Roadmap for Energy Efficient Buildings and Construction in ASEAN

The 7th IEA-Tsinghua Joint Workshop. Achieving carbon neutrality pledges: The role of buildings

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Project Background

- A joint collaboration of the International Energy Agency (**IEA**), ASEAN Centre for Energy (**ACE**), the **ASEAN Secretariat**, and the **Energy Efficiency and Energy Conservation Sub-Sector Network**

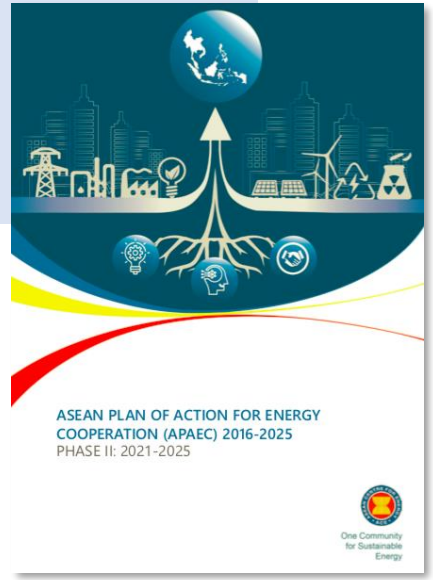
- The project aims to develop a detailed **roadmap for the buildings and construction sector** and a **roadmap for space cooling** in the ASEAN region, to help reduce energy demand in the sectors and improve stakeholder collaboration.

- The project is funded by the ASEAN-Australian Development Cooperation Project Phase II (**AADCP II**).

Programme Area No. 4 – Energy Efficiency and Conservation

OBS 1: Expand, Harmonise, and Promote Energy Efficiency Standards and Labelling on Energy-related Product

OBS 3. Strengthen Sustainability of Energy Efficiency in Buildings

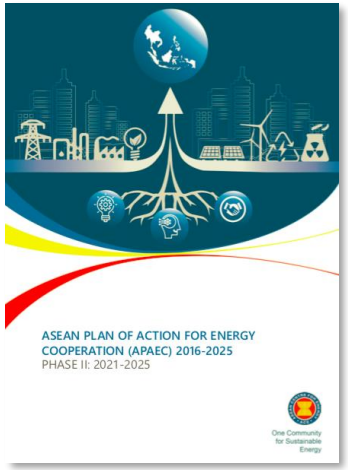


Rationale (Demand and Potential)

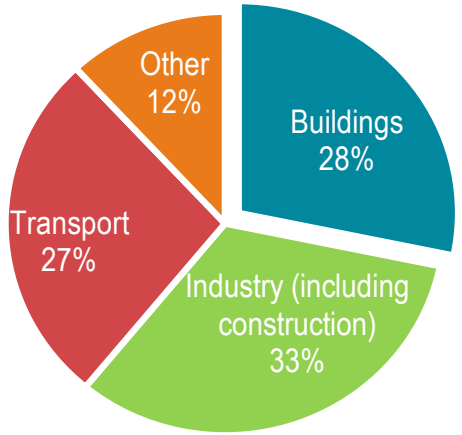
Building Sector in ASEAN

APAEC Phase II:

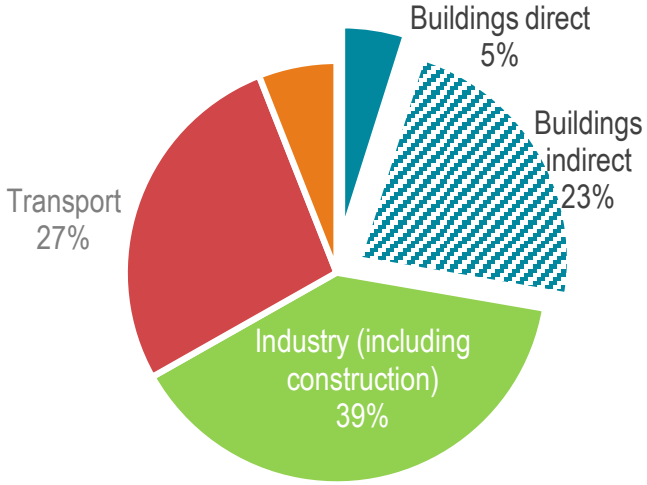
Energy intensity reduction target of 32% by 2025 based on 2005 level.
Renewable energy share of 23% in total primary energy supply (TPES)
Renewable energy share of 35% in power generation by 2025



Buildings' share of total final energy consumption in ASEAN, 2018



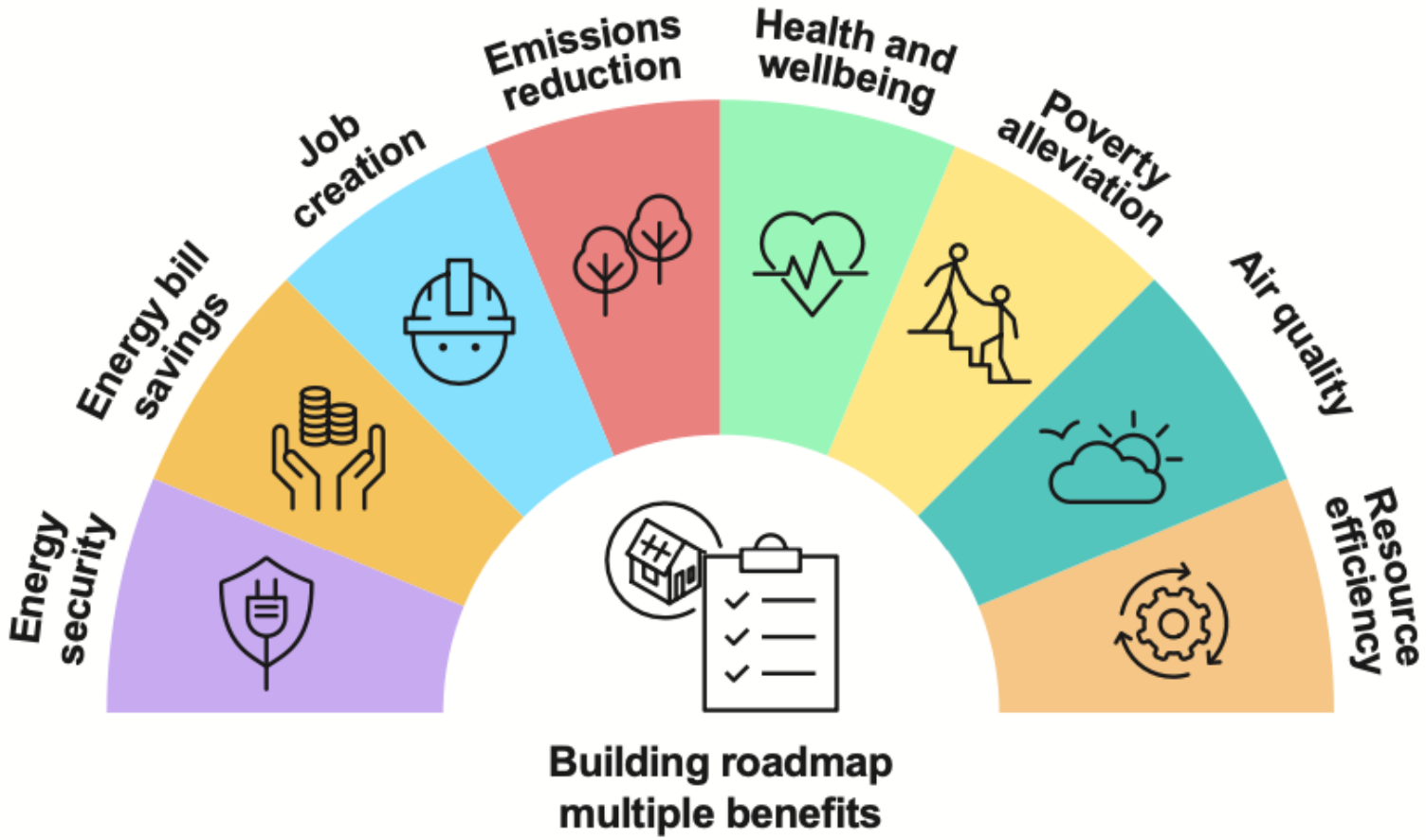
Buildings' share of energy and process related CO2 emissions in ASEAN, 2018



Urbanisation rate is expected to increase from 50% in 2018 to 60% by 2040, adding120 million of urban dwellers, increasing floor area by 60% from today

ASEAN's TFEC is expected to grow by two-thirds by 2030, and by 120% by 2040. Achievement of existing national and regional targets on energy efficiency and renewable energy could limit this growth to less than one-third by 2030, and to less than 50% by 2040

Multiple Benefits of the net-zero transition



Improving energy efficiency and decarbonisation of buildings offer a number of economic, social and environmental benefits beyond energy savings and emissions reductions.

ASEAN Buildings Roadmap objective and key principles

Roadmap intends to to support policy-makers in developing, adopting, and enforcing energy efficiency and low-carbon buildings policies and programmes

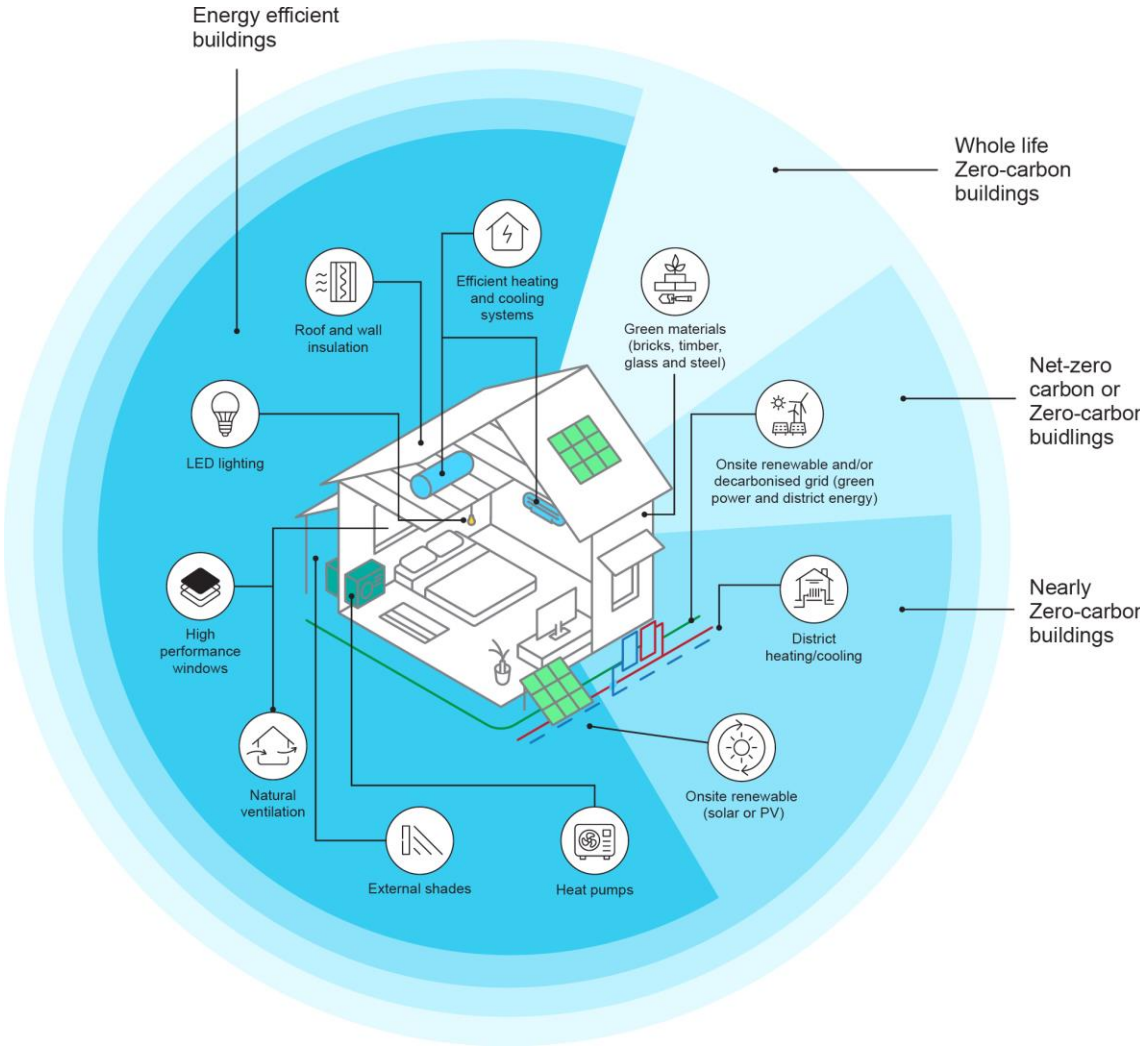
The Roadmap provides goals over the short-term (2025), mid-term (2030), and long-term (net-zero carbon). These goals and timelines are not intended to represent the views of AMS, but to provide future milestones towards energy efficient, low-carbon and eventually net-zero carbon building sector in the region.

- ***Adaptability*** – configuration of the Roadmap's recommendations into an effective implementation plan based on in-depth knowledge of local context
- ***Holistic approach*** – applying an integrated view on the building sector, while acknowledging its complexity and fragmentation
- ***Strategic planning*** – integrating the selected from the Roadmap actions into specific policy processes and strategic plans or developing new ones, where it is needed
- ***Multi-stakeholder collaboration*** – establishing effective communication channels and coordination mechanisms between national, subnational, and local governments, as well as taking into account interests of various stakeholder groups

ASEAN Buildings Roadmap's understanding of net-zero carbon

Journey toward the net-zero carbon building and construction sector consists of multiple steps.

- **Energy-efficient**: a building with a high degree of energy efficiency in its fabric and building services that consume energy, e.g. heating, cooling, cooking, lighting, ventilation, hot water, and appliances.
- **Low-carbon**: a building that is energy efficient (low-energy) and is supplied by low-carbon energy.
- **Nearly-zero carbon**: a building that is energy efficient and may have some available renewable energy supply (onsite or offsite), but complete demand offset.
- **Net-zero carbon**: a building that is energy efficient and relies on renewable energy sources that meet the energy demand over the course of a period.
- **Zero-carbon**: a building that is energy efficient and its energy demand is completely met through renewable energy generated either onsite or offsite.
- **Whole life-cycle net-zero carbon**: zero-carbon buildings, in which embodied carbon emissions from the materials used in their construction



ASEAN Buildings Roadmap vision and Actions

URBAN PLANNING

Cities are developed using integrated approaches and policies to be more sustainable, resource-efficient, compact, connected, and livable

- Improve coordination and policy alignment for low-carbon development
- Boost low-carbon urban infrastructure and construction
- Expand capacity to deliver low-carbon urban development

NEW BUILDINGS

New buildings are designed such that they enable higher levels of thermal comfort and energy efficiency, resulting in comfortable, affordable and low carbon buildings

- Strengthen the adoption and compliance of mandatory building energy codes
- Boost market demand for efficient, low carbon buildings
- Boost capacity for delivery of efficient, low carbon buildings

EXISTING BUILDINGS

Existing buildings are retrofit to achieve high levels of energy performance and lower levels of embedded carbon to reduce fuel costs and improve thermal comfort

- Promote utilization of high-performance fabric systems
- Boost the rate of energy efficiency retrofits
- Boost the quality of energy efficiency retrofits
- Promote the adoption of building performance standards

MATERIALS

Materials and construction techniques that lower embodied carbon and improve energy performance are commonly applied in construction of new buildings and renovation of existing ones

- Promote new design and construction practices for material efficiency
- Collect data and promote disclosure of embodied carbon
- Decarbonise production of carbon intensive materials
- Governments leading by example to create demand for low carbon materials

SYSTEMS AND OPERATIONS

Energy efficient systems and modes of operations that reduce energy use, energy bills and emissions, while increasing comfort are dominant on the market

- Improve quality, availability and efficiency of appliances and systems
- Encourage uptake of sustainable energy devices and systems
- Improve efficiency of building operation
- Promote awareness of system and operational energy performance

SUSTAINABLE ENERGY

Buildings are powered by integrated and sustainable energy systems enabling buildings to provide flexibility to the power system supported by an effective policy package

- Promote the uptake of sustainable distributed energy resources
- Promote grid interactive energy efficient buildings

RESILIENCE

Cities are planned to limit construction in risk areas, ensuring critical urban infrastructure services, including vulnerable populations, and integrating resilience attributes in building design

- Improve climate change resilience of built environment
- Integrate climate change resilience in building energy codes and materials regulations
- Enhance data monitoring of disaster risks and their impacts on built environment

Introduction

- Vision
- Guiding principles

Current context

- Trends and challenges
- Current policies

Summary of strategy

- Milestones to Net Zero Carbon
- Summary of strategy elements
- Stakeholder mapping

Actions, Activities and Timelines

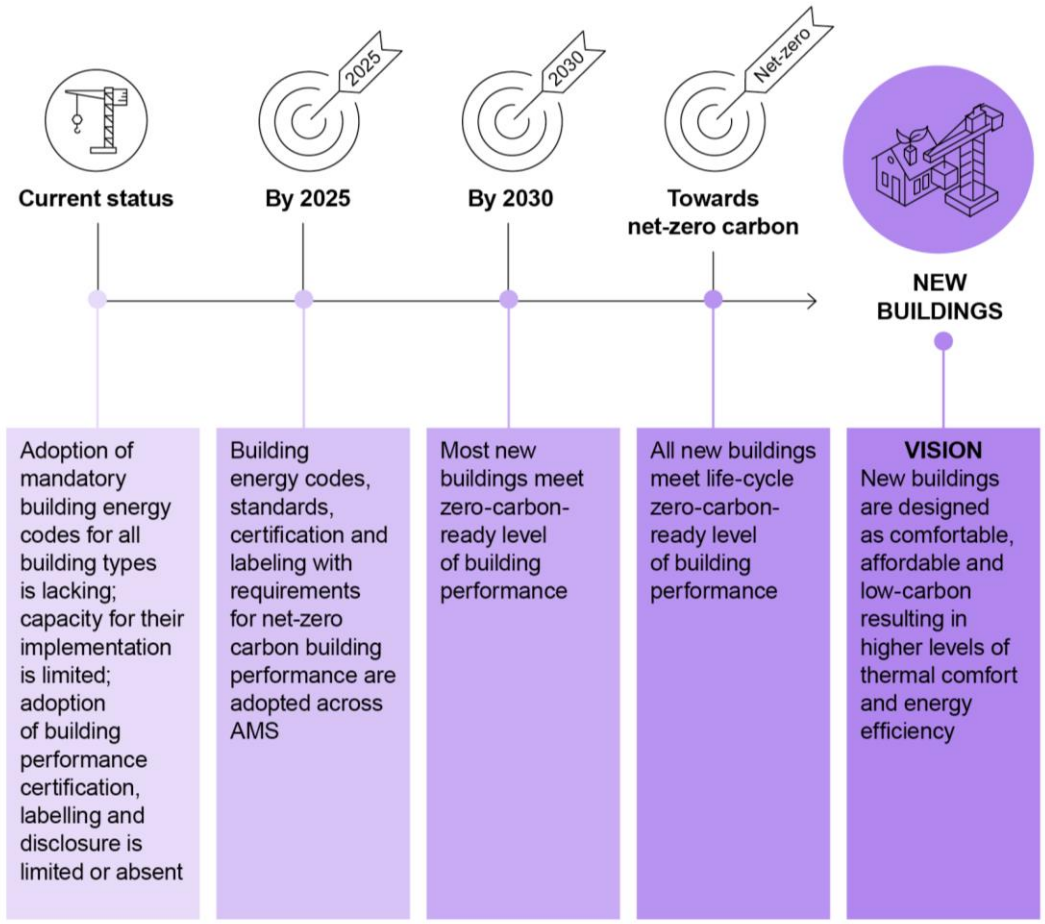
- Timelines
- Actions, Activities, Near-term recommendations
- Examples

Tracking progress

- Proposed regional and national indicators for tracking

Roadmap Milestones and Strategy: New Buildings

Milestones for New Buildings



Roadmap Strategy for New Buildings

NB.1 Strengthen the adoption of compliance with mandatory building energy codes

- **NB.1.1** Increase strength and coverage of building energy codes
- **NB.1.2** Strengthen implementation capacity for building energy codes

NB.2 Boost market demand for efficient, low carbon buildings

- **NB.2.1** Increase adoption of building energy certification
- **NB.2.2** Enhance awareness of consumers and private sector on benefits of low-carbon buildings
- **NB.2.3** Facilitate access to finance and development of business models for low-carbon buildings

NB.3 Boost capacity for delivery of efficient, low carbon buildings

- **NB.3.1** Build capacity on integrated passive building design
- **NB.3.2** Mainstream lifecycle analysis tools for design of new buildings
- **NB.3.3** Increase availability of key materials and components for low-carbon buildings

Roadmap Action Areas: New Buildings

NB.1.1 Increase strength and coverage of building energy codes	**Current status:** Across ASEAN, only Singapore has mandatory building energy codes (BECs) covering all sectors (residential, commercial and public). Some AMS have voluntary or mandatory codes for certain parts of the sector (often for buildings with the floor area above a certain threshold), and in others - BECs are still under development		
	By 2025:	**By 2030:**	**Towards net-zero carbon**
	All AMS have mandatory BECs covering all sectors. National governments provided guidance to subnational and local governments on implementation of BECs. Most AMS have national standards for net-zero carbon buildings	All AMS included requirements for embodied carbon, urban planning, resilience, clean energy in their BECs, at least for new buildings. National governments provided guidance to subnational and local governments on implementation of BECs and these requirements. All AMS have standards for net-zero carbon buildings at the national and subnational levels	All AMS, subnational and local jurisdictions have adopted net-zero carbon compatible BECs
NB.1.2 Strengthen implementation capacity for building energy codes	**Current status:** Low implementation capacity for BECs at the national and local levels is a barrier to adoption and enforcement of mandatory BECs. Low adoption of voluntary standards across many AMS		
	By 2025:	**By 2030:**	**Towards net-zero carbon**
	Tools developed to facilitate compliance checking and implementation of BECs at the subnational and local levels Training programmes on BECs implementation and compliance are rolled for national, subnational and local governmental officials Most subnational jurisdictions adopt mandatory building code for public buildings	Continuation of capacity building and accreditation programmes to support the roll-out of BECs All subnational jurisdictions adopt mandatory BECs for public buildings Most local/municipal jurisdictions implement local BECs in line with the national guidance and requirements	Ongoing capacity building at all levels of governance and implementation chain. Full enforcement and compliance with BECs across all subnational and local jurisdictions

Stakeholder mapping: New Buildings

As multi-stakeholder collaboration is one of the overarching principles of this Roadmap it is important to consider which stakeholder groups should be involved into the delivery of each activity.

Action Area
2. New Buildings

	National government	Subnational government	Utility companies	Property and project developers	Financial institutions	Architects and engineers	Manufacturers, retailers and suppliers	Labourers and installers	Building owners and occupants	Civil society
NB.1.1 Increase strength and coverage of building energy codes	High	High	Low	Low	Low	High	Medium	Medium	Medium	Low
NB.1.2 Strengthen implementation capacity for building energy codes	High	High	Low	High	Low	High	Medium	Medium	Medium	Low
NB.2.1 Increase adoption of building energy certification and labelling	High	High	Low	High	Low	High	Medium	Medium	Medium	High
NB.2.2 Enhance awareness of consumers and private sector on benefits of low-carbon buildings	High	High	Low	High	High	Low	High	High	High	High
NB.2.3 Facilitate access to finance and development of business models for low-carbon buildings	High	Low	Low	Low	High	Low	Low	Low	Low	Low
NB.3.1 Build capacity on integrated passive building design	High	High	Low	High	Low	High	Low	High	Low	High
NB.3.2 Mainstream lifecycle analysis tools for design of new buildings	High	High	Low	High	Low	High	High	Low	Low	High
NB.3.3. Increase availability of key materials and components for low-carbon buildings	High	High	Low	High	High	High	High	Low	Low	Low

Key: High, Medium, Low

The darker the colour, the higher the importance of that stakeholder group for the activity and the more essential they are for its effective implementation

Key recommendations

- Recommendations of the roadmaps are voluntary and are not prescriptive
- Developing and implementing building energy performance codes with progressive update timelines and ‘stretch’ features for new buildings – transitioning towards mandatory for all building types.
- Promote the use of certification programmes as both a good practice approach for new building construction with attention to low-cost development and operational efficiency benefits.
- Build capacity among government and industry through accessible training on building energy performance certification, sustainable urban development, materials decarbonization and others through developed with professional accreditations.
- Develop a monitoring and tracking framework through a range of indicators designed to inform policymakers and industry on the progress, delivery and performance of sustainable low carbon buildings across the region.
- Building capacity for financing of sustainable low carbon buildings through harmonizing regulations and assurance programmes to address risk aversity and broaden investment opportunities.
- Collect building data to develop baselines for building efficiency tracking and policy development

Policy package to support net-zero buildings

Each ASEAN Member State will have its unique journey but the destination of a net-zero carbon building and construction sector outlined in this Roadmap is the same.

Among all action areas a set of key recommendations can be synthesised to offer the necessary ingredients for a **policy package to undertake this transition**.

The policy package includes a combination of regulations, incentives, and information policy instruments.

THANK YOU