy Conservation Building Code (ECBC)

States can follow a series of steps included in this How-To-Manual to successfully adopt and implement the ECBC. The manual considers the experiences of Telangana and Andhra Pradesh. The two states adopted mandatory building codes (ECBC 2007) for commercial buildings in 2014 and managed to implement the code for the first time incorporating the code in the online building compliance systems in state. The State of Telangana and the Greater Hyderabad Municipal Corporation partnered with ASCI and NRDC to accelerate the process and create a compliance framework.

The following steps also acknowledge information from the Alliance for an Energy Efficient Economy's (AEEE) report "Roadmap to Fast Track Adoption and Implementation of Energy Conservation Building Code (ECBC) at the Urban and Local Level".²¹ Additionally, steps relating to the notification process were developed using information from ACE:E² (Adoption, Compliance, Enforcement for Energy Efficiency) presentations from their Regional Level Workshops.²²

The objective of this How-To-Manual is to create a clear pathway for states to implement the ECBC in order to save consumers money while reducing harmful air pollution and developing climate resilient cities and states.

1. STAKEHOLDER ENGAGEMENT AND EVIDENCE BASE

Engage market leaders and government officials to integrate the best evidence regarding energy efficiency into the planning. Stakeholders include real estate developers, building experts, and local representatives. Developers can be invited to technical committee meetings as well as specially organized consultative workshops. The inclusive and collaborative multi-stakeholder consultation process in Telangana helped raise concerns and was instrumental in developing practical, mutually acceptable solutions while also building trust among stakeholders. Local media such as news articles, advertisements in local newspapers and trade publications can help publicize the importance of ECBC and invite applications for third-party assessors' training and certification. Finally, the Urban Local Bodies (ULBs) can create incentives for developers and owners to invest in energy-efficient buildings.

2. MANDATORY CODE ADOPTION AND TECHNICAL STEERING COMMITTEE

A Technical Steering Committee can oversee the development of a state-wide code. In Telangana, the Technical Steering Committee is chaired by the Principal Secretary of the Municipal Administration and Urban Development Department (MAUD) and involves active participation of ministries and departments including Energy, Roads and Building, department of Town and Country Planning, Urban Local bodies and Housing as well as leading real estate developers and academic experts. In Andhra Pradesh, the Technical Committee prepared a roadmap for adoption of the ECBC into the state's existing legal framework, based on the analysis, benchmarking with best practices and expert recommendations.

The ECBC should be amended in accordance with 2017 requirements. The UDD is responsible for amending the code and can collaborate with the Technical Steering Committee to tailor the code to the state's specific regional and climatic conditions. Once the code is amended, the next, and arguably most important step is to get the code notified in the state gazette. The state's draft code must be submitted for approval to stakeholders such as the state's Energy Department to finalize the ECBC rules. The draft ECBC rules along with a concept note for notification can be sent to Law and Judiciary departments as well. Once the rules are finalized after comments from various departments and the public, the State Designated Agency (SDA) or UDD should legally notify ECBC for mandatory implementation.

3. REVISION OF BUILDING BYLAWS AND ONLINE CODE COMPLIANCE FRAMEWORK

After the ECBC has been notified, a structured implementation and compliance process needs to be in place. Under the purview of the state UDDs, the building bylaws need to be revised and implementation rules such as a Third-Party Assessor (TPA) Model/ BEE Building Energy Auditor model can be used.

To enforce ECBC in the state, an online framework for code compliance can be developed. The Telangana government's online platform for building applications is called the Development Permission Management System (DPMS).

Andhra Pradesh has also developed and adopted a similar DPMS. The online DPMS integrates the ECBC requirements into the online process for building permits, making the ECBC mandatory. Real estate developers must



demonstrate that their building meets energy efficiency requirements through a certified-empowered third-party assessor before a construction permit is issued. The DPMS expedites the building permission process and makes it transparent and accountable. States can choose to develop their own online tools or collaborate with states that currently have online platforms.

In addition, states can integrate their online development permission management system with BEE’s Energy Management Information System to bring transparency in ECBC compliance. The integrated tool will be the first step towards the monitoring and verification of ECBC compliance as a whole.

4. LOCAL THIRD-PARTY ASSESSORS AND CAPACITY BUILDING RESOURCES

In Telangana, empaneling third party assessors and creating a two-tiered approach (design and construction phase) for code compliance were critical. Third party assessors are key to the system since they provide the technical expertise to developers and alleviate the burden on government experts. Third party assessors are empaneled by the state and review and certify

the building for ECBC compliance both before and after the construction stage. In a large-scale capacity building exercise, supported by BEE and United Nations Development Program (UNDP), more than 700 architects, engineers, and experts received training on the ECBC in both Telangana and Andhra Pradesh. The State of Telangana, with ASCI, NRDC, and IIIT Hyderabad, conducted workshops to enhance capacity among builders, designers, engineers, architects, and other stakeholders on the code compliance process.

To enable the use of the online compliance system and provide answers on the technical aspects of the code, the Telangana State government along with ASCI and NRDC, developed a list of Frequently Asked Questions (FAQs). Please refer to the resource guide section of this report to read the FAQs.

5. EVALUATION

The last step involves evaluating the compliance and implementation of the ECBC to ensure progress. To evaluate implementation of the ECBC, ASCI and NRDC are developing an evaluation system with Hyderabad. A series of case studies on the online system, to document developer experiences and process for commercial buildings, is planned. In addition, evaluation updates are

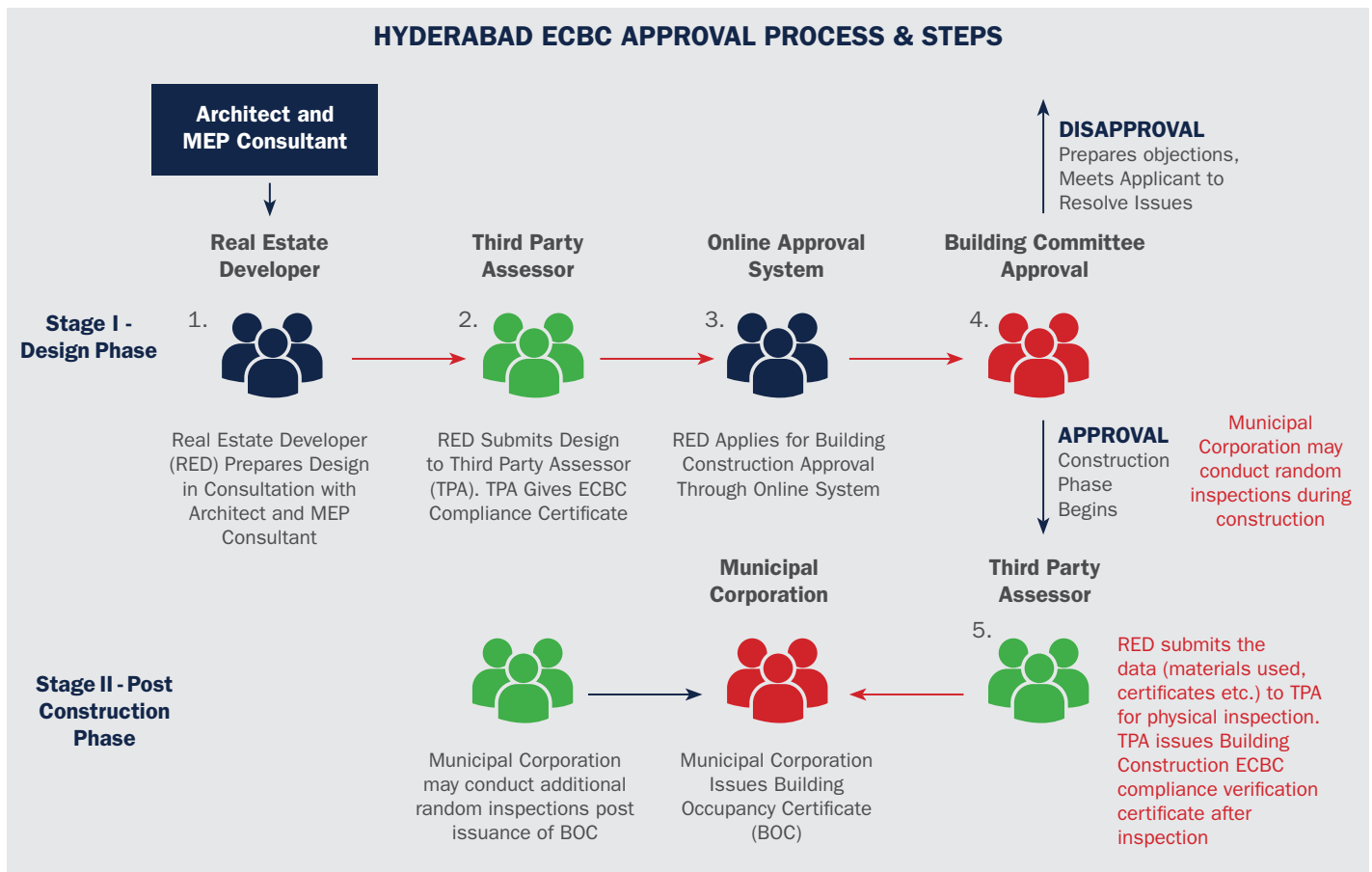


Figure 4 Hyderabad ECBC Approval Process & Steps

Source: NRDC, Getting Cities Climate Ready: The Story of India’s First Mandatory Energy Efficient Building Compliance System & How to Guide in Five Steps, 2018.²³

part of periodic stakeholder and the technical steering committee meetings. The aim of the evaluation is to improve the code compliance process and track its progress. The evaluation also promotes recordkeeping and gathers information that may lead to broader benchmarking practices. The evaluation through its findings and recommendations is also an effort to improve governance and capacity among developers, architects and stakeholder to build better, more efficient buildings as well as support research for update and further improve compliance.

SIMPLE ADDITION TO BUILDING APPROVAL FORM INTEGRATING ECBC

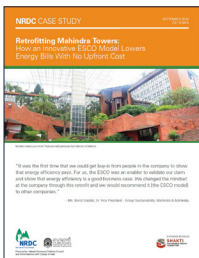
C				
DETAILS OF BUILDER / LICENSED PERSONNEL				
S. No.	Name	Address	License No.	Validity
1 Builder / Developer			
2 Architect/Engineer/Surveyor			
3 Structural Engineer			
4 ECBC Empanelled TPA			

Figure 5 Modifying Local Forms to Include ECBC
 Source: NRDC-ASCI, *Building A Better Future: Implementing the Energy-Saving Building Code in Hyderabad, 2016.*²⁴

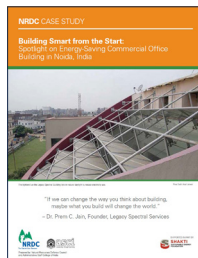
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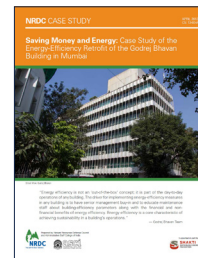
ASCI-NRDC Building Efficiency Case Studies



Retrofitting Mahindra Towers: How an Innovative ESCO Model Lowers Energy Bills With No Upfront Cost
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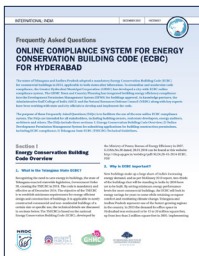


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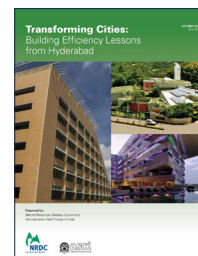
City and State Focused Resources



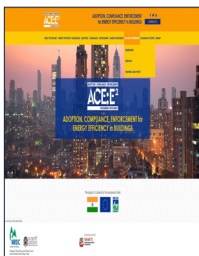
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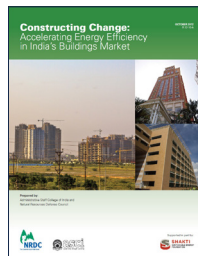
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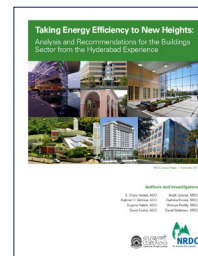
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Adoption, Compliance, Enforcement for Energy Efficiency in Buildings
<http://ace-e2.eu/>



Constructing Change: Accelerating Energy Efficiency in India's Buildings Market
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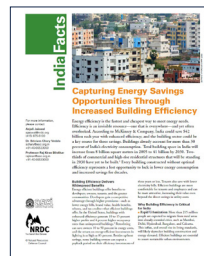


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National Level Resources

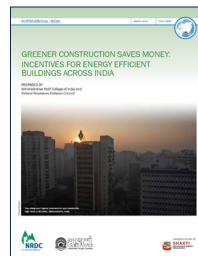


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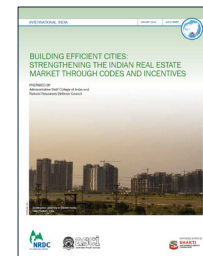


Capturing Energy Savings Opportunities Through Increased Building Efficiency
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Resources for Developers



Greener Construction Saves Money: Incentives for Energy Efficient Buildings Across India
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Building Efficient Cities: Strengthening the Indian Real Estate Market Through Codes and Incentives
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