

SUPPORTING SUSTAINABLE MOBILITY
UNDER SMART CITY MISSION



HANDBOOK: ECBC COMPLIANCE IN INDIAN CITIES

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IN INDIAN CITIES**

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About Shakti Sustainable Energy Foundation

Shakti Sustainable Energy Foundation works to strengthen the energy security of India by aiding the design and implementation of policies that support renewable energy, energy efficiency and sustainable transport solutions.

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MESSAGE

Greetings!

Urban areas in India act as catalysts of economic growth as they play a significant role in contributing towards national income, employment generation and productivity in their region of influence. Yet, city governments in urban areas continue to lag behind in capacity and have poor infrastructure, resulting in substandard quality of life for end users even today. In order to address the above challenge, Government of India identified Smart City Mission as an integral source of funding amongst its on-going flagship programs to tackle the infrastructural gaps and capacity of urban local bodies.

We are glad to provide our support in the built environment sector to four cities which are being developed as Smart Cities. This has been a unique initiative by engaging with different agencies and analyzing the existing application of the energy conservation building codes in the project cities though it has been observed that the cities need to go a long way in adopting the same.

I would like to express our gratitude to Shakti Sustainable Energy Foundation for initiating the approach of assisting the city government’s w.r.t mobility and built environment. I would also wish to thank the built environment sector experts, BEE officials, and municipal staff of the project cities for their timely inputs in the completion of this report.

Warm regards,

(Emani Kumar)
Deputy Secretary General, ICLEI – Local Governments for Sustainability &
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ABBREVIATIONS

AAI	Airport Authority of India
ASI	Archaeological Survey of India
ASCI	Administrative Staff College of India
AVVNL	Ajmer Vidyut Vitran Nigam Limited
BEE	Bureau of Energy Efficiency
BEEP	Building Energy Efficiency Project
CEPT	Centre for Environmental Planning and Technology
CSE	Centre for Science and Environment
DA	Development Authority
EAB	Energy Auditor (buildings)
EC	Energy Conservation
ECBC	Energy conservation Building Code
EDS	Environmental Design Solutions
EPI	Energy Performance index
EU	European Union
FAR	Floor area ratio
GKSPL	Greentech Knowledge Solutions Pvt. Ltd.
GRIHA	Green Rating for Integrated Habitat Assessment
HVAC	Heating ventilation and air conditioning
IGBC	Indian Green Building Council
IIA	Indian Institute of Architects
IIIT	Indian Institute of Information Technology
J&K	Jammu and Kashmir
LEED	Leadership in Energy and Environmental Design
MoHUA	Ministry of Housing and Urban Affairs
MoP	Ministry of Power
MPUVNL	Madhya Pradesh Urja Vikas Nigam Ltd
NGO	Non-Governmental Organisation
NOC	No Objection certificate

NRDC	National Research Development Corporation
PEDA	Punjab Energy Development Agency
PwC	PricewaterhouseCoopers
PWD	Public Works Department
RUIDP	Rajasthan Urban Infrastructure Development Project
SDA	State designated agency
SoR	Schedule of Rates
TERI	The Energy and Resources Institute
TWh	Terra watt hour
ULBs	Urban Local Bodies
UTs	Union Territories

Conversion table: 1 crore = 100 lakh = 10 million = 0.01 billion

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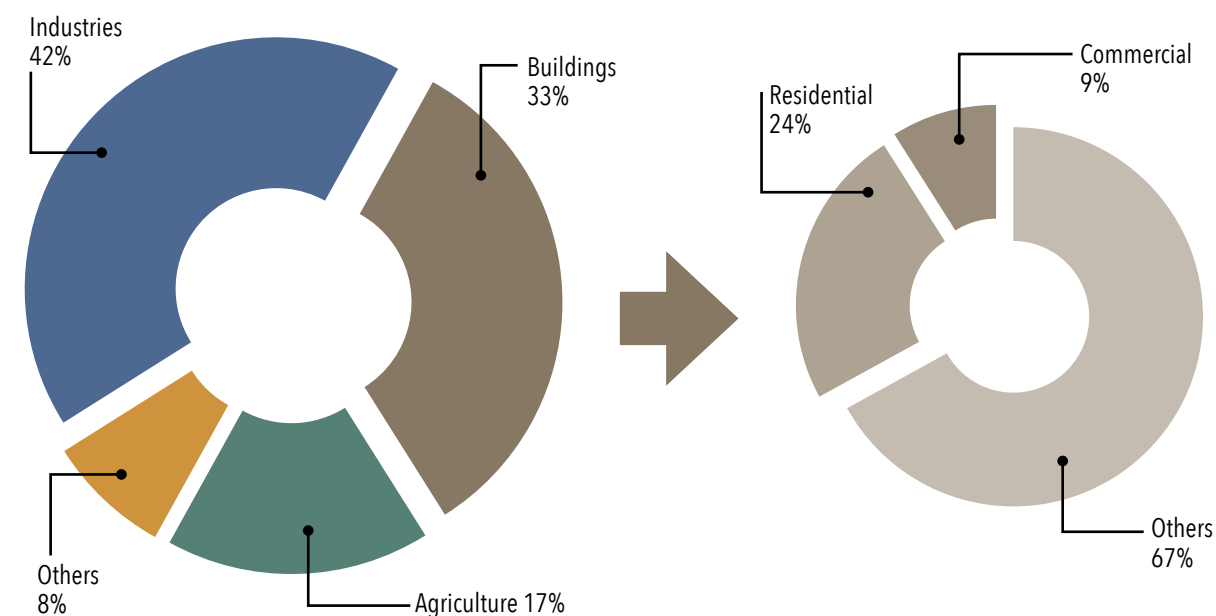
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1 OVERVIEW OF GROWTH OF BUILDINGS SECTOR IN INDIA

Urbanisation in India is resulting in increase of towns and cities along with the rising population in urban areas. According to census 2011, 37.7% of India's 121 crore people live in urban areas¹ and this number is rising continuously. Increasing population in urban areas require more buildings to work, live and interact leading to an increase in number of buildings further resulting to projected rise in electricity demand. India is the fourth largest energy consumer after China, USA and Russia as per Dunn (2014)².

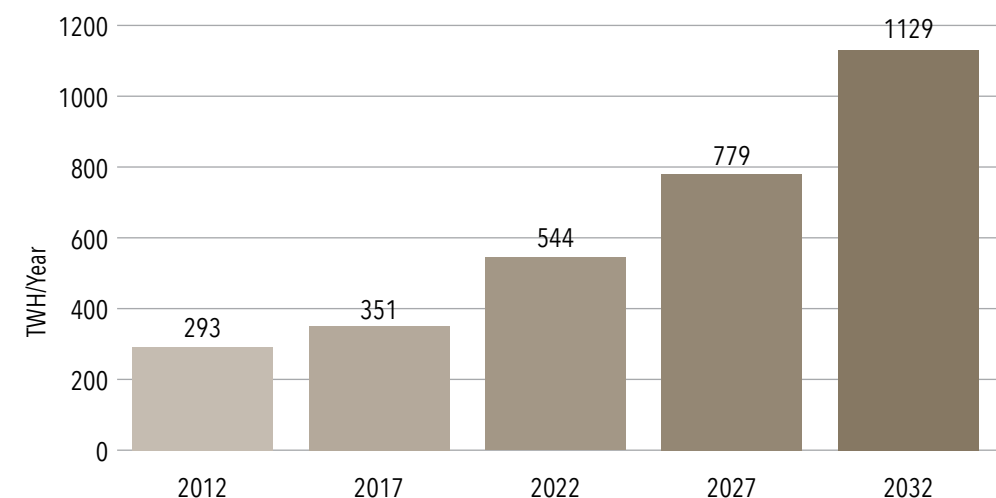
In India, building sector contributes to consumption of about 33% of the total energy produced in the country which is second highest after industrial sector which accounts for 45% of net production. Building sector includes major two categories- residential and commercial (includes retails, offices and public buildings) along with industries, agricultural, etc. 24% of this energy consumed by building sector includes residential sector buildings and 9% include commercial sector buildings³.

Figure 1: Percentage of energy demand; sector wise (left) and building type (right) in India 2015-16



It is projected that building stock in urban area is growing at a rate of about 5% annually with a simultaneous increase in building energy at a rate of 8% annually⁴.

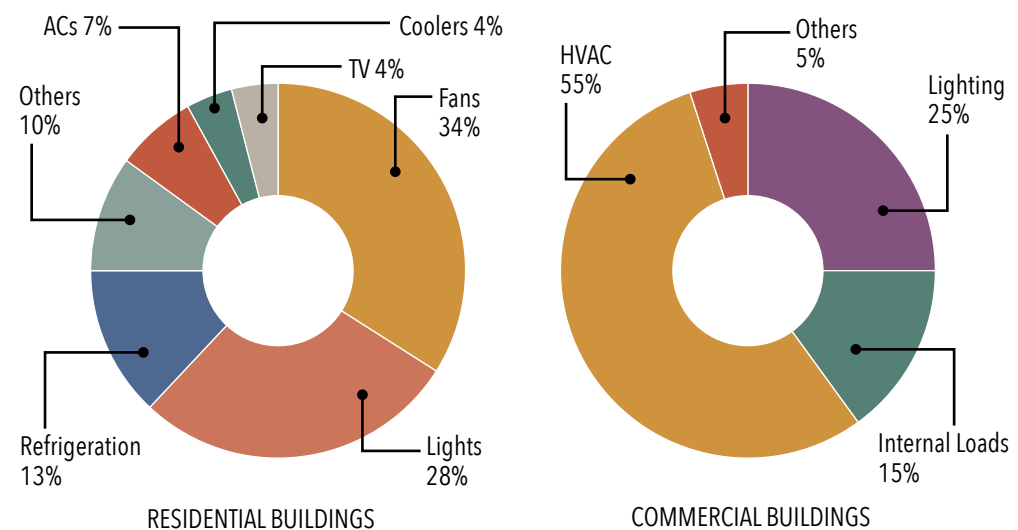
Figure 2: Increasing electricity demand in building



If current scenario continues, electricity demand will rise from 336 TWh/year to 4,697 TWh/year and buildings will demand 55% of total electricity generated by 2047⁵. Also electricity demand in sector of residential and commercial buildings is predicted to rise by 5 folds and 3 folds respectively by 2032⁶. Energy demand by end use in buildings of residential and commercial buildings have a distinct pattern. In residential buildings, fans and lights are major consumers whereas in commercial buildings, major part of electricity is consumed for HVAC operation⁷. It is due to this reason that specific energy conservation code is required for each building type depending on its energy use.

It is also extremely important for India to explore new electricity generation alternatives and conserve electricity managing the demands of consumer.

Figure 3: Electricity Consumption by end use in residential and commercial buildings



1.1 HISTORY AND TIMELINE

With a view of increasing electricity demand and need of managing it, an effort for energy conservation was initiated by Government of India with introduction of Energy Conservation Act published in the Gazette of India in October 2001. Bureau of Energy Efficiency (BEE) was instituted in 2002, to implement EC Act. Further first version of Energy Conservation building Code was launched by Government of India in 2007. A user guide was also published in July 2009 (reprinted in April 2011) to provide technical guidance for compliance⁸. Development of act and code led to the amendment/adoption of code at state level as State ECBC. State ECBC were developed by amending central ECBC according to local weather conditions.

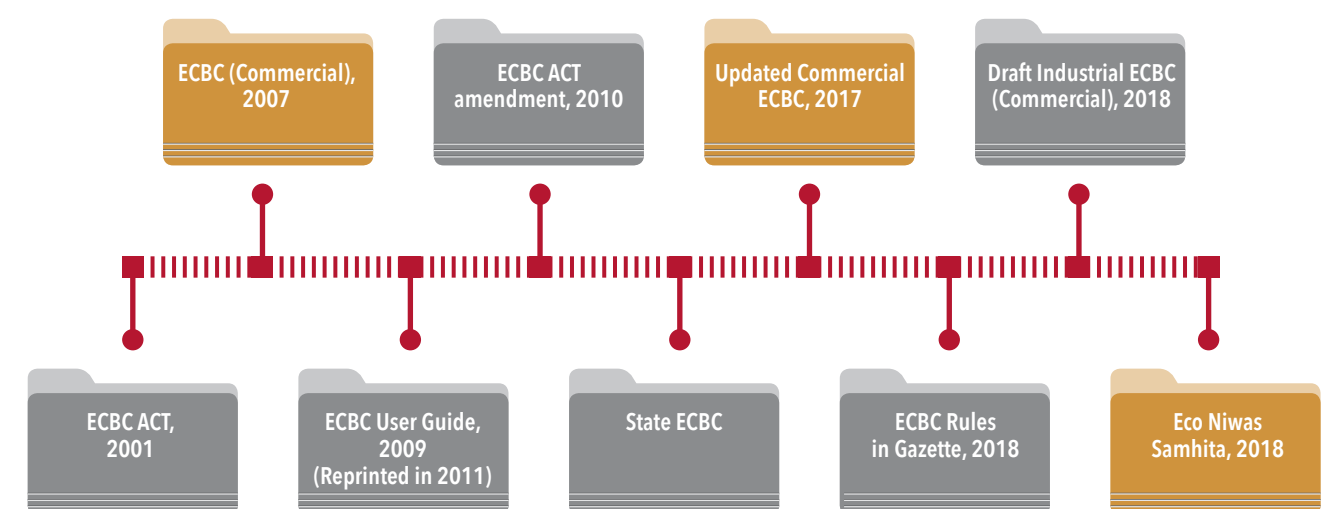
EC Act was amended in 2010 with further update of Commercial ECBC in 2017. After this update, ECBC (commercial) was mandated for all commercial buildings falling in its purview (Connected load $\geq 100\text{KW}$ or contract demand $\geq 120\text{ KVA}$). This required a notification by state or inclusion of ECBC mandate in the process of building approval process.

With existence of current policy landscape, the process of erecting an ECBC compliant building was still not very clear among the owner/developer of buildings. Thus ECBC rules were published by the Government of India (Gazette of India) in February 2018, providing detail of policy implementation. The process of compliance may be eased by incorporation of these rules.

Recent developments such as Residential ECBC (Eco Niwas Samhita 2018), draft industrial ECBC (2019) and ECBC rules (2018) are set to increase the number of urban buildings that will be covered by ECBC (if mandated), potentially increasing the overall impact on energy savings at city level substantially.

Illustration below details the process flow of ECBC along with highlighting timeline of major events.

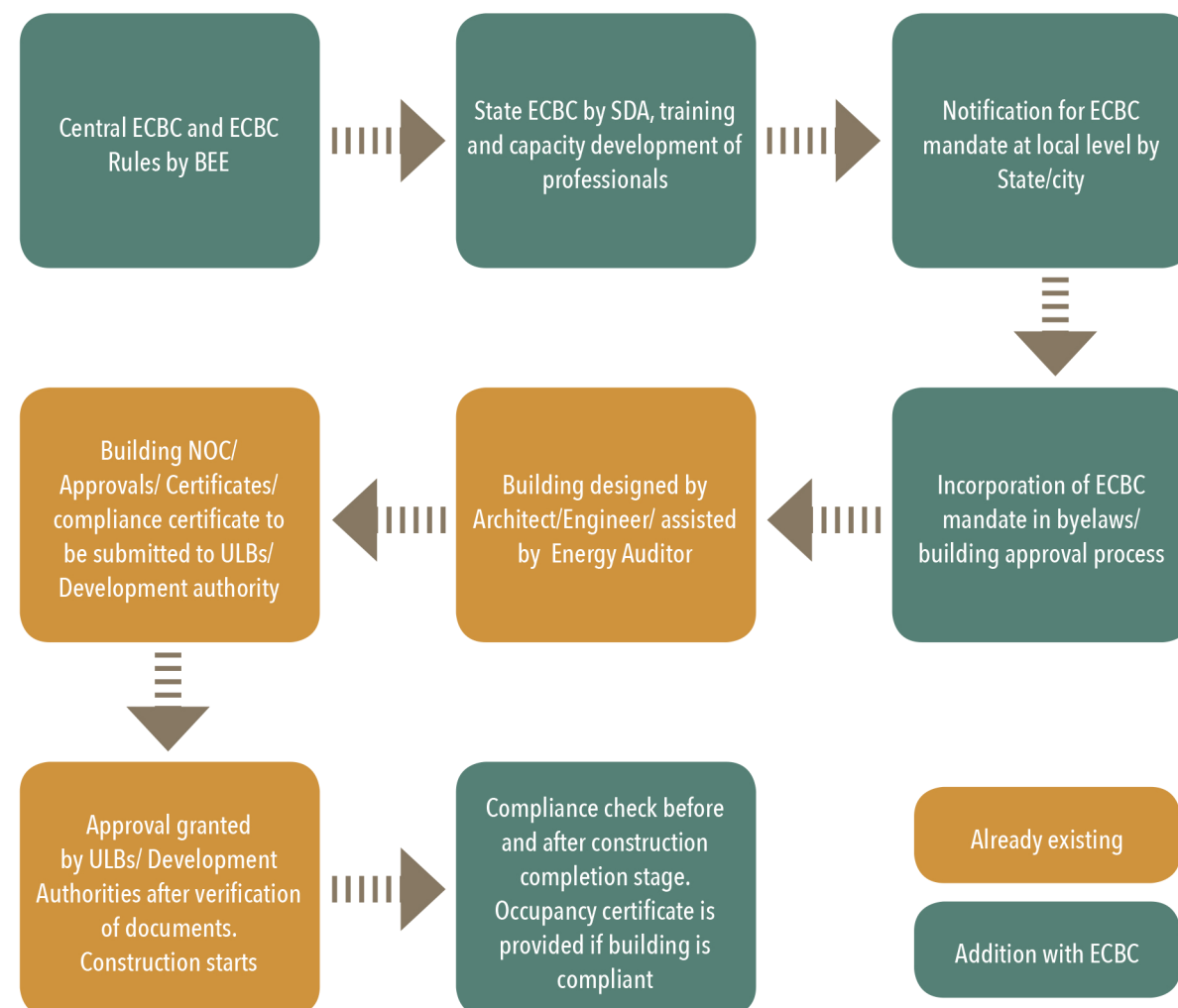
Figure 4: ECBC process flow



2 ECBC DEVELOPMENT AND IMPLEMENTATION

It has been almost 12 years since the launch of commercial ECBC in 2007, but status of implementation of ECBC is still debilitated. With the recent ECBC rules (2018), the process of ECBC compliance is available for developer/owner of buildings. Resulting implementation flow for ECBC compliant buildings from central level to local level may be summarized as under:

Figure 5: Implementation flow for ECBC compliant building



With existence of EC Act, ECBC, ECBC rules and guide as reference documents, amendment of ECBC, notification and incorporation of ECBC in building approval system are next step towards ECBC compliant buildings.

In case a building falls in category which requires mandatory ECBC compliance, building developer/owner has to appoint an Energy Auditor (Buildings) which verifies ECBC compliance of building and provides a certificate of compliance which is further submitted to ULBs/Development authority for approval. Building is approved for construction and occupancy only if it satisfies the requirement of ECBC code⁹.

2.1 CITIES AND ECBC

Since ECBC was developed to manage electricity demand and to ensure energy conservation in buildings, building approval processes and systems at the city level thus need to inculcate ECBC compliance checks to achieve this national goal.

In few states/UTs (Karnataka, Andhra Pradesh, Telangana, etc.), ECBC has already been included in unified building byelaws¹⁰ (which have to be followed by all their cities) but still there are not many examples of buildings which comply with ECBC in these cities. This indicates that mere inclusion in byelaws does not assure implementation of ECBC on ground. Impactful implementation requires policy, institutional setup and implementation capacity. With the existing policy setup, the link between the institutional setup and capacity needs to be strengthened.

3 REQUIREMENTS

With ECBC rules and code already in place, further steps for implementation includes cities to incorporate ECBC as a requirement in byelaws and regulations but this process has already started in case of few cities/states. Further steps require capacity and monitoring to implement ECBC.

Compliance can be ensured at local level by mandating the ECBC compliance certificate as one of the document to be submitted to ULBs/Development authority for building approval. Schedule of rates document should also to be updated by Public Works Department (PWD), including the energy efficient materials which may be used as a reference document in construction of a building. These steps will ensure implementation of ECBC with immediate effect and ensure energy conservation.

These series of actions required for ECBC integration in buildings and their status in the states of India at present is summarised in Table 1¹¹.

(This table is illustrative of existing status of ECBC in India and is based on the understanding of project team's engagement with Smart cities and data available.)

Table 1: Implementation flow for ECBC compliant building

S. No	Actions	Status
1	Status of regulation	
A	ECBC Adoption	<div><div></div><div></div><div></div></div>
B	Notification by state	<div><div></div><div></div></div>
C	Inclusion in state/city/unified building bylaws	<div><div></div><div></div><div></div></div>
D	Included as a separate code	<div><div></div><div></div><div></div></div>
E	Updating of schedule of rates including energy efficient materials	<div><div>*</div><div></div><div></div></div>
2	Implementation	
A	ECBC cell	<div><div></div><div></div></div>
B	Training and capacity development	<div><div></div><div></div></div>
C	Building approval	
C1	Building design by architect/engineer	<div><div></div><div></div></div>
C2	Building ECBC compliance (by Empanelled engineer auditor (buildings))	<div><div></div><div></div><div></div></div>
C3	Building approval and compliance check from municipal corporation/development authority	<div><div></div><div></div></div>
D	Compliance check	
D1	Pre-Construction/ Design stage	<div><div></div><div></div><div>\$</div></div>
D2	Construction	<div><div></div><div></div><div>\$</div></div>
D3	Post Construction	<div><div></div><div></div><div>\$</div></div>
D4	Pre occupancy	<div><div>\$</div><div></div><div></div></div>
E	Incentives and penalty	
E1	Incentives (grants and subsidy/tax incentive/fast track construction approval)	<div><div></div><div></div><div></div></div>
E2	Penalty (Fine/refusal of permission to construct or occupy)	<div><div>\$</div><div></div><div></div></div>

Not existing Partially existing Existing

\$ > Mentioned in ECBC rules 2018

* > In Andhra Pradesh, Telangana, Punjab and Kerala, PWD is in the process of revising its Schedule of Rates (SoRs) document and Karnataka has already issued its upgraded SoRs as per 2018¹². Not much information is available on this.

4 ACTORS AND THEIR ROLES

ECBC incorporation requires various actors at central, state and city level.

4.1 CENTRAL LEVEL ACTORS

At central level, EC Act, Rules and Code are reference documents developed by Central government in consultation with BEE, Ministry of Power (MoP) and Ministry of Housing and Urban Affairs (MoHUA). National ECBC Implementation committee has to be established by BEE for monitoring of compliance. It would review SDA's work at state level for quality and consistency. It would also evaluate recommendations of State ECBC implementation committee and finalise recommendations regarding energy consumption norms

4.2 STATE LEVEL ACTORS

At state level, Urban development department, energy department and PWD provides recommendations for ECBC amendments, notifies ECBC compliance mandate, update Schedule of rates (SoRs) (including energy efficient materials) and building byelaws (in case of unified building byelaws).

Further State Designated Agency (SDA) is formulated by BEE which should include State ECBC implementation Committee. State ECBC cell is also posted under SDA. SDA is a statutory body constituted at State level and acts as the nodal agency which coordinates and cooperates with BEE at central level.

ECBC cell provides support for implementation through training and capacity building. It also assists in amendment of ECBC according to their local requirements which are further incorporated in building byelaws through a notification by state government or incorporated

in online building approval process.

As stated in ECBC rules, State ECBC implementation Committee would provide recommendations to National ECBC implementation committee, review EAB's performance and assist in capacity building of professional.

4.3 LOCAL/CITY LEVEL ACTORS

At local level, ULBs/Development authority and Town planning authority ensures compliance by document verification, providing recommendations for ECBC and also notifying ECBC mandate in case of city level byelaws (in case of unified building byelaws this notification role is vested with state)

As stated in ECBC rules, Energy Managers and Energy Auditors (Buildings) (EAB) would be selected by BEE. EAB would be an organisation/firm/company fulfilling the eligibility criteria laid by BEE. It will play an important role in building construction approval process by providing consultation assistance (if required), inspecting building plans at design stage, visiting building site and verifying compliance at construction and completion stages. A compliance certificate would be provided by EAB to owner /developer under intimidation to ULBs/ Development Authority and SDA (at completion stage). This would be submitted to ULBs/DA for construction approval and occupancy certificate.

5 ACTIONS REQUIRED

Energy efficiency in the built environment covers various themes and aspects and various actors which assist in incorporation and implementation of ECBC from central to local level.


ECBC incorporation at local level requires the primary step of amending and upgrading the code which is done by the central government while the notification and directives related to mandate in buildings are given by the state level organisations. Incentives are on the discretion of the state or city government to encourage the people to integrate energy efficiency.

After ECBC mandate, the buildings to be constructed are approved by Municipal Corporation and the owner/developer, architect, consultant, auditor, and all the organisations granting approval/NOCs (electricity department, water supply agency, fire department, ASI, Airport Authority, etc.) are actors in this approval process. Certification of ECBC compliance should be provided by Energy auditor (Buildings) appointed by the owner (local level). EAB develops assessment report and provides a building compliance certificate to the owner/developer of building under intimation to ULBs/DA and SDA. Municipal Corporation/Development Authority have to check all the documents and issue a certificate of approval after ensuring that the compliance certificate is submitted.

Awareness and capacity building related to ECBC, helps in improving the implementation process. It is provided by State ECBC cell in assistance of external players including NGOs, institutions, bilateral/multilateral partners, etc. All these actors performing their respective roles help in better incorporation of ECBC and further to ECBC compliant buildings is summarised in Table 2.

Table 2: Actors engaged in awareness and capacity building for ECBC

Levels	Stakeholders	ECBC amendment	ECBC notification/ rules/ directives	Building approval/ byelaws	Incentive	ECBC Certification and reports	Awareness/ Capacity building/ implementation	Monitoring
Central level	MoHUA, Ministry of Power, BEE		Central ECBC					
	National ECBC implementation Committee							
State level	Urban development department, PWD, Dept. of Energy		State ECBC	Unified Building byelaws				
	SDA (State ECBC implementation committee and State ECBC cell)							
Local level	ULBs, Town planning department, Development Authority							
	Building owner/ developer							
	Stakeholders including engineers, architect, contractor, vendors, etc.							
	Energy Auditor (Buildings)*/ Third party assessors							
All the above levels	External players at all levels bilateral/ multilateral partners, NGOs, institutions, funders.							

Least important  Most important

* As per ECBC rules but EABs have not yet been selected (Till 9/4/19)

6 BUILDING APPROVAL PROCESS

ECBC rules(2018) specifies the roles of national level authorities, state level authorities, local level authorities, EABs and owner/developer of building (which is covered under ECBC compliance) in approval process of a building. City government has to coordinate with State Designated agencies to implement ECBC at local level. The process flow illustration (Figure 6) briefly describes the process of approval for ECBC compliance in a building and may be useful in understanding ECBC compliant building approval¹³.

Building compliance and approval involves verification and document submission at designing, construction and post construction stages. A detail of documents to be submitted is provided in appendix (section 8.3) of this report.

Owner/developer of a building under ECBC purview has to appoint an EAB for consultation and for compliance check of building. Building has to be designed considering building byelaws/unified building byelaws and ECBC mandate. The performance of buildings may be monitored by SDAs. EAB has to submit building performance report to SDA for next 2 years after building occupancy stage.

Energy Performance index (EPI) of a compliant building should be less than or equal to 1. If it is greater than 1, after completion of building, EAB provides technical support for compliance. If still the building has $EPI > 1$, ULB/DA may issue provisional occupancy certificate to achieve EPI within 3 years. In case the owner/developer of building fails to achieve $EPI \leq 1$, the issue may be reported to ECBC compliant technical grievances redressal committee which may provide required recommendations which have to be followed.

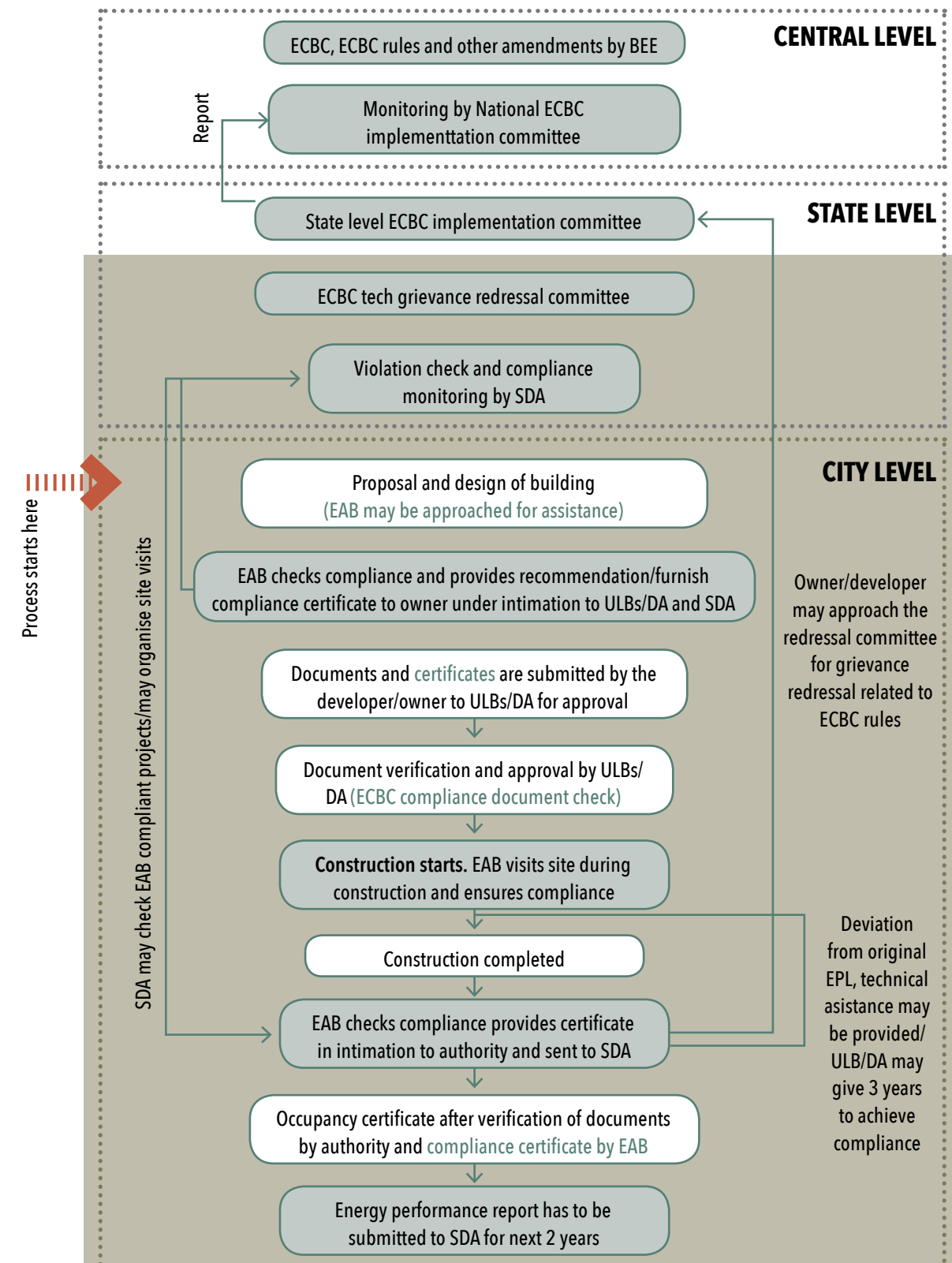
LEGEND

Existing building approval process

To be included in approval process according to ECBC rules

Building approval process

Figure 6: The process of approval for ECBC compliance in a building



7 EXECUTION PROCESS

Although the process of implementation is already in progress but integration of further actions for improving its pace is required. The actions stated below will help in further improving the status of implementation of ECBC on ground:

7.1 CAPACITY ACTIONS:

Capacity actions include awareness among the officials of Municipal Corporation/ Development Authority related to their roles. They should be aware about their specific roles- they have to check the documents for completeness and issue the certificate of approval for buildings and do not have to review the documents in order to check the compliance. The empanelled energy auditor at local level plays the role of ensuring compliance. A certificate of compliance is issued by EAB which is submitted with the documents ensuring the assurance of ECBC compliance of building.

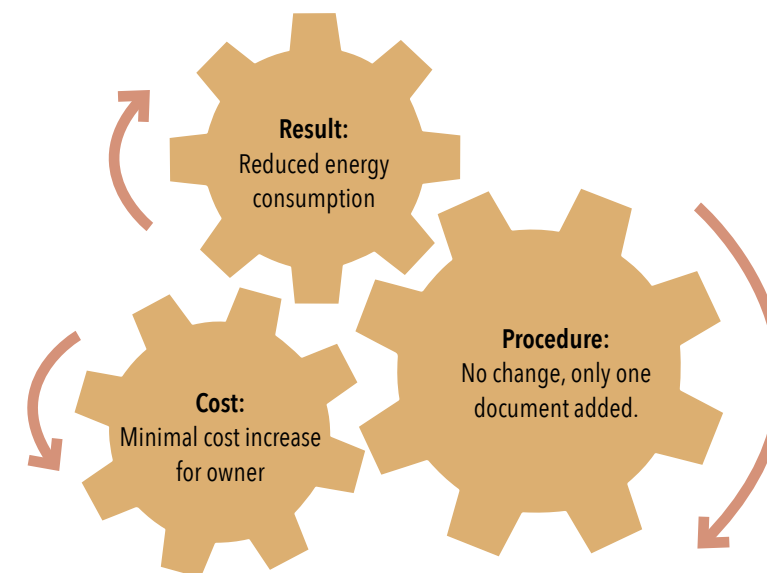
7.2 POLICY ACTIONS:

Rules and regulations outlining the policy structure of ECBC already exists, only the building byelaws of the city/state has to be updated mentioning the compliance with ECBC as a mandate if the building falls in certain category of area or connected load, for e.g. Udaipur building byelaws include a statement detailing the mandate of ECBC compliance. This is required at city level.

Another option to ensure compliance is to develop/update the online building approval system and mandate to upload ECBC compliance certificate (from the empanelled energy auditor) for submission of building approval application for e.g. City of Greater Hyderabad has developed an online platform which ensures compliance. The compliance certificate has to be submitted along with the documents for approval.

8 IMPACTS

Incorporation of ECBC in the system of building approval process affect the procedure of building plan approval, cost associated in process and have various other impacts. These are detailed below:



8.1 PROCEDURAL IMPACTS:

Currently the process of building approval can be categorized in three categories of pre sanction/sanction stage, construction stage and completion and occupancy stage¹⁴. The owner/developer has to submit all the documents for approval before commencement of building construction, plinth level notice during construction and completion certificate after construction is complete. With inclusion of ECBC mandate, there is an addition in the documents to be submitted for approval in the first stage and last stage. The list of documents is accompanied by a report prepared by the Energy Auditor in the sanction stage and with compliance certificate in the completion stage.

Thus there is no change in the procedure, the Municipal Corporation/ Development Authority officer has to approve a compliant building to be constructed in the same way as before, with an additional document added to ensure ECBC compliance. No additional time or stage is required on level of municipal corporation/development authority.

Additional the owner/developer has to appoint an EAB for consultancy and provision of report to be submitted to the corporation.

8.2 COST IMPACTS:

No additional cost has to be incurred from the city level officials. A minimal cost is involved at owner's level to appoint the Empanelled Energy Auditor (Buildings). Thus in terms of cost, impact is limited to the owner/developer at local level.

8.3 RESULT IMPACTS:

With the incorporation of ECBC compliance procedures at local level, all new buildings (commercial, residential and industrial) would be ECBC compliant. Energy consumption of buildings would decrease and energy savings potential of 23% to 46% is estimated as per GRIHA directive (2019). At city level also, there would be decrease in demand of electricity and increase in conservation of energy

9 APPENDIX

9.1 CURRENT STATUS OF ECBC IMPLEMENTATION IN STATES OF INDIA

ECBC has been included in unified building byelaws of some states (Karnataka, AP, Rajasthan, etc.) and cities (like Udaipur, Greater Hyderabad, Bhubaneswar, etc.) but practical widespread implementation is slow in progress. 22 states have completed amendment of ECBC, 13 states have issued notifications and 9 states have updated their building byelaws on state level. ECBC cell has been reported to be incorporated in 31 states/UTs. Apart from this, states have invested in organizing awareness and training sessions to encourage the incorporation of ECBC.

The states lagging behind in the implementation process, Jammu and Kashmir, Assam, Tripura, Arunachal Pradesh, Nagaland, Manipur, Meghalaya, Mizoram, Sikkim, UTs of Daman and Diu, Lakshadweep, Chandigarh, Andaman and Nicobar Islands and Dadar and Nagar.

There are 3 broad typology of states related to implementation process of ECBC in India. These can be categorized as follows:

9.1.1 Category 1:

States which have begun to enforce/implement ECBC locally: These states have moved further to the implementation process in their jurisdiction. These may have an ECBC cell or may be assisted by consultants or research institutes. This category includes states which have incorporated ECBC in their byelaws/unified building byelaws to ensure compliance to the code. The builder/owner has to submit compliance certificate in the process of getting the plans approved from corporation. Examples of such cases include Rajasthan, Andhra Pradesh, Telangana, etc.

Some cities have also moved forward incorporate ECBC in their building byelaws, but at present these belong to the states which have unified building byelaws overpowering local byelaws. Examples of these cities include Bhubaneswar, Greater Hyderabad, Udaipur, Cuttack, etc.

9.1.2 Category 2:

State which have amended and notified ECBC: States in this category have amended the code according to their requirements. The changes are required according to the climate. Thus the code has to be amended as per the requirement and then notified as mandated. This amended code is known as the state ECBC for e.g. Andhra Pradesh Energy Conservation Building Code. These states include Andhra Pradesh and Telangana, Odisha, Punjab, West Bengal, etc. which have notified ECBC.

9.1.3 Category 3

States which have not yet notified/amended ECBC but have initiated capacity development: This category includes states in which capacity building/training have already been initiated after development of ECBC cell at state level, but further development has not yet started. Examples include J&K, Manipur, Meghalaya, Nagaland, etc.

Table3: Status of ECBC implementation process in various states of India

States	ECBC Adoption	ECBC Cell	ECBC Notification	Notification in byelaws	Byelaws/ policy	Enforcement	Training & Capacity Development
Category 1							
Karnataka	✓	✓	✓	✓	Karnataka municipalities model building byelaws 2017	✓	✓
Andhra Pradesh	✓	✓	✓	✓	AP building rules 2017	✓	✓
Telangana	✓	✓	✓	✓	AP building rules 2017	✓	✓
Gujarat	✓	✓	Under process	*	General development Control regulation 2016	✓	✓
Punjab	✓	✓	✓	✓	Municipal building byelaws 2018	✓	✓
Rajasthan	✓	✓	✓	✓	Unified building byelaws 2017	✓	✓
Haryana	✓	✓	✓	✓	Haryana building code 2017	✓	✓
West Bengal	✓	✓	✓	✓	West Bengal Municipal building rules 2007 (2016 amendment)	✓	✓
Uttarakhand	✓	✓	✓	✓	Uttarakhand building byelaws and regulation 2011 (2016 amendment)		✓
Odisha	✓	✓	✓	✓	Rourkela Development Authority Planning and Building Standards Regulations, 2017	✓	✓
Maharashtra	✓	✓	*	*	State energy conservation policy 2017	✓	✓
NCT of Delhi	✓	✓	Under process	*	Unified building byelaws 2016 (amendment 2017)		✓
Himachal Pradesh	✓	✓	✓ (ECBC 2017)	*	*	✓	✓

States	ECBC Adoption	ECBC Cell#	ECBC Notification	Notification in byelaws	Enforcement	Training & Capacity Development
Category 2						
Tamil Nadu	✓	✓	*	In process (2018)	✓	✓
Uttar Pradesh	✓	✓	✓ (ECBC 2017)	in process (2018)		✓
Kerala	✓	✓	✓	*	✓	✓
Madhya Pradesh	✓	✓				✓
Pondicherry UT	✓	✓	✓			
Chhattisgarh	✓	✓				✓
Assam	✓	✓				
Bihar	✓	✓				
Arunachal Pradesh	✓	✓				✓
Goa	✓	✓				✓
Category 3						
J & K		✓				✓
Chandigarh UT		✓		*		✓
Manipur		✓				✓
Meghalaya		✓				✓
Mizoram		✓				
Nagaland		✓				✓
Sikkim		✓				✓
Tripura		✓				✓

#There is one ECBC cell for Andaman and Nicobar Islands, Daman and Diu, Lakshadweep, Pondicherry, and Goa, one for Arunachal Pradesh, Assam, Meghalaya, Sikkim and one cell for Manipur, Mizoram, Nagaland, and Tripura. (as per 2018 data)

* Status not known (2018)

9.2 STATUS IN ICLEI'S PROJECT STATES AND CITIES

ICLEI's intention was to help the cities in including ECBC as a part of their byelaws and further support state ECBC cells (in Andhra Pradesh, Rajasthan, Madhya Pradesh and Punjab) in the process of implementation specifically in the four cities (Gwalior, Udaipur, Ludhiana and Visakhapatnam), through involvement. With the mandate of ECBC in states, incorporation of ECBC in building byelaws is already in place in the states of Punjab, Madhya Pradesh, Andhra Pradesh and Rajasthan but the implementation at city level is still dithered and needs support.

Table 4: The status of ECBC implementation in states till now

Tasks related to mainstream ECBC	Category 1: State byelaws have included ECBC.			Category 2: States which have amended and notified ECBC.
	Punjab	Rajasthan	Andhra Pradesh	Madhya Pradesh
Status of code adoption	Punjab Energy Conservation Building Code (2014-15).	Energy Conservation Building (ECB) directives, 2011	Andhra Pradesh Energy Conservation Building Code (APECBC), 2014	Madhya Pradesh ECBC (MPECBC) 2017
Adoption and notification	Adopted and amended. Notified on 24 June 2016.	Adopted in March 2011, notified in March 2011 and mandated in September 2011.	Adopted and amended. It was notified in 2016	Adopted and amended. Not yet notified.
Technical committee/ ECBC cell	ECBC cell established and functional since October 2016	Established in 2018	No separate cell established. NRDC and ASCI are providing technical support to AP.	Supported by EU and PWC with MPUVNL.
Revision of byelaws and inclusion at state level	Municipal building byelaws 2018 includes ECBC mandate	Unified Building byelaws 2017 includes ECBC mandate.	AP building rules 2017 states compliance APECBC mandate	Not yet included
Incentives	15% rebate in property tax For green Building: 5% extra FAR for GRIHA, IGBC & LEED.	0.5% extra floor area will be provided to green buildings.	20% Reduction on Permit Fees. If the property is sold within 3 years, one-time reduction of 20% on Duty on Transfer of Property on the submission of Occupancy Certificate.	No information
Status of implementation	ECBC compliant buildings as demonstration projects	Pilot project in MNIT, Prabha Bhawan and Jaipur	No example of implementation	No example of implementation

Table 5: Status of implementation in cities of Udaipur, Ludhiana, Visakhapatnam and Gwalior

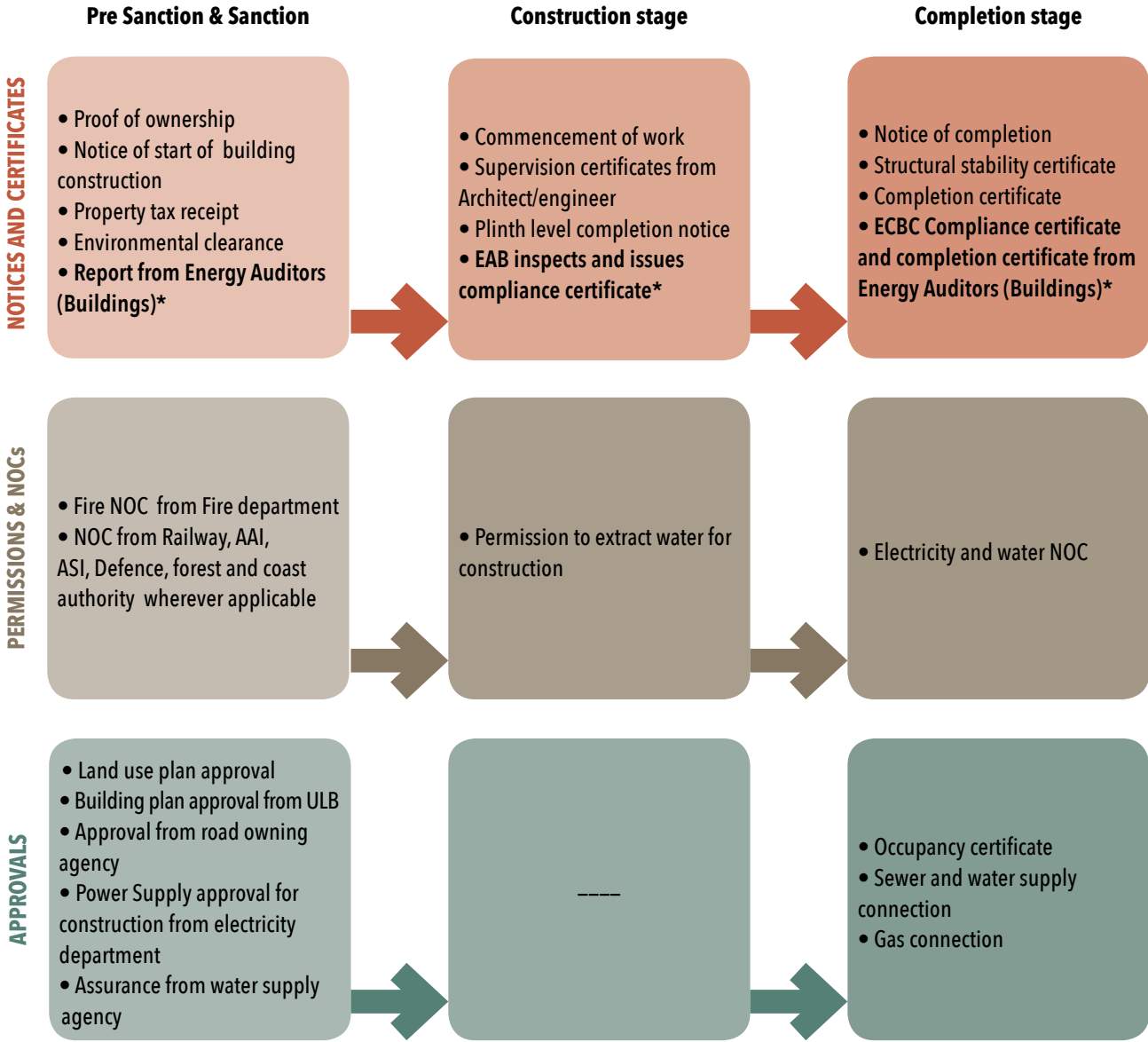
Tasks related to mainstream ECBC	Ludhiana	Udaipur	Visakhapatnam	Gwalior
Actors at state level	PEDA, TERI, CSE, IIA-Chandigarh Chapter, NITTR and CSE	GKSPL, EDS, MNIT Jaipur, AVVNL and RUIDP	ASCI, NRDC, IIIT and GKSPCL	MPUVNL, CEPT and PwC
Adoption of ECBC	Mandated in Punjab and city has to abide by state notification	Mandated in Unified building byelaws 2017 of Rajasthan and city had to abide to the notification.	Not yet adopted locally	Not yet adopted locally
Inclusion in building byelaws/ approval system	Included in state draft building byelaws which cities have to follows.	Included in local building byelaws also.	To be included in online building approval system	To be included in online building approval system
Implementation status	Demonstration projects: Cluster of SME in Textile industries and Christian medical hospital are examples of ECBC compliant buildings. Trainings and workshops conducted by PEDAs.	On ground implementation is not yet available Training and workshops conducted by BEEP (in May 2018).	Fluent Grid (Office building) is proposed ECBC compliant building. Training session has been conducted. Roadmap for implementation under proposal.	No example available. Training and workshops will be conducted after notification of ECBC.

9.3 BUILDING APPROVAL PROCESS

The building owner/developer has to seek approval from the Municipal Corporation/ Development Authority for constructing a building. The following steps have to be followed in order to get the building approved (considering the ECBC rules 2018 also)¹⁵:

1. Owner/developer has to give a notice stating his/her intentions of construction of building to the Authority (Form 1). Form 2 has to be submitted by the owner for construction of ECBC compliant building
2. Owner/developer has to submit all the documents before the commencement of construction for approval. These includes the ownership proof, notice to start construction, property tax receipt, environmental clearance (if applicable), NOCs (from Fire department, Railways, AAI, ASI, Defense, Coast authority, etc.), approvals, ECBC compliance certificate and plans of building.
3. Owner/developer has to appoint an Energy Auditor Buildings (from the list of EAB specified) at his level who prepares a report for the building which has to be submitted in the approval process. (Form 3 to be submitted by EAB). Form 4 has to be sent to the owner in case there is a case of non-compliance. The owner is asked for details and technical assistance may be provided for compliance and form 5 has to be submitted after the compliance deficiencies have been improved.
4. Building construction is commenced according to the approved plans. Form 6 has to be submitted by the owner stating the commencement of construction of ECBC compliant building.
5. The Owner/developer has to submit the plinth level notice to the authority.
6. The EAB inspects the building during construction and submit form 7 enclosing documents and compliance forms to the authority. If there are compliance deficiencies during construction, form 8 has to be submitted to the owner with a copy to local authority. Form 9 has to be submitted to the local authority after the compliance deficiencies have been amended.
7. Notice of completion is submitted by the owner/developer after the construction is complete. It should include the certificate from the Energy Auditor stating the compliance of building with ECBC. Completion certificate is issued by the authority (Form 10). If there are omissions related to compliance, form 11 has to be sent to the owner by EAB after the constructed site is inspected.
8. Occupancy certificate is issued by the local authority after verification of all the documents submitted by the owner and EAB (Form 12).
9. NOCs for water, electricity and has connection is to be obtained by the owner/developer.
10. Connection to sewer and water supply is issued after the occupancy certificate is issued by the authority.
11. Energy Performance Index (EPI) report has to be submitted to the SDA by EAB for two years after the building is fully operational. If EAB>1, authority may issue provisional occupancy certificate to achieve desired EPI within three years by using energy conservation methods.

Figure 7: List of documents required for approval of buildings, categorized in the stages of pre sanction/ sanction, construction and completion and occupancy



ENDNOTE

- 1 (UMC, CEPT University supported by Shakti, February 2016)
- 2 (UMC, CEPT University supported by Shakti, February 2016)
- 3 GRIHA ECBC Directives 2019
- 4 State EE Index report, 2018
- 5 Bureau of Energy Efficiency (BEE)
- 6 GRIHA ECBC Directives 2019
- 7 GRIHA ECBC Directives 2019
- 8 (USAID (ECO -III project), July 2009)
- 9 Detailed process of building approval for ECBC compliant building is explained in upcoming section of 'Requirements' and 'Roadmap for your city'.
- 10 Table of current ECBC implementation in States/UTs of India is provided in appendix section 8.1 of this document
- 11 The status of these actions in states of India is added as annexure and can be referred to for details.
- 12 Alliance for an Energy Efficient Economy (AEEE), 15 July 2017
- 13 Source: Author. Source of information: (CEPT University and Weidt Group, n.d.)
- 14 Process of building plan approval is explained in detail in appendix (section 8.3)
- 15 All the forms mentioned in this process are the forms attached with the ECBC Rules (2018), published in the Gazette of India
- 16 State ECBC cell/ ECBC master trainer and nodal agency officials
- 17 State and city officials

