What are the steps?

Implementing building energy codes and standards

Buildings

Buildings energy efficiency sessions in partnership with:

BEEP

INDO-SWISS BUILDING ENERGY EFFICIENCY PROJECT

IEA #energyefficientworld

Energy Efficiency Training Week: Buildings programme

1. **Where to start:** Energy use in buildings
2. **Where to start:** Energy efficiency potential in buildings
3. **Toolkit:** Energy efficient building design
4. **Toolkit:** Energy efficient building technologies

   Special session. Technology demonstration

   Where do I get help? IEA's Technology Collaboration Programmes
5. **Toolkit:** Energy efficiency policies and target setting
6. **What are the steps?** Enabling investment with energy efficiency policies
7. **What are the steps?** Implementing building energy codes and standards
8. **What are the steps?** Building operations and procurement

   Special session. The multiple benefits of energy efficiency
9. **Did it work?** Evaluation and energy efficiency indicators

   Where do I get help? International and regional energy efficiency initiatives
10. **Energy efficiency quiz:** Understanding energy efficiency in buildings

7. What are the steps?: Implementing codes and standards

Trainers: Brian Dean and Pierre Jaboyedoff

Purpose: To teach the fundamentals of building energy codes and standards. This course will include discussions of regulation types (e.g. mandatory, voluntary and stretch codes) and compliance paths (e.g. prescriptive, performance and outcome-based).

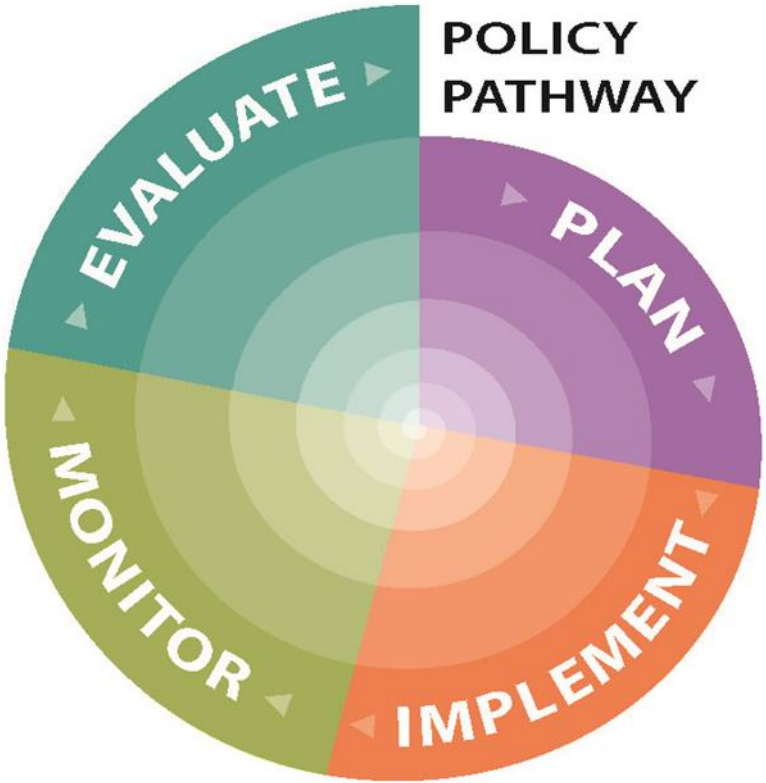
Scenario: A respected industry association claims that the building energy codes are out of date. *How do you advance building energy codes in your jurisdiction?*

Building energy code vision

Review IEA's Policy Pathway

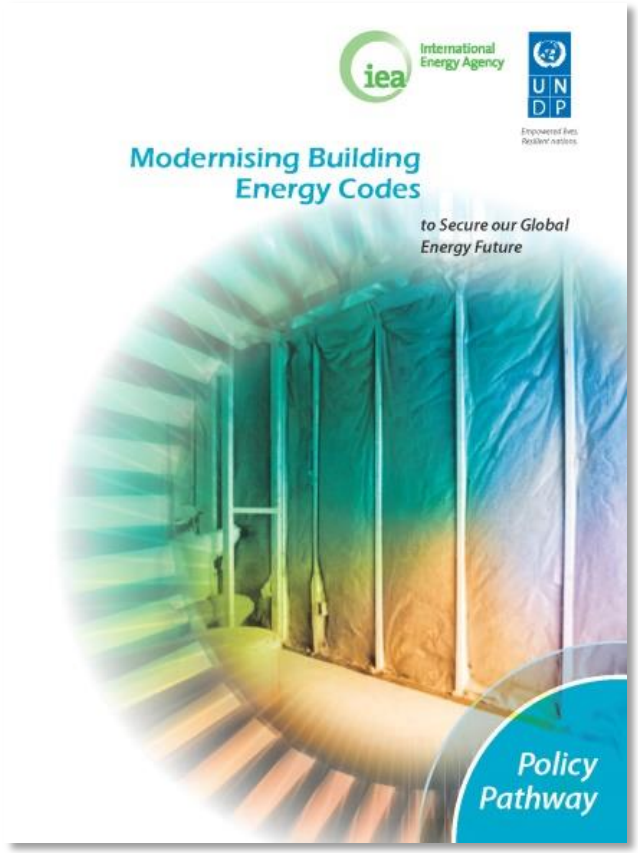
Set a strategy

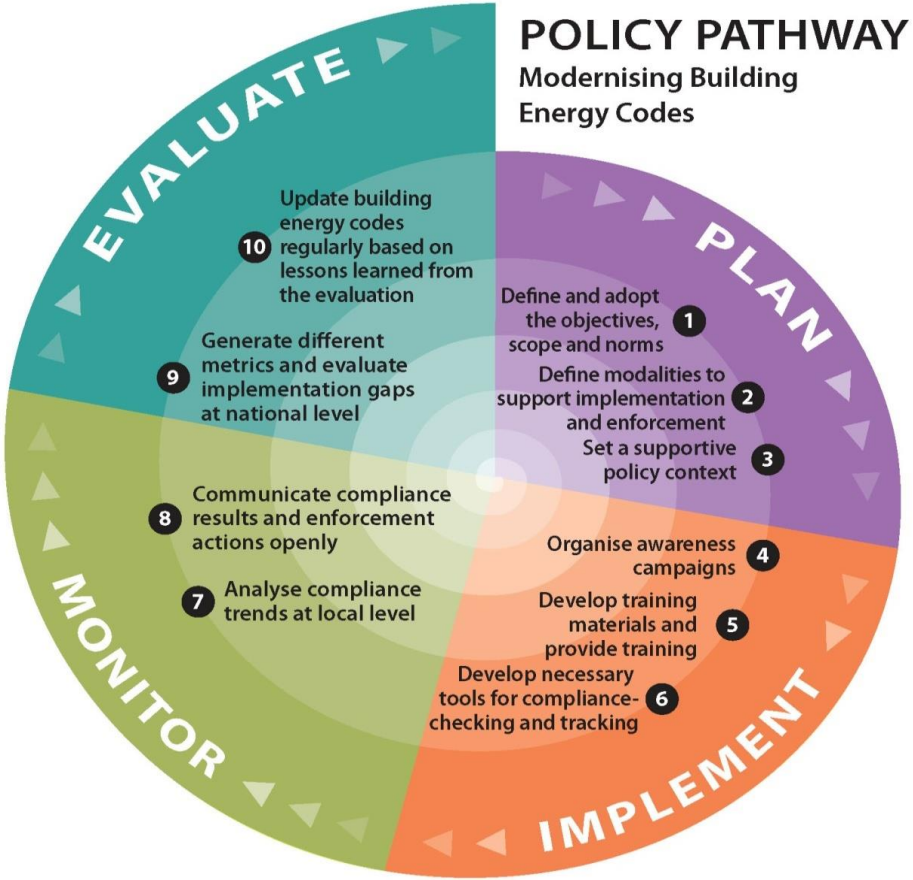
Online resource: IEA's Policy Pathway series



www.iea.org/publications/policypathwaysseries/

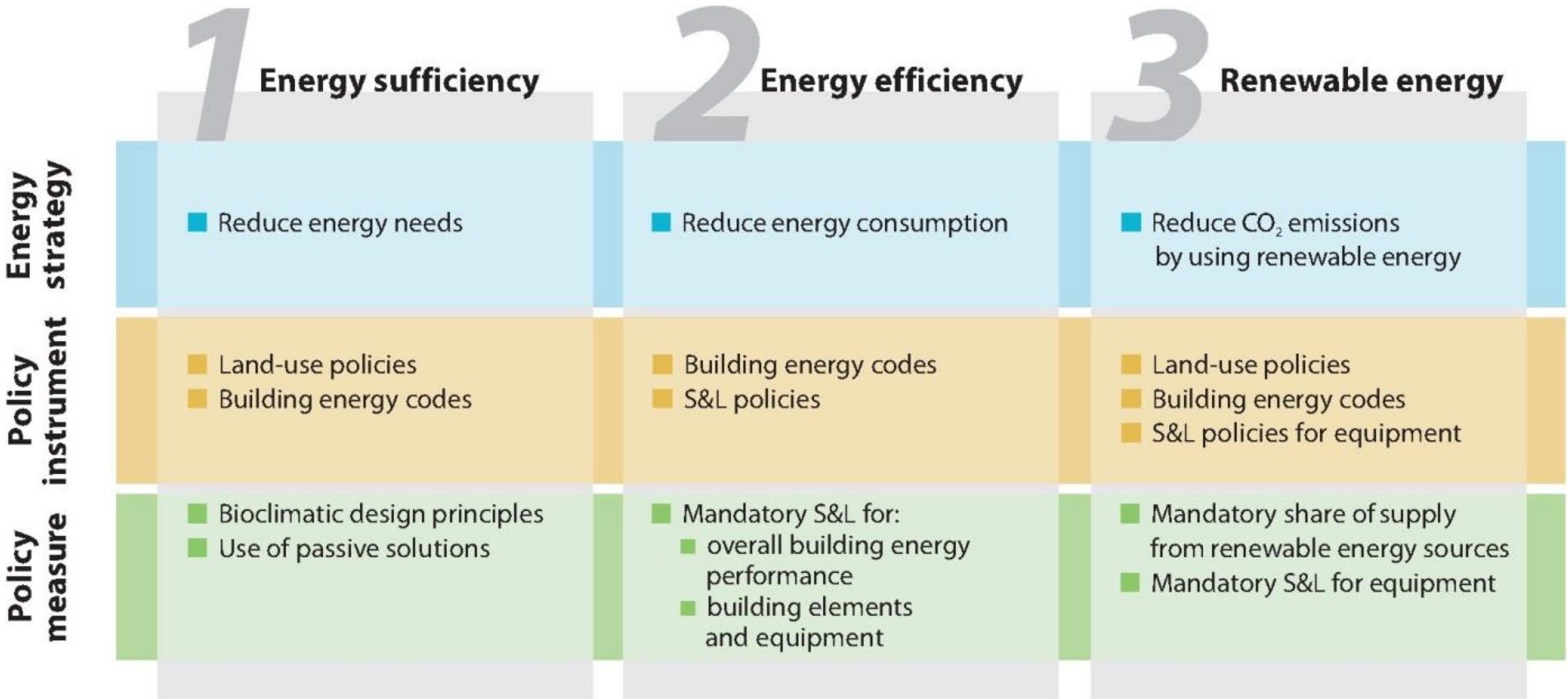
Building energy codes: policy pathway





www.iea.org/publications/policypathwaysseries/

Building energy codes: set a strategy



www.iea.org/publications/policypathwaysseries/

Building energy code types

Code type

- Prescriptive
- Simple trade-off
- Performance
- Outcome-based

Document type

- Model code
- Stretch code

Building energy code types

1. Prescriptive codes:

- Specify requirements for key elements such as wall and ceiling insulation, window and doors, roofs, foundations, heating, ventilation air-conditioning, equipment efficiency, water heating, lighting fixtures, and controls.
- Compliance with these codes is commonly assessed by checking the list of prescribed requirements.

2. Simple trade-off codes:

- Allow for trade-offs between similar building components. For example, less efficient insulation for more efficient windows in the building envelope.

3. Performance codes:

- Specify a minimum required level of energy consumption or intensity for the whole building. They require energy modelling to be conducted at design stage.
- Compliance is commonly checked by comparing the modelled energy performance of the design with a reference building of the same type.

4. Outcome-based codes:

- Demonstration of performance during the operation of buildings.
- Compliance is typically possible through energy performance certificates or with energy disclosure policies.

Code document type: Model code vs. regulation

- **Model code:** a code document that is designed to be copied and adopted for implementation by multiple jurisdictions.
  - To enable increased consistency across multiple jurisdictions
  - To simplify the code adoption and implementation process

- **Regulation:** a code becomes a regulation when it is legally adopted for implementation by a jurisdiction.
  - A legal regulation that has been notified or adopted by a government
  - Binding requirements that are able to be enforced by the government

Model code examples: United States, Mexico and India

- **International Energy Conservation Code**
  - Available for use across multiple countries
  - Currently used in Mexico and the United States as a model code
- **ASHRAE (90.1 and 90.2)**
  - Available for use across multiple countries
  - Commonly used for state and city commercial building codes in the United States
- **Energy Conservation Building Code**
  - Developed for local adoption by states in India
  - Originally based on ASHRAE 90.1

Code achievement type: Stretch codes vs. base code

- **Stretch code:** a code that has higher energy efficiency requirements than the base code.
  - To allow leading local jurisdictions to adoption higher energy efficiency requirements
  - To enable incentive programs tied to higher efficiency levels

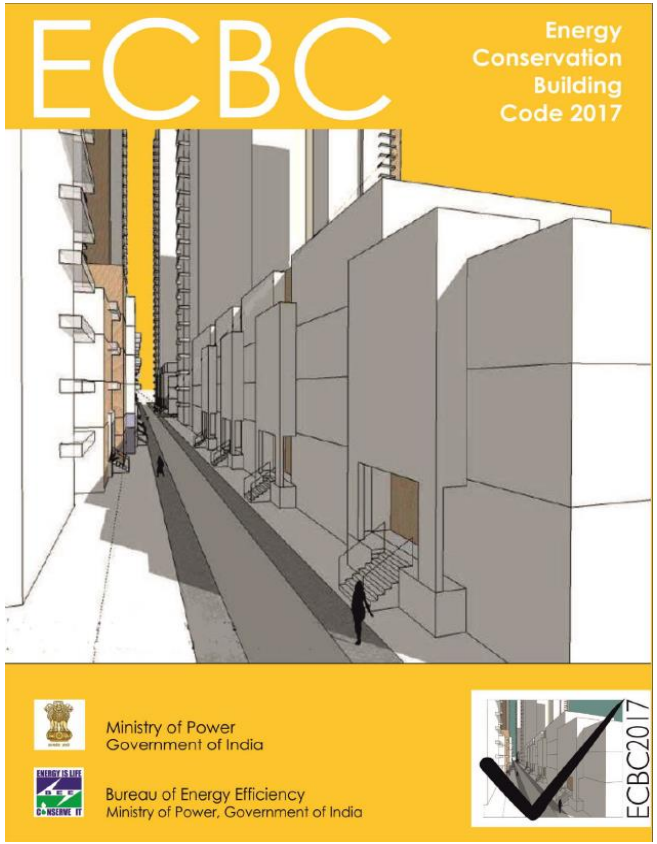
- **Base code:** the minimum code with a set of requirements that are typically directly from the model code.
  - Commonly used by the majority of jurisdictions

Stretch code examples: United States and India

- **Massachusetts**
  - First stretch code in the United States
  - Originally 20 percent energy savings beyond the 2009 IECC, and then updated to be more efficient than the 2015 IECC / 2013 ASHRAE
  - Jurisdictions covering 66% of the Massachusetts state population have adopted the stretch code in their city/town
  - California, Oregon and Vermont have also started using stretch codes

- **India**
  - 2017 Energy Conservation Building Code includes multiple tiers in the code, ranging from the base code and two stretch levels that are more efficient (called ECBC+ and SuperECBC)
  - This is an example of a single code document that can be adopted by local jurisdictions with both base and stretch code requirements available to builders

India's Energy Conservation Building Code 2017

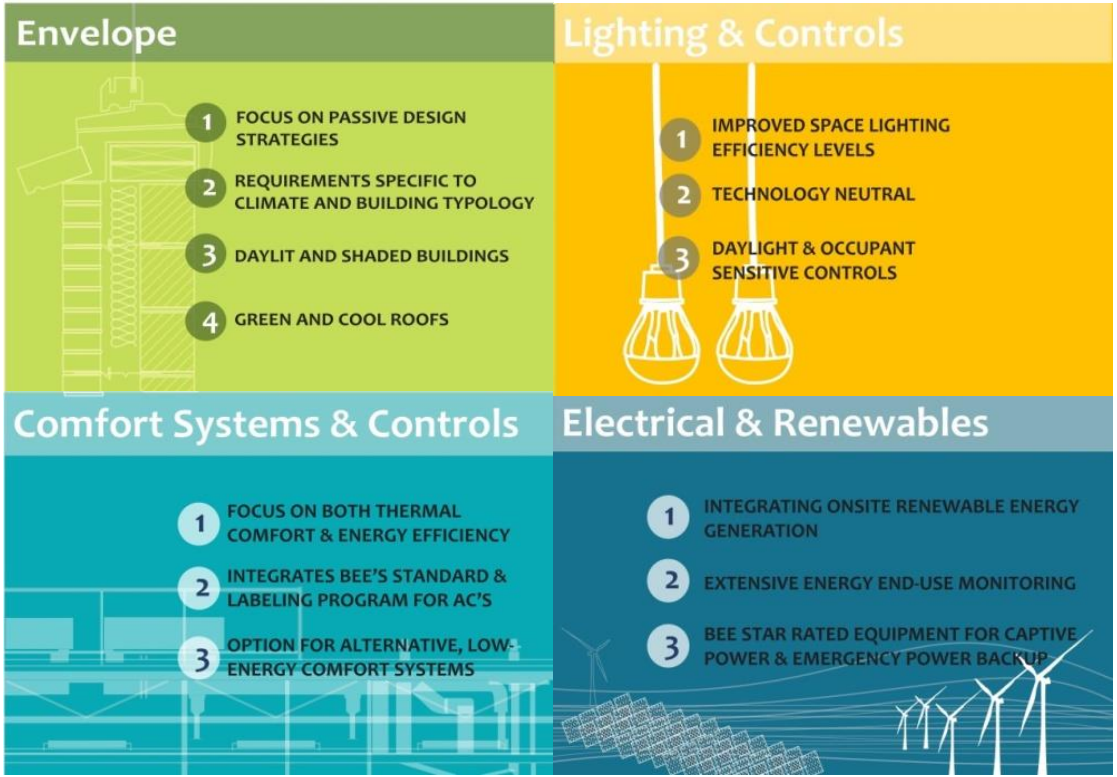


Code update process:

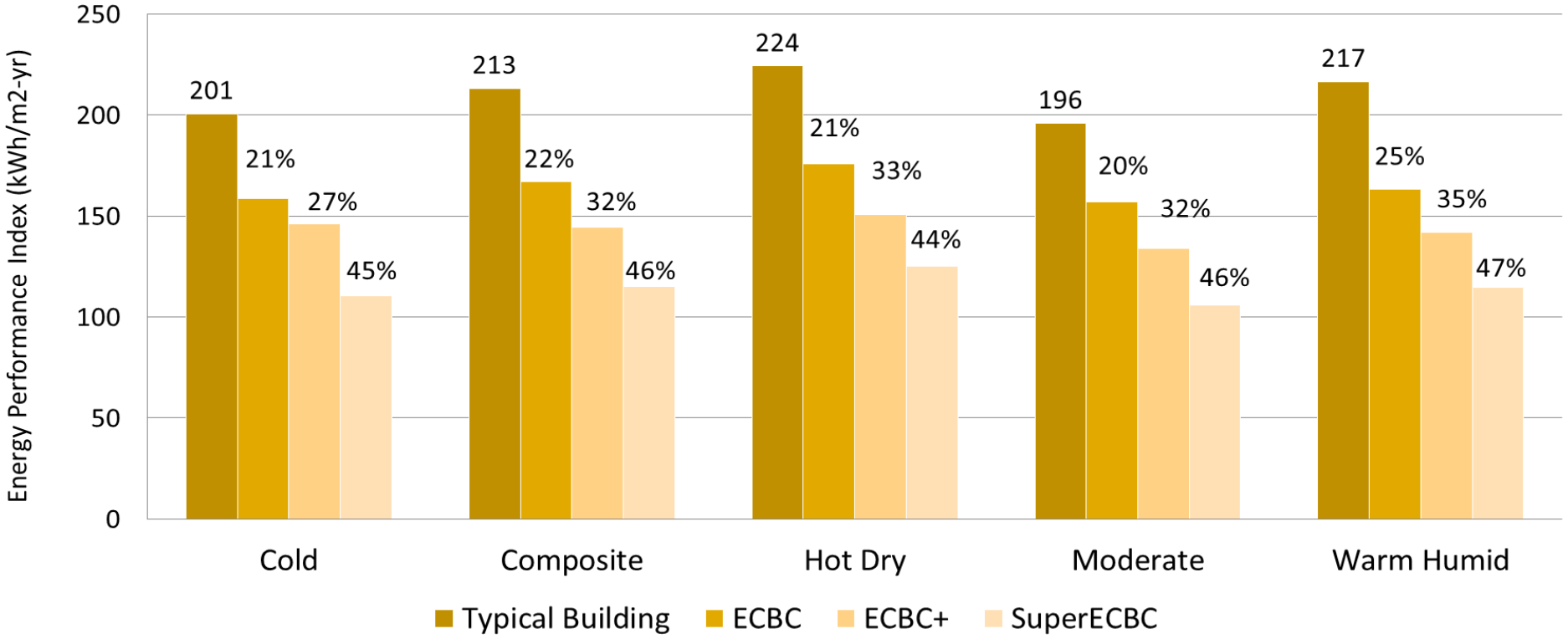
- **Working Groups**
  - Market Assessment
  - Technical Analysis
  - International Best Practice
  - Expert Comments
- **Technical Committee**
  - Regional and National Workshops
  - Public Consultation
- **Steering Committee**
  - Overall Review and Guidance

India's Energy Conservation Building Code 2017: Objective

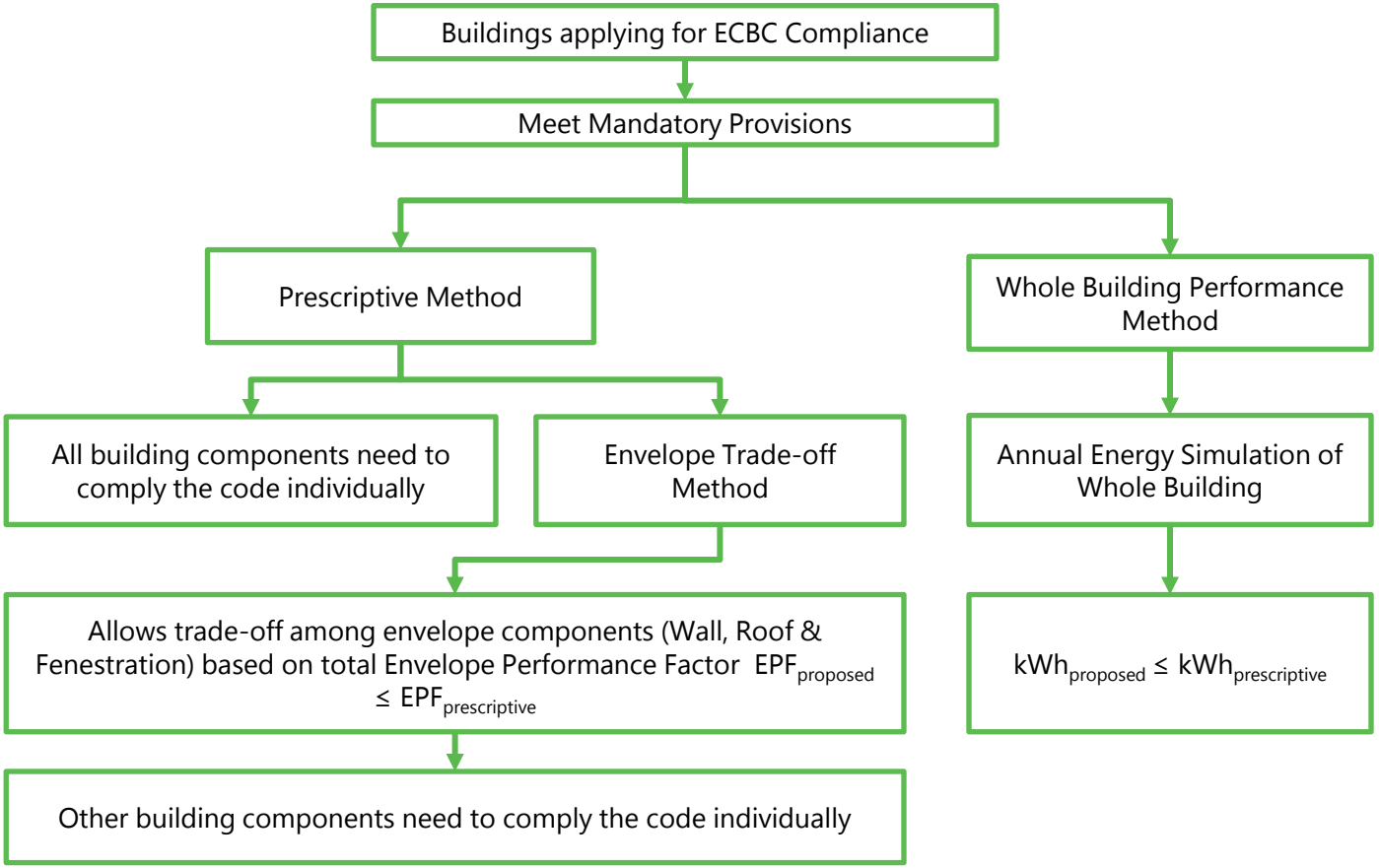
- Systematic implementation and enforcement
- Strong push towards energy efficiency
- Net Zero Energy Building Vision by matching both energy efficiency and renewable energy
- Response to recent technological advancements
- Applicable to various categories of buildings and passive design strategies
- Technology neutral



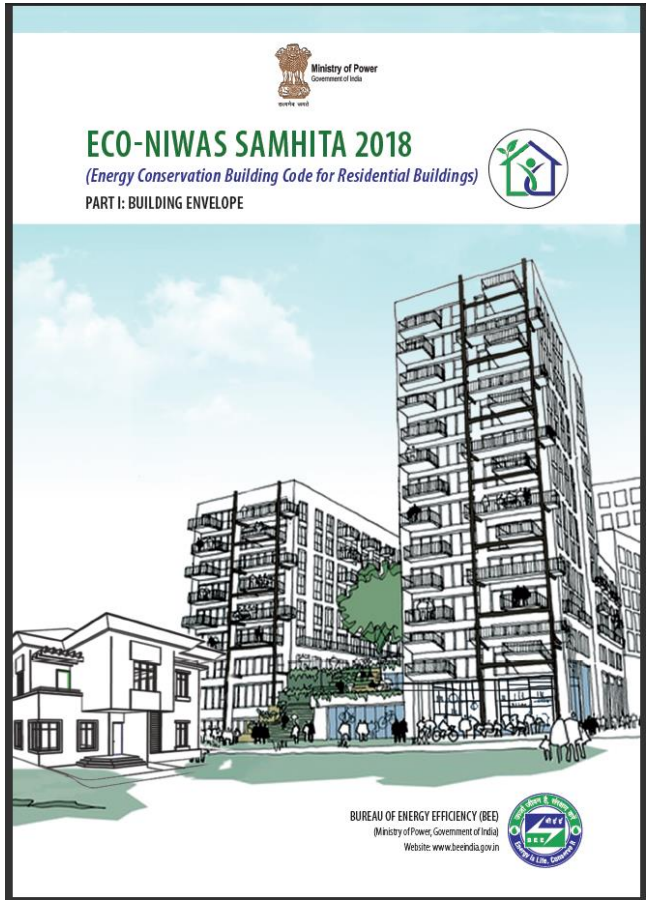
India's Energy Conservation Building Code 2017: Estimated impact



India's Energy Conservation Building Code 2017: Compliance



India's Energy Conservation Building Code - Residential



- **ECO-NIWAS SAMHITA 2018 (Eco-House Code 2018)**

Ministry of Power
Government of India
सत्यमेव जयते

- ***(Energy Conservation Building Code for Residential Building***
- **PART I: BUILDING ENVELOPE**
- The approach, the development and the code draft has been reviewed by the Steering Committee, the Technical Committee, by a consultation on the web site of India Bureau of Energy Efficiency (BEE) and by consultations in cities like Chennai, Delhi, Calcutta, Mumbai
- All comments have been taken into account and included in the draft code in consultation with BEE
- Applicable to all residential buildings built on a plot area of ≥500 m^2

Development Team

(Government)

Bureau of Energy Efficiency
Abhay Bakre, Director General
Saurabh Diddi, Director
Arijit Sengupta, Director
Abdullah Nisar Siddiqui, Project Manager
Anju Singh, Project Engineer

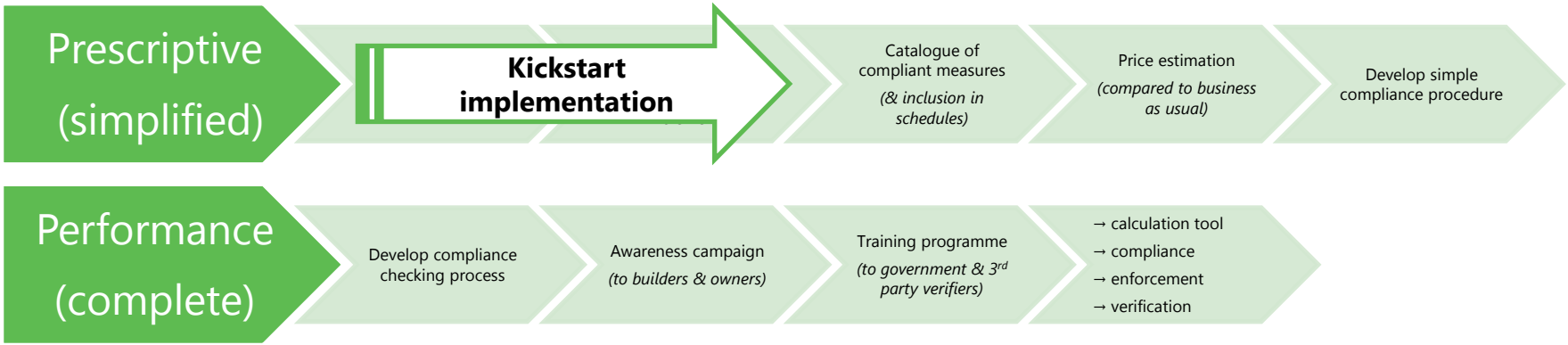
(Technical)

Swiss Agency for Development and Cooperation
Anand Shukla

Indo-Swiss Building Energy Efficiency Project
Effin'art Sarl: Pierre Jaboyedoff,
Greentech: Sameer Maithel, Prashant Bhanware Saswati Chetia, Vernica Prakash Kapoor, Satyendra Rana,
Ashok B. Lall Architects: Ashok Lall, Salil Mohan

ECBC-R: a simplified two tier process

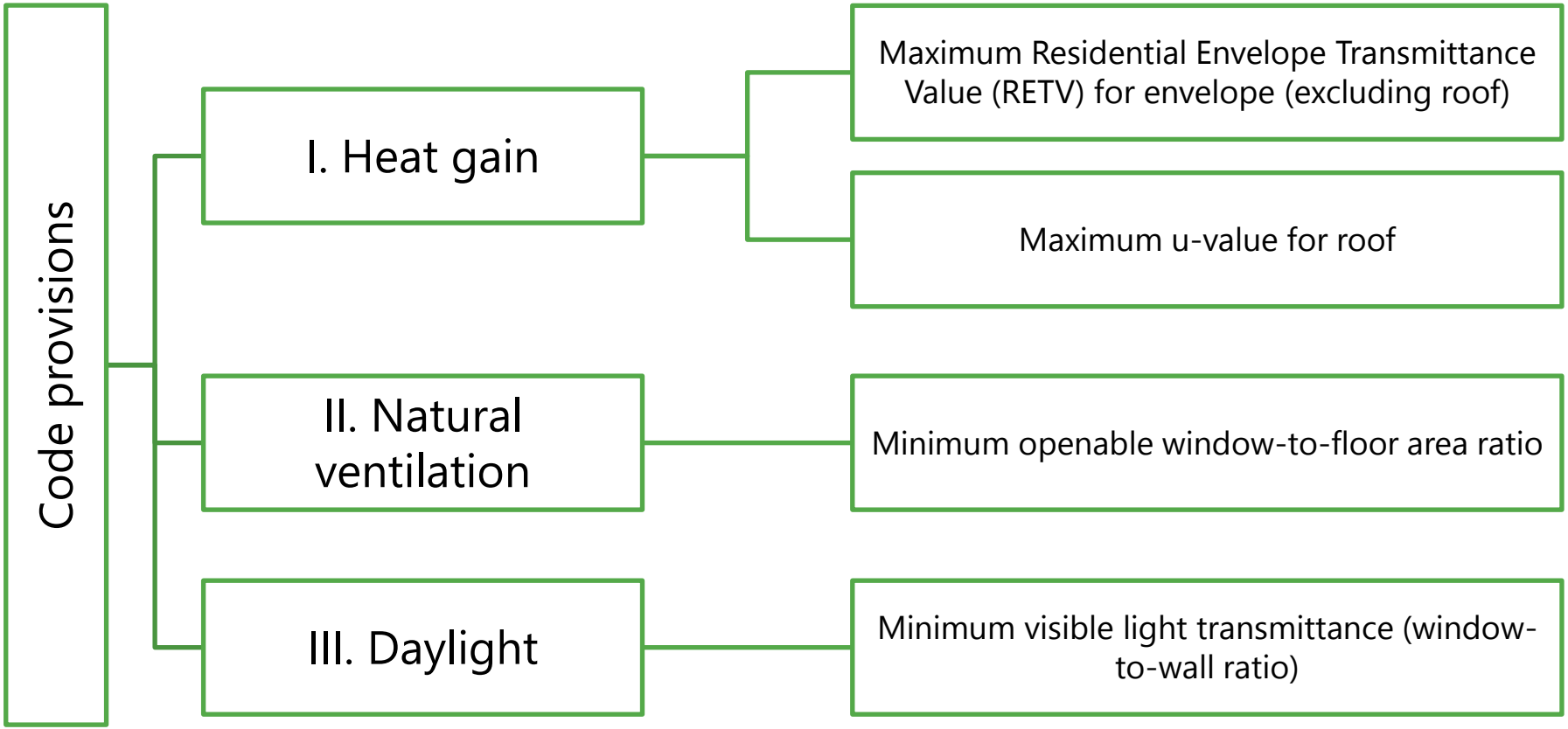
- **Development:** Review experience in the region Singapore, Hong Kong, others…
  - Buildings survey, representative buildings, > 20,000 Energy Plus simulations across climates



- **Adoption and enforcement:** Model bye-laws developed at the national level can be adopted by the states to implement the building code.
  - Rajasthan: www.dnaindia.com/jaipur/report-rajasthan-gets-unified-building-bylaws-2553952

- **Review and update:** Further improvement could be achieved:
  - 15 W/m^2 can be lowered to 12 W/m^2

ECBC-R: building envelope requirements



Standards

How is a standard different than a code?

Examples

“What’s the difference between a code and a standard?”

As we saw previously, codes are comprehensive legal documents that enable energy efficiency for buildings as a whole.

While, standards are often shorter and very detailed specifications for a specific equipment, product or material.

Often, building energy codes include requirements from or refer directly to a range of standards.

Code example: *Código de Conservación de Energía para las Edificaciones de México*

OBJECTIVE

Provide a guideline for energy-efficient buildings construction in Mexico, integrating existing and new standards together with recommendations into a single document. Moreover, the codes establish the national baseline for the deployment of energy efficiency programs.

BACKGROUND

Based on the International Energy Conservation Codes developed in the US, the Mexican building code *Código de Conservación de Energía para las Edificaciones de México (IECC)* was released in 2016. The document is an evolution of the Sustainability chapter of the *Código de Edificación de Vivienda* from 2009, and contains minimum energy efficiency requirements for energy conservation of commercial and residential new buildings and renovations, including air conditioning and water heating systems, appliances consumption, solar gains and envelope.

While in Federal level, the code is voluntary. However, once adopted by a local government, it becomes mandatory. The code will be updated every three years, addressing developments in technology and the evolution of energy efficiency standards.

México developed its code based on the IECC, from the International Code Council. First version released in 2016, with goal for updates every three years.

Standards Example: *Normas Oficiales Mexicanas en Eficiencia Energética*

OBJECTIVE

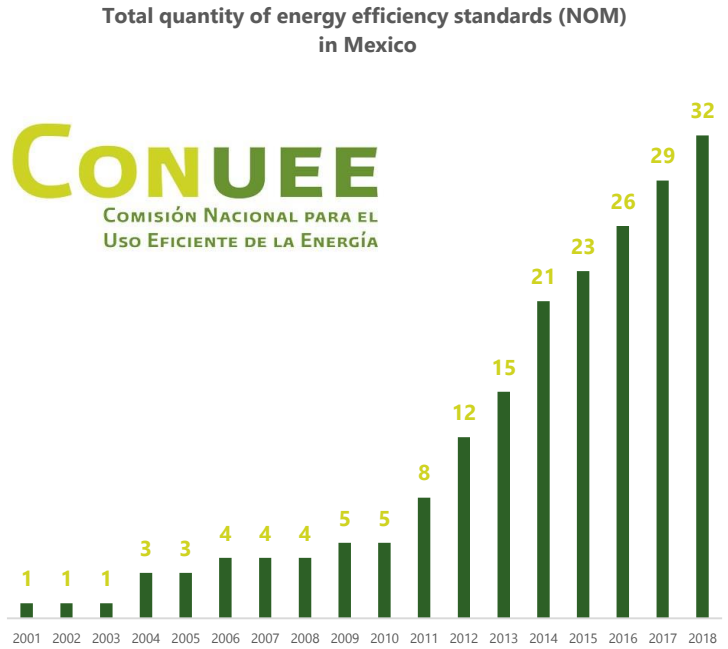
Create technical regulation on products, processes, methods, installations, services, systems or activities related to the security, health and protection of consumers and the environment.

BACKGROUND

Mexico has 32 different standards related to energy efficiency (*Normas Oficiales Mexicanas – NOM*), of which 4 are directly related to buildings (building envelope, insulation, lighting and fenestration included). By the end of 2018, 74 test laboratories, 10 certification institutions and over 200 verification units are part of the structure for developing the standards and putting them to force. These are mandatory standards and are backed by the National Law of Metrology and Normalization.

In addition to the NOMs, there are also Normas Mexicanas (NMX), which contain specifications focused on the quality of products, processes and services, and are also known as *normas de calidad* or quality standards. NMXs are voluntary standards and are generally recommendations.

The mandatory standards can be found here.



México has mandatory (NOMs) and voluntary (NMX) standards. There are 32 mandatory standards on energy efficiency, of which 15 are buildings-related.

Standards example: *Norms in Mexico*

RESIDENTIAL ENERGY EFFICIENCY STANDARDS

NOM-003-ENER-2011 *Thermal efficiency of water heaters for residential and commercial use*
NOM-004-ENER-2008 *Energy efficiency of centrifugal pumps for water pumping of domestic use with powers from 0.187 kW to 0.746 kW*
NOM-005-ENER-2012 *Energy efficiency of residential washing machines*
NOM-015-ENER-2012 *Energy efficiency of residential refrigerators and freezers*
NOM-017-ENER-2012 *Energy efficiency of Compact Fluorescent Lamps*
NOM-018-ENER-2011 *Thermal insulation for buildings*
NOM-020-ENER-2011 *Energy efficiency in buildings, envelope of buildings for housing purposes*
NOM-021-ENER/SCFI-2008 *Energy efficiency and user safety requirements for air conditioners of room type*
NOM-030-ENER-2012 *Lighting efficacy of integrated Light-Emitting Diode (LED) lamps for general lighting*

NON-RESIDENTIAL ENERGY EFFICIENCY STANDARDS

NOM-007-ENER-2004 *Energy efficiency in lighting systems of non-residential buildings*
NOM-008-ENER-2001 *Energy efficiency in buildings, envelope of non-residential buildings*
NOM-011-ENER-2006 *Energy efficiency of central, packaged or Split air conditioners*
NOM-023-ENER-2010 *Energy efficiency of Split, free discharge and ductless air conditioners*
NOM-024-ENER-2012 *Thermal and optical characteristics of glass and glass systems for buildings*
NOM-028-ENER-2010 *Energy efficiency of lamps for general use*

Mexico has 9 residential and 6 non-residential standards.
These standards can then be referred to within the building energy code.

Codes and standards process

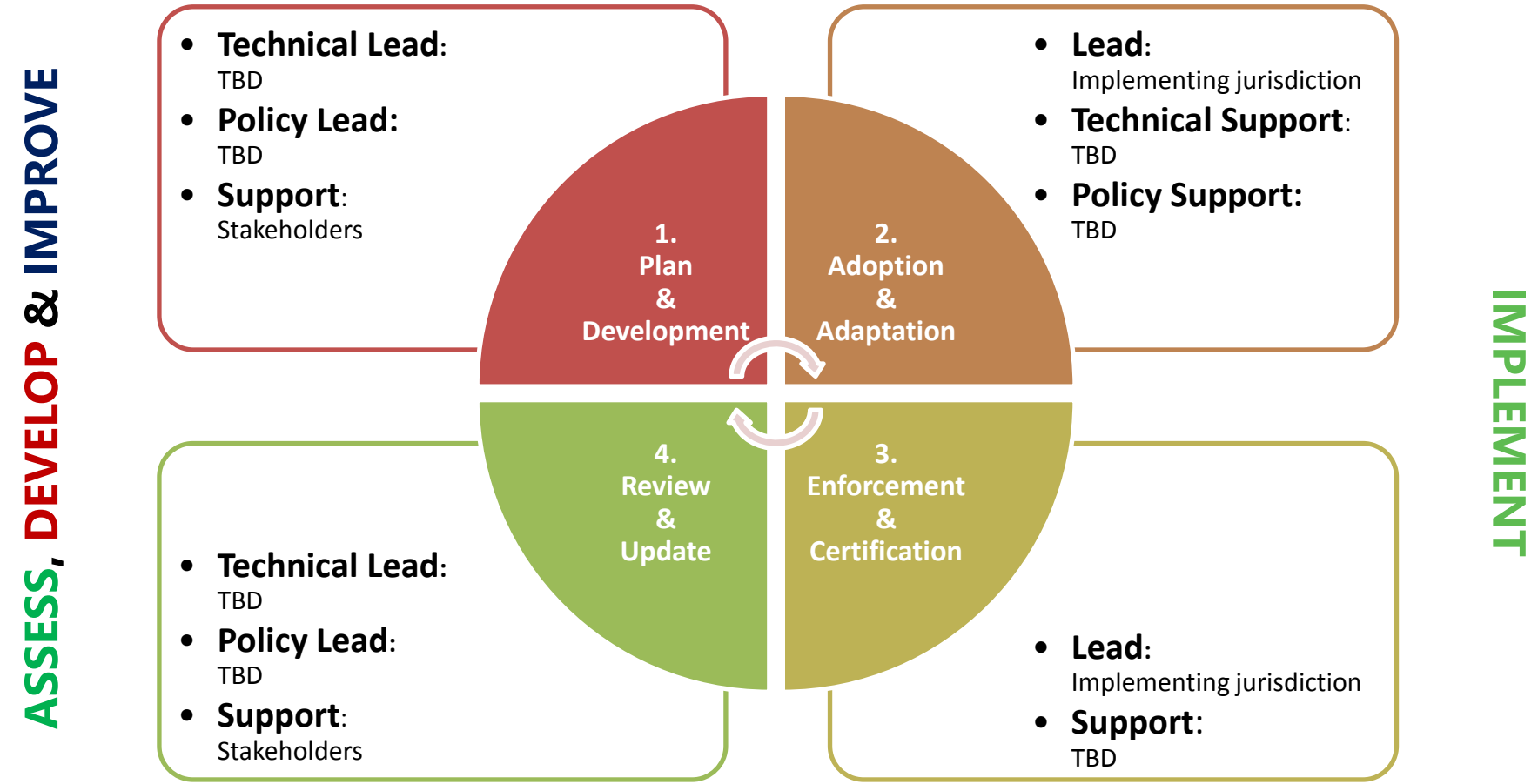
Set roles with stakeholders

Create a roadmap timeline with targets

Understand the steps of implementation

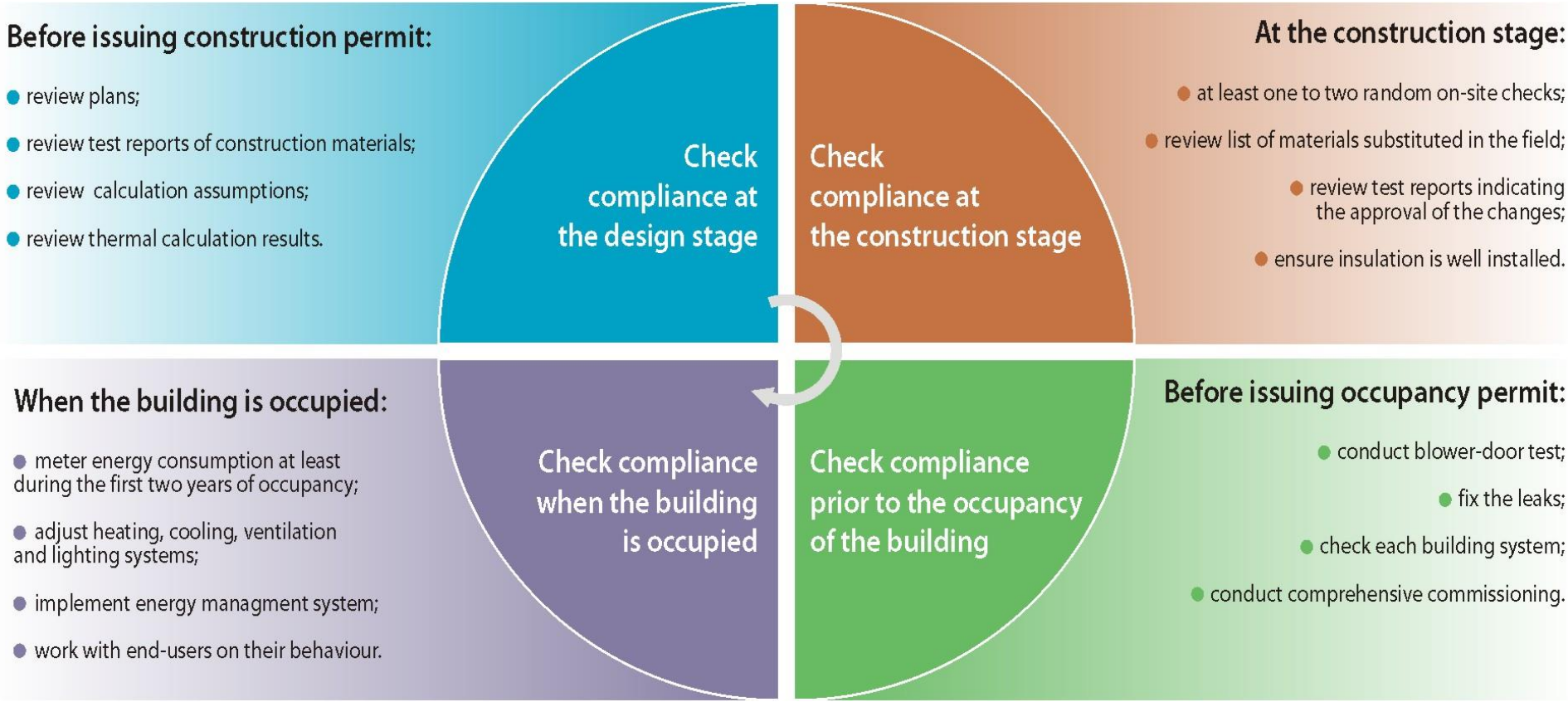
Achieve continuous improvement

Building energy codes: 4-step cycle and 4-part governance



Source: Mexico and IEA

Building energy codes: implementation



Group discussion

Scenario:

A respected industry association claims that the building energy codes are out of date.

How do you go about testing this claim, and what do you do if this information is correct?

ASEAN
THAILAND 2019
ADVANCING PARTNERSHIP
FOR SUSTAINABILITY

International
Energy Agency
Secure
Sustainable
Together

Department of Alternative
Energy Development and Efficiency
MINISTRY OF ENERGY

www.iea.org

IEA #energyefficientworld