GGGI

Policy Recommendations for Low Carbon Buildings: India

Asia Low Carbon Buildings
Transition (ALCBT) Project

September 2025

Supported by:

Federal Ministry
for Economic Affairs
and Climate Action

IKI INTERNATIONAL CLIMATE INITIATIVE

on the basis of a decision
by the German Bundestag

**ASIA LOW CARBON
BUILDINGS TRANSITION**
*Life Cycle Assessment for Transitioning
to a Low-Carbon Economy* **|PROJECT**

CONTENTS

LIST OF FIGURES

ABBREVIATIONS

ABPAS	Automated Building Plan Approval System
AHJ	Authority Having Jurisdiction
ALCBT	Asia Low Carbon Building Transition Project
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
BEE	Bureau of Energy Efficiency
BMWK	Federal Ministry for Economic Affairs and Climate Action of Germany
CERC	Central Electricity Regulatory Commission
CII	Confederation of Indian Industry
CREDAI	Confederation of Real Estate Developers' Associations of India
DISCOM	Distribution Company
DoE	Department of Energy
DoP	Department of Power
DPMS	Development Permission Management System
EC Act	Energy Conservation Act
ECBC	Energy Conservation building Code
ECSBC-C	Energy Conservation and Sustainable Building Code- Commercial
ECSBC-R	Energy Conservation and Sustainable Building Code- Residential
EDGE	Excellence in Design for Greater Efficiencies
ENS	Eco-Niwas Samhita
EPC	Energy Performance Certificates
EPC	Energy Performance Contract
EPD	Environmental Product Declaration
EPI	Energy Performance Index
ESCO	Energy Service Company
EU	European Union
EUI	Energy Use Intensity
GFIT	Green Finance Industry Taskforce
GHG	Greenhouse Gases
GHMC	Greater Hyderabad Municipal Corporation
GPP	Green Public Procurement
GRIHA	Green Rating for Integrated Habitat Assessment
HVAC	Heating, Ventilation, and Air Conditioning
IDA	International Development Agencies
IDDI	Industrial Deep Decarbonization Initiative
IEA	International Energy Agency
IGBC	Indian Green Building Council
IIA	Indian Institute of Architects
IIID	Institute of Indian Interior Designers

IKI	International Climate Initiative
ISHRAE	Indian Society of Heating, Refrigerating and Air Conditioning Engineers
ISO	International Organization for Standardization
KPI	Key Performance Indicator
LCA	Life Cycle Assessment
LCC	Life Cycle Costing
LEED	(Leadership in Energy and Environmental Design)
MEAT	Most Economically Advantageous Tenders
MoEFCC	Ministry of Environment Forest and Climate Change
MNRE	Ministry of New and Renewable Energy
MoHUA	Ministry of Housing and Urban Affairs
MoP	Ministry of Power
MOU	Memoranda of Understanding
NPEB	Net Positive Energy Buildings
NZEB	Net Zero Energy Building
NZEBC	Net Zero Energy Building Code
PAYS	Pay-As-You-Save
PED	Primary Energy Demand
PMAY	Pradhan Mantri Awas Yojana
PWD	Public Works Department
RE	Renewable Energy
REC	Renewable Energy Certificate
REIT	Real estate investment trusts
RESCO	Renewable Energy Service Company
SDA	State Designated Agencies
TCP	Town and Country Planning
TPA	Third Part Assessors
UADD	Urban Administration and Development
UDD	Urban Development Department
ULB	Urban Local Bodies
USD	United States Dollar
USGBC	U.S. Green Building Council

Executive Summary

India's building sector is undergoing a transformative phase, marked by rapid urbanization and economic expansion. Currently, buildings account for more than 30% of India's electricity usage, and this figure is expected to rise dramatically, posing a significant challenge to the country's climate commitments under the Paris Agreement, COP26, and its Net Zero Emissions (NZE) targets. Recognizing the urgency, the **Asia Low Carbon Buildings Transition (ALCBT) Project**, led by the Global Green Growth Institute (GGGI) and supported by Germany's Federal Ministry for Economic Affairs and Climate Action (BMWK) through the International Climate Initiative (IKI), has developed a comprehensive set of draft policy recommendations. These aims to accelerate India's transition to low-carbon buildings through **five key domains:**

1. Localization of ECSBC/ ECBC/ ENS Code Compliance
2. Performance Disclosure for Existing Buildings
3. Green Public Procurement (GPP) for Low Carbon Materials
4. Institutionalizing Net Zero Energy Buildings (NZEBs)
5. Building Taxonomy Framework

While India has established progressive frameworks such as the Energy Conservation Building Code (ECBC), Eco-Niwas Samhita (ENS), and the recently launched Energy Conservation and Sustainable Building Code (ECSBC), their implementation presents a significant opportunity for deeper integration and impact. The current landscape marked by fragmented adoption across states and urban local bodies (ULBs) highlights untapped potential to harmonize efforts nationwide. To address these untapped potential opportunities, a multi-pronged structure is recommended around five key domains. The first domain focuses on code compliance for new buildings. It emphasizes the need to integrate ECSBC/ ECBC into building approval systems. The recommendations include establishing ULB-level subcommittees empowered with strategic steering functions to ensure strict code adherence, empanelled ECSBC expert professionals and energy auditors' capacity to perform timely and thorough code compliance evaluations and launching value driven incentive programs and training initiatives to build local capacity.

The second policy recommendation addresses performance disclosure for existing buildings. Drawing from international best practices in the EU, Japan, Singapore, and the United States, the policy recommendation advocates for mandatory energy assessments, a standardized star rating system, and a centralized digital dashboard managed by the Bureau of Energy Efficiency (BEE). By systematically revealing operational performance data, this policy aims to enhance transparency, catalyse market-driven improvements, enable programmatic retrofitting of inefficient building stock and support evidence-based policymaking.

Concurrently with these operational reforms, leveraging the government's substantial public procurement market, the third domain explores the potential of Green Public Procurement (GPP) to promote low-carbon building materials. With public procurement accounting for over 20-22% of India's GDP, the policy recommendation highlights the opportunity to embed low carbon building materials into government purchasing in construction sector. It recommends integrating carbon reduction criteria into tender evaluations through Life Cycle Assessment (LCA), Environmental Product Declarations (EPD), and Type 1 ecolabels in procurement specifications which will create rigorous, transparent standards to guide manufacturers, suppliers, and contractors.

The fourth policy recommendation focuses on institutionalizing Net Zero Energy Buildings (NZEBs). The buildings aim to achieve energy neutrality by combining rigorous energy efficiency measures with

renewable energy integration. This will require the formation of a dedicated national Net Zero Building Mission under the leadership of the Bureau of Energy Efficiency, tasked with setting a clear governance framework, aligning policy across ministries, and integrating net-zero objectives directly into urban planning instruments and building byelaws. The development of technical compendium outlining innovative passive and active design strategies, energy efficiency technologies, renewable energy integration, and smart building management systems. Additionally, financial models incorporating green bonds, subsidies, equity investments, concessional loans, and energy performance contracts will be instrumental in mitigating upfront costs and attracting private sector participation. Harnessing emerging technologies, including artificial intelligence for operational optimization, is highlighted as a transformative enabler for reducing energy consumption and facilitating NZEB adoption at scale.

The fifth and final policy recommendation introduces the concept of a Building Taxonomy Framework, aligned with India's draft Climate Finance Taxonomy. This framework seeks to harmonize existing codes and certifications, define eligibility and technical screening criteria, and facilitate access to green finance. A centralized monitoring platform and third-party verification system are recommended to ensure transparency and accountability. The framework will serve as a credible and verifiable mechanism to align sustainable building activities with green financing instruments such as green loans, bonds, and Real Estate Investment Trusts (REITs). Crucially, the taxonomy's success will depend on establishing a multi-stakeholder governance platform comprising of regulators, industry representatives, financial institutions, certification bodies, academia, and civil society to foster transparency, accountability, and ongoing adaptation.

In conclusion, the challenges confronting India's building sector in achieving energy efficiency and sustainability objectives are formidable but surmountable through decisive, coordinated policy action. The recommendations articulated in this report offer a comprehensive, actionable roadmap that integrates regulatory enforcement, transparency, market incentives, technology adoption, and financial innovation. Immediate initiation of pilot programs combined with phased scaling, ongoing monitoring, capacity building, and adaptive policy refinement will be essential to ensure success. By embracing this multifaceted strategy, India can substantially improve the energy performance of its buildings, contribute meaningfully to its climate commitments, and set a global example for sustainable urban development aligned with its national ambition

1 Introduction

The building sector in India is experiencing rapid growth, accounting for over 30% of the country's total electricity consumption[1]. With an estimated 27,870 square meters of floor space being constructed daily, India is poised for one of the largest building construction booms in the coming decades[2]. This growth is intrinsically linked to India's economic progress and the urbanization trend. By 2050, it is anticipated that the urban population will hit 814 million, leading to a demand for 35 billion square meters of residential and commercial spaces[3]. The escalating energy consumption in this sector which is projected to increase from 414 TWh per year to 4,697 TWh per year by 2047[4], poses a significant challenge to India's commitment to its net zero emissions pathway, the Paris Agreement, COP 26, and Nationally Determined Contributions (NDCs).

This surge in energy consumption in the building sector can be attributed to a variety of factors such as population growth, accelerated urban expansion, changing lifestyles etc. In response to the challenge of escalating energy consumption in the building sector, India has prioritized energy efficiency which has led to the development of several key policies and programs, including standards and labelling programs, Energy Conservation and Sustainable Building Code (ECSBC), Energy Conservation Building Code (ECBC), and Eco-Niwas Samhita (ENS). While India has made commendable progress, many opportunities, such as refining and updating existing standards, and making low-carbon building materials available, still exist to further accelerate progress towards the net zero emissions goal and meeting its climate commitments.

To achieve the goal of Net Zero 2070, Global Green Growth Initiative (GGGI) with the German Federal Ministry for Economic Affairs and Climate Action (BMWK) under the International Climate Initiative (IKI) is implementing the "Asia Low Carbon Buildings Transition (ALCBT)" project in India under the guidance of Ministry of Housing and Urban Affairs (MoHUA), Government of India. The project will aim to facilitate nationwide transition towards low carbon buildings by 2028.

The project approach consists of assessing the status quo and potential growth in the building sector in India, developing policy initiatives for building energy efficiency, modelling scenarios for achieving net zero by 2050, establishing a financial pathway for net zero buildings. To support India's transition to low-carbon buildings, the project follows a systematic framework for developing draft policy recommendations:

1.1 Policy Review and Institutional Mapping

The study aimed to comprehensively analyse policies and initiatives from various international development agencies, NGOs, ministry-level departments, and others, focusing on building energy efficiency programs and green building materials. Key activities included reviewing India's policies on building energy efficiency, examining government policies, regulations, and strategies across commercial and urban residential sectors. The study on policy review initiative was conducted to understand the path toward net-zero emissions by 2050, with an assessment of low carbon building materials' roles within energy efficiency frameworks.

---

[1] BEE's Impact Assessment Report for Energy Efficiency Measures – 2022-23,
https://beeindia.gov.in/sites/default/files/publications/files/Impact%20Assessment%202022-23_%20FINAL%20Report.pdf
[2] Bureau of Energy Efficiency Buildings Background,
https://beeindia.gov.in/en/programmes/buildings0#:~:text=This%20sector%20alone%20accounts%20for,over%20the%20next%20two%20decades
[3] World Urbanization Prospects: The 2014 Revision,
https://www.compassion.com/multimedia/world-urbanization-prospects.pdf
[4] BEE's Impact Assessment Report for Energy Efficiency Measures – 2022-23,
https://beeindia.gov.in/sites/default/files/publications/files/Impact%20Assessment%202022-23_%20FINAL%20Report.pdf

A comprehensive review revealed challenges and opportunities in energy efficiency policies and programs, such as the ECBC for commercial buildings, ENS for residential buildings, Shunya Labelling, and the Star Rating system. These gaps were categorized into regulatory, technological, market, and fiscal transformation areas. To address these challenges, a multi-faceted approach involving regulatory reforms, technological advancements, market development, and fiscal incentives have been recommended. These insights provided guidance for strategic policy recommendations to enhance energy efficiency and integrate sustainable materials in the sector.

1.2 Comprehensive Scenario Modelling

A comprehensive scenario modelling for building sector was conducted which included key activities such as conducting detailed analysis to explore various pathways and potential outcomes for achieving a net-zero scenario. This modelling process encompassed a wide range of factors, including energy consumption trends, technological advancements, policy frameworks, and socio-economic dynamics, with the goal of identifying challenges and opportunities in reaching net-zero emissions.

The Net-Zero scenario, with all new buildings meeting Super ESCBC standards by 2070, sharply reduces operational energy demand and emissions through enhanced building performance and widespread rooftop PV. Remaining operational energy and emissions are relatively small, demonstrating that efficiency combined with on-site renewables can largely neutralize everyday impacts. However, cumulative embodied energy and embodied emissions remain substantial, indicating that materials, construction practices and lifecycle processes continue to drive significant carbon. Achieving true sectoral net-zero therefore requires focused action on low-carbon materials, circular construction, reuse and supply-chain decarbonization alongside strong operational standards and supportive policy, innovation and investment to scale change.

1.3 Stakeholder consultations

The stakeholder consultation process aimed to engage a diverse group of participants from various organizations across the nation. The main goal was to validate the assumptions used in scenario modelling and systematically map out policy recommendations proposed by key experts to support the country's transition towards low carbon. By encouraging open dialogue, these consultations sought to gather a wide range of perspectives through virtual and in-person meetings, ensuring broad and inclusive participation. This inclusive approach allowed for the incorporation of diverse viewpoints, providing a thorough understanding of the sector's various challenges.

Based on these consultations, draft policy recommendations focusing on code compliance, public disclosure, low carbon building (LCB) materials, net zero energy buildings, and building taxonomy were developed. These drafts were informed by current market insights and aligned with the sector's changing needs.

1.4 Draft Policy Recommendations

The primary objective of this assignment is focused on providing the Government of India with detailed insights and recommendations to facilitate the transition toward low-carbon buildings across short, medium, and long-term horizons. This involves developing a strategic roadmap for reducing carbon emissions within the building sector, tailored to meet the specific needs and challenges of the Indian context. The recommendations aim to address immediate opportunities for carbon reduction, set achievable targets for medium-term progress, and outline sustainable strategies for long-term transformation.

This report builds upon the stakeholder consultation, involving experts from diverse sectors, yielded numerous suggestions and recommendations for promoting a low-carbon transition in the building sector. These recommendations are methodically organized into six primary categories: a) Policy

Initiatives, b) Institutional Framework and Governance, c) Emission Monitoring and Reporting, d) Low-Carbon Building Materials, e) Energy-Efficient Technologies, and f) Stakeholder Engagement.

This structured approach facilitated the creation of these policy recommendations to address five major domains in the building sector- code compliance for new buildings, public disclosure for existing building, LCB materials, net zero buildings and building taxonomy. The in-person workshop further offered valuable inputs, which helped to refine and strengthen the policies, ensuring they are both strategic and ready for implementation.

Launch of the report on, "Policy Review and Institutional Mapping of Building Energy Efficiency Programs in India" on June 6, 2025. The same is available on alcbt.gggi.org

12th Stakeholder Consultation Workshop on, "Reviewing Draft Policy Interventions for Promoting the Transition towards Low Carbon Buildings in India", organized in IHC, New Delhi on June 6, 2025.

2 Localization of Building Code Compliance

2.1 Introduction

India's building sector is experiencing rapid growth, fueled by initiatives such as the Pradhan Mantri Awas Yojana (PMAY), Smart Cities Mission, Building Energy Efficiency Programs etc. With the anticipated increase of floor area and the energy demand in the building sector and need for managing it, an effort for energy conservation has been initiated by Government of India with the introduction of Energy Conservation (EC) Act published in the gazette of India in October 2001. The Energy Conservation Building Code (ECBC) was launched in 2007 to establish baseline energy performance standards for commercial buildings, enhancing energy efficiency and reducing consumption. The code was updated in 2017 to reflect evolving energy needs. Its objectives were further reinforced with the introduction of the Eco Niwas Samhita (ENS) in 2019 and 2021, followed by the Energy Conservation and Sustainable Building Code (ECSBC) in 2024, which emphasizes sustainable sites, water conservation, waste management, indoor environmental quality, and energy efficiency.

For new constructions, compliance with ECSBC, ECBC, and Eco-Niwas Samhita (ENS) is crucial, as non-compliance would impede the building sector's efforts to minimize energy demand. The Bureau of Energy Efficiency (BEE) and State Designated Agencies (SDAs) have collaborated to integrate ECBC and ENS into local byelaws, resulting in the adoption of 25 states and ENS 2021 by 17 states.

Despite these advancements, significant gaps remain at the local level, particularly with Urban Local Bodies (ULBs) across regulatory, technical, market, and fiscal dimensions. Addressing these challenges is vital for achieving energy efficiency objectives in the building sector, requiring targeted strategies to bridge the implementation gaps at various administrative levels, with an emphasis on localization for mandatory code compliance in new constructions. An illustrative gap assessment, depicted in Figure 1, provides further insights into these bottlenecks.

Gap Assessment

Regulatory	Different enforcement levels in various regions contribute to uneven compliance
	The absence of unified guidelines creates inefficiencies in code integration
	ULBs lack resources to implement and enforce codes effectively
Technical Adaptability	Lack of technical understanding hinders the effective adoption of energy codes by authorities and builders
	Regions lack tools and expertise for compliance verification
	Traditional building methods slow the adoption of energy-efficient technologies
Market and Fiscal	Adoption of energy-efficient building practices is hindered by a lack of demand and awareness
	Upfront costs deter developers, especially in regions lacking tailored financing
	Absence of incentives reduces motivation for adopting energy-efficient practices

Figure 1: Gaps and challenges for ECBC/ ECSBC implementation in the building sector

To effectively address the escalating energy demand in the country, it is essential to enhance the support mechanisms for the energy codes through strategic localization efforts. This entails enhancing the readiness and capacity of the state and local departments including SDA, PWD, ULB's, TCP and UDD. Additionally, there is a need to reinforce governance at the local level (municipal corporations) to ensure robust implementation and compliance with energy efficiency standards.

2.2 Key insights

The current landscape of code implementation in India involves a multi-tiered approach coordinated across central, state government and local bodies. At the central level, the ECBC rules and codes are developed by Bureau of Energy Efficiency (BEE), Ministry of Power (MoP). At state level, the Urban Development Department (UDD) and State Designated Agencies (SDAs), amend ECBC/ENS guidelines, update building bylaws, and facilitate compliance through training and capacity building.

At the local level, Urban Local Bodies (ULBs) like municipal corporations and Town & Country Planning (TCP) play a crucial role in enforcing the code, adopting the code in the local regulations and empanelment of ECSBC Expert Professionals & Energy Auditors (Buildings) appointed by state level stakeholders or BEE. The experts provide essential consultation and verification advisory through construction process, ensuring adherence to energy efficiency mandates, which are crucial for obtaining necessary certificates and approvals. [567] The illustrative structure of the multi-tiered approach across central, state and local bodies is given in Figure 2.
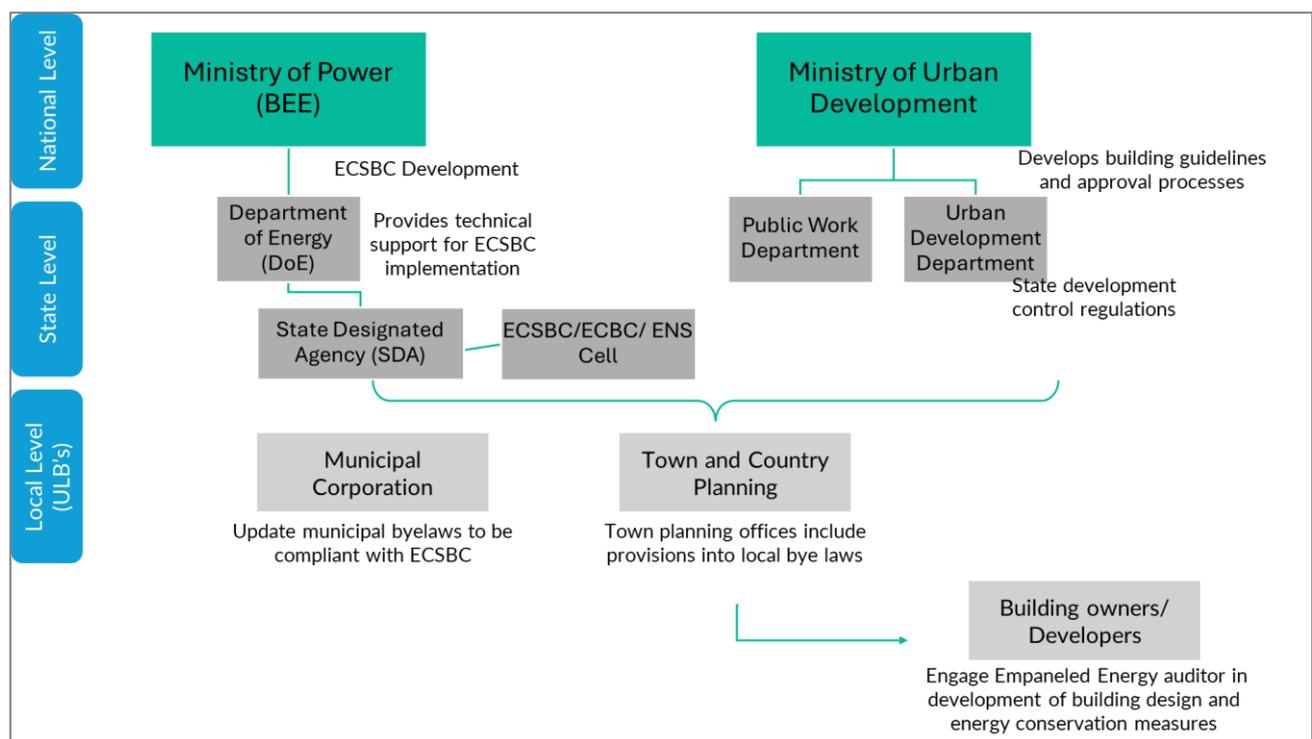
Figure 2: Current Landscape of ECBC/ ECSBC- C /ECSBC-R code implementation

2.3 Policy Recommendations

The following draft recommendations aim to fortify the process of energy code adoption across India, with a focus on fostering collaboration and streamlining implementation procedures. These

[5] Alliance for an Energy Efficient Economy, Energy Conservation Building Directives,
https://www.grihaindia.org/sites/default/files/pdf/ECBC-Code.pdf
[6] ECBC Compliance in Indian Cities, 2019, https://shaktifoundation.in/wp-content/uploads/2019/11/ECBC_compliance_in_Indian_Cities.pdf
[7] BEE's ECBC Rule, https://beeindia.gov.in/sites/default/files/ECBC%20Rules_Gazette.pdf

recommendations listed in Figure 3 are designed to ensure seamless integration of energy codes across all levels of governance, thereby enhancing compliance and promoting sustainable building practices:

Figure 3: Draft policy recommendations for facilitating the adoption, institutionalization, and effective implementation of building energy codes

2.3.1 Integrating ECSBC/ ECBC/ ENS Code Compliance into Building Approval System

As defined by ECBC rules 2018, the State Energy Conservation Building Code Implementation Committee is responsible to promote energy efficiency standard of the building sector and forward recommendations to National Energy Conservation Building Code Implementation Committee. The committee further develops and revises the standards as per state specific requirements, creating awareness about ECBC and procedure for increasing the uptake of code compliant buildings, promoting construction of energy efficient buildings and capacity building of building professionals, developers and contractors and undertake performance review of Empanelled Energy Auditors. This committee comprises of various stakeholders and representatives from various departments such as Energy department, State Designated Agencies, Municipal corporation, Urban Administrative Department, PWD, Town & Country Planning and can include Industry Partners like; Confederation of Real Estate Developers' Associations of India (CREDAI), Confederation of Indian Industry (CII), Indian Institute of Architects (IIA), Institute of Indian Interior Designers (IIID), Real Estate Developers Association and Academia.[8]

To facilitate code enforcement, a sub-committee under the state-specific ECBC technical committee could be established at the ULB level to provide strategic steering guidance ensuring the adoption of the energy code. The dedicated subcommittee, comprising of key stakeholders, could oversee the integration of the code into the building approval process. This will be achieved through meticulous documentation and active engagement with stakeholders at both the state and local government levels. The subcommittee's primary function is establishing a direct correlation between building permits and code compliance, thereby ensuring rigorous evaluation of building projects for adherence to code standards during both the design and construction phases. The subcommittee could include the following designated members from:

- Energy department
- State Designated Agencies
- Municipal corporation
- Urban Planning Department
- Town and Country Planning

During the stakeholder consultation workshop on 6th June 2025, it was suggested to introduce penalties for buildings failing to meet code requirements such as withholding occupancy certificates or

---

[8] BEE's ECBC Rule, https://beeindia.gov.in/sites/default/files/ECBC%20Rules_Gazette.pdf

construction permits. It was also suggested that a portion of funds transferred from the central to state government should be devoted specifically towards code compliance, targeting Urban Local Bodies (ULBs)for efficient implementation. Through these inputs, the policy could be further strengthened, and adequate financial funding could be ensured.

The ECBC facilitates the resolution of technical grievances through the State Energy Conservation Building Code Technical Grievances Redressal Committee, which may include issues such as non-compliance with energy efficiency standards, misinterpretation of technical provisions, or delays in code enforcement. Meanwhile, ULBs are responsible for addressing grievances related to building approval permits, such as procedural delays, lack of transparency in application processing, or discrepancies in documentation requirements. By empowering this committee with essential technical support and capacity building at ULB level, they can effectively enforce code compliance requirements. In situations where no such committee exists, the subcommittee should be established to manage and ensure adherence to code compliance effectively.

Several states such as Telangana, Andhra Pradesh, Madhya Pradesh etc. have integrated ECBC into their existing building approval system. While governance structure and implementation methods vary, but the high-level incorporation is similar. The following are examples from the states:

- Telangana established the *Development Permission Management System (DPMS)*, an online platform that integrates ECBC compliance into the application system for construction permits, started in Hyderabad in 2017 and expanded to major cities in the state in 2018.[9] Figure 4 illustrates the integration of ECBC in the Greater Hyderabad Municipal Corporation (GHMC) application form.
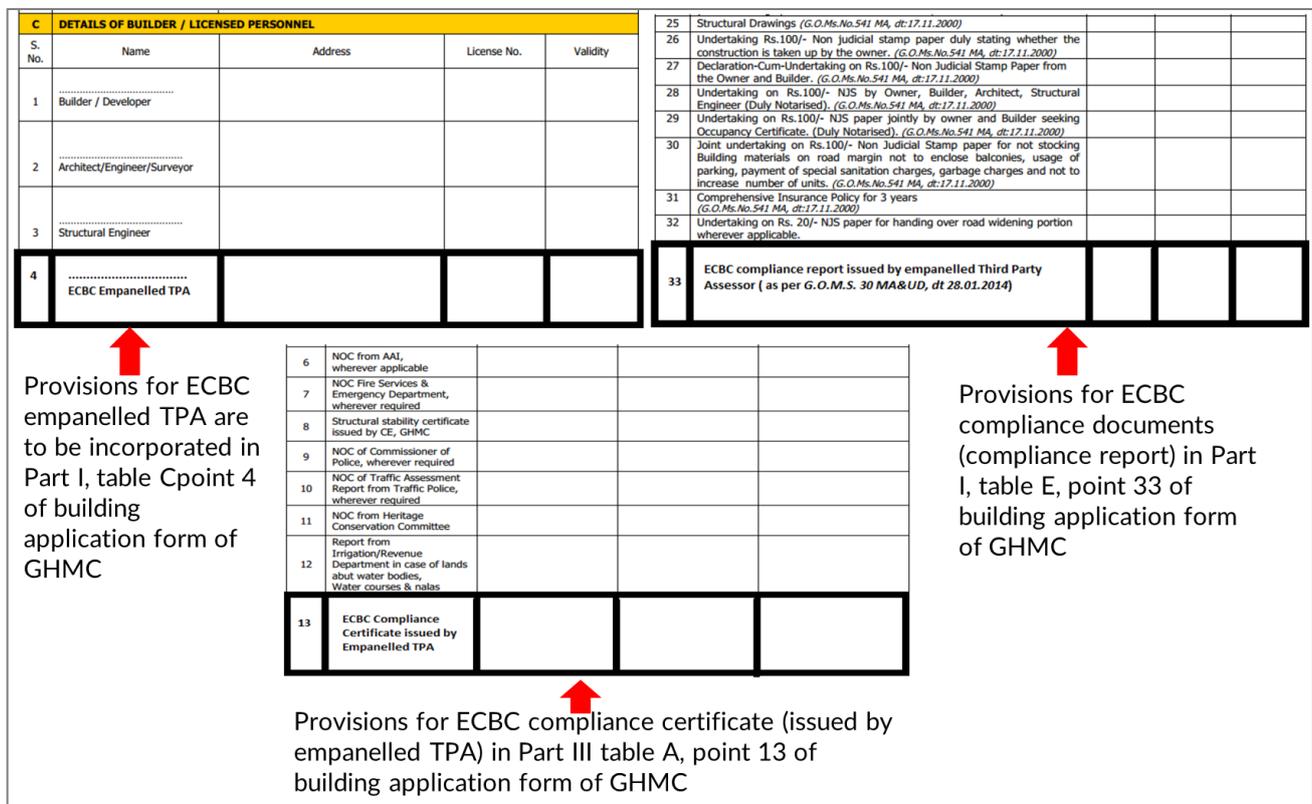
Figure 4: Sample illustration of ECBC compliance integration within the GHMC Building Application

---

[9] Implementation of Energy Conservation Building Code (Andhra Pradesh and Telangana), https://www.cecp-eu.in/uploads/documents/ace-e2/S2-P2_Rajkiran_Implementation-of-ECBC.pdf

- The *Automated Building Plan Approval System (ABPAS)* of Madhya Pradesh, where Energy Conservation Building Code (ECBC) directives have been integrated. This integration aims to assess the feasibility of ECBC compliance building in the state. [10] Figure 5 details out the integration in the new property application form.
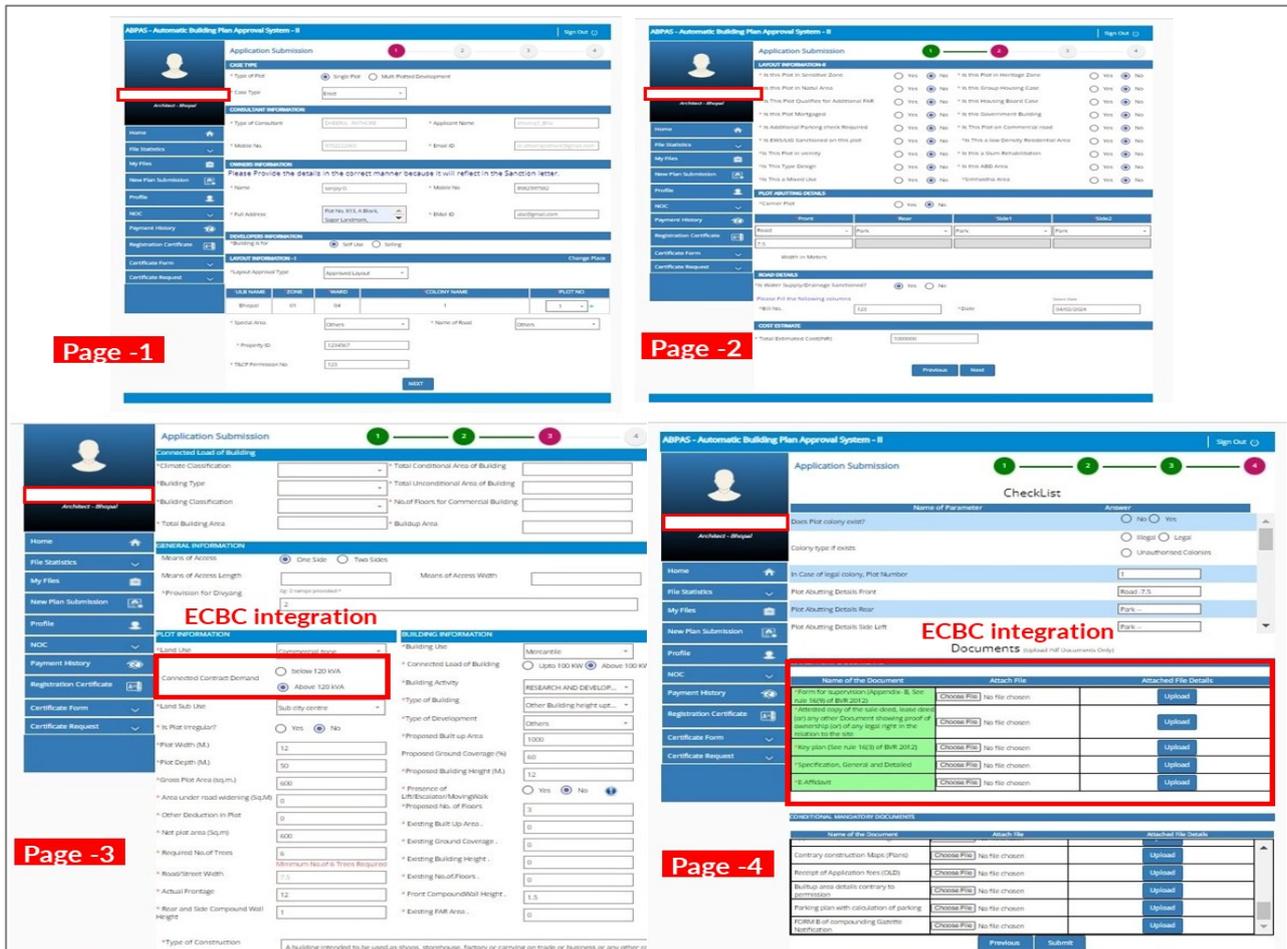
Figure 5: Sample illustration of Automated Building Plan Approval System (ABPAS) of Madhya Pradesh

2.3.2   Facilitation of ECSBC Expert Professionals & Energy Auditors (Buildings)

Successful implementation of energy codes at the local level relies heavily on skilled personnel, such as ECSBC Expert Professionals and energy auditors, who play a critical role in assessing energy performance and ensuring compliance with code requirements. However, a current market analysis indicates a significant shortage of these trained professionals within Urban Local Bodies (ULBs), which poses a challenge to effective code adoption and enforcement, potentially hindering progress in energy efficiency efforts.

At the state level, the Department of Energy (DoE) or Department of Power (DoP) act as primary stakeholders, while Town & Country Planning (TCP) and Urban Development Department (UDD) departments and other regional bodies fulfil this role locally. Despite this, government and public sector agencies like ULBs, State Designated Agencies (SDAs), and utilities often lack the manpower and technical expertise necessary for conducting compliance checks for ECSBC, ECBC, and ENS codes.

To address this challenge, a strategic approach aimed at facilitating the empanelment of ECSBC Expert Professionals and energy auditors within states is essential. To improve the accuracy of code compliance and complement the role and responsibilities of ECSBC Expert Professionals and Energy

---

[10] Madhya Pradesh E-Nagar Palika Portal Link:
https://www.mpenagarpalika.gov.in/irj/portal/anonymous?NavigationTarget=navurl://c2ab4b583522d59eab1df6c0616a3d77

Auditors, the Building Emission Assessment Tool (BEAT) platform developed by HEAT GmbH a consortium partner of the ALCBT Project led helps in assessment of both embodied and operational carbon. [11] This approach can be seamlessly integrated into the existing framework, enhancing the capacity of local and state bodies to perform compliance checks effectively and thereby support the enforcement of energy codes. The illustrative empanelment of as ECSBC Expert Professionals and energy auditors (buildings) in the state is depicted in Figure 6.

- **ECSBC Expert Professionals:**
  - To address the state and region-specific requirements there is a need to cultivate a robust pool of qualified professionals with technical understanding of local bylaws, state level schemes and policies, building approval systems and state SoR. A state-level empanelment focusing on the technical aspects of the code can be executed. The empanelled candidates would be listed on the SDA's website, accessible to developers, owners, and architects.
  - Developers/owners/architects can hire these expert professionals empanelled by SDA for ensuring ECSBC assessment and compliance of the buildings.

- **Energy Auditors (Buildings):**
  - Energy Auditor (Buildings) review each building project in two stages to determine code compliance, i.e. Design Review and Construction Review During Design Review, the EA examines drawings, specifications, and Code Compliance Forms. During Construction Review, the EA reviews the Code Compliance Forms and inspect the building to verify the incorporation of Energy Conservation Measures (ECMs) in the construction.
  - BEE to conduct the national level examination to establish a pool of certified Building Energy Auditors. A state wise list to be published by BEE for the empanelled energy auditors (buildings) to strengthen the capacity of the state and provide hand holding support to the ULBs.
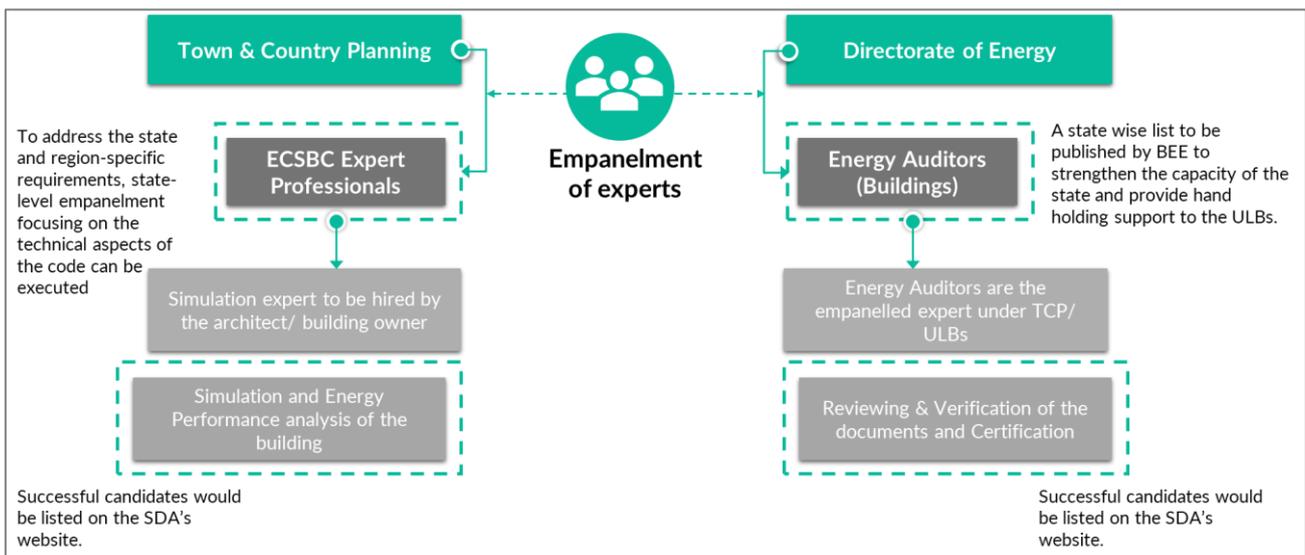
Figure 6: Indicative process of empanelment of ESCBC Expert Professionals and energy auditors (buildings) in the state

As suggested during stakeholder consultations for improving building code enforcement, it is crucial to separate the code development team from the implementation team. This separation would allow for a dedicated group of experts to focus solely on code enforcement, ensuring specialized attention to compliance and regulation. Furthermore, it was suggested that for more effective code reinforcement within the states, a structured approach to phase-wise launches should be implemented, particularly in major cities identified through construction growth analyses. By doing so, cities with significant urban expansion can receive prioritized attention and resources, optimizing code compliance efforts. This

---

[11] https://alcbt.gggi.org/subnational-building-registry-and-carbon-assessment-in-india-approach-and-key-recommendations/

strategic division of responsibilities and targeted implementation is expected to lead to more robust enforcement practices, ensuring that energy efficiency codes are upheld effectively.

2.3.3   Developing Preparedness and Readiness at the ULB Level

The effective implementation of energy codes at the local level hinges on the preparedness of stakeholders, which involves comprehensive code education, the development of supportive infrastructure like online platforms, and robust collaboration between local and state entities. Ensuring effective enforcement requires adequate financial resources, such as Energy Service Company (ESCO) and Pay-As-You-Save (PAYS) models, along with human resources, including technical experts, consultants, and simulation experts.

While financial incentives play a crucial role in promoting energy efficiency, they should be complemented by value-driven strategies that emphasize stakeholder engagement and collaborative efforts to integrate these codes effectively into existing systems. The following strategies can be implemented by state or local stakeholders to motivate developers and building owners.

- Launch national level award programs for states for highest code-compliant buildings to incentivize adherence to energy codes and encourage competition among states.
- Private developers can partner with government bodies via Memoranda of Understanding (MOUs) to create pilot projects that demonstrate energy efficiency and code compliance, serving as exemplars for broader adoption.
- Government bodies could establish MOUs with International Development Agencies (IDAs) to promote code adoption and energy efficiency by utilizing IDA funding.
- Develop and implement Market based instruments (MBIs) such as Sustainability-Linked Financing, State Level Revolving EE Funds, certifications, green loans etc. for all code compliant buildings to increase the uptake of energy code at the state level.
- Sensitization of private sector through partnership with professional bodies (IIA, ISHRAE, ASHRAE, CII etc.) to increase the stakeholders' collaboration by code adoption, technological advancements and knowledge dissemination.
- Targeted training for building owners, developers, and end users by engaging bodies like Real Estate Regulatory Authority (RERA), Residents Welfare Association's (RWA), Confederation of Real Estate Developers' Associations of India (CREDAI), National Real Estate Development Council (NAREDCO) for increasing awareness on residential and commercial building energy codes.

This policy recommendation acts as an enabler to fast track the code implementation and enforcement at the local level. Continuous monitoring, evaluation, and adaptation are essential to ensure its effectiveness and achieve the envisioned outcomes. Collaboration between states through local level stakeholders is critical to achieve the desired outcomes.

2.4 Strategic Framework for Policy Implementation

With the support of stakeholders and their valuable input, the policy has been further enhanced. To facilitate phase-wise implementation of the code, it is crucial to streamline the process through mandatory requirements to build momentum and increase the number of code-compliant buildings across the country. The code provides two distinct methods of compliance for various building typologies: the Integrative Compliance Method and the Standardized Compliance Method. Regardless of the chosen method, buildings must adhere to the mandatory requirements specified in the document. This approach will help rationalize the stringent and time-consuming code requirements by lowering the compliance threshold and boosting code adoption.

To ensure a successful implementation of the ECBC/ ECSBC-C/ ECSBC-R code, complete authority and responsibility to be vested in the Department of Energy or Department of Power, operating under the Bureau of Energy Efficiency. This department will oversee all aspects of enforcement and BEE to

provide a strategic approach, monitoring compliance methodology, and addressing any challenges the department faces during the implementation process. As a central authority, BEE to ensure uniform implementation of the code and adherence to best practices, facilitating a cohesive approach across different regions and building typologies. This transition can be implemented in phases, targeting different cities and states in the country:

- **Phase 1 (2-3 years):** Focuses public and commercial buildings in Tier 1 cities where the ECBC is notified[12]. For effective implementation, the State Designated Agencies (SDAs), DISCOMs and Urban Local Bodies (ULBs) shall map all upcoming public and commercial buildings under state-level departments and private builders. Annexure 1 provides the detailed list of Tier 1 cities in India.
- **Phase 2 (3-5 years):** Focuses public and commercial buildings in Tier 2 and Tier 3 cities where the ECBC is notified. For effective implementation, the State Designated Agencies (SDAs), DISCOMs and Urban Local Bodies (ULBs) shall map all public and commercial buildings under state-level departments and private builders. Annexure 2 provides the detailed list of Tier 2 & 3 cities in India.
- **Phase 3 (5- 10 years):** Focuses on residential buildings in all Tier 1 and Tier 2 cities where the ECSBC-R /ENS code is notified. For effective implementation, the State Designated Agencies (SDAs), Real Estate Regulatory Authority (RERA) Act, DISCOMs and Urban Local Bodies (ULBs) to map all upcoming residential properties according to the scope of code requirements.
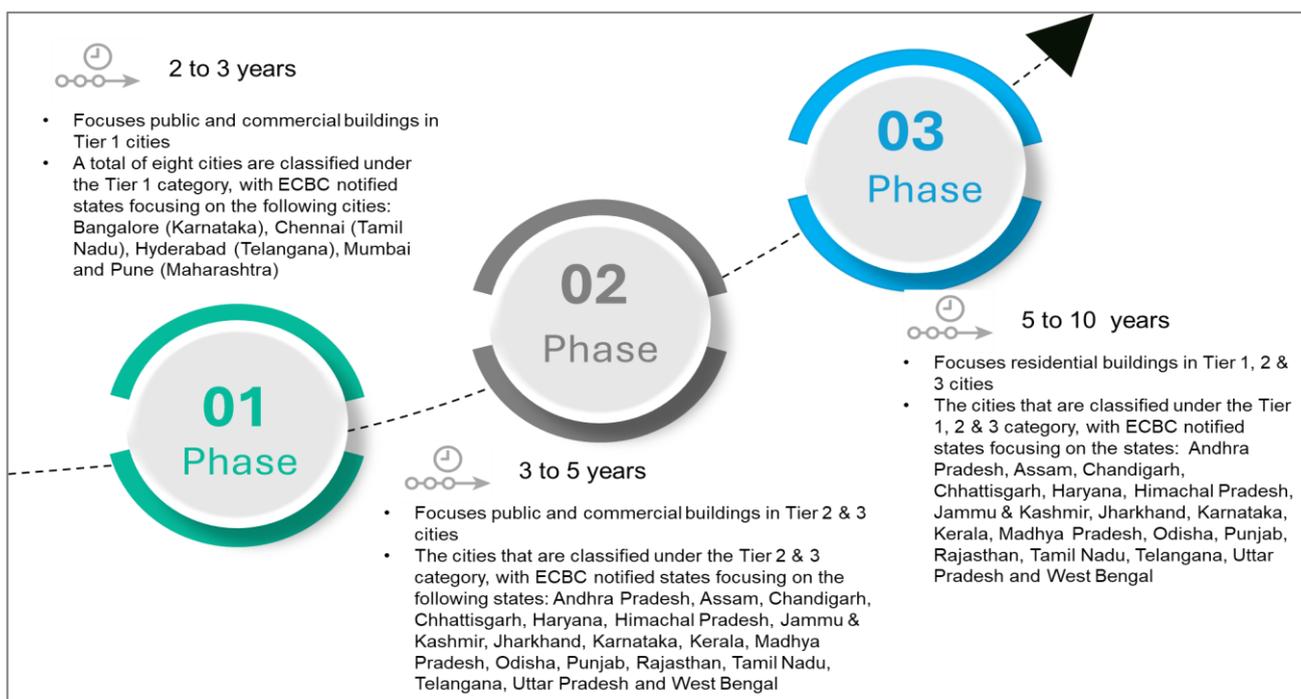
Figure 7: Phase wise ECBC/ ECSBC-C/ ESCBC-R code implementation in the country

It is suggested that during each phase of the implementation timeline, all respective buildings should either achieve compliance or actively engage in the compliance process to ensure effective code implementation. In instances where buildings do not meet compliance within the allocated timeframe, it is proposed that measures be introduced to encourage timely adherence to the code. These measures could include the conditional issuance of permits, such as construction permits or occupancy certificates, coordinated by the Department of Energy or Department of Power in collaboration with ULBs. This collaborative approach aims to support building developers and owners in meeting code requirements and promoting a smooth transition to full compliance.

---

[12] State Energy Efficiency Insdex (SEEI), 2023, https://aeee.in/our-publications/state-energy-efficiency-index-2023/

2.5 Long Term Impacts

Adopting this policy recommendations will embed ECSBC/ECBC/ENS code into building approval workflows, creating ULB subcommittees, empanelment of ECSBC experts and BEE-certified auditors, ensure consistent enforcement and faster permits. Phase-wise launch of the code and targeted training will build local technical capacity. Financial instruments, MoUs and market-based instruments will reduce upfront costs and scale code compliance. Together, these measures will increase energy efficiency, increase code compliance at the state level and align building growth with India's net-zero objectives.

The recommendations embed regulatory barrier through ECSBC/ECBC/ENS code into approvals with ULB subcommittees, empaneled experts and BEE-certified auditors, penalties and earmarked funds, additionally a phased rollout and targeted trainings to build the local capacity. Technical and market shortfalls are tackled through trained design and review teams, on-site validation, and support via MoUs, awards, and market instruments. Fiscal barriers are addressed with state revolving funds, sustainability-linked finance, green loans, and targeted transfers to ULBs at the state level. Together these measures aim to speed permits, secure consistent enforcement, raise code compliant buildings.

The Bureau of Energy Efficiency (BEE) establishes technical standards, certifies auditors and supplies toolkits and registries that enable states to operationalize codes. State Designated Agencies adopt these frameworks, empanel ECSBC experts and integrate compliance checks into municipal approval systems, while ULBs implement inspections, enforce occupancy controls and coordinate on-the-ground audits. Empanelled professionals perform design and construction reviews and advise developers, contractors and architects. Industry bodies, financiers and ESCOs offer training, incentives and green finance while resident associations and academia drive awareness and pilot evaluations. This coordinated approach strengthens enforcement, ensures audit quality, generates reliable compliance data, accelerates scalable adoption and helps BEE measure energy savings, impact and policy effectiveness

3 Performance Disclosure for Existing Buildings

3.1 Introduction

Public disclosure is essential for enhancing transparency in the building sector, allowing developers to share energy performance metrics and adhere to legal and regulatory requirements. By disclosing these metrics, developers can benchmark their energy consumption against industry peers, facilitating robust evaluation of energy efficiency and sustainability efforts. This practice not only sets informed sustainability goals but also fosters a culture of accountability and continuous improvement in energy performance.

Energy performance is typically assessed through metrics like Energy Performance Index (EPI), Energy Use Intensity (EUI) etc. which measures energy consumption relative to building size. Public disclosure of such operational performance reveals insights into a building's energy use, allowing developers to identify areas for improvement. Implementing energy efficiency measures helps in optimizing building operational performance, and achieving green building certifications such as IGBC, LEED, GRIHA etc. and offers multitude of benefits encompassing increased property value, enhanced marketability, as well as a positive impact on the occupant wellbeing. However, challenges such as data accessibility, accuracy, and stakeholder resistance present obstacles to implement public disclosure at the state and central level. Addressing these challenges requires a structured approach that considers the complexities and promotes transparency, competition, and accountability across the industry.

3.2 Key Insights

Globally, public disclosure for building sectors has been addressed by various countries through benchmarking of public and commercial buildings, mandatory disclosure of benchmarking results, mandatory energy audits for energy intensive buildings, whole building energy audit or building component level assessment based on countries and its regulations. The following are examples from various countries that serve as models for adopting a public disclosure framework:

- **EU Member States**- Energy Performance Certificates (EPCs) in the EU are a system for rating the energy efficiency of buildings, designed to promote energy efficiency and reduce greenhouse gas emissions. EPCs are mandatory for new buildings, buildings undergoing major renovations, and buildings owned and occupied by public authorities exceeding a certain floor area.[13]
- **Japan**- In 2014, Carbon Report Cards were introduced to compare energy efficiency and CO_2 emission intensity across similar typologies of buildings. The cards show a building's performance on a scale relative to benchmarks derived from the city's benchmarking scheme. The card also lists any ongoing or planned energy reduction measures for that specific building.[14]
- **Singapore**- In 2012, the Building and Construction Authority (BCA) introduced the requirement for periodic audit for building's cooling system under Building Control Act and building control for existing buildings. This was set as a minimum efficiency standard for cooling systems.
- **United States**- New York City has three laws addressing access to building's performance data on energy and water consumption, periodic energy audits and retro-commissioning measures and installing electrical sub-meters for large non-residential tenant spaces. In 2013, three cities Minneapolis [15], Houston and Chicago [16] have mandatory benchmarking requirements for large public and commercial buildings through the ENERGY STAR Portfolio Manager Program. Austin in the United States requires energy audits and disclosure for residential and multifamily units older than 10 years, alongside annual reporting of an energy rating for commercial buildings over 10,000 square feet.[17]

Key learnings from international use cases: While the EU's Energy Performance Certificates are mandatory with clear rating systems and Japan's Carbon Report Cards provide performance benchmarks, Singapore's audits focus on efficiency standards, and the U.S. cities adopt comprehensive benchmarking and audit frameworks. These models balance regulatory rigor with market flexibility through quantifiable performance measures, recognized certifications, and transparent public reporting. Key takeaways include the following:
- Public disclosure policies enhance energy efficiency and reduce emissions across building sectors.
- Metrics often involve energy consumption, CO2 emissions intensity, and system-specific efficiency standards.
- Integration with certification systems like EPCs and ENERGY STAR is crucial for driving market competitiveness and fostering sustainable building practices.
- Mandatory audits and sub-metering allow precise measurement and reporting, driving continuous improvement.
- Effective disclosures are supported by clear quantitative benchmarks (EPC ratings, emissions reductions).
- Policies involve multiple stakeholders, including government agencies, building owners, and technology providers

---

[13] Energy Performance Certificates, https://energy.ec.europa.eu/system/files/2016-11/enerperfcertificates_0.pdf
[14] Tokyo Carbon reduction reporting program, https://www.kankyo.metro.tokyo.lg.jp/documents/d/kankyo/climate-tokyo_carbon-files-overviewofcarbonreporting
[15] Minneapolis Energy benchmarking website, https://www.minneapolismn.gov/government/programs-initiatives/environmental-programs/energy-benchmarking/
[16] Chicago Energy Benchmarking Homepage, https://www.chicago.gov/city/en/progs/env/building-energy-benchmarking---transparency.html
[17] Austin Energy, City of Austin Utilities, https://austinenergy.com/en/energy-efficiency/ecad-ordinance

3.3 Policy Recommendations

The building performance disclosure policy publicizes measured energy performance data for existing buildings, stimulating market-driven energy efficiency improvements. By institutionalizing performance disclosure, the policy enhances regulatory accountability and encourages building owners to make data-driven investments in energy efficiency upgrades.

3.3.1   Institutionalizing Building Performance Assessment as a Regulatory Norm

The successful model for public disclosure to mandate building energy assessments through onsite inspections of technologies and building performance. As suggested in stakeholder consultations for optimizing energy usage in energy-intensive buildings categorization should be done based on typology and energy thresholds. The policy can be to make the assessments mandatory for priority building types or high energy-intensive buildings, specifically those with a connected load above 100 kW or contract demand exceeding 120 kVA, ensuring focus on buildings with the highest energy impact. A phased approach could facilitate implementation of this policy:

- **Phase 1 (2-3 years):** Focuses existing public buildings in Tier 1, 2 and 3 cities where the ECBC is notified. For effective implementation, the State Designated Agencies (SDAs) shall map all public buildings under state-level departments, and Bureau of Energy Efficiency (BEE) certified auditors could be appointed to conduct the assessments.
- **Phase 2 (4-5 years):** Focuses on private commercial buildings in urban areas for Tier 1 & 2 cities. ULBs, Town and Country Planning (TCP) departments, Municipal Corporations, and DISCOMs to map top developers based on their existing portfolios, and Bureau of Energy Efficiency (BEE) certified auditors could be appointed to conduct the assessments.
- **Phase 3 (>5 years):** Focuses on large residential societies in urban areas for Tier 1, 2 & 3 cities. Real Estate Regulatory Authority (RERA) and DISCOMs to map top real estate developers based on their existing portfolios and residential end users to disclose energy consumption of dwelling units in their society.

3.3.2   Establishing a Standardized Benchmarking Framework through Star Rating for all Existing Buildings

The Star Rating for Commercial Buildings, developed by BEE, Ministry of Power was launched in 2009 which benchmarks building's energy efficiency based on annual energy usage per square meter (kWh/sqm/year). Buildings are rated on a scale from 1 to 5 stars, with 5-star ratings denoting the highest efficiency. This labelling provides clear, performance-based benchmarks essential for evaluating and improving building energy efficiency, serving as a standardized indicator for public disclosure frameworks.

Buildings rated 4 stars and above demonstrate high energy efficiency and can undergo biennial assessments to maintain equipment and operational performance. Conversely, the buildings with 3 stars or below focus on retrofit models for specific improvements, undergoing annual assessments targeting deep retrofitting opportunities such as HVAC upgrades, smart technology integration etc. to reduce grid electricity dependency. The policy recommendation aligns with stakeholder suggestions by including comprehensive assessment of existing buildings on year-on-year basis to assess the building operational performance. *This systematic approach is to be supported by technical assistance, incentives like dynamic tariff pricing, and technology adaptation to encourage market transformation. By ensuring accountability and transparency, the Star Rating framework drives continuous improvements in building energy efficiency across all performance tiers.* Figure 8 provides an indicative process for public disclosure for existing buildings by integrating the star rating program.
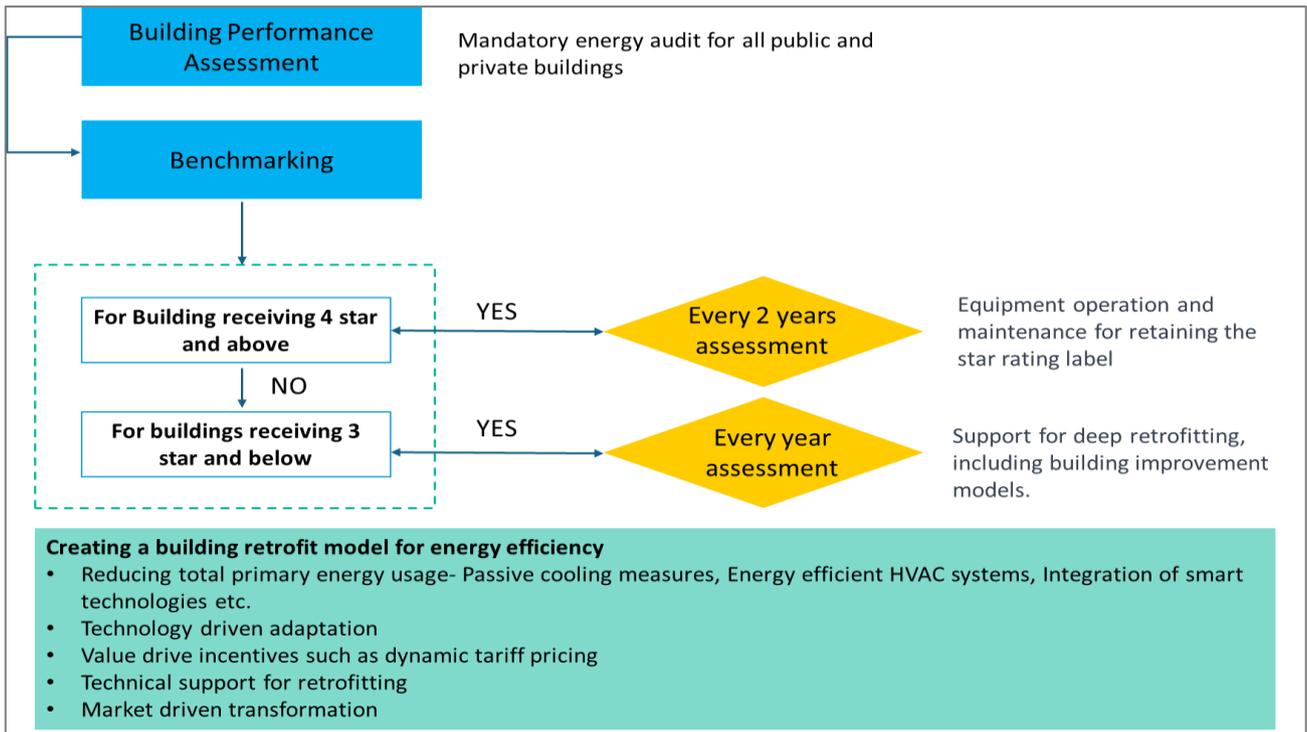
Figure 8: Indicative process for public disclosure for existing buildings

3.3.3 Promoting Informed Decision-Making Through a Public Disclosure Dashboard on Building Energy Performance

Establishing a comprehensive digital dashboard for public disclosure of building energy performance, hosted by BEE, will significantly enhance stakeholder engagement and advance energy efficiency in the built environment. This platform to consolidate building performance data, providing accessible insights into energy consumption, efficiency metrics, carbon emissions, and benchmarking statistics, thus facilitating evidence-based policy design for policy makers and regulators.

The development of the dashboard involves defining objectives and engaging stakeholders such as building owners, facility managers. The policy recommendation incorporates stakeholder feedback on ensuring privacy and data security through measures like encryption and Data Loss Prevention (DLP). BEE to lead the effort as the nodal agency responsible for developing the Measurement, Reporting, and Verification (MRV) system, with data aggregated, processed, and verified through State Designated Agencies (SDAs) and distribution companies (DISCOMs) based on assessment outcomes and star ratings. Management of this system, along with data validation, could be overseen by BEE or an authorized third party by BEE. The public disclosure platform aims to transform market engagement, driving systematic improvements in building energy efficiency through transparent, centralized governance.

Effective development of public disclosure policy requires collaboration amongst multiple stakeholders from central to site level. A centralized governance mechanism involving BEE, SDAs, ULBs, and DISCOMs will be established to ensure efficient coordination with specific roles and responsibilities, as outlined in Figure 9.
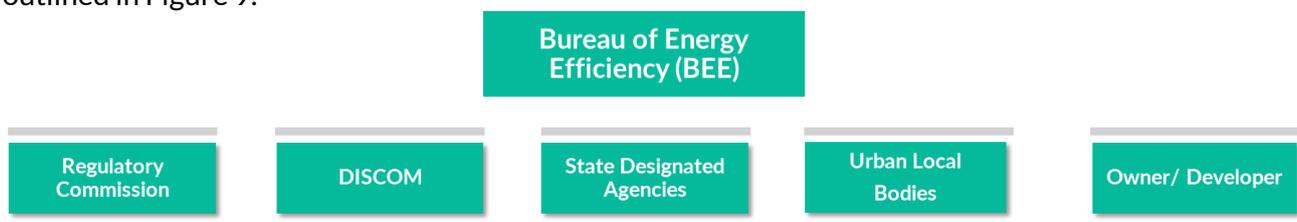
Figure 9: Key Stakeholders for Implementing the Policy Recommendations

Following are the stakeholder's roles and responsibilities:

Bureau of Energy Efficiency (BEE)
- BEE to establish the overarching legal and regulatory framework for energy disclosure, creating guidelines and standards to ensure uniformity across regions.
- BEE to monitor compliance, coordinate with other stakeholders, and address challenges or deviations in policy implementation.

Electricity Regulatory Commission (ERC) – Central/State
- Develop and implement dynamic tariff structures that incentivize efficient energy use through demand-side management and demand response strategies.
- Ensure the energy providers and consumers adhere to established regulatory standards and facilitate measures to promote energy efficiency.

Distribution Companies (DISCOMs)
- Monitor and collect building energy consumption data, ensuring its accuracy and timely submission to the SDA.
- Enhance grid infrastructure to support advanced metering and ensure reliable and consistent data gathering.

State Designated Agencies (SDA)
- Act as intermediaries between various stakeholders, facilitating information sharing and ensuring data integrity.
- Coordinate with ECSBC Expert and Energy Auditors (Buildings) on the energy assessments and verify data quality before submission to the centralized dashboard.
- Provide technical assistance and guidance to local bodies and building owners, ensuring understanding and adherence to the disclosure policy.

Urban Local Bodies (ULB)
- Enforce local compliance with code requirements and collaborate with building owners to facilitate assessments and necessary regulatory actions.
- Conduct awareness campaigns and training sessions to educate the public and building managers about energy efficiency benefits and responsibilities

Owner/ developer
- Ensure the buildings meet the energy performance standards and comply with the regulatory requirements.
- Implement measures to improve building energy performance, considering feedback from ECSBC experts.

3.4 Strategic Framework for Policy Implementation

The **strategic framework for implementing the building performance disclosure policy has been informed and strengthened through inputs from stakeholder consultations**. The feedback provided by stakeholders has been carefully integrated into each phase of the implementation plan as depicted in Figure 10 to ensure the policy's alignment with practical needs and industry priorities.
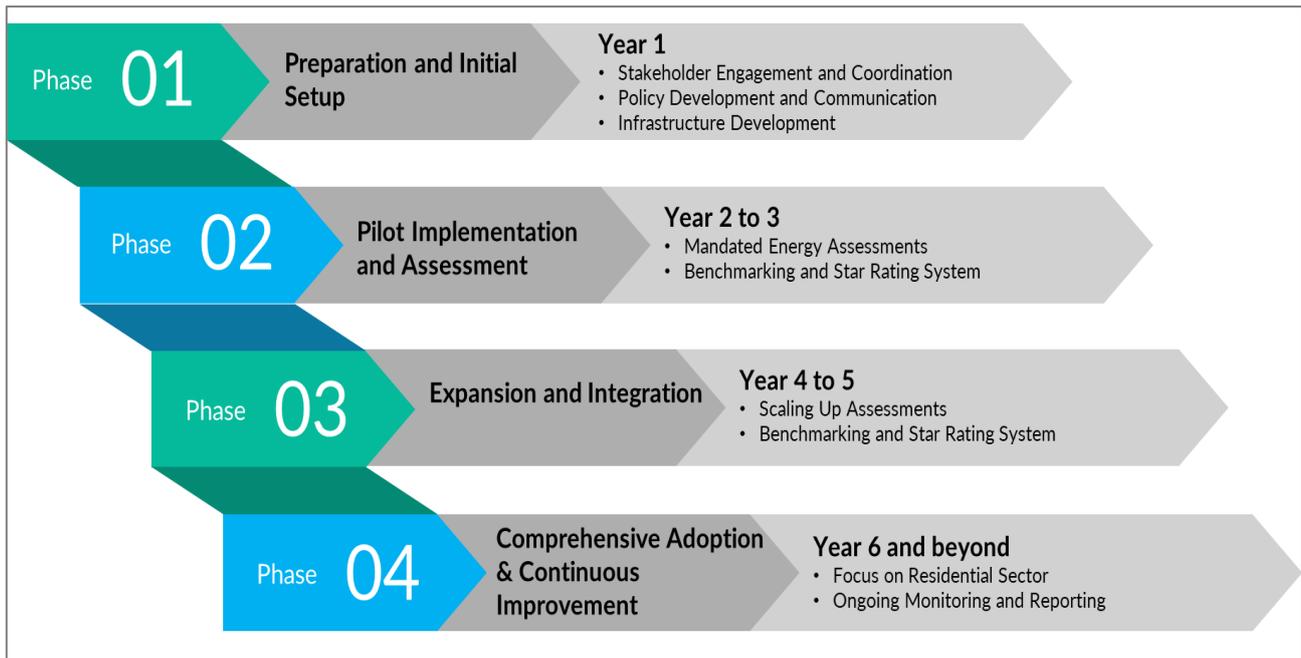
Figure 10: Strategic framework for an effective policy implementation

Phase 1: Preparation and Initial Setup (Year 1)

The focus of this phase is on "Promoting informed decision-making through a public disclosure dashboard on building energy performance" policy recommendations. A detailed, step-by-step approach for its implementation is outlined below.

- **Stakeholder Engagement:** Engaging key stakeholders, including BEE, SDAs, ULBs, DISCOMs, building owners, and facility managers, via a stakeholder registry. Establish a governance framework with steering committees and working groups for inclusive oversight and clear role definitions to ensure collaboration and streamlined decision-making.
- **Policy Development:** Define clear policy objectives that highlight the benefits of public disclosure and establish a confidentiality framework for energy data. Implement awareness campaigns across various channels to educate stakeholders in the building sector and encourage compliance.
- **Infrastructure Development:** Develop a scalable and secure digital platform for the public disclosure dashboard, paired with comprehensive data management protocols that cover data acquisition, processing, secure storage, and authorized access, ensuring compliance with privacy norms.

Phase 2: Pilot Implementation and Assessment (Years 2-3)

The focus of this phase is on "Institutionalizing building performance assessment as a regulatory norm" and "Establishing a standardized benchmarking framework through star rating for all existing buildings" policy recommendations. A detailed, step-by-step approach for its implementation is outlined below.

- **Mandated Energy Assessments:** Implement mandatory energy assessments for public buildings in Tier 1 and 2 ECBC-notified states, using a diverse sample to refine processes. SDAs will collect data and ensure region-specific assessment procedures while maintaining communication with local authorities. Establish an accreditation system for BEE-certified auditors to uphold high standards of competency and professionalism in assessments and reporting.
- **Benchmarking and Star Ratings:** Deploy the Star Rating for Commercial Buildings as a mandatory benchmarking tool, incentivizing public and commercial building owners and developers to meet energy efficiency standards. Establish biennial and annual evaluation cycles for buildings to encourage continuous improvement and alignment with energy standards

Phase 3: Expansion and Integration (Years 4-5)

- **Scaling Up Assessments:** Expand energy assessments to include private sector commercial buildings, focusing on high consumption properties for maximum energy savings. Collaborate

with DISCOMs, ULBs, and SDAs to map major developers, using property databases and energy consumption records.

Phase 4: Comprehensive Adoption and Continuous Improvement (Year 6 and beyond)
The focus of this phase is on "Institutionalizing building performance assessment as a regulatory norm" and "Establishing a standardized benchmarking framework through star rating for all existing buildings" policy recommendations. A detailed, step-by-step approach for its implementation is outlined below.

- **Residential Sector Focus:** Target large residential complexes in Tier 1 and Tier 2 cities by extending assessments under existing real estate regulations with RERA and DISCOMs to encourage participation. Promote transparency by supporting residential units in disclosing energy consumption.
- **Ongoing Monitoring:** Regularly update the digital dashboard to incorporate technological advancements and user feedback, ensuring its relevancy and usability. Utilize data analytics to inform policy adjustments, providing a data-driven basis for strategic improvements and modifications.

3.5   Long Term Impacts

The implementation of the proposed policy recommendation is expected to bring about significant improvements in the existing building stock by enhancing transparency, energy efficiency and facilitating market-driven improvements, all while ensuring regulatory compliance and addressing existing challenges. By making performance assessments and public disclosures mandatory, there will be an increase in accountability for energy consumption among stakeholders and will foster greater competition and promote a shift toward more energy-efficient practices within the market.

From the international cases, it was observed that various countries have adopted public disclosure at various capacities through benchmarking, building energy audit or building component level assessment based on countries and its regulations. For example, European Commission has estimated that renovation of buildings under the EPC framework has the potential to achieve energy savings of up to 46% between 2021 and 2030.[18] Japan's Carbon Report Cards showed approximately 3% energy savings were achieved through behaviour change programs using report cards.[19] In United States, according to the EPA Energy Star the three cities i.e., Chicago, Houston and Minneapolis prevented 993,600 $MTCO_2$ emissions together.[20] In Austin, Energy Conservation Audit and Disclosure (ECAD) contributing to reduction of 120,200 $MTCO_2$ emissions.[21]

For this policy recommendation, *BEE is to be designated as the national authority to operationalize and enforce the disclosure and star-rating framework, develop technical standards for all building typologies, establish an accreditation system, and maintain a secure national database.* BEE, in collaboration with SDAs and DISCOMs, to deliver a phased rollout, monitor KPIs, provide capacity building training programs, dynamic tariffs, and consumer-level financing to de-risk investments, manage upfront costs, and catalyse market-driven retrofits toward NZEBs.

The implementation of the proposed policy recommendations is anticipated to yield substantial enhancements to the existing building stock by fostering greater transparency, improving energy efficiency, and promoting market-driven advancements.

---

[18] Impact of Minimum Energy Performance Standards in the revision of the Energy Performance Building Directive, October 2021, https://www.housingeurope.eu/wp-content/uploads/2024/10/Impact-of-MEPS-in-revision-EPBD_Copenhagen-Economics_20211004_final-report.pdf

[19] Energy Efficiency and Conservation Policies in Japan, https://www.apec.org/docs/default-source/satellite/egeec/files/63/20241107-1345-%283%29-jap-update.pdf?sfvrsn=59c87d23_1

[20] ENERGY STAR Certified Buildings, Top Cities With the Most ENERGY STAR Certified Buildings, https://www.energystar.gov/buildings/about-us/newsroom/top-cities

[21] Austin Energy, City of Austin Utilities, https://austinenergy.com/energy-efficiency/ecad-ordinance

4 Green Public Procurement (GPP) for LCB Materials

4.1 Introduction

Public procurement accounts for at least 20-22% of India's gross domestic product (GDP)[22] and this represents a significant market to leverage the implementation of GPP. While India has implemented initiatives like the S&L and Ecomark schemes for appliances, there is strong potential to apply GPP to low-carbon building materials, aligning manufacturers and consumers towards a more sustainable future.

Several important steps have already been initiated to integrate Green Public Procurement (GPP) within India's procurement ecosystem. Notable examples include EESL's procurement of green RACs (Room Air Conditioners) through the Government e-Marketplace (GeM), the emerging green steel mandate for central government projects, and Rajasthan's state-level green procurement policy. These initiatives demonstrate early successes in embedding sustainability within government purchasing However, challenges remain in scaling up and mainstreaming GPP across India. These include absence of dedicated oversight, limited usage and information of Environmental Product Declaration[23] (EPD), lack of GPP pilot implementation, lack of awareness and weak monitoring mechanisms. Addressing these challenges requires adherence to values like transparency, accountability, and climate commitment to optimize regulations and implement greener practices effectively. As India endeavours to achieve its net-zero goal by 2070, advancing GPP is crucial to minimizing the environmental impact of government purchasing and fostering sustainable development in the construction sector.

4.2 Key Insights

Globally, GPP has been executed in many countries to showcase their adoption of sustainability in the supply chain of procurement of building materials for construction. In addition to these government-led GPP policies in various countries, additional strategies and frameworks have been established to further support the adoption of LCB materials. Following are the examples from various countries that can serve as models for integrating GPP in the system

- **EU Member States** has focused its GPP policies on concrete and steel by requiring core and comprehensive criteria. The disclosure method is project-level life-cycle assessment and environmental product declarations. The targets are set through a collaborative process with stakeholder consultation. Under EU, Netherlands has focused its GPP policies on concrete and steel by requiring project-level environmental impact and environmental business certification. Its disclosure method includes project-level life-cycle assessments using the DuboCalc tool[24] & CO2 Performance Ladder certification of companies. It sets its targets based on EU processes.
- **Japan** has focused its GPP policies on concrete and steel by requiring percentage use of recycled content by product category. The disclosure method involves several eco-labeling schemes, such as Eco Mark, which are based on ISO standards 14020 and 14024. The Ministry of the Environment is the main agency managing GPP and develops the basic policy with the help of review committees.
- **China** has focused its GPP policies on concrete by requiring green product certification. The disclosure method includes an environmental labelling and certification scheme managed by the China Environmental United Certification Centre. To set targets, a carbon emissions accounting and certification system will be established.
- **US Federal Government** has focused its GPP policies on concrete and steel by requiring maximum acceptable Global Warming Potential through product category. The disclosure

---

[22] Government E-Marketplace (GeM), https://pib.gov.in/factsheetdetails.aspx?id=148586&reg=3&lang=1

[23] Environmental Product Declarations (EPDs) are a way for manufacturers to take comprehensive, third party-verified LCAs, which are quite complex, and turn them into standardized declaration labels for their products.

[24] DuboCalc Tool, https://www.dubocalc.nl/en/

method is environmental product declarations. The targets are set based on industry average with tolerance for uncertainty.[25]

Key Learnings from International GPP Use Cases: Countries like the EU, Japan, China, and the US have shown diverse approaches to integrating Green Public Procurement (GPP) into their construction industries, leveraging regulatory frameworks alongside market-based tools. These models effectively balance environmental goals with industry capabilities through standardized criteria, certification systems, and stakeholder engagement. Key takeaways include the following:

- **Targeted Material Focus and Standards**: GPP practices are often centered on high-impact materials like concrete and steel, requiring specific criteria such as recycled content (Japan) or Global Warming Potential limits (US) to guide sustainable procurement choices.
- **Environmental Certification Integration:** Utilizing certifications and assessments, like the EU's environmental product declarations and China's green product certification, enhances credibility and ensures the environmental integrity of building materials.
- **Lifecycle Assessments and Impact Measurement:** Employing lifecycle impact evaluations, as seen in the EU, provides comprehensive insights into the environmental effects of construction projects across their duration.
- **Collaborative Target-Setting**: Engaging stakeholders in the target-setting process, like the EU's collaborative model, ensures realistic policy goals that reflect both environmental priorities and industry capacities.
- **Centralized Government Oversight**: Effective GPP implementation involves oversight by a centralized body or ministry, such as Japan's Ministry of the Environment, which facilitates consistent policy application and regulatory alignment.
- **Adaptive Policy Frameworks:** Allowing flexibility within GPP criteria, like the US's industry-average-based targets, accommodates technological advances and industry feedback, promoting broader compliance and innovation.

4.3 Policy Recommendations

Green Public Procurement (GPP) within India's public building sector can be effectively facilitated through the Ministry of Housing and Urban Affairs (MoHUA). The ministry plays a critical role in advancing housing and urban development by overseeing public procurement processes that are strategic in nature, ensuring that development goals are met efficiently. By leveraging its robust procurement framework, the ministry can aim to attract qualified and competitive bidders who can contribute meaningfully to green public procurement landscape in the country.

4.3.1 Integrating Carbon Emissions Reduction Criteria with Quality Cum Cost-Based Selection Method

To enhance green public procurement in India, the tendering process to incorporate emission reduction criteria alongside price, methodology, and delivery time. By combining this with quality cum cost-based selection, bids to be evaluated on cost, quality, and environmental impact, aligning with carbon reduction goals in building materials and systems.

This integration involves a comprehensive tender management framework, emphasizing transparency and as stakeholders suggested, particularly in providing information in tender bids on material manufacturers and including comprehensive Bills of Quantities (BOQ) with a focus on low carbon materials. The Figure 11 indicates the process of integrating green standards into public procurement is presented below:

- **Preparation of Tender Documents:** This begins by considering the project nature alongside procurement regulations and procedure setting. The two suggested processes are Most Economically Advantageous Tenders (MEAT) approach and Market Dialogue through stakeholder engagement enhances value and participation. Incorporating stakeholder input

---

[25] Global Efficiency Intelligence, The role of green public procurement, August 2019, https://www.climateworks.org/wp-content/uploads/2019/09/Green-Public-Procurement-Final-28Aug2019.pdf

through these two approaches helps to create a supportive ecosystem for low-carbon materials, thereby boosting both supply and demand.

- **Setting Award Criteria:** Includes technical specifications incorporating green criteria, use of ecolabels, and certification targets. Promotes the application of Life Cycle Assessment (LCA), Life Cycle Costing (LCC), and Environmental Product Declarations (EPD) to evaluate environmental impact. As suggested during stakeholder consultation a Type 1 ecolabel could be developed for top building materials to set market benchmarks as part of award criteria.
- **Tender Evaluation:** Comprises calling for tenders, shortlisting, engaging in dialogue, and awarding contracts based on green selection criteria. Stakeholders recommended establishing a robust monitoring, verification, and evaluation system, mandating that a percentage of procurement be green focused to foster adoption. Additional stakeholders emphasized on sustainable construction practices, such as minimizing waste and adopting innovative technologies. These assessment criteria are also to be considered in the tender evaluation by assessing the baseline practice with proposed innovation.
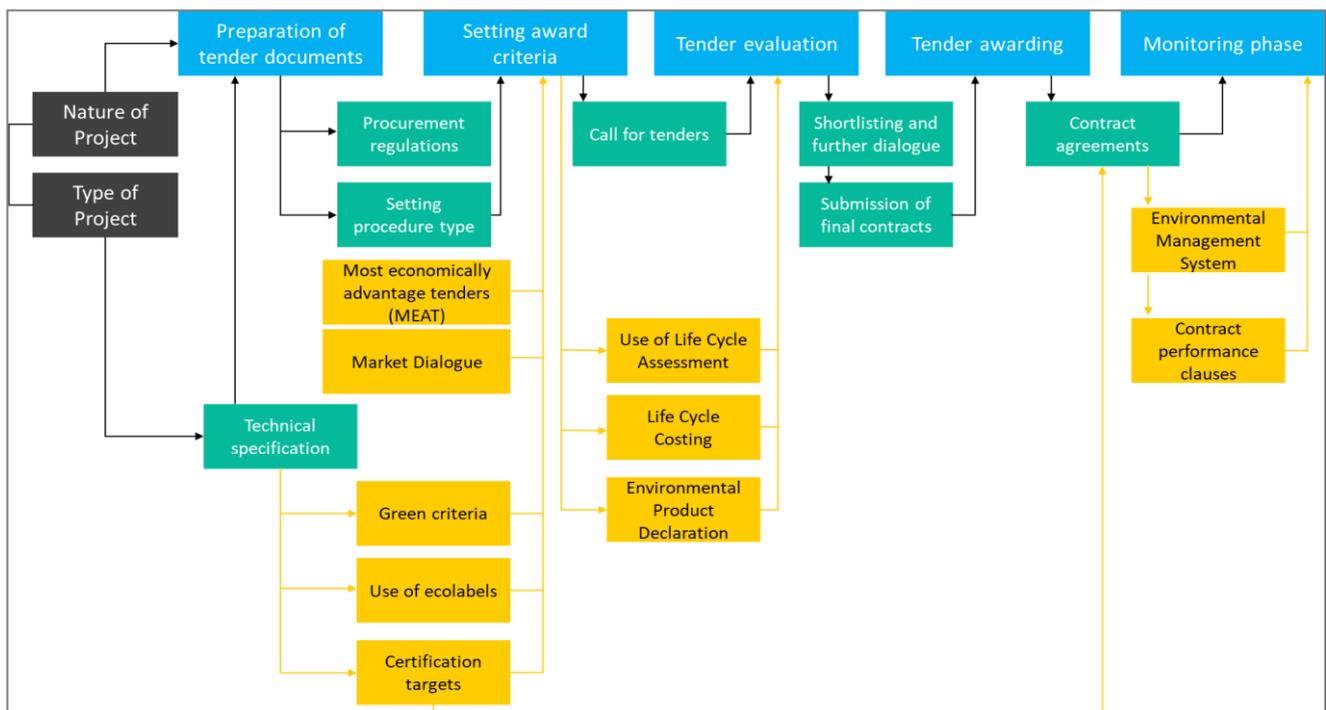
Figure 11: Indicative process of integrating green standard into public procurement[26]

Pilot Program for GPP Initiative:

For an effective initiative of GPP in India, a pilot program could be launched for upcoming high energy-intensive commercial buildings like district and sub-district hospitals, government offices, assembly buildings, etc. This pilot program shall facilitate the adoption of low carbon building materials, thereby fostering market momentum towards GPP initiative. *As suggested during stakeholder consultation,* Building Materials and Technology Promotion Council (BMTPC) will continue to support increasing awareness among developers and contractors regarding BMTPC grants while supporting R&D collaboration with research institutions to ensure the verification of quality materials and technologies. A successful integration of green public procurement into the public procurement landscape is through active collaboration of key stakeholders. Figure 12 defines the key stakeholders and their roles and responsibilities.

---

[26] International Institute for Sustainable Development (IISD), Green Public Procurement in India, December 2024, https://www.iisd.org/system/files/2024-12/india-green-public-procurement.pdf

| Ministry of Finance | Ministry of Housing and Urban Affairs | Building Materials and Technology Promotion Council | Public sector procurement offices | Material manufacturers | Architects/ Consultant |

Figure 12: Key Stakeholders for Implementing the Policy Recommendations

Following are the stakeholders' roles and responsibilities:

Ministry of Finance
- The Ministry of Finance is instrumental in creating a robust legal framework that supports green public procurement policies. Its primary role is to set regulatory standards that ensure these policies are effective and enforceable across governmental departments and agencies.
- The Ministry is responsible for evaluating existing procurement laws and integrating sustainability criteria, providing a fiscal policy environment conducive to sustainable practices.
- It oversees budget allocations and financial incentives that encourage green procurement initiatives.

Ministry of Housing and Urban Affairs (MoHUA)
- The ministry leads the charge in transitioning government construction projects towards sustainable practices. It integrates green procurement into tender bidding processes, setting a precedent for government-led environmental stewardship.
- Develops guidelines and best practices for incorporating sustainability in building projects and supports pilot programs to test and refine these practices in real-world scenarios.

Building Materials and Technology Promotion Council (BMTPC)
- Focuses on advancing the use of sustainable construction materials. It develops directives promoting materials with lower embodied energy and emissions, acting as a crucial resource.
- Conducts research and disseminates findings on new technologies and materials that enhance sustainability in building projects.
- Technical guidance and support, encouraging innovation and facilitating the incorporation of eco-friendly materials into building designs through certifications and informative publications.

Public sector procurement offices
- The offices are responsible for the direct implementation of green public procurement policies within governmental and public sector organizations. The environmental criteria are seamlessly integrated into the procurement processes and tenders, in alignment with predefined sustainability standards.
- Draft tender documents that include specifications for low-carbon materials and evaluating proposals based on their environmental impacts, alongside traditional metrics.

Material manufacturers
- Tasked with developing and supplying eco-friendly building materials that meet sustainability standards.
- Offer transparency through the publication of Environmental Product Declarations (EPDs), allowing procurement offices and consultants to evaluate materials based on detailed environmental impact reports.
- Encourage to innovate and adopt sustainable production processes, reducing the carbon footprint of materials while maintaining competitive pricing and quality.

Architects and consultants
- Conduct lifecycle assessments and providing strategic insights on eco-friendly design choices. They serve as advocates for sustainability, promoting the benefits of green procurement among stakeholders and ensuring compliance.

- Identify appropriate green building materials, emphasizing long-term cost savings, durability, and reduced environmental impact.

4.4 Strategic Framework for Policy Implementation

Developing a supportive ecosystem for low-carbon building materials requires a coordinated approach, beginning with a robust policy and regulatory framework offering value driven incentives, mandates, and certifications to build market trust. To increase the options of low carbon materials in the market, collaboration with academic institutions and funding for R & D will drive innovation, improve material quality and discover cost-effective production techniques.

Additionally, optimizing supply chains and encouraging region wise manufacturing and production will ensure efficient distribution and accessibility of materials. Finally, implementing robust monitoring systems with feedback mechanisms will enable continuous refinement of strategies based on performance data and stakeholder insights, ensuring the ecosystem's growth and resilience. This transition can be implemented in phases as depicted in Figure 13, targeting different building typologies:
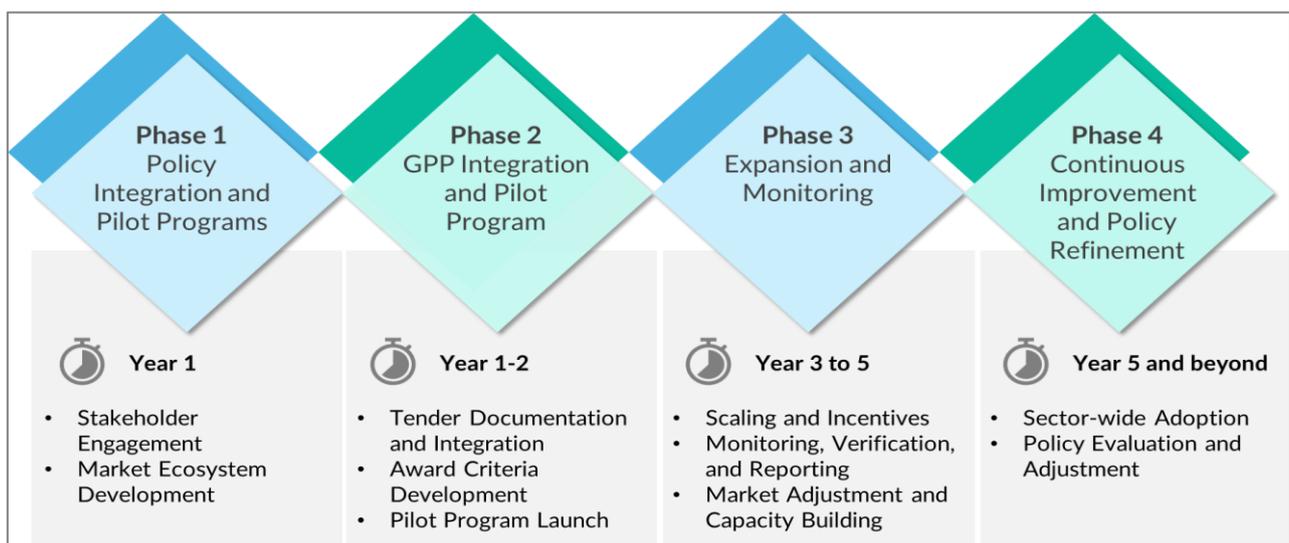
Figure 13: Strategic framework for an effective policy implementation

Phase 1: Policy Integration and Pilot Programs (Year 1)
- **Stakeholder Engagement:** Maximize stakeholder involvement by facilitating dialogues between government agencies such as BMTPC, real estate developers, contractors, material manufacturers, procurement specialists, and research institutions. Conduct workshops to build consensus on tendering processes, emphasizing the importance of low-carbon material usage and sustainable practices particularly focusing on high-impact materials such as construction blocks, glass, insulating materials, cement, steel, concrete, and solar rooftop systems.
- **Market Ecosystem Development:** Develop a supportive ecosystem that fosters supply and demand for low carbon building materials, leveraging BMTPC grants and technology innovation support. Encourage collaboration with research institutions to ensure materials meet high-quality standards through verification and innovation.
- **National Low-Carbon Materials Registry:** Initiate the development of a secure national low-carbon materials registry to centrally track, verify, and share information on low carbon and high impact building materials.

Phase 2: GPP Integration and Pilot Program (Year 1-2)
- **Tender Documentation and Integration:** Prioritize detailed documentation within tender processes, providing transparent information on material manufacturers and a comprehensive Bill of Quantities (BOQ) for low-carbon materials such as construction blocks, glass, insulating

materials, cement, steel, concrete, and solar rooftop installations. Mandate sustainable construction practices that empower developers and contractors to minimize waste and utilize innovative technologies at construction sites.

- **Award Criteria Development:** Establish award criteria that integrate green criteria, ecolabels, and certification targets, applying Life Cycle Assessment (LCA), Life Cycle Costing (LCC), and Environmental Product Declarations (EPD) standards. Initiate type 1 ecolabel for top building materials as part of the award criteria, setting market benchmarks in alignment with General Financial Rules (GFR) and Schedule of Rates (SoR).
- **Pilot Program Launch:** Launch pilot programs focusing on high energy-intensive commercial buildings such as hospitals and government offices to test integration of green public procurement (GPP) practices. The pilot programs emphasize the use of low-carbon materials such as construction blocks, glass, insulating materials, cement, steel, concrete, and solar rooftop systems and assess market readiness and refine procurement processes and contracts.

Phase 3: Expansion and Monitoring (Years 3-5)

- **Scaling and Incentives:** Expand the green procurement initiative to additional building sectors while integrating recommendations for improving the GeM portal with a dedicated section for low carbon and energy efficient building materials specifically focusing on construction blocks, glass, insulating materials, cement, steel, concrete, and solar rooftop systems. Develop incentives and support mechanisms, including financial rebates and grants, to encourage broader adoption of sustainable building practices.
- **Monitoring, Verification, and Reporting:** Establish a robust system for monitoring, verifying, and evaluating the environmental impacts of procurement processes by mandating 3-5% of public procurement focus on green materials. Digital platforms to be used to enhance transparency, offering data-driven insights to support policy adjustments.
- **Market Adjustment and Capacity Building:** Facilitate continuous market engagement and education, raising awareness about BMTPC grants among developers and contractors. Implement capacity-building programs and training sessions to bolster competency in green procurement and building solutions.

Phase 4: Continuous Improvement and Policy Refinement (Year 5 and beyond)

- **Sector-wide Adoption:** Aim for widespread adoption of carbon reduction criteria across construction sectors and increase market awareness for sustainable building materials and solutions. Support ongoing collaboration among stakeholders to drive innovation in material development and procurement practices.
- **Policy Evaluation and Adjustment:** Conduct regular evaluations to assess policy effectiveness and stakeholder impact, using feedback to refine strategies and enhance outcomes. Encourage iterative improvements aligned with international green standards and best practices.

4.5 Long Term Impacts

Implementing the policy recommendations will help create a steady and dependable demand for low carbon building materials and practices through public procurement, encouraging the market to shift toward low carbon alternatives. Requiring emissions criteria alongside quality cum cost selection and embedding life cycle assessment or life cycle costing and environment product declarations in tender evaluation will drive manufacturers to disclose product footprints, invest in low carbon production of materials, and compete on lifecycle value rather than upfront price. Mandating a percentage of green procurement and using stakeholder-driven market dialogue and pilot tenders, and scale supply chains while lowering costs through bulk demand and innovation.

From the international cases, it was observed that various countries have adopted green public procurement approach and through this, approximately 43% (~19 Mt CO_2/year) material emissions are

expected to reduce through EU GPP targeting concrete and steel.[27] In the Netherlands, 67% of public procurements included at least one environmental criterion in 2020.[28] Japan's GPP measures for concrete and steel includes recycled content and ecolabeling contributing about 2.6 Mt CO_2 savings in 2020 (~13.9% of cement emissions).[29] Public procurement of steel and cement in China accounts for ~1,148 Mt CO_2 annually and transformative GPP scenarios show substantial additional reductions.[30] Under Buy Clean Transformation in USA, a 10% shift to low carbon materials could cut ~3.6 Mt CO_2 from cement and ~2 Mt CO_2 from steel annually.[31]

A noticeable carbon emission reduction can be observed with the policy implementation across the globe. This proposed Green Public Procurement (GPP) integrating carbon emission criteria addresses regulatory gaps by institutionalizing EPD/LCA/ecolabel requirements, standardizing material accountability, and embedding green thresholds into tendering to align procurement with NZEB goals. Technological gaps are tackled by mandating LCA/EPDs and Type1 ecolabels, MRV systems, collaborative R&D, inclusion of low carbon building materials in Schedule of Rates (SoR), and real-world performance validation for low carbon materials. Market barriers are reduced through market dialogue and BOQ level green specification that create demand, and fiscal obstacles are mitigated via lifecycle costing, procurement guarantees and derisk green investments.

BMTPC can be the national lead to operationalize and enforce GPP for building materials by defining material level technical standards, LCA/EPD protocols and developing TypeI ecolabel requirements; developing model BOQs and tender clauses to embed lifecycle carbon and cost criteria; and maintaining a secure national low carbon materials registry. BMTPC to institute accreditation and testing pathways (labs, certification bodies, third party verifiers), run pilot tenders and procurement aggregation exercises to create demand signals, and deliver targeted capacity building for procurement officers, designers and manufacturers. Working with BEE, MoHUA, CPWD, BIS, SDAs and finance agencies, BMTPC must convene industry dialogue, coordinate R&D and scale up supply chains through demand guarantees and pooled procurement, while integrating lifecycle costing and derisking instruments.

5 Institutionalizing Net Zero Building

5.1 Introduction

India, as the second fastest-growing economy globally, is witnessing a surge in energy demand due to population growth, economic progress, and urbanization. In response, the central government introduced ECSBC, enabling buildings to achieve energy savings of 25% to 50% compared to conventional structures. A new initiative, net-zero energy buildings aim to further curb energy consumption by encouraging the public and private sectors to not only meet Super ECSBC criteria but go beyond to achieve net-zero goals. This approach involves offsetting remaining energy use through renewable energy and other measures, while integrating governance structures, technological adaptations, and financial models to simplify implementation.

Currently, Indian buildings contribute to around one-third of annual carbon emissions, with projections

---

[27] Environmental Coalition on Standards, Green public procurement a 'no-brainer' that could cut construction product emissions almost by half with a minimal price tag, November 2024, https://ecostandard.org/news_events/green-public-procurement-a-no-brainer-that-could-cut-construction-product-emissions-almost-by-half-with-a-minimal-price-tag-new-data-shows/

[28] Global Efficiency Intelligence, Advancing Green Public Procurement of Steel and Cement in China, February 2024, https://www.globalefficiencyintel.com/green-public-procurement-of-steel-and-cement-in-china

[29] Nagoya University Research information, Concrete evidence: Japanese buildings absorb 14% of cement production's carbon footprint, March 2025, https://www.nagoya-u.ac.jp/researchinfo/result-en/2025/03/20250305-01.html

[30] Global Efficiency Intelligence, Advancing Green Public Procurement of Steel and Cement in China, February 2024, https://www.globalefficiencyintel.com/green-public-procurement-of-steel-and-cement-in-china

[31] Global Efficiency Intelligence, Federal Buy Clean Policy for Construction Materials in the United States, https://www.aceee.org/sites/default/files/pdfs/ssi21/panel-4/Shi.pdf

of a sevenfold increase by 2050 compared to 2005 levels. Decarbonizing buildings, both existing and new buildings, by improving energy efficiency and reducing energy demand, holds significant potential to decrease these emissions and support grid decarbonization. Despite the available literature on frameworks and financial instruments for developers and owners, a holistic framework guidance for NZEB addressing the relationships between regulatory policies, embodied energy and emissions, operational energy and emissions, renewable energy and green finance remain lacking.

Adoption of net-zero energy buildings faces challenges including limited awareness of available technologies, insufficient capacity among professionals, absence of supportive government policies, and consequently, low demand in the construction sector.

5.2 Key Insights

India is advancing in energy efficiency practices through various initiatives led by government and professional bodies to promote net-zero energy buildings in the country. These efforts focus on encouraging energy-efficient designs, integrating renewable energy sources, and recognizing achievements in net-zero construction through benchmarking. Below are some notable programs and ratings that demonstrate the country's commitment to sustainable development in the building sector.

- BEE is introducing "Shunya" Labelling Programme for NZEB and Net Positive Energy Buildings (NPEB). For this programme the buildings having 10 ≤ EPI ≤ 0 kWh/m2/year, will be awarded by Shunya Label, while the buildings having EPI < 0 kWh/m2/year will be awarded by Shunya+ label. The programme encourages the building owners and promoters to make energy-efficient buildings and further make improvements to make net zero or net positive energy buildings. [32]
- U.S. Green Building Council (USGBC) developed LEED Zero which offers a framework for high-performance buildings and spaces and reducing greenhouse gas emissions. LEED Zero highlights the achievements of exemplary projects in areas that are critical to the goal of reaching a regenerative future. These projects are evaluated based on LEED Zero Carbon, LEED Zero Energy, LEED Zero Water Certification and LEED Zero Waste Certification.[33]
- Indian Green Building Council (IGBC) developed ratings for net-zero building. The IGBC rating, which is intent oriented and voluntary in nature, rates net zero buildings based on their usage of renewable energy, energy efficiency, passive design strategies, and thermal comfort.[34]
- International Finance Corporation (IFC), a member of the World Bank Group, developed Edge Zero Carbon certification. The certification rating focuses on 100% energy savings on site and additionally focuses on 100% renewables integration on-site or off-site.[35]

5.3 Policy Recommendations

A NZEB produces enough renewable energy to meet its own annual energy consumption requirements, thereby reducing the use of non-renewable energy in the building sector. [36] This balance reduces greenhouse gas emissions and dependence on fossil fuels, achieved by first implementing rigorous energy efficiency measures and installation of renewable energy systems.

5.3.1 Developing a Robust Governance Structure

A robust governance structure is essential for the successful implementation of the NZEB. This section details the institutional framework required for its development, adoption, and enforcement, emphasizing the establishment of clear responsibilities, streamlined processes, and capacity-building among stakeholders. To enhance integration with existing systems, it is proposed by the stakeholders to establish a *Net Zero Building Mission*. This mission would focus on incorporating net-zero objectives

---

[32] BEE's Shunya label, https://beeindia.gov.in/en/programmesenergy-efficiency-in-buildings/shunya-labeling
[33] USGBC, LEED Zero Rating, https://www.usgbc.org/programs/leed-zero
[34] IGBC, Net Zero rating, https://igbc.in/igbc-net-zero-energy-rating/
[35] EDGE, zero carbon rating, https://edgebuildings.com/certify/certification/
[36] U.S. Department of Energy, https://www.energy.gov/eere/buildings/articles/common-definition-zero-energy-buildings#:~:text=Generally%20speaking%2C%20a%20zero%20energy,campuses%2C%20portfolios%2C%20and%20communities

into local building bylaws, master planning, and other planning instruments, ensuring NZEB goals are embedded at every level of urban planning and regulation.

A dedicated national body to be established to oversee NZEBs, collaborating closely with the national steering committee responsible for ECSBC to create synergies. The integration of Super ECSBC-compliant buildings will be supported through technical adaptations and innovative financial instruments, fostering a supportive ecosystem where regulatory frameworks, financial incentives, and technological support are aligned.

Adoption should proceed in phases, starting with pilot projects in select cities or states and gradually expanding to encompass all new construction. Initial efforts might focus on specific building typologies such as public buildings, subsequently extending to commercial and residential buildings. To ensure effective phased implementation, training programs for architects, engineers, contractors, and building officials are essential to build expertise in net-zero energy building design, construction, and operation. Furthermore, simplifying the building permit process, including a fast-track approval mechanism for NZEBs, will encourage higher adoption rates.

5.3.2 Developing a Compendium for Addressing Innovative & Smart Technologies and Maximizing RE Transition

Technological advancements are crucial for achieving net-zero energy performance in buildings. This directive explores key solutions and strategies to minimize energy consumption and maximize renewable energy generation, focusing on innovative building designs, materials, and systems suited to India's context and diverse climatic conditions. The objective is to provide a guide for real estate developers and building owners, facilitating the adoption of smart technologies to reduce energy demand and support the renewable energy transition. The directive addresses technology integration through passive and active design strategies, sustainable construction practices, and renewable energy systems. Key components include Climate-Responsive Design, Building Envelope Optimization, Thermal Mass, High-Efficiency HVAC Systems, Smart Building Management Systems, Energy-Efficient Lighting and Appliances, Material Selection, Construction Waste Management, and Prefabrication and Modular Construction. Utilizing these technological innovations can help achieve Super ECSBC-compliant building, potentially reducing energy consumption by 50-60%.

Successful NZEBs require the integration of renewable energy systems to balance residual energy demand. Installation of equipment to harness energy from the sun, wind, water, or other renewable sources is increasingly cost-effective, offering short payback periods for corporations. Market-driven instruments, such as Renewable Energy Certificate (REC) and open access solar, further promote renewable energy purchase and reduce grid reliance. The Central Electricity Regulatory Commission (CERC) has regulated the REC to encourage renewable energy sources and market development in electricity; however, every state currently has its own regulations around renewable energy instruments such as Net Metering, open access, and related interconnection and tariff rules, leading to regulatory fragmentation and the absence of a consolidated national framework that would simplify deployment and procurement for large consumers.. Figure 14 provides an overview of how to achieve net zero energy building through code and renewable energy integration.
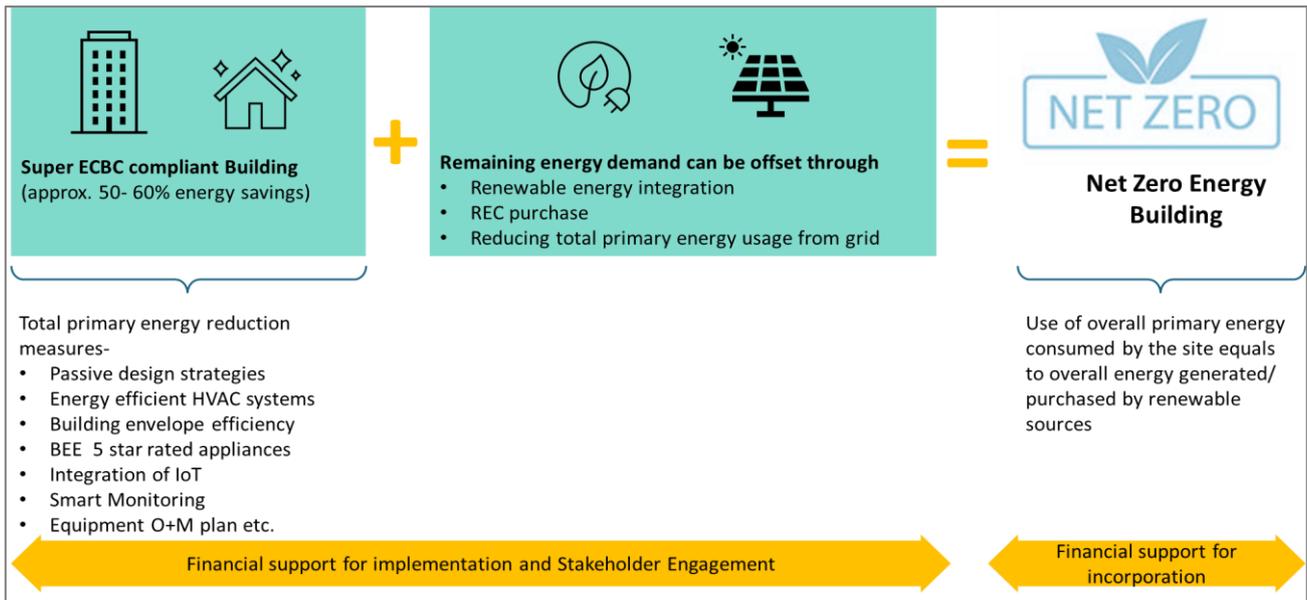
Figure 14: Indicative process on integrating ECBC code with RE model for NZEB

5.3.3 Facilitating an Ecosystem for Market-Driven Transformation for Net Zero Buildings

To support emerging technologies in NZEBs, a market-driven transformation encompassing affordability, scalability, financing solutions, and technological advancements is essential. Developing tailored financial instruments is critical to the successful implementation of NZEBs, providing incentives and mechanisms to make such projects financially viable and attractive to investors and building owners. For effective market transformation, *collaboration among BEE, Ministry of Science and Technology, and the Ministry of New and Renewable Energy (MNRE) can enhance demand aggregation for emerging technologies. The BEE can work alongside organizations like Energy Efficiency Services Limited (EESL) to facilitate pilot projects and innovate through bulk procurement of energy-efficient technologies, thereby reducing costs and increasing accessibility.*

Also considering the integration of Artificial Intelligence (AI) into the building operations as suggested by stakeholder will facilitate data-driven decision-making, thus supporting the transition toward net-zero targets. Embracing AI will enhance energy management and optimize building performance, ensuring smarter and more efficient buildings.

Additionally, a strategic approach should be crafted to stimulate market momentum and encourage collaboration among stakeholders, addressing financial bottlenecks and promoting NZEBs. The NZEB incorporates various financial models for implementing advanced technological measures, offering options such as green bonds, subsidies, equity financing, multilateral agency support, credit agency backing, and project sponsorship. Support from national or state authorities, multilateral agencies, commercial banks, and project implementation sponsors will further drive adoption and ensure the financial attractiveness of NZEB initiatives.

Figure 15 provides an overview of financial models in the Indian landscape.

National/ state authorities	Multilateral agencies	Credit agencies	Commercial banks	Project implementation sponsor
• Green bonds • Subsidies/ grants • Equity	• Guarantee/ risk/ funding	• Grant credits/ funding	• Debit funds • Green bonds	• RESCO • ESCO • EPC

Figure 15: Financial Models to drive market transformation

National/State Authorities:
- **Green Bonds:** Debt instruments specifically earmarked to raise capital for environmentally friendly projects, including NZEBs. Governments issue these bonds, and the proceeds are used to finance eligible green building initiatives.
- **Subsidies/Grants:** Direct financial assistance provided by the government to reduce the cost of NZEB projects. Subsidies can cover a portion of the project cost, while grants are typically non-repayable funds.
- **Equity:** Government investment in NZEB projects through direct ownership stakes. This can involve taking a minority share in the project or providing seed capital to attract private investment.

Multilateral Agencies: International development organizations like the World Bank or Asian Development Bank (ADB) offer financial support and risk mitigation instruments. Guarantees reduce the risk for private investors, encouraging greater participation in NZEB projects.

Credit Agencies: Specialized credit agencies can offer concessional loans and grants specifically for NZEB projects. These loans typically have lower interest rates and more favourable repayment terms than conventional loans. Such as the National Housing Board etc.

Commercial Banks: Standard bank loans used to finance NZEB construction or retrofits. These loans are subject to standard commercial lending terms and interest rates,

Project Implementation Sponsor: Under sponsorship category, they are categories into energy efficiency funding, renewable energy funding and guaranteed savings models.
- **RESCO (Renewable Energy Service Company):** A RESCO finances, installs, and operates renewable energy systems on a client's property. The client pays for the energy generated, avoiding the upfront capital costs of the system.
- **ESCO (Energy Service Company):** ESCO implements energy efficiency projects and guarantees energy savings. ESCO is often paid from the cost savings generated by the project.
- **EPC (Energy Performance Contract):** A legal agreement between a building owner and an ESCO where the ESCO guarantees energy cost savings. The savings are used to pay for the project implementation, and any additional savings are shared between the owner and the ESCO.

For effective policy implementation, it is important to build capacity of stakeholders at different levels in an organizational set up that includes central to local government level and private sector. Figure 16 provides the list of stakeholders and below are their roles and responsibilities.

Ministry of Power	Ministry of New and Renewable Energy	Ministry of Science and Technology	State Designated Agencies	DISCOM	Owner/ Developer

Figure 16: Key Stakeholders for Implementing the Policy Recommendations

Ministry of Power
- Ministry of Power is pivotal in adapting and implementing NZEB across India. It holds all rights and responsibilities for the integration of NZEB principles into national policy frameworks.
- BEE to maintain a continuous exchange of information on advancements in energy efficiency, ensuring the NZEB model aligns with current industry standards and innovations.
- Ministry of Power drives the development of policies and initiatives that support NZEB practices, providing regulatory oversight and guidance on energy norms and benchmarks.

Ministry of New and Renewable Energy (MNRE)
- Promoting the integration of renewable energy sources like solar into building designs and facilitating programs and incentives for rooftop solar installations, encouraging widespread adoption of renewables in building projects.
- Collaborate with industry stakeholders to develop guidelines for implementing renewable energy technologies, ensuring these are accessible, cost-effective, and efficiently integrated into buildings to contribute to their net zero energy targets.

Ministry of Science and Technology
- Lead technical R&D, develop and maintain NZEB definitions, metrics, modelling tools and verification protocols, and run pilots and demonstrations to generate evidence for building codes and compliance systems.
- Enable market uptake through targeted funding, public procurement and innovation prizes, build training/certification programs, coordinate standards and interagency action, and engage international partners and financiers to remove regulatory and financial barriers.

State Designated Agencies (SDAs)
- SDAs act as nodal agencies, orchestrating the efforts of all supporting stakeholders involved in NZEB projects and work closely with ULBs to ensure site developments are compatible with state-specific requirements and standards.
- SDAs play a liaison role, coordinating activities between government bodies, consultants, and developers to ensure seamless project execution. They also provide technical support, facilitate stakeholder engagement, and oversee compliance with energy codes and regulations related to NZE buildings.

Distribution Companies (DISCOMs)
- Collaborate with other stakeholders, including SDAs and building owners, to optimize energy distribution and consumption, supporting the NZE building's goal of achieving energy neutrality.

Urban Local Body (ULB)
- Enforce NZEB project compliance within planning and approval processes and ensure the building designs meet local standards and regulations and are aligned with state and city plans.
- ULB representatives support SDAs, DISCOMs, and developers/owners by facilitating communications and coordinating necessary approvals throughout the project development and operational phases.

Owners/ Developers
- Primary responsibility for the design, construction, and operational strategies of NZE buildings and ensuring the building achieves optimal energy performance and minimizes environmental impacts throughout its lifecycle.
- Oversee construction practices to ensure adherence to energy efficiency standards and are responsible for implementing operational strategies, such as commissioning energy systems and maintaining building performance.

5.4 Strategic Framework for Policy Implementation

Creating a strategic framework for implementing the policy recommendation on uptake of net zero energy building involves several key components, which can be broken down into phases and strategic actions as mentioned in Figure 17.

Figure 17: Strategic framework for an effective policy implementation

Phase 1: Establish Governance and Stakeholder Engagement (Year 1)

The focus of this phase is on "Developing a robust governance structure" policy recommendation. A detailed, step-by-step approach for its implementation is outlined below.

- **Develop Robust Governance:** Form a dedicated national body to oversee the uptake of NZEB development along with uptake of Shunya Label and enforcement, collaborating with existing bodies such as the ECSBC Steering Committee. Define clear roles and responsibilities to streamline processes and build capacity within stakeholders.
- **Stakeholder Engagement:** Conduct workshops and seminars to integrate inputs from architects, engineers, contractors, and developers, emphasizing AI's role in transitioning to net-zero buildings and acquiring Shunya label. Promote collaboration across cross-sectoral industries such as material manufacturers and technology providers to incorporate innovative approaches, new technologies, and regulatory frameworks.
- **Ecosystem Development:** Create a supportive ecosystem by aligning financial incentives, regulatory frameworks, and technological support to facilitate the seamless implementation of net-zero energy buildings and net positive energy buildings.

Phase 2: Pilot Implementation and Capacity Building (Years 2-3)

The focus of this phase is on "Developing a robust governance structure" and "Developing a compendium addressing innovative & smart technologies and maximizing RE transition" policy recommendation. A detailed, step-by-step approach for its implementation is outlined below.

- **Launch Pilot Projects:** Initiate pilot projects in select cities/states and net-zero principles into building byelaws and master planning. Target specific building typologies such as public buildings before expanding to commercial and residential buildings.
- **Innovative Technology Integration:** Develop a compendium to address innovative and smart technologies in energy efficiency and renewable energy transition. Include adaptation of low carbon building materials and systems suited to diverse climatic conditions, and update the compendium annually to incorporate new technologies and innovations.
- **Training and Capacity Building:** Develop training programs for architects, engineers, contractors, and building officials to ensure expertise in net-zero energy building design,

construction, and operation. For academic institutions, integrate net-zero energy building design principles into architecture curriculum.

Phase 3: Full Scale Implementation and Monitoring (Years 4-5)

The focus of this phase is on "Developing a robust governance structure" and "Developing a compendium addressing innovative & smart technologies and maximizing RE transition" policy recommendation. A detailed, step-by-step approach for its implementation is outlined below.

- **Expand Implementation:** Gradually expand NZEB & NPEB implementation and acquiring Shunya Label for all new constructions, with streamlined building permit processes and fast-track approval mechanisms.
- **Monitoring and Evaluation:** Establish a robust monitoring, verification, and evaluation system to ensure compliance and effectiveness of NZEB and NPEB implementation and operation. Employing AI for data-driven decision-making and continuous improvement in net zero buildings uptake in the country.

Phase 4: Market Transformation and Long-Term Sustainability (Year 6 and beyond)

The focus of this phase is on "Facilitating an Ecosystem for Market-Driven Transformation for Net Zero Buildings" policy recommendation. A detailed, step-by-step approach for its implementation is outlined below.

- **Market-Driven Transformation:** Collaborate with BEE, the Ministry of Science and Technology, and the Ministry of New and Renewable Energy to drive demand aggregation for emerging technologies. Partnering with EESL to facilitate pilot projects and bulk procurement of energy-efficient technologies.
- **Financial Instruments and Incentives:** Promote various financial instruments, including green bonds, subsidies, equity investments, and concessional loans, to make net zero buildings projects attractive to investors and building owners.

5.5 Long Term Impact

Implementing the NZEB policy recommendation will embed net zero objectives across planning and permit via a dedicated national body and Net Zero Building Mission and a development of compendium and AI enabled building operations, accelerating adoption of passive and active measures and renewable integration in delivering NZEB in the country. Empaneled experts, training programmers and standardized financing models plus demand aggregation will lower upfront costs, scale markets, and derisk investments. Together, these measures strengthen local capacity, increase awareness, harmonize policy, and create verifiable data essential to achieve India's building decarbonization and 2070 net zero goals.

Over the past 20 years India has faced regulatory, technological and market/financial gaps such as fragmented mandates and weak enforcement, limited vetted low-carbon technologies and field validation, and fragmented demand, thin supplier capacity and high upfront costs. The recommendations propose creating a national body and a Net Zero Building Mission to harmonize targets, embed NZEB in local planning, fast-track permits, and establish a national compendium with mandated pilots alongside AI-enabled operations and renewables integration to validate scalable solutions. This also calls for ministry-level demand aggregation, EESL procurement, and standardized financing mechanisms to scale supply and de-risk investments.

To implement this, Bureau of Energy Efficiency could be designated as the national lead for a Net Zero Building Mission. BEE to standardize financing models, enable demand aggregation and bulk procurement, coordinate with MoHUA, MoEFCC, states/ULBs, utilities, MNRE and Ministry of Science and Technology, BMTPC, EESL and finance agencies to derisk investments, operate a secure NZEB data platform linked to the building registry, and fast track permitting and procurement incentives to reward compliance. Policymakers must resource BEE with a dedicated NZEB unit, seed funding for the compendium and pilots, and an interministerial steering committee for enforceable, rapid rollout.

6 Building Taxonomy

6.1 Introduction

India's infrastructure and built environment sector are central to both the country's economic development and its climate transition. With infrastructure investment needs projected at USD 1.4 trillion by 2040 (IEA India Energy Outlook 2021), the buildings sector forms a major component of this growth. It currently accounts for 30% of India's total electricity consumption and emissions and is expected to increase substantially with accelerating urbanization.

In May 2025, the Government of India released the draft Climate Finance Taxonomy, a framework designed to direct financial flows towards climate-aligned activities across five priority sectors, including building sector. The draft taxonomy follows a hybrid, phased approach — initially applying qualitative eligibility criteria to identify activities and projects considered climate-relevant, and progressively integrating quantitative performance thresholds (such as emission reduction intensity benchmarks) in subsequent iterations. Activities are then classified into 3 tiers: Climate Supportive Tier 1' (absolute emission avoidance/net-zero), 'Climate Supportive Tier 2' (emission intensity reductions with improvement pathways) and 'Transition Supportive' (incremental improvements where absolute avoidance isn't feasible).

The policy brief, based on the recent Climate Finance Taxonomy and international climate finance frameworks, proposes the development of a **Building Taxonomy Framework for India**, drawing from international practices while tailoring the approach to India's market realities and policy ecosystem.

India has already taken progressive steps to improve sustainability in its built environment through instruments such as the Energy Conservation Sustainable Building Code (ECSBC), Eco Niwas Samhita (ENS), and voluntary green certification programs like IGBC and GRIHA. However, these initiatives operate with varying definitions and eligibility criteria for what constitutes a 'sustainable building'. This creates variation in how projects are assessed and recognized, affecting the ability to channel finance effectively toward climate-aligned buildings. Tapping on this opportunity, this initiative will focus on aligning and harmonizing these existing systems within the structure and classification logic of India's Climate Finance Taxonomy. This will help establish a unified reference system for identifying, classifying, and tracking climate-aligned building activities, facilitating consistent climate finance mobilization and credible emissions tracking.

Such a taxonomy framework can enhance market clarity, boost investor confidence, and support consistent tracking of building performance relative to national and global climate goals.

6.2 Key Insights

Several countries have implemented or piloted sustainable building taxonomies. While their governance structures and levels of enforcement vary, key patterns have emerged that offers valuable direction for India. An analysis of three countries that have exclusive taxonomies for buildings is briefly discussed below. The EU, Singapore, and South Africa have each adopted contextually unique, yet functionally aligned taxonomies.

European Union: EU Taxonomy for Sustainable Activities[37]
- Standard Name: *EU Taxonomy Regulation (2020/852).*
- Issue: *Investors lacked clarity on which economic activities were genuinely climate-aligned.*

---

[37] ERPA Guide, EU Taxonomy Alignment in Listed Real Estate 2022,
https://www.epra.com/application/files/3316/6540/6020/EPRA_EU_Taxonomy_Guide.pdf

- Solution: *Developed a mandatory taxonomy covering six environmental objectives.*
- Scope: *Broader economic sectors including real estate, energy, manufacturing, transport.*
- Building Metrics: *Maximum Primary Energy Demand (PED) threshold (20% better than national NZEB standards), lifecycle GHG emissions, and resilience adaptation plans.*
- Impact: *As of 2023, over €400 billion green bonds aligned with taxonomy criteria issued, with real estate assets gaining preferred investor ratings.*

Singapore: Green Finance Industry Taskforce (GFIT) Taxonomy[38]
- Standard Name: *Singapore-Asia Taxonomy (Phase I launched in 2021)*
- Issue: *No consistent definition of sustainable activities for Southeast Asia's transition.*
- Scope: *A principle-based taxonomy covering energy, buildings, transport, and agriculture.*
- *Building Metrics: Energy Use Intensity (EUI), carbon intensity per m², renewable energy integration, and water efficiency.*
- Impact: *Improved market confidence in green bonds, boosting issuance by 30% between 2021-2023; supported Singapore's Green Mark 2021 scheme alignment.*

South Africa: National Green Finance Taxonomy[39]
- Standard Name: *South African Green Finance Taxonomy (2022)*
- Issue: *Absence of sustainable investment criteria limited green finance growth.*
- Solution: *Voluntary, disclosure-led taxonomy linked to the EU model.*
- Scope: *Energy, buildings, transport, water, circular economy.*
- Building Metrics: *EDGE and Green Star certifications, carbon performance tiers (Net Zero, Advanced, Entry), operational emissions, and energy benchmarks.*
- Impact: *Enabled first green REIT listings and accelerated green bond issuance by 40% in 2023.*

Key learnings from international uses cases: While the EU Taxonomy is legally binding with uniform thresholds and the Singapore Taxonomy leans toward transitional, sector-neutral pathways — South Africa's Taxonomy is principles-based and disclosure-driven. The models used in these three countries balances ambition with market flexibility through tiered thresholds, reliance on recognized local certifications and a strong focus on transparent, evidence-backed reporting rather than prescriptive regulations. Key takes aways include the following,
- Taxonomies integrate green finance with sustainable infrastructure.
- Metrics vary but commonly cover energy, carbon, resilience, and certification levels.
- Linkages with finance and certification systems are crucial to attract capital and scale green buildings. (green bonds, REITs, loans).
- Phased voluntary, performance-led approach allows flexibility across regions and building types.
- The taxonomy should be backed by clear technical metrics (EUI*, emissions, certifications).
- Governed by multi-stakeholder platforms.

6.3 Policy Recommendations

To enable a credible, scalable, and investment-ready sustainable building ecosystem, a phased and integrated framework is envisaged. The following interconnected actions are proposed to progressively build on one another - starting with the foundation of a taxonomy framework, linking it with national programs, ensuring governance continuity through stakeholder working group, operationalizing through pilot projects, and finally enabling robust performance measurement systems.

---

[38] Green Mark certification standards 2021, https://www1.bca.gov.sg/docs/default-source/docs-corp-buildsg/sustainability/20211028_certification-standard_r1-1.pdf
[39] Developing A Buildings Taxonomy Entry For South Africa, March 2022, https://sustainablefinanceinitiative.org.za/wp-content/downloads/Briefing-Paper_Developing-a-Buildings-Taxonomy-Entry-for-South-Africa.pdf
EUI (Energy Use Intensity) is the amount of energy a building uses per unit of area, typically expressed as kilowatt-hours per square meter per year (kWh/m²/year).

6.3.1 Development of a Building Taxonomy Framework Aligned with India's Draft Climate Finance Taxonomy

To effectively mobilize green finance within India's building sector, a Building Taxonomy Framework could be developed, aligned with India's recent Climate Finance Taxonomy and relevant international best practices. This framework will serve as a standardized tool to classify, assess, and certify sustainable building activities, offering consistency, credibility, and clarity to policymakers, financial institutions, and market stakeholders.

Illustrative Components of the Building Taxonomy Framework

The proposed taxonomy framework can be structured around the following components:

- **Scope Definition:** Outlining the taxonomy's coverage across building typologies (commercial, residential, industrial, public infrastructure) and lifecycle stages (new construction, retrofitting, operations).
- **Objective Finalization:** Defining the primary objectives of the taxonomy framework such as accelerating low-carbon building adoption, standardizing green finance eligibility, supporting social inclusion through affordable and gender-responsive infrastructure, and aligning domestic classifications with international frameworks.
- **Eligibility Criteria:** Establishing broad pre-conditions for a building or project to qualify for taxonomy assessment. These could include existing green building certifications, mandatory compliance with applicable energy codes, minimum environmental clearance standards, or eligibility under national/state incentive schemes.
- **Technical Screening Criteria:** Framing technical thresholds across environmental and social dimensions, to assess taxonomy-aligned projects. These can cover:
  - **Environmental parameters like** embodied energy for construction materials, energy efficiency, renewable energy integration, operational emissions intensity, water conservation, and waste management.
  - **Social parameters** like affordability, gender-responsive provisions, and accessibility.
  - **Resilience and climate risk reduction measures**, ensuring long-term environmental and socio-economic benefits.
- **Certification and Categorization Process:** Outlining a structured process to evaluate, verify, and classify projects as taxonomy-aligned based on eligibility and technical criteria. This can include third-party verification mechanisms, standard reporting templates, and graded categorization (e.g., 'compliant,' 'high performing').
- **Key Performance Indicator (KPI) Finalization:** Developing a standardized set of KPIs to consistently track taxonomy-aligned projects. These would measure environmental outcomes (energy, carbon, water), affordability metrics, social inclusivity, and resilience attributes.
- **Reporting, Verification, and Disclosure Process:** Defining protocols for regular performance reporting against KPIs, independent verification of reported data, and public disclosure requirements to ensure market transparency and build investor confidence.
- **Performance Monitoring and Data Management:** Establishing a centralized digital platform to aggregate and monitor taxonomy-aligned projects, their KPIs, and cumulative sectoral impacts, enabling data-driven decision-making and facilitating national climate reporting.

Integration within Regulatory and Financial Systems

For enhanced adoption, the taxonomy framework can be progressively integrated into national and sub-national regulatory mechanisms and financial markets through the following pathways:

- Embedding taxonomy thresholds and criteria into Development Control Regulations (DCRs), municipal bylaws, and urban planning policies, by linking specific approval processes, incentive provisions (such as additional FAR, property tax rebates), and compliance requirements to taxonomy-aligned building categories. This can be operationalized by notifying taxonomy categories through urban planning notifications and integrating them into state-level green building programs and incentive guidelines.
- Positioning the taxonomy as an eligibility and risk classification tool for green financial products such as green loans, bonds, and REITs, by mandating taxonomy alignment as a pre-condition for

eligibility. Additionally, encouraging financial regulators, including the Reserve Bank of India (RBI), to formally recognize taxonomy-aligned assets for preferential treatment within risk-weighted asset (RWA) frameworks, concessional lending rates, and green investment norms — ensuring the taxonomy enhances both project bankability and investor confidence.

Institutional Oversight and Implementation Support
A multi-stakeholder technical committee can be constituted to oversee the framework's design, market consultations, pilot rollouts, and phased implementation. This committee would ensure regulatory alignment, resolve operational challenges, and periodically update taxonomy thresholds and KPIs based on sector feedback and evolving climate priorities.

6.3.2   Launch a Phased Building Taxonomy Framework Aligned with Existing Programs

A phased rollout can be implemented, allowing for gradual adoption and continuous refinement based on real-world data and feedback. This approach will help fine-tune performance thresholds, reporting mechanisms, and financial integration strategies, ensuring that the taxonomy is robust, effective, and scalable.

Pilot Projects in Select Urban Centres- The initial phase could involve pilot projects across select metros and urban centres. This would offer a controlled environment to validate the taxonomy's design, criteria, and financial instruments in practice. The primary focus would be on commercial and public buildings, where performance metrics related to energy use, emissions, and operational savings can be effectively monitored. During these pilot projects, baseline data on key performance indicators can be collected, helping to assess the real impact of taxonomy-aligned approaches. This information can help refine the taxonomy's thresholds and provide a clearer picture of its effectiveness in driving sustainable outcomes.

Expanding to Broader Sectors- Following successful pilots, the taxonomy framework can be expanded to cover residential, industrial, and smart city projects, with adjustments made to address sector-specific challenges and opportunities. These expanded phases would introduce new sets of criteria and performance benchmarks relevant to these categories, further broadening the taxonomy's applicability and impact.

Global Alignment and Cross-Border Integration- In the final phase, taxonomy could explore alignment with international standards, such as those developed in other leading markets, to facilitate green finance access from global investors. This alignment would ensure that Indian building projects can tap into international funding channels and benefit from global recognition in green finance markets.

Establishment of a Centralized Monitoring Framework- To support ongoing performance measures and ensure transparency, a centralized monitoring system can be set up. This platform could track taxonomy-aligned projects and their performance against established KPIs, offering real-time data to stakeholders. Additionally, this system can help report on the volume of green finance raised, the extent of emissions reductions achieved, and the number of certified buildings within the taxonomy.

Effective stakeholder engagement requires building capacity across diverse levels in an organizational set up that includes central to local government level and private sector. Figure 18 provides the list of stakeholders and their roles and responsibilities.

Figure 18: List of Stakeholder

Government Ministries & Urban Authorities
- Ministries of Finance, Energy, Environment, and Urban Development, along with Local Municipal Bodies, are responsible for formulating policies that integrate building taxonomy frameworks into broader urban development strategies. They provide the regulatory and legal framework needed to enforce the taxonomy.
- Ensure coordination among different agencies to effectively integrate sustainability principles and support the taxonomy's implementation across various jurisdictions.

Regulators and Financial Sector
- Financial market regulators like Securities and Exchange Board of India (SEBI), as well as energy and construction authorities, must establish and enforce standards related to building ratings and sustainable practices.
- Oversee compliance with taxonomy standards, including the requirements for energy performance codes and building labels, ensuring transparency and accountability in the sector.
- Entities like State Bank of India (SBI), National Housing Bank (NHB), RBI, ESG mutual funds, and REIT managers offer capital and financial products like green bonds and infrastructure debt funds to incentivize adoption of the taxonomy framework.
- Evaluate and manage risks associated with investments in green buildings, using the taxonomy framework to assess and enhance sustainability credentials of projects.

Private Real Estate Players
- Large developers and infrastructure companies, such as CREDAI, DLF, and Godrej Properties, are tasked with integrating taxonomy framework principles into their development projects.
- Lead in the adoption of innovative technologies and sustainable building practices that meet taxonomy criteria, guiding industry standards for others to follow.

Civil Society & Academia
- Organizations like CSTEP, TERI, and CEPT University conduct research to support the taxonomy framework and advocate for policies that enhance sustainable development.
- Enhance public understanding and acceptance of building taxonomy frameworks through educational campaigns, workshops, and policy dialogues

Certification Agencies
- Agencies like IGBC, GRIHA, and LEED are responsible for verifying compliance with taxonomy standards and providing necessary certifications.
- Continually update the taxonomy standards to reflect evolving best practices and technological advancements in sustainable building construction.

6.4 Strategic Framework for Policy Implementation

Creating a strategic framework for implementing the building taxonomy framework involves several key components, which can be broken down into phases and strategic actions. Following the draft plan for the implementation.

Phase 1: Design of Taxonomy Framework (Year 1-2)

The focus of this phase is on "Developing a Building Taxonomy Framework aligned with India's Draft Climate Finance Taxonomy" policy recommendations. A detailed, step-by-step approach for its implementation is outlined below.

- **Establish Working Group:** Create a multi-stakeholder working group involving policymakers such as BEE, MoF, MoP etc., financial institutions like ADB, IFC, Work Bank, GiZ etc., industry experts like NAREDCO, CII, CREDAI etc., and NGOs such as WRI, AEEE, CSTEP etc. to guide framework development.
- **Define Taxonomy Scope:** Clearly outline the framework's coverage across building typologies as per ECSBC requirement and lifecycle stages for a new construction and existing buildings. Map the national landscape of building sustainability frameworks and green finance instruments by compiling existing building codes (ECSBC, ENS), certification systems (GRIHA, IGBC) and the green financing ecosystem (including green bonds and REITs linked to buildings).
- **Finalize Objectives:** Set primary objectives for the framework, focusing on low-carbon adoption, green finance standardization, and social inclusion.
- **Framework Design:** Define the scope, objectives, and classification categories for different building typologies (residential, commercial, public) and lifecycle stages (new construction, retrofitting, operation), ensuring alignment with global taxonomy frameworks and insights from stakeholder consultations. Apply the phased methodology replicating the climate finance taxonomy — beginning with qualitative eligibility criteria to identify climate-relevant building activities, and progressively integrating quantitative performance thresholds (e.g., emission reduction intensity, energy efficiency targets) in subsequent iterations.

Phase 2: Pilot Implementation (Year 2-4)

The focus of this phase is on "Launch a phased building taxonomy framework aligned with existing national programs" policy recommendations. A detailed, step-by-step approach for its implementation is outlined below.

- **Select Urban Pilots:** Launch pilot projects in key urban centres, targeting commercial and public buildings to validate taxonomy design and criteria.
- **Collect Baseline Data:** Gather initial data on key performance indicators (KPIs) like energy use and emissions for analysis and refinement of taxonomy parameters.
- **Testing Instruments:** Test the effectiveness of financial instruments and incentives during real-world application in pilot projects.
- **Third-Party Verification:** Establish mechanisms for third-party project verification, ensuring robust and credible certification.
- **Reporting Templates:** Develop standardized reporting templates to facilitate uniform performance tracking.
- **Financial Market Integration:** Work with financial institutions to adopt taxonomy-based financing models, promoting their use in green bond issuances and other financial instruments.

Phase 3: Expansion and Integration (Years 5)

The focus of this phase is on "Launch a phased building taxonomy framework aligned with existing national programs" policy recommendations. A detailed, step-by-step approach for its implementation is outlined below.

- **Expand to New Sectors:** Extend taxonomy framework to industrial, and smart city projects, adapting criteria and benchmarks for these new categories.
- **Refine Technical Criteria:** Adjust technical screening thresholds based on pilot project outcomes to suit sector-specific requirements.

- **Regulatory Alignment:** Integrate taxonomy with existing national programs and sub-national regulatory mechanisms to ensure cohesive policy support.
- **Stakeholder Training Programs:** Provide training sessions for stakeholders to understand taxonomy application and benefits, enhancing capacity building and orientation.
- **Knowledge Sharing Platforms:** Establish knowledge-sharing platforms and forums to facilitate dialogue and learning across sectors.

6.5 Long Term Impact

Implementing the proposed building taxonomy will harmonize codes and certifications into clear, verifiable categories, creating market clarity and investor confidence needed to scale green finance for India's $1.4 trillion infrastructure push. Phased pilots will validate thresholds, generate KPI baselines, and refine reporting workflows, while a centralized monitoring platform and third party verification ensure transparency and accountability. Additionally, integration with national programs and procurement will drive demand for low carbon materials, standardize EPD usage, and reduce regulatory overlapping.

The Building Taxonomy Framework is a key policy for mobilizing private capital toward climate goals by clarifying which activities qualify as "green" and reducing investor uncertainty. This has been implemented into various countries such as EU Taxonomy underpins 2050 neutrality and by the 2030 targets 55%[40] reduction in carbon emissions and this could unlock €390 billion annually[41], Singapore's GFIT taxonomy supports Green Mark 2021 and boosted green issuance by 30% between 2021–2023 and South Africa's taxonomy enabled green REITs and a 40% rise in green bonds in 2023.

From the international use cases, the role of taxonomy is observed and the impact it plays for the investors and the capital funds. Considering the importance and the impact, to implement this in India, a National Sustainable Building Taxonomy Working Group (NSBTWG) is to be established. The proposed NSBTWG composition brings together regulators, technical experts, industry and finance to design, pilot and scale a credible building taxonomy. BEE's leadership ensures energy and technical assessment while SEBI and MoHUA co-chairs align financial market rules and urban policy. Green building certification bodies like IGBC, GRIHA, IFC EDGE, and academia could provide robust LCA/EPC methodologies. Developers and ULBs can test their real-world applicability, banks, NHB and REITs can embed investment criteria and disclosure requirements, and experts from MoEFCC, RBI and NITI Aayog can offer policy guidance policy coherence. This cross sectoral forum accelerates standard harmonization, mobilizes capital, reduces implementation risk through pilots, and links technical outcomes to market incentives.

---

[40] European Commission, EU taxonomy for sustainable activities, https://finance.ec.europa.eu/sustainable-finance/tools-and-standards/eu-taxonomy-sustainable-activities_en
[41] Understanding the Impact of the EU Taxonomy on the Energy Sector, https://www.sustainabilityadvocates.dk/blog/understanding-the-impact-of-the-eu-taxonomy-on-the-energy-sector

Annexure 1

Tier I cities in India represent the epitome of urban development, offering a wealth of opportunities and amenities. These cities serve as major economic, commercial, and cultural hubs, drawing both national and international attention. They boast exceptional infrastructure, world-class educational institutions, and diverse industries. These Tier I cities attract a diverse population, fostering cultural diversity and innovation, and offer abundant employment opportunities. The following Table 1 provides the list of all Tier 1 cities in India.

Table 1: Tier 1 city list in India

S.NO	CITY	STATE	CODE COMPLIANCE STATUS
1	Mumbai	Maharashtra	ECBC notified
2	Delhi	New Delhi	-
3	Bangalore	Karnataka	ECBC notified
4	Chennai	Tamil Nadu	ECBC notified
5	Kolkata	West Bengal	ECBC notified
6	Hyderabad	Telangana	ECBC notified
7	Ahmedabad	Gujarat	-
8	Pune	Maharashtra	ECBC notified

Annexure 2

Tier 2 & 3 cities are experiencing significant economic and infrastructural advancements, attracting investments and fostering business growth. They offer a range of industries, educational institutions, and healthcare facilities, catering to the needs of their growing populations. These cities are becoming attractive destinations for investment and are playing a crucial role in the economic growth of their respective regions. The following **Error! Reference source not found.** provides the list of all Tier 2 & 3 cities in India.

Table 2: Tier 2 and 3 cities in India

STATE/REGION	TIER 2	TIER 3	CODE COMPLIANCE STATUS
Andhra Pradesh	Visakhapatnam		ECBC notified
Andhra Pradesh	Vijayawada		
Andhra Pradesh	Guntur		
Andhra Pradesh	Nellore		
Andhra Pradesh	Warangal		
Andhra Pradesh		Rajahmundry	
Andhra Pradesh		Chilakaluripet	
Assam	Guwahati		ECBC notified
Bihar	Patna		-
Bihar		Hajipur	
Chhattisgarh	Raipur		ECBC notified
Chhattisgarh	Durg-Bhilai Nagar		
Gujarat	Surat		-
Gujarat	Vadodara		
Gujarat	Rajkot		
Gujarat	Jamnagar		
Gujarat	Bhavnagar		
Gujarat		Gandhinagar	
Gujarat		Junagadh	
Haryana	Faridabad		ECBC notified
Haryana	Gurgaon		
Haryana		Rohtak	
Jharkhand	Jamshedpur		ECBC notified

Jharkhand	Ranchi		
Jharkhand	Dhanbad		
Jharkhand	Bokaro Steel City		
Karnataka	Mysuru		ECBC notified
Karnataka	Mangalore		
Karnataka	Hubli-Dharwad		
Karnataka	Belgaum		
Karnataka	Gulbarga		
Karnataka		Hosur	
Kerala	Kochi		ECBC notified
Kerala	Kozhikode		
Kerala	Thiruvananthapuram		
Kerala	Thrissur		
Kerala	Malappuram		
Kerala	Kannur		
Kerala	Kollam		
Madhya Pradesh	Bhopal		ECBC notified
Madhya Pradesh	Indore		
Madhya Pradesh	Jabalpur		
Madhya Pradesh	Gwalior		
Madhya Pradesh	Ujjain		
Maharashtra	Nagpur		ECBC notified
Maharashtra	Nashik		
Maharashtra	Aurangabad		
Maharashtra	Amravati		
Maharashtra	Kolhapur		
Maharashtra	Solapur		
Maharashtra	Sangli		
Maharashtra	Malegaon		
Maharashtra	Vasai-Virar		
Maharashtra		Bhiwandi	
Odisha	Bhubaneswar		ECBC notified
Odisha	Cuttack		
Odisha	Rourkela		
Punjab	Amritsar		ECBC notified
Punjab	Ludhiana		
Punjab	Jalandhar		
Punjab		Bathinda	
Punjab		Kapurthala	
Rajasthan	Jaipur		ECBC notified
Rajasthan	Jodhpur		
Rajasthan	Kota		
Rajasthan	Ajmer		
Rajasthan	Bikaner		
Rajasthan		Udaipur	
Rajasthan		Sujangarh	
Tamil Nadu	Coimbatore		ECBC notified
Tamil Nadu	Madurai		
Tamil Nadu	Tiruchirappalli		
Tamil Nadu	Salem		
Tamil Nadu	Tirupur		
Tamil Nadu	Erode		
Tamil Nadu		Hosur	
Telangana	Warangal		ECBC notified
Uttar Pradesh	Lucknow		ECBC notified
Uttar Pradesh	Ghaziabad		

Uttar Pradesh	Kanpur		
Uttar Pradesh	Agra		
Uttar Pradesh	Varanasi		
Uttar Pradesh	Meerut		
Uttar Pradesh	Jhansi		
Uttar Pradesh	Gorakhpur		
Uttar Pradesh	Moradabad		
Uttar Pradesh	Bareilly		
Uttar Pradesh	Allahabad		
Uttar Pradesh		Etawah	
Uttar Pradesh		Mathura	
Uttar Pradesh		Firozabad	
Uttar Pradesh		Aligarh	
Uttar Pradesh		Saharanpur	
Uttar Pradesh		Faizabad	
Uttar Pradesh		Basti	
Uttar Pradesh		Banda	
Uttar Pradesh		Gonda	
Uttar Pradesh		Rampur	
Uttarakhand	Dehradun		ECBC notified
Uttarakhand		Roorkee	
West Bengal	Asansol		ECBC notified
West Bengal	Siliguri		
West Bengal	Durgapur		
West Bengal		Kalyani	

Source [42] [43] [44]

[42] List of Tier 1, Tier 2, and Tier 3 Cities in India, Available at: https://addressadvisors.com/blog/list-of-tier-1-tier-2-and-tier-3-cities-in-india
[43] Tier I, II, III & IV Cities in India (2025): Full List and Real Estate Impact, June 2024, Available at: https://www.magicbricks.com/blog/tier-1-2-3-and-4-cities-in-india/132637.html
[44] List of Tier 1, 2, 3, 4 cities in India, July 2025, Available at: https://housing.com/news/classification-of-indian-cities-into-tier-i-ii-iii-and-iv/

About ALCBT

The Asia Low Carbon Buildings Transition (ALCBT) Project seeks to significantly reduce GHG emissions by catalyzing nationwide transition towards low carbon buildings in Cambodia, India, Indonesia, Thailand, and Vietnam. In India, the project is being implemented across three states Kerala, Haryana and Uttar Pradesh under the guidance of the Ministry of Housing and Urban Affairs and with support of the state-designated agencies. The project addresses regulatory, capacity, and financing gaps that prevent large scale adoption of low carbon buildings and build technical GHG emission reduction targets from building materials and operations, particularly from cooling, complementing regional and global initiatives.

The ALCBT project implementation is led by the Global Green Growth Institute (GGGI), in partnership with the ASEAN Centre for Energy (ACE), Energy Efficiency Services Limited (EESL), and HEAT International. It is supported by the German Federal Ministry for Economic Affairs and Climate Action under the International Climate Initiative (IKI).

About GGGI

The Global Green Growth Institute (GGGI), headquartered in Seoul, Republic of Korea is a treaty-based international, inter-governmental organization dedicated to supporting and promoting strong, inclusive and sustainable economic growth in developing countries and emerging economies.

About ACE

The ASEAN Centre for Energy (ACE) is an intergovernmental organization within the Association of Southeast Asian Nations' (ASEAN) structure that represents the 10 ASEAN Member States' (AMS) interests in the energy sector.

About EESL

Energy Efficiency Services Limited (EESL) is a super energy service company that seeks to unlock energy efficiency market in India, estimated to at Rs. 74,000 crore that can potentially result in energy savings of up to 20 percent of current consumption, by way of innovative business and implementation models.

About HEAT International

HEAT International is an independently acting consulting firm with 30 years of experience in the field of climate, heating & cooling, and transport. HEAT's goal is to support countries in their effort to mitigate emissions and to implement transformative pathways towards zero GHG emission solutions.

ASIA LOW CARBON BUILDINGS TRANSITION | PROJECT

Life Cycle Assessment for Transitioning to a Low-Carbon Economy

HQ Address:
The Global Green Growth Institute
19F Jeongdong Building 21-15, Jeongdong-gil Jung-gu, Seoul, Republic of Korea 04518

Office in India:
The Global Green Growth Institute
M-6 Haus Khas, Third Floor, Aurobindo Marg. New Delhi – 110068
Contact: india@gggi.org | +91 +91 1140501471

Support the ALCBT project in India through our project hashtag**s**

#AsiaLowCarbonBuildings
#IndiaTowardsLCBT
#LowCarbonHighComfort

Follow GGGI India

www.alcbt.gggi.org

Supported by:

Federal Ministry for Economic Affairs and Climate Action

IKI INTERNATIONAL CLIMATE INITIATIVE

on the basis of a decision by the German Bundestag