International Energy Agency

The GlobalABC Regional Roadmap for Buildings and Construction in Asia

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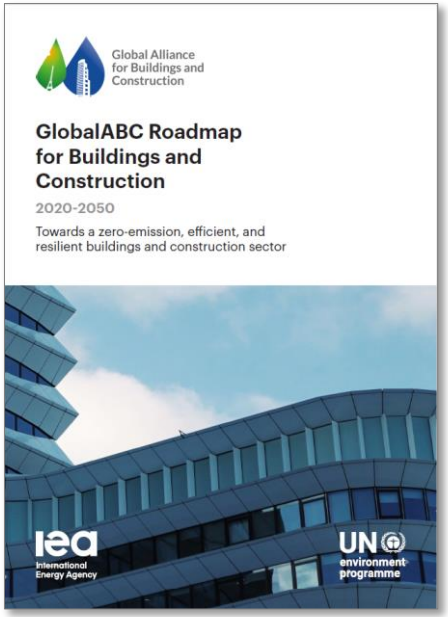
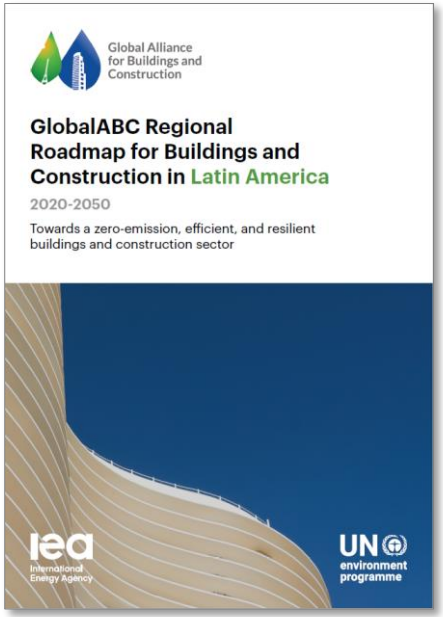
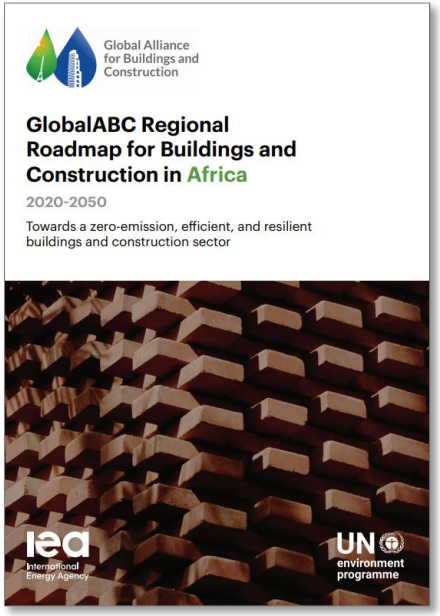
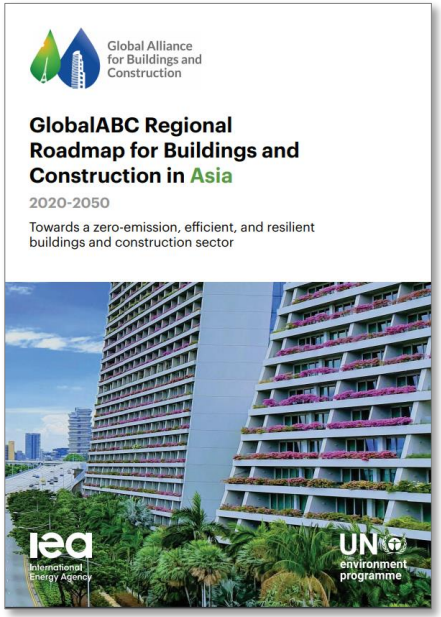
29th October 2020

Roadmaps available to download!









https://www.iea.org/areas-of-work/promoting-energy-efficiency/global-alliance-for-building-and-construction

Thank you to our partners

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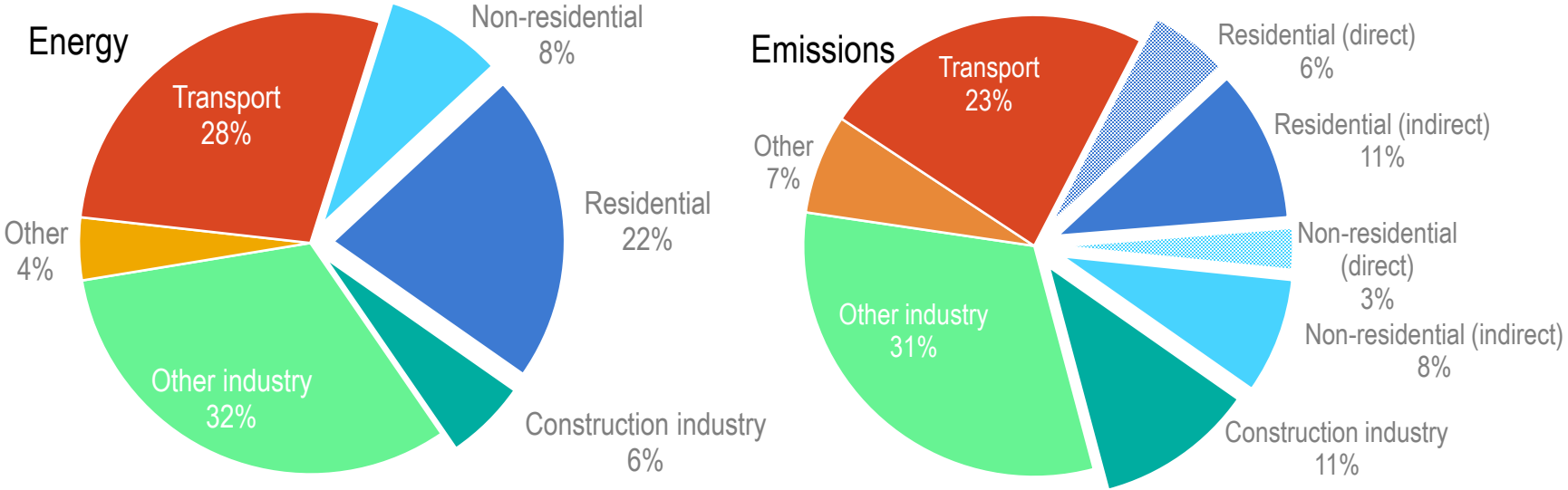
Funders of IEA's Clean Energy Transitions Programme

And all stakeholders who contributed!

Why is buildings decarbonisation so critical?

Energy and emissions from buildings, globally

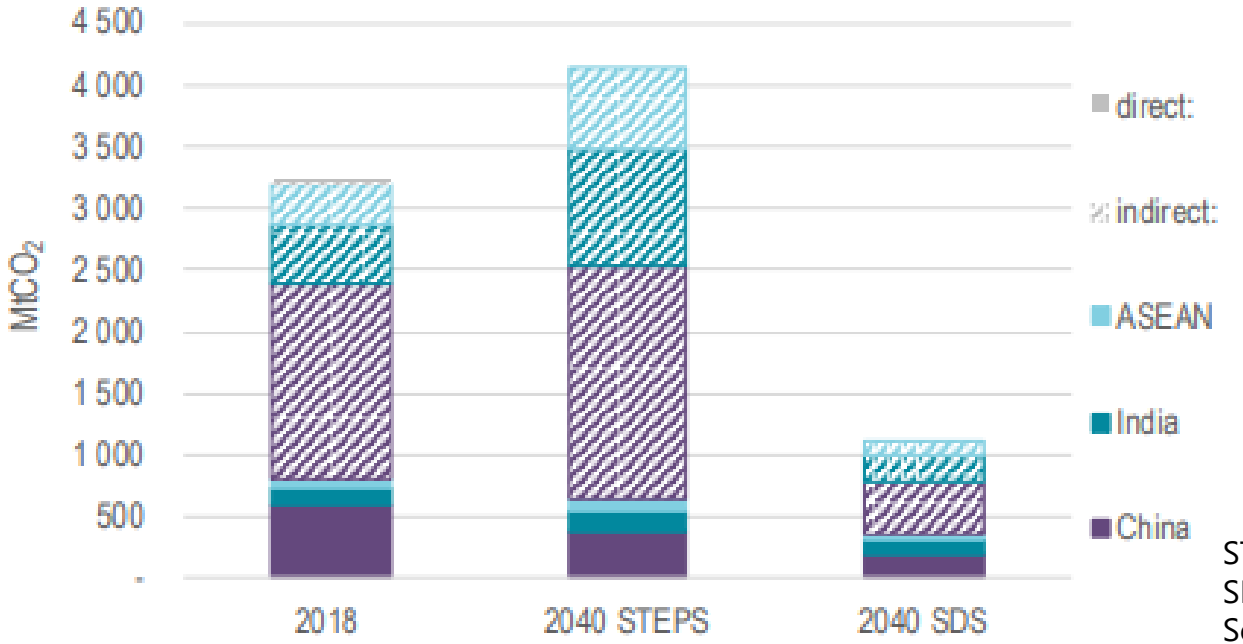


Source: GlobalABC/UNEP/IEA, (2019), *Global Status Report for Buildings and Construction 2019*

Buildings and construction are a key sector for the clean energy transition, and reaching the goals of the Paris Agreement

The building sector's potential for reduction in Asia

Emissions from buildings in ASEAN, India and China in 2018 and in 2040 under the IEA STEPS and SDS

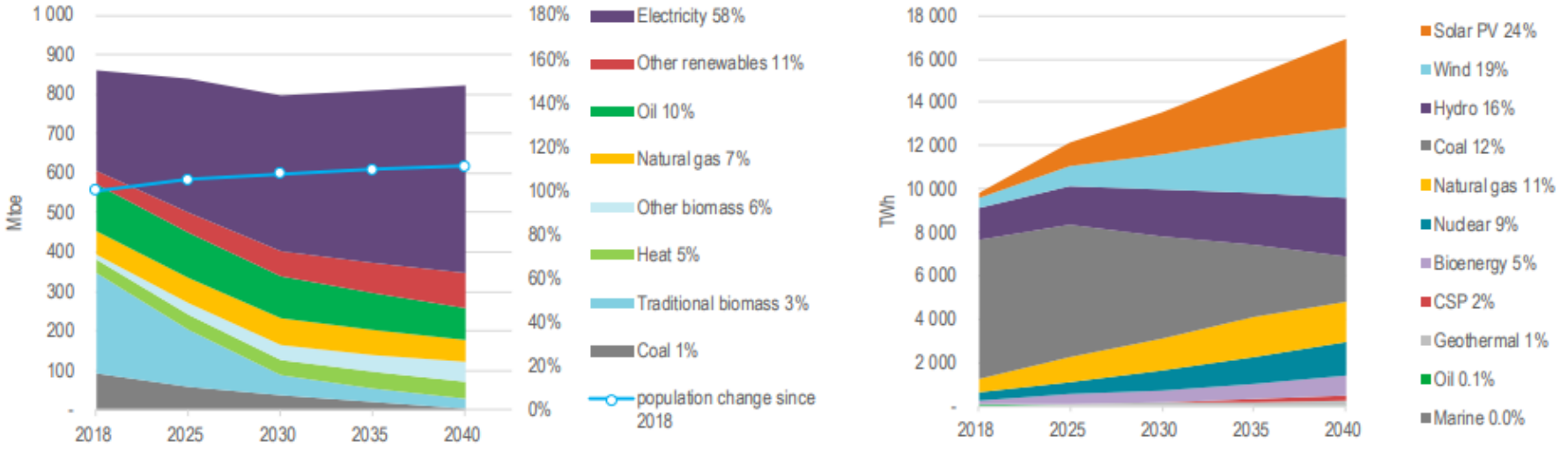


STEPS = Stated Policies Scenario
SDS = Sustainable Development Scenario

Emissions from buildings in the SDS in 2040 could be up to 3000 $MtCO_2$ per year lower than they are on track to be, while still ensuring the achievement of the SDGs and supporting a 200% growth in GDP per capita and increase in floor area of 2/3.

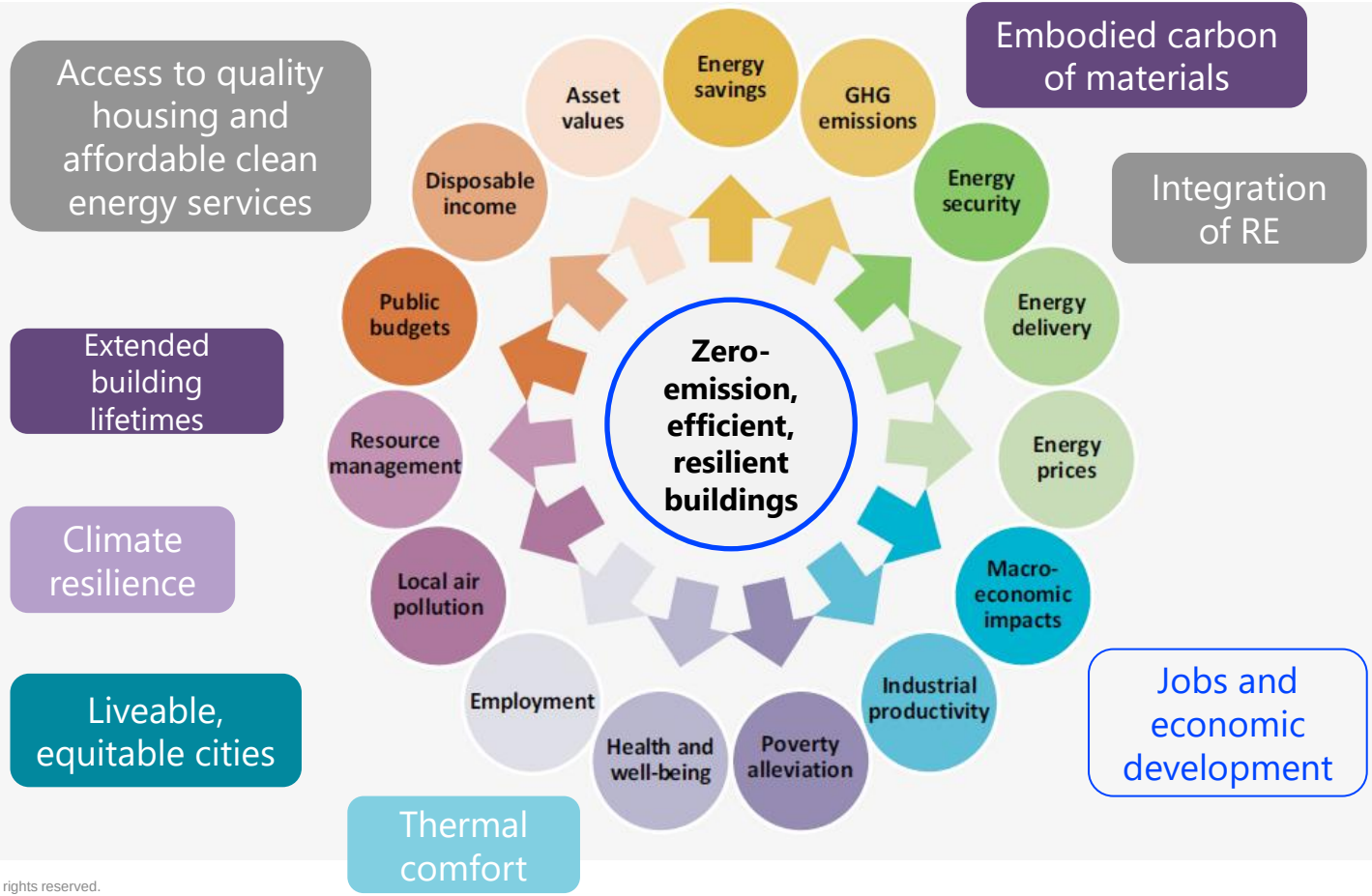
The evolution of buildings energy consumption in the SDS

Energy consumption in buildings in ASEAN, China and India in the SDS (left) and electricity generation mix in the SDS, and % share in 2040 (right)



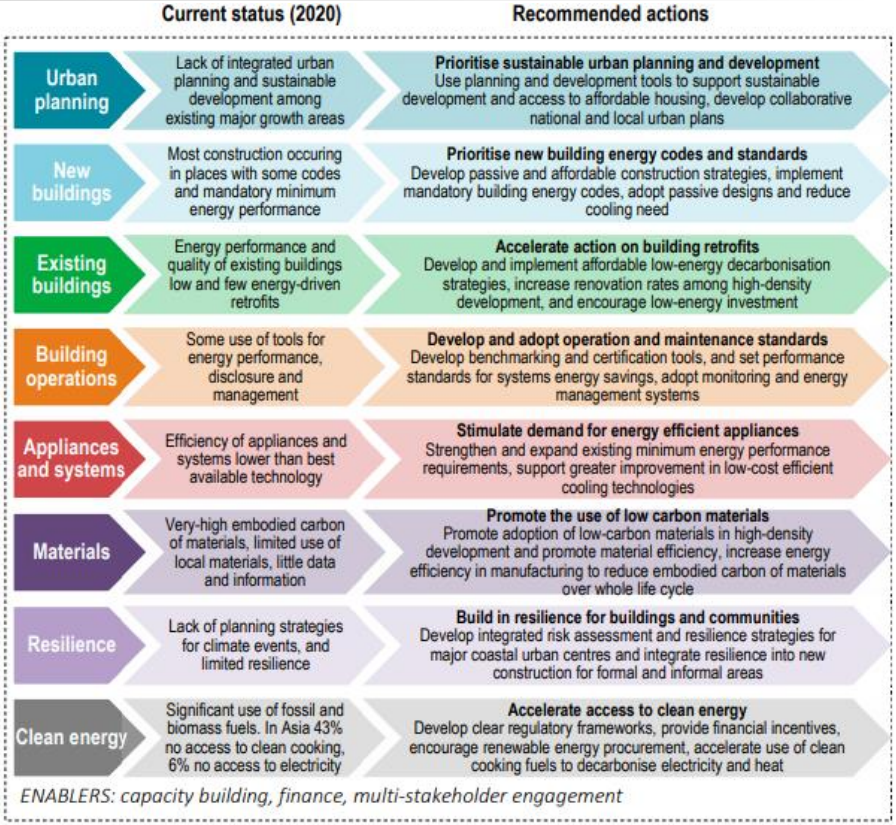
Electricity consumption grows enabling primary energy consumption of buildings to remain stable while enabling growth in per capita electricity electricity.

Buildings are also key for sustainable development



GlobalABC Regional Roadmaps for Buildings and Construction

- 3 Regional Roadmaps: Asia, Africa, Latin America
- Extensive stakeholder engagement, over 700 people overall
- Feedback on targets and timelines, submission of best practice case studies, feedback on key actions
- Key findings include:
  - Ambition is there
  - Excellent examples of existing programmes
  - A wide range of multiple benefits for range of stakeholders
  - Need for increased integration and coordination across disciplines
  - Need for more mandatory regulatory policies
  - Need for more data and knowledge of the baseline
  - Significant information gaps for materials and resilience



Source: GlobalABC/UNEP/IEA, (2020), *GlobalABC Regional Roadmap for Buildings and Construction in Asia*

How we built the Roadmaps

Methodology:

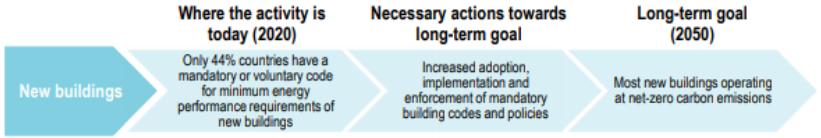
- Regional trends
- Key actions
- Stakeholders
- Policy timelines + regional examples
- Technology timelines + regional examples
- Finance
- Capacity building
- Multiple benefits

Consensus building

New buildings – Trends and key actions

Trends and challenges for *New Buildings* in the region:

- Another 65% floor area to be built between now and 2050, mostly in residential sector
- Growth in per capita energy consumption, increasing demand for space cooling
- Very few mandatory codes, some voluntary codes, some in development
- High (perceived) additional cost of efficient construction
- High participation of informal sector
- Challenges in building code implementation



Key actions for new buildings in Asia include:

- **Develop a roadmap strategy**. Develop a locally appropriate strategy for decarbonising buildings using an efficiency-first and whole-life-cycle carbon assessment approach, including a strategy for decarbonising construction materials and energy aiming to reach new buildings that are ready to operate at net-zero carbon by 2030.
- **Develop and implement mandatory energy codes**. Transition existing voluntary to mandatory codes that set the minimal energy efficiency and thermal performance in new buildings. Codes should set or refer to guidelines for locally adapted bioclimatic design principles, and increasingly incorporate climate resilience and low embodied carbon materials.
- **Strengthen building energy codes**. Ensure that there is a building code improvement cycle that strengthens the performance requirements every 3-5 years with aspirations of achieving zero carbon emission codes for betw
planning strategies.
- **Minimise the need for**
Focus on using highly
design in order to maint
- **Enable sustainable bu**
buildings by increasing
new and emerging cons
- **Governments lead by**
emission and efficient,
- **Increase the use of b**
modelling tools such as
cost-effective manner. For new development, have BIM as part of the design brief.
- **Increase material efficiency** through optimised design, the reuse of existing buildings or materials, and other materials measures to reduce the embodied carbon of materials (see Activity 6: Materials); **reduce operational carbon** through the provision of clean energy (see Activity 8: Clean energy).
- **Increase awareness and information**. Awareness of the multiple benefits of more sustainable buildings will enable consumers to make better choices and can enable more advantageous financing.

- ✓ A strategy
- ✓ Codes & labelling as a tool
- ✓ Tools for efficient and passive design
- ✓ Awareness and information

New buildings – timelines

Figure 17 • Policy timelines for new buildings in Asia

	Current status (2020)	Short term (2030)	Medium term (2040)	Long term (2050)
Building energy codes	44% countries with voluntary or mandatory codes in some of the sector	**Mandatory for most sectors/jurisdictions** Some with voluntary near-zero codes	**Mandatory for almost all buildings** Many with near-zero carbon codes	**All countries and jurisdtictions with near-zero carbon codes**
Compliance with building energy codes	Some enforcement and monitoring of compliance by local jurisdictions	**Monitoring framework in place** About half of buildings compliant with code	**Most new buildings compliant with code** All buildings compliant	**All buildings compliant with code**
Participation of the informal sector	High share of construction in the informal sector	**Tools to enable easier compliance** Most countries monitor informal building	**Tools to enable easier compliance in all countries** Most of the informal building sector compliant	**Both informal and formal sector meeting minimum standards of regulation**
Building labelling	Few to half of buildings receiving voluntary labels or certifications	**Most new buildings with voluntary labels** Labelling is mandatory for most buildings	**Most new buildings with mandatory labels** Mandatory for all buildings	**All countries to make building labelling mandatory**
Labelling of building components	Little information on performance of materials or components	**Mandatory labelling for main components** Includes embodied carbon	**Mandatory labelling including carbon** Compliance in all countries	**Mandatory comprehensive labels for roof, wall and glazing materials**
Building passports	Very few have information collection	**About half with basic information** Includes materials	**Most with detailed information** Includes embodied carbon	**Widespread use of comprehensive passports for all new buildings**
LCA	Almost no LCA tools and adaptation	**LCA voluntary for most new buildings** National database for main materials	**Improved database for all materials** LCA mandatory for all new buildings	**Comprehensive LCA mandatory for all buildings. All countries have data for all materials**
Incentives	Some incentives for low-energy/-carbon buildings	**Increased use of financial and non-financial incentives to reward high performance**		

Figure 18 • Technology timelines for new buildings in Asia

	Current status (2020)	Short term (2030)	Medium term (2040)	Long term (2050)
Building envelope	Typical: 150-180 watts per m² OTTV	**Identify appropriate targets for OTTV depending on building type and bioclimatic zone**	**Widespread knowledge and availability for optimising building fabric**	**Building fabric optimised according to building type and climate**
Passive design	Passive design and natural/ hybrid ventilation strategies not optimised	**Passive and hybrid strategies identified for all bioclimatic regions** Including natural ventilation for hot and humid climates	**Passive and hybrid strategies documented and widespread for all types and regions**	**Passive and hybrid strategies widespread and optimised in all climates**
External shading	Use of external shading in some regions	**External shading in about half of new buildings** In more than half of new buildings	**In more than half of new buildings** In almost all new buildings	**Use of static and movable external shading widespread in all buildings**
Reflective surface finishes	Light/reflective surfaces to reflect solar radiation not common	**Reflective surfaces for roofs for half of new buildings** Reflective roofs and walls	**Reflective surfaces for roofs for most new buildings** Reflective roofs and walls	**Use of light or reflective roofs and walls widespread in all countries**
Insulation	Insulation is used in colder climates, very little in hot climates	**Insulate walls or roofs in about half of new buildings** Insulate roofs and walls	**Insulate walls or roofs in most new buildings** Insulate roofs and walls	**Insulate roofs and walls in all new buildings, in all climates**
Windows (solar)	Simple, unprotected glazing common	**Low-e/low-SHGC glazing in commercial buildings** Increased use of low-e/ SHGC in residential	**Increased use of low-e/ low SHGC glazing** Use in residential further increased	**Widespread use of low-e or solar control glass where appropriate**
Windows (thermal)	Typical: single-glazing, high thermal transmittance	**Increased use of double-glazing in commercial sector where appropriate** Increased use in residential buildings	**Availability and use of double-glazing further increased where appropriate**	**Double-glazing available and used where appropriate**
Daylighting	Minimal opimisation of daylight through design or controls	**About half of new buildings optimise daylight** Most new buildings	**Most optimise daylight** All new buildings	**All new buildings undertake analysis to optimise daylight**
Design tools	Limited use of tools in the design process of new buildings	**Integrated design in most projects** BIM and simulation used in design phase	**Integrated design in all projects** Increased use of BIM and simulation	**Integrated design process and simulation tools for all construction projects**

New buildings – regional examples

Global Alliance for Buildings and Construction

IEA

Box 6 • Regional examples of policy action for new buildings

India: Building code, certification and incentives

The Ministry of Power of India launched ECO Niwas Samhita, an Energy Conservation Building Code for Residential buildings, to promote energy efficiency design and construction of homes, apartments and townships. Given the pace at which building stock is growing in India, it is a landmark policy ushering energy efficiency into the buildings sector, relevant for all contributors to the construction process. Implementation of the code is at the state level with national support.

The Ministry of Environment, Forest and Climate Change (MoEF&CC) offers fast-track environment clearance to new building projects that are registered under a Green Rating for Integrated Habitat Assessment (GRIHA), Indian Green Building Council (IGBC) or Leadership in Energy and Environmental Design (LEED) rating system. The notification became effective in 2011. The copy of registration certificates along with other documents required for environmental clearance are required to be submitted by the agencies seeking fast-track clearance under the scheme.

Similarly, different states have launched policy initiatives in terms of extra floor area ratio, financial assistance, subsidies on total fixed capital investments, reduction in permit fees for buildings, etc., which demonstrate compliance with one of the existing rating systems for new buildings, such as GRIHA, IGBC or LEED.

China: Technical guidance for low energy buildings

The Passive Ultra-low Energy Green Building technical guidance for residential buildings was issued by the Ministry of Housing and Urban-Rural Development (MoHURD). The primary energy consumption for cooling, heating and lighting has to be below 60 kilowatt-hours per m^2 (kWh/m^2), with a specific requirement of heating and cooling demand depending on the climate zone.

China also launched the technical standard for nearly-zero-energy buildings GB/T 51350-2019, which was put into action on 1 September 2019.

The 13th Five-Year Plan for the construction industry issued by MoHURD includes a commitment for all new civil buildings to meet energy efficiency 20% higher than that of 2015, and expects that by 2020 green buildings in urban areas will account for at least 50% of new construction (China Academy of Building Research, 2019).

Malaysia: Building codes for all buildings

Malaysia has codes for energy efficiency and use of renewable energy for non-residential (MS 1525) and residential (MS 2680) buildings. The code has guidelines on energy-efficient measures relating to the building design as well as systems for new and existing buildings.

Korea: Zero-energy building code certification

The Korean Building Code includes provisions for zero-energy buildings (ZEB), which is defined as a "green building" that has minimised the building load and energy requirement through the supply of new and renewable energy (Prof Xu, 2018). The Ministry of Land, Infrastructure and Transport and Ministry of Trade, Industry and Energy developed the ZEB certification system in 2017.

Singapore: Green building standards

Since 2008, all new buildings with a gross floor area of 2 000 m^2 or more in Singapore are required to meet the green building standard. In 2018, the Building Construction Authority launched the Super Low Energy (SLE) Programme to push the boundary of energy efficiency towards "super" low or net-zero energy buildings in the tropical urban environment. The SLE implementation is supported by an innovation programme (Green Buildings Innovation Cluster) and the Green Mark scheme for wider adoption. This includes technology roadmapping, demonstration, building certification, and a series of resource development and engagement initiatives.

Box 7 • Examples of regional technologies for new buildings

Technology roadmaps for moderate and humid regions

The Innovation for Cool Earth Forum describes in its ZEB roadmap, developed under Japan's Ministry of Economy, Trade and Industry research programme, the key technologies and the timelines for their evolution, particularly targeted to warm and humid regions. Technology developments relating to insulation, surface finishes and sealing between now and 2030 focus on reducing the cost and improving the standardisation and efficiency of components, while from 2030 the focus will be to enable their market diffusion through market mechanisms. Measures such as shading and ventilation are already considered to be proven and ready for mass uptake by the market (Institute of Applied Energy, 2016).

Singapore's first net-zero energy building

The National University of Singapore's School of Design and Environment inaugurated the country's first net-zero energy building in January 2019. The building makes use of hybrid ventilation where fans provide air movement enabling thermal comfort at a high temperature set point, topped up with a chilled water system, and features a facade that optimises daylight. The building's energy demand was reduced through building design and efficient system choices such that its annual energy demand can be supplied by the electricity generated on its rooftop PV panels. The use of a hybrid ventilation system in a hot and dry climate makes it a demonstration project for the region, though its success relies on its occupants adapting to higher ambient temperatures and humidity than traditional air-conditioning systems, as well as higher air velocities.

More efficient construction techniques in China

3D printing is one of the latest technologies being implemented in China. It has helped to reduce construction time between 50-80%, thus enabling speedier, efficient and precise construction. The method also facilitates the use of recycled materials, with concrete making the construction more environment-friendly.

IFC EDGE Tool

The EDGE certification (for "Excellence in Design for Greater Efficiencies") was developed by the IFC, a member of the World Bank Group, as an international rating system for buildings in emerging markets. EDGE provides a broad framework for evaluating and monitoring projects, and provides third-party verification for green buildings, catering to different building types. IFC uses EDGE data, collected from the projects, to track investment opportunity in green buildings. As of 10 February 2020, over 16 million m^2 have been registered for certification under the EDGE system, delivering 385 317 megawatt-hours per year in energy savings.

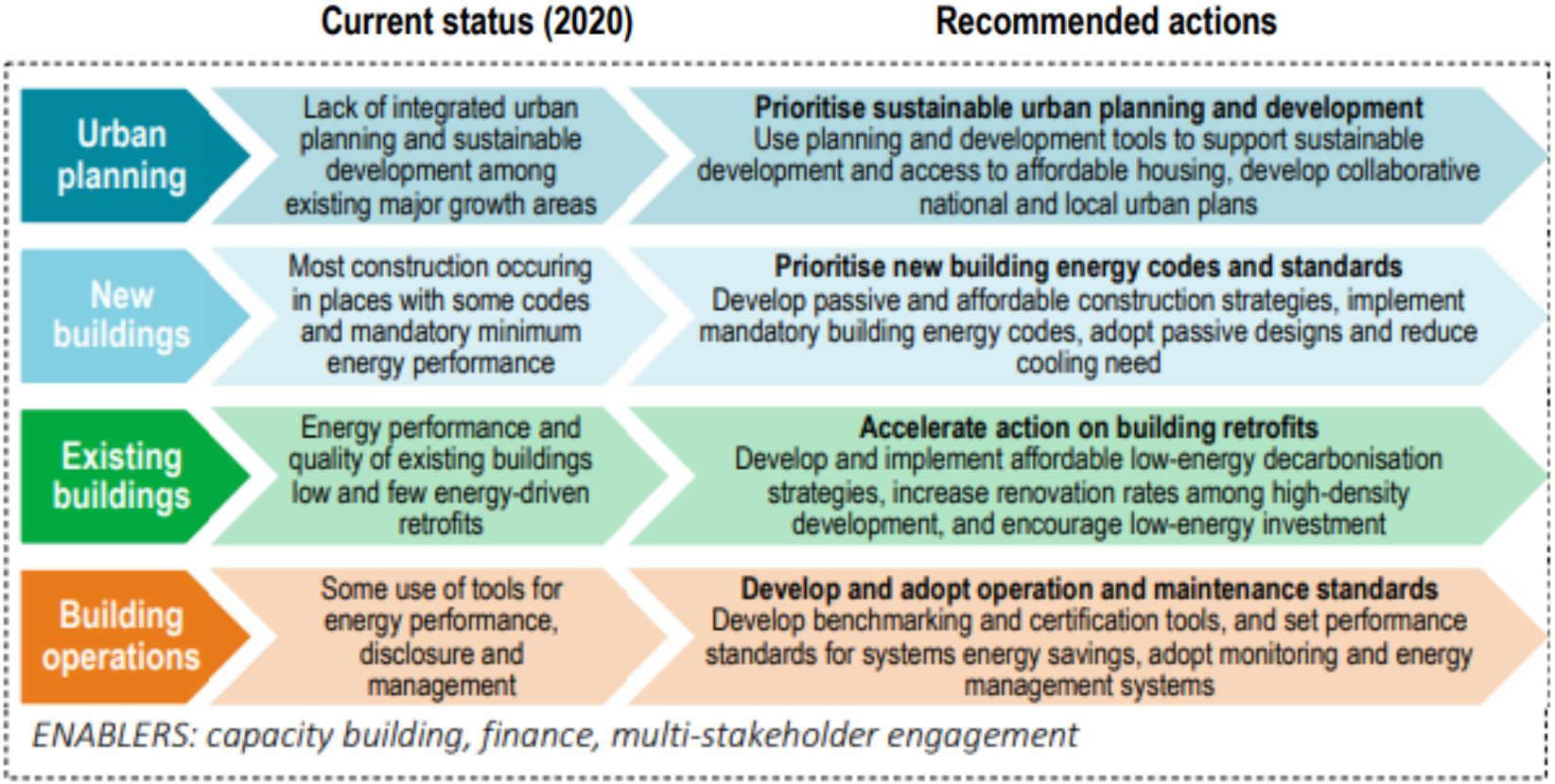
The free of charge online design software enables users to explore the most cost-effective energy, water and materials efficiency measures for a building project. Savings are represented as comparisons with a standard building of the same typology and geometry in the same location. The types of measures which can be explored through this tool include the impact of shading; improved performance of roof, walls and glazing; surface finishes; glazing area; and more efficient systems, among many more. It can assess estimates of incremental cost, utility cost savings, and energy and water savings to optimise design choices, which are shown in an accessible manner that facilitates communication among the client, designer, and building and finance teams.

The asset manager Asia Green Real Estate requires all projects that apply for financing to commit to EDGE certification before they can receive funding. The firm finances residential and commercial properties across Asia, attracting both private and institutional investors looking to fulfill environmental, social and governance investor commitments. Asia Green Real Estate reports that its green projects have lower operational costs and lower vacancy rates. Overall the firm has invested in more than 2 million m^2 of green floor area, with an estimated energy savings of 22 399 460 kilowatt-hours (kWh) per year and CO2 savings of 13 410 tonnes/year.

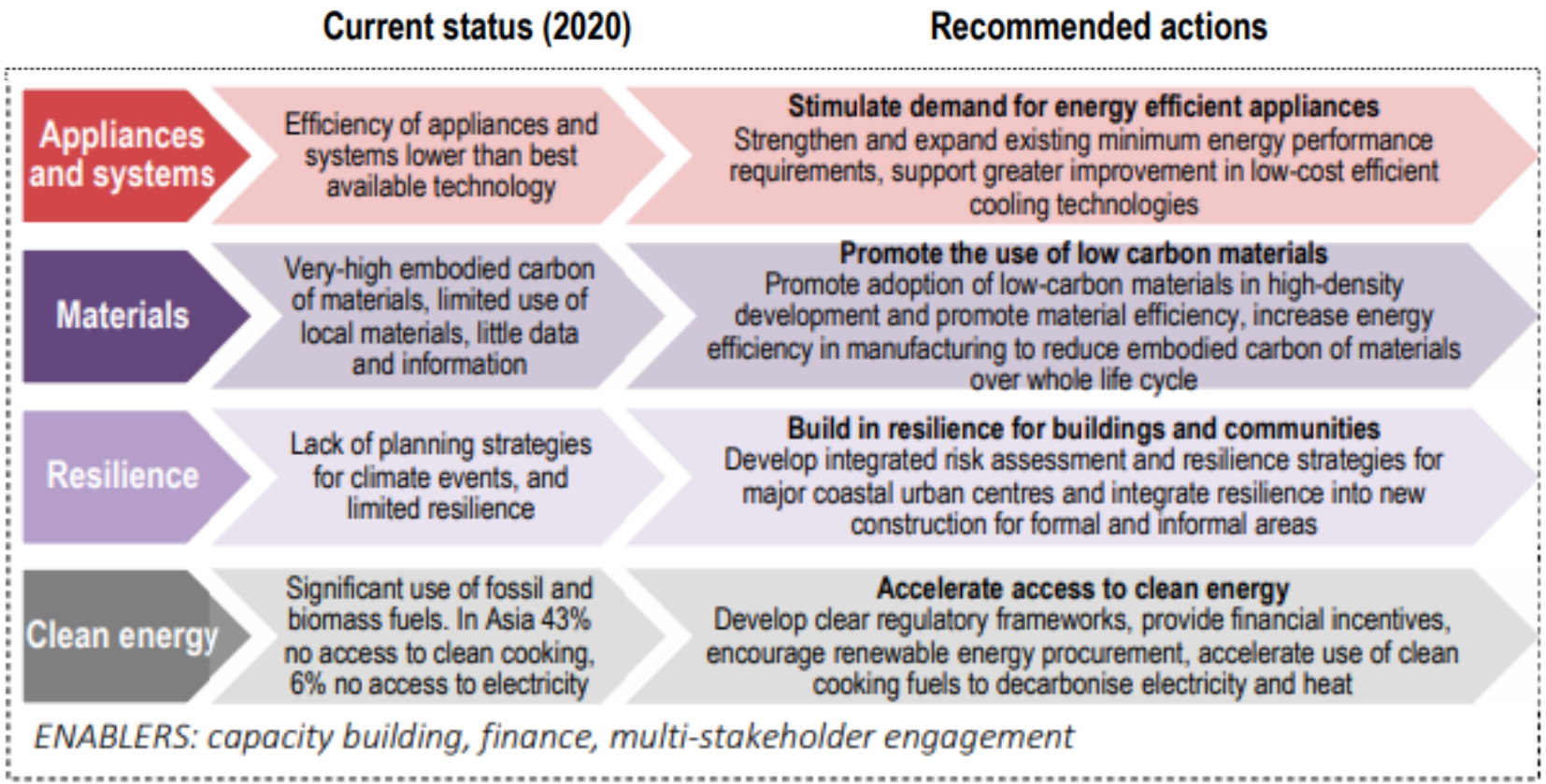
New buildings – enablers

- **Finance**
  - Description of the most relevant financial mechanisms such as funds, credit lines, green bonds, green mortgages, community financing, etc.
- **Capacity-building priorities**
  - Training within government
  - Training of professionals
  - Training of financers and developers
  - General awareness of public
  - Training of product and material manufacturers
- **Multiple benefits**
  - Environment, energy, economy, society, and UN SDGs

Summary of findings of the other areas



Summary of findings - continued



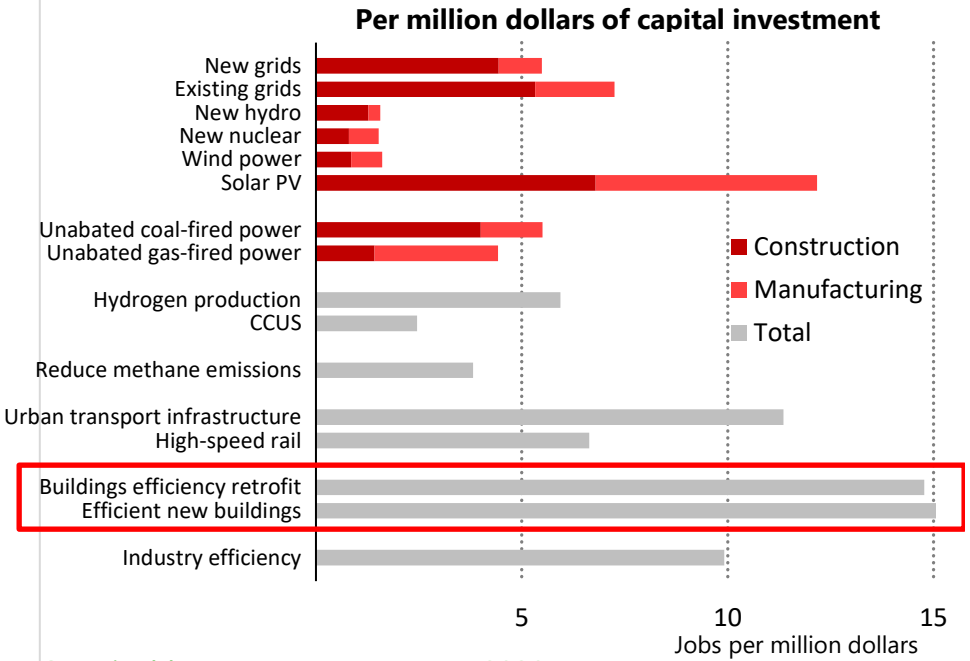
Other highlights

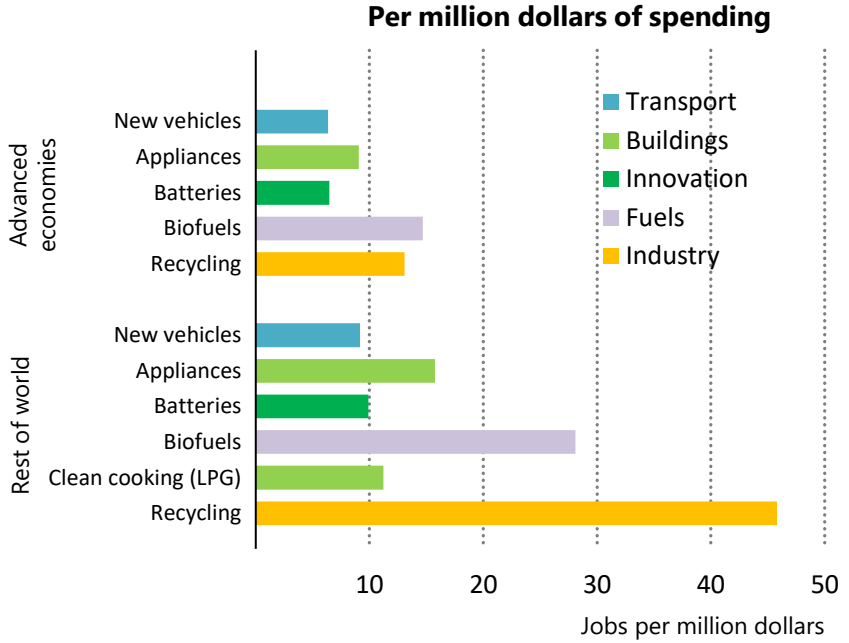
- Importance of developing national strategies & government leading by example
- Standards and codes gradually drive up performance
- Regulatory frameworks to facilitate integrated action
- Narratives and engagement to drive demand
- Capacity building
- Addressing data and ambition gaps

… but what about Covid-19 and the “new normal”?

Energy efficiency is a job-creating machine

Jobs created per million dollars of capital investment and spending by measure





Sustainable Recovery Report, IEA, 2020

Efficiency and solar PV create many jobs per unit of investment, with recycling and biofuels in developing and emerging markets. These align with other policymaker objectives for recovery.

What can we learn from past programmes?

- **Consider ‘shovel-ready’ options**
  - Projects that can mobilise quickly, e.g. upgrading schools and offices
- **Leverage existing programmes**
  - Use administration, contracts, guidelines and delivery partners for faster impact
- **Standardise**
  - Contracts, designs, approved technologies
- **Set the right level of ambition**
  - Efficiency requirements as high as possible while also considering uptake and delivery
- **Get the level of incentive right**
  - Driving uptake avoiding risks or boom-bust cycles.
- **Address regulatory barriers**
  - Use the opportunity to remove or simplify red-tape
- **Turn short-term impacts into long-term transformations**
  - Harness the investment from stimulus programmes to lock-in improvements

What next?

- We hope that this process and these Regional Roadmaps will:
  - Spark regional dialogue and collaboration
  - Inspire concrete actions and national strategies for decarbonisation **and economic recovery**
  - Highlight the need to fill information and ambition gaps

Immediate next steps for IEA:

- India Roadmap for Mainstreaming Energy Efficiency in Residential Buildings
- ASEAN Roadmap for Buildings and Construction
- ASEAN Roadmap for Space Cooling

Thank you for listening, and I welcome your questions!

Maxine Jordan

on behalf of the IEA, the GlobalABC and UNEP

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