Global Alliance for Buildings and Construction

UN environment programme

DECARBONIZING THE BUILDING SECTOR

10 KEY MEASURES

JUNE 2021

This publication aims to inspire senior officials and decision makers in national, subnational and local governments to decarbonize the building sector, and to show them how to start. It does not present a comprehensive strategy, but rather highlights a set of essential measures and successful examples from intervention areas identified in the GlobalABC Regional Roadmaps – new buildings, existing buildings, building operations, building materials, and resilience. It assists officials and decision makers in identifying a starting point of a process for systematically incorporating building activities in their Nationally Determined Contributions under the Paris Agreement. For a holistic approach, senior officials and decision makers may refer to the more comprehensive GlobalABC Global and Regional Roadmaps.

ACKNOWLEDGEMENTS

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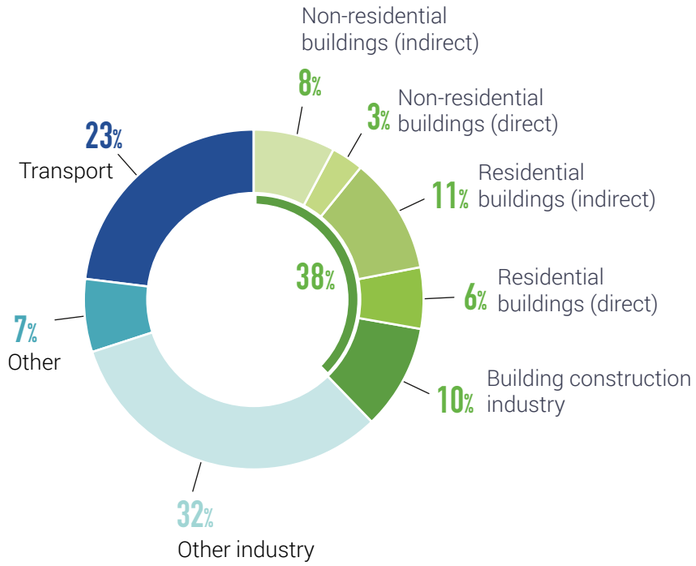
WHY BUILDINGS MATTER

The building sector accounts directly and indirectly for 38 per cent of global energy-related CO_2 emissions (UNEP 2020). Energy use and global emissions associated with buildings had been increasing steadily until 2019, and estimates suggest that the global pandemic will have only modest effects on this trend. The major drivers of these increases are the continued use of coal, oil and natural gas for heating and cooking; the growing world population; increases in purchasing power in emerging economies and developing countries; rapid expansion in total floor area in the building sector; and growth in demand for energy-consuming services.

BUILDING SECTOR EMISSIONS AS A PART OF GLOBAL ENERGY EMISSIONS



Building sector emissions as a part of global energy emissions, 2019. Source: UNEP 2020, based on date from IEA 2020. Building construction industry refers to emissions related to manufacturing of construction materials such as steel, cement and glass.

The world is becoming increasingly urbanized, particularly in Asia and Africa, and building stocks in these regions are expected to double by 2050. Global material use is expected to more than double by 2060, with a third of this rise attributable to materials used in the building and construction sector (OECD 2019). Meeting the Paris Agreement goal to limit global warming to well below 2°C, preferably to 1.5°C, above pre-industrial levels, requires global decarbonization of the building and construction sector. For their part in this effort, governments can integrate building decarbonization into their Nationally Determined Contributions.

As outlined in the Human Settlements Climate Action Pathway and underlined by the Race to Zero global campaign, net-zero carbon emissions must be achieved across the overall built environment life cycle by no later than 2050. By 2030, all new buildings must be net-zero carbon in operation, and embodied carbon in building materials and equipment must be reduced by at least 40 per cent from today's levels. By 2050 at the latest, all buildings must be net zero, both operationally and in embodied emissions. This transition to an efficient and resilient building and construction sector with zero-carbon emissions across the life cycle of the built environment calls for a sector-wide transformation that applies the principles of a circular economy.

The Global Alliance for Buildings and Construction (GlobalABC) is the leading global platform for helping governments, the private sector, civil society and intergovernmental and international organizations move towards a zero-emission, efficient and resilient building and construction sector, and its Global and Regional Roadmaps help set pathways to decarbonization. The measures offered here complement the GlobalABC resources and are intended for senior officials and decision makers in national, subnational and local governments.

INCORPORATING BUILDING ACTIONS IN NDCs

Nationally Determined Contributions (NDCs) describe a country's post-2020 national climate change mitigation and adaptation and resilience goals and targets under the Paris Agreement. They provide significant opportunities to include mitigation policies specific to buildings, and to use codes, standards, and certifications that drive the sector towards zero-carbon emissions. By committing to binding mitigation and decarbonization targets for the building sector, governments can establish frameworks for action in policy, technology, research, education, awareness-raising and finance.

International finance institutions require NDC programmes and actions to demonstrate a high level of ambition to receive funding. Currently, the collective NDC targets across all sectors are not ambitious enough – even if all the targets were met, we would miss our goal of limiting global warming to 2°C or 1.5°C. In addition, the NDCs insufficiently address the building sector. Meeting the global warming goal depends on all countries having sufficiently ambitious building sector actions in their NDCs and then implementing them effectively. National governments can increase their NDC commitments in the building sector, and accelerate the spread of net-zero buildings by:

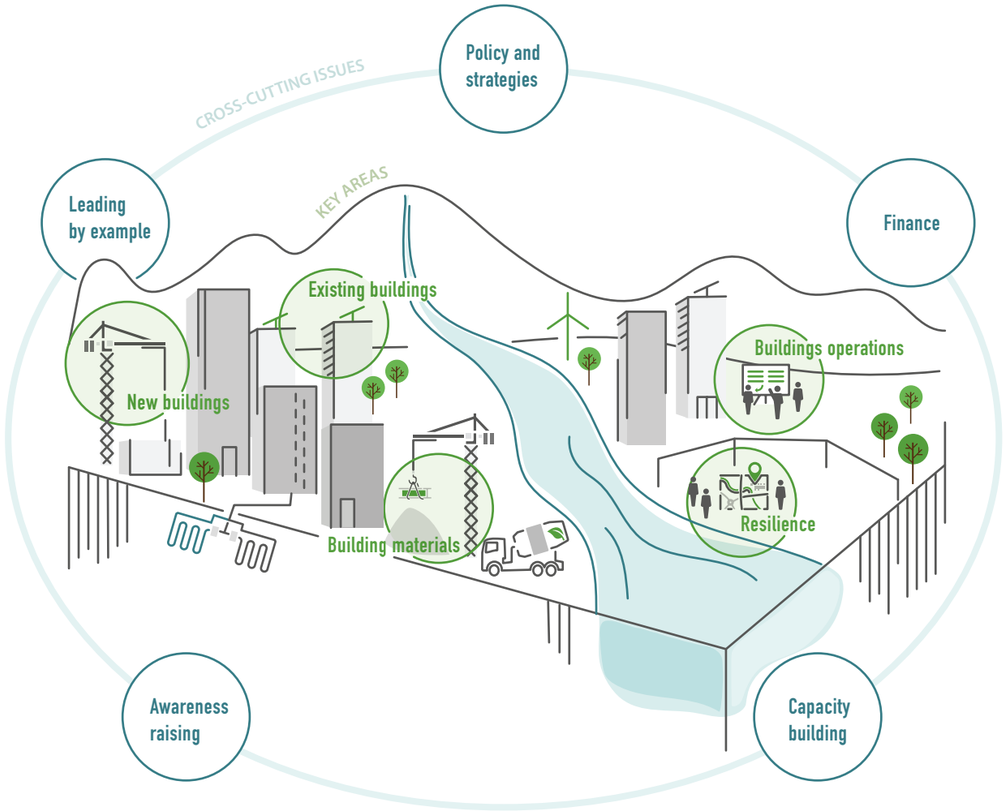
- Increasing the scope of existing building energy regulations and policies to include a greater proportion of building types, to include renovation projects and to address emissions released at all life cycle stages
- Including or ratcheting up energy performance standards for building envelopes, heating, cooling and ventilation systems, and appliances and by making them mandatory
- Integrating building sector actions with urban land-use planning to enable the decarbonization opportunities in mobility or energy supply and other sectors
- Considering the essential role of cities and their climate commitments as a significant resource for national governments in planning and implementing building sector climate action in their NDCs

In "A Guide for Incorporating buildings actions in NDCs", the GlobalABC sets out a process of mapping, prioritizing, implementing and monitoring building sector climate actions in line with international obligations (UNEP 2018).

EXAMPLE: MOROCCO'S NDCs

Morocco is one of the few countries with targets within the range considered to be its fair share compatible with the 1.5°C global effort. The country is further advancing its climate policies and may be one of the few developing countries able to curb its emissions by 2030. It has committed to reducing energy consumption in buildings, industry and transport by 15 per cent by 2030. A modelling study assessed the options for policy reforms to optimally achieve the NDCs targets for energy efficiency in the building sector. A roadmap covering all the sectors listed in the NDCs, and in particular the building sector, supports the implementation of the NDCs.

KEY AREAS AND KEY MESSAGES



Moving to a zero-emission and resilient building and construction sector requires action in all key areas – new buildings, existing buildings, building operations, building materials and resilience. Senior officials and decision makers can contribute to the decarbonization of the building sector by setting up effective regulation, planning policies and strategies; financing and enabling increased action; building capacities and raising awareness among stakeholders in the building sector; and leading by example through their own public buildings and policies.

KEY MESSAGES

- **Decarbonizing and future-proofing buildings requires effective action covering the entire building life cycle from design and the selection and manufacturing of materials to construction to operations through renovation and deconstruction**
- **Efforts towards decarbonization can be mutually reinforcing, provide cross-benefits, support just transitions, and contribute to health and well-being and air quality**
- **All countries can adopt key measures**
- **Comprehensive action extends beyond site boundaries to neighbourhood planning, cross-sectoral strategies and clean energy**
- **Cost-effective and no-cost measures exist, but are not yet sufficiently promoted and implemented**

THE 10 KEY MEASURES

1. Establish and implement an ambitious energy code for buildings
2. Support the use of integrated design

3. Promote deep energy renovation
4. Lead by example by decarbonizing public buildings

5. Use energy information and behaviour change to drive energy efficiency
6. Promote financing for energy efficiency

7. Enable easy access to information on the carbon footprint of materials
8. Develop public procurement policies that incentivize materials with low carbon footprints

9. Integrate nature-based solutions into urban planning, buildings and construction
10. Develop integrated resilience strategies and plans for the built environment

The key measures summarize the ways to address decarbonization in buildings, and cover five of the eight key areas of the GlobalABC roadmaps. The key measures focus on transformative action related to the building itself while the GlobalABC key areas include urban planning, appliances and systems and clean energy. For a more holistic approach, senior officials and decision makers may refer to the roadmaps.

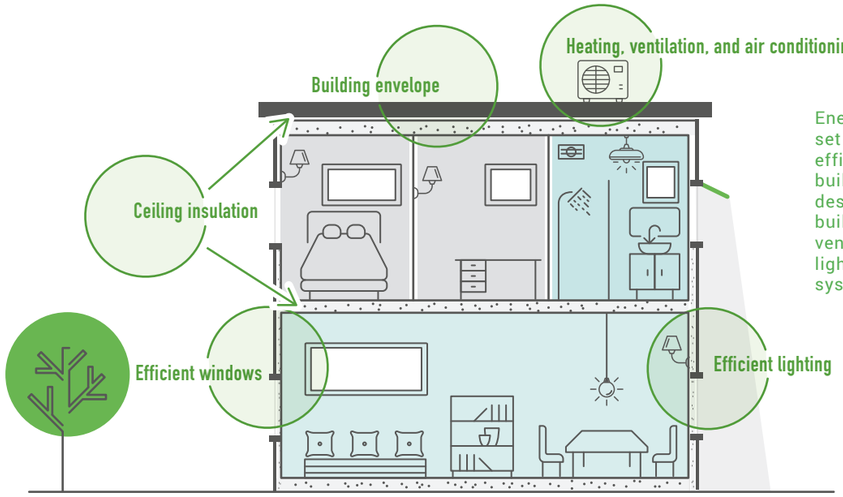
KEY AREA: **NEW BUILDINGS**

WHY IT IS IMPORTANT

With global population increasing by 2.0 billion by 2050, new buildings will have an important effect on building-related energy use and emissions. In emerging markets, most buildings that will be standing in 2050 are not yet built, and most of those buildings will be in countries without mandatory building codes. The higher uptake of buildings with zero operating emissions and with very low or even negative carbon footprints of their building structure is essential to the reduction of emissions in the sector. In addition, net-zero buildings improve resilience by remaining comfortable for longer periods in the absence of mechanical cooling or heating.

1. KEY MEASURE 1.
ESTABLISH AND IMPLEMENT AN AMBITIOUS ENERGY CODE FOR BUILDINGS

Building codes regulating the energy performance of new and existing buildings are a powerful way to address future emissions growth related to both operational and embodied emissions. They are a key regulatory measure for decarbonizing the building sector. A good building code allows for locally adapted designs that offer an opportunity for countries to valorize local materials and climate knowledge.



Energy codes for buildings set minimum energy efficiency standards for building technologies and design elements such as building envelope; heating, ventilation, air conditioning; lighting; and water heating systems.

EXAMPLE: ECO-NIWAS SAMHITA

India's building stock is growing rapidly as is electricity consumption in residential buildings, and air conditioners and room heaters are in wide use. ECO-NIWAS Samhita sets energy efficiency standards for residential buildings across the country. In recognition of the potential of building design to regulate thermal comfort, the code specifies minimum building envelope performance standards that limit heat gain in hot climates and heat loss in cool climates. The code also specifies standards for adequate natural ventilation and daylight potential. Professional tools for architects and developers facilitate the implementation of the building code. The Indian Government has committed to build 10 million affordable urban dwelling units under the code.

Lessons and implications:

- The building code should be user-friendly to ensure that it can be easily and widely used, and should give the architect the flexibility with the building design and materials depending on regional climate and building traditions
- Free-of-cost compliance checks and simulation tools support the implementation of the code
- Early introduction of a voluntary building energy code provides important lessons across the sector and helps create acceptance for ultimately making the code mandatory
- Performance-based building codes increase the likelihood of a building performing as designed
- The building code goes hand in hand with efforts to provide sustainable homes to urban poor as it provides affordable indoor thermal comfort in a climate-friendly way

Further resources:

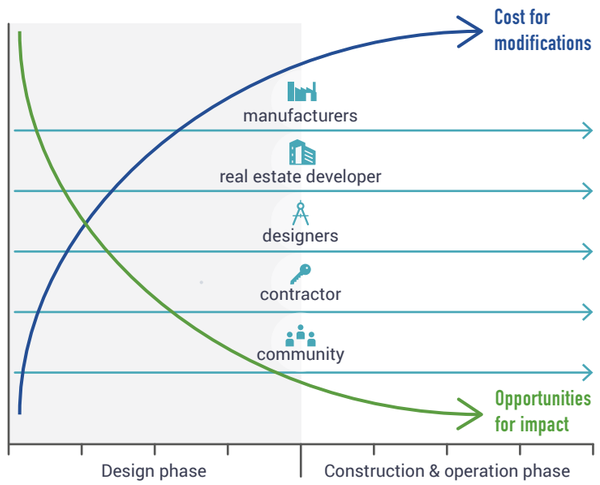
- ECO-NIWAS: India building code
- IEA: Database of national and regional building energy policies, including energy code for buildings

SPECIFIC CHALLENGES

Many parts of the world still have no mandatory green building codes, some areas have codes that lack ambition, and in many areas, effective implementation and enforcement are challenging. The costs of ambitious regulation may be high, and particularly in regions with increasing demand for affordable housing, the costs may be a challenge. Designing a building to meet net-zero targets is a complex undertaking that requires a systematic and integrated design and planning approach.

2. KEY MEASURE 2.
SUPPORT THE USE OF INTEGRATED DESIGN

An early stage integrated design process involving all disciplines of a building project enables the adoption of effective passive design measures. It helps find effective, low-cost solutions and make the best design choices. Life cycle assessments in the design phase allow designers to minimize the whole life carbon emissions of buildings. As a project progresses, design changes become more challenging and costly.



The greatest savings in life cycle carbon emissions can be realized at the early stages of a project, involving all disciplines and stakeholders in an integrated manner. As a project progresses, design changes become more challenging and costly.

EXAMPLE: GREEN BUILDING STANDARDS, CERTIFICATION SCHEMES AND RATING TOOLS

Green building standards, certifications and rating systems establish green and sustainable design standards that are used to develop, assess and recognize buildings that go beyond regulatory compliance. Buildings that meet these standards provide a market signal to carbon-conscious consumers. The number of national, regional and global certification schemes is growing, and the use of these schemes is increasing.

Lessons and implications:

- Performance-based rating tools provide guidance in integrated design processes, while certification assures compliance and provides access to market benefits
- The high-quality certification schemes should adopt a life cycle perspective with science-based targets and address both operational and embodied carbon emissions
- Effective green building certification unlocks investment flows by serving as a verification instrument for facilitating the issuance of green bonds and other forms of sustainable finance
- Governments can develop their own voluntary labelling schemes and require life cycle assessments or use such tools as an element of their zero-emission building plans
- Ambitious certification schemes stimulate the market by setting standards that in turn elevate the ambition of government building codes and regulation

Further resources:

- WorldGBC: Overview of rating tools supporting the design process
- WBCSD: Building system carbon framework
- European Commission: European approach to assessing the sustainability performance of buildings

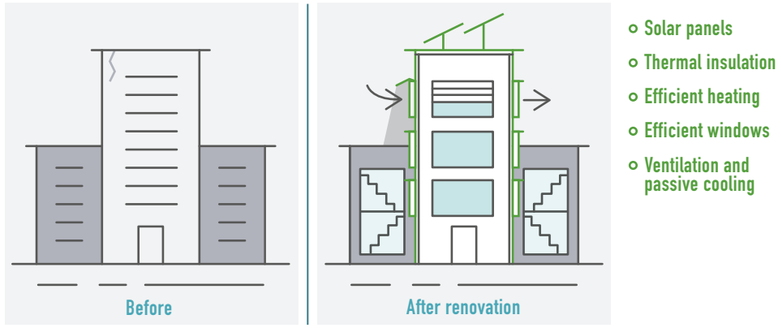
KEY AREA: **EXISTING BUILDINGS**

WHY IT IS IMPORTANT

The increasing energy demand for heating and cooling in existing buildings has to a large extent been responsible for the rise in energy-related CO_2 emissions in the housing sector. In many middle- and high-income countries, more than 60 per cent of the existing building stock is likely to be in use in 2050 (IEA 2020). Improving the performance of today's existing buildings to be close to zero emissions – a requirement for meeting the Paris Agreement goal – will likely depend on an increase in the renovation rate, an upgraded level of energy efficiency and a transition to a decarbonized energy supply.

3. KEY MEASURE 3. PROMOTE DEEP ENERGY RENOVATION

Performing deep renovations at scale is a necessity for building a zero-carbon society. Boosting the energy performance of existing buildings improves living conditions of residents and supports several economic sectors. Ensuring adequate and well-targeted funding is key to enabling the appropriate depth and scale of renovations.



Deep energy renovation that follows a systems-thinking approach leads to overall improvement of existing buildings' performance to close to zero emissions.

EXAMPLE: EU RENOVATION WAVE

In the European Union, more than 220 million building units, representing 85 per cent of the EU building stock, were built before 2001. Only a fraction of the renovated buildings undergoes deep interventions to substantially cut energy demand and CO_2 emissions. Building renovation is one of the sectors facing the largest investment gap in the EU.

In 2020, the EU started the "Renovation Wave", a climate and energy governance strategy intended to develop a cleaner and climate-resilient building stock, to create jobs and strengthen the post-pandemic economy and to reduce energy poverty. The strategy includes a broad set of strategic actions with specific targets, strengthened energy efficiency directives, minimum energy performance requirements, renovation obligations for public buildings and enabling activities in finance and capacity-building.

Lessons and implications:

- A renovation wave can spur the development of green financing schemes that reduce the upfront costs of energy efficiency refurbishment and retrofit
- Awareness-raising, capacity-building and one-stop shops for advising homeowners and small and medium enterprises to prepare good renovation projects improve the number and quality of renovations
- Building renovations might be prioritized in recovery plans related to the Covid-19 crisis and in regular funding instruments
- Renovation activities can be used as leverage to address energy poverty and access to healthy housing for all households
- Faster and deeper renovations provide multiple benefits: thermally comfortable, healthy and affordable buildings for users, more attractive and stable building portfolios for owners and more green jobs for the national economies

Further resources:

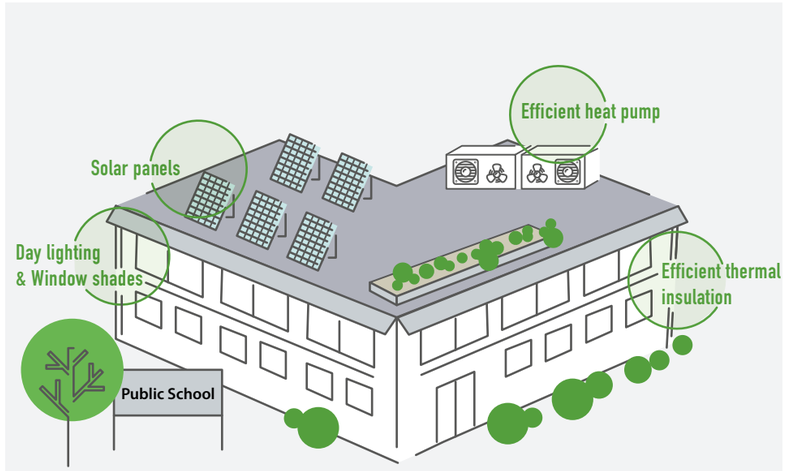
- European Commission: EU Renovation Wave

SPECIFIC CHALLENGES

Spending for energy-efficient buildings remains outpaced by investment in conventional buildings and construction. Energy-focussed building renovations currently affect less than 1 per cent of the building stock annually, a slow rate of change for the building sector. Codes and standards for energy efficiency refurbishment are rare. A life cycle analysis that captures the range of economic benefits and other co-benefits of comprehensive refurbishment and energy retrofits is necessary to justify the high upfront costs. A focus on upfront costs may discourage some investments.

4. KEY MEASURE 4. LEAD BY EXAMPLE BY DECARBONIZING PUBLIC BUILDINGS

The schools, offices, hospitals and other buildings owned by state and municipal authorities provide an opportunity for government to lead by example. Many of these buildings were constructed decades ago with little regard for renewable energy and energy efficiency, and they offer a large potential for transformation into zero-energy buildings. By renovating public buildings to a zero-energy standard, governments can raise the awareness of the population and educate industry about net-zero building solutions.



Public buildings transformed into zero-energy buildings offer significant potential for emissions savings and may encourage others to adopt similar strategies.

EXAMPLE: ZERO-ENERGY SCHOOLS PROGRAMME

The State Government of Paraná, Brazil, signed a memorandum of understanding to create a zero-energy public building programme, which will become part of the Government's strategic plan. The programme aims to transform all public buildings in Paraná into zero-energy buildings, starting with the public schools. A first phase began with 212 public buildings from seven different municipalities. Retrofit projects for energy efficiency included lighting, heating, ventilation and air conditioning and on-site photovoltaic energy generation that provided all the energy consumed over a 12-month period. This programme will educate more than 100,000 students in a zero-energy building, and contribute to awareness-raising among the population.

Lessons and implications:

- In-depth analysis and audits of existing buildings and equipment help to define appropriate energy efficiency strategies for individual buildings and building types
- Public procurement can be used to catalyse activity, for example by commissioning net-zero compatible retrofits of public assets, such as social housing, schools, offices and healthcare facilities
- Even without on-site renewable energy, net-zero buildings provide resilience benefits by remaining comfortable for longer periods during power outages and reducing peak demand, thus improving the reliability of the grid

Further resources:

- Programa GBC Zero Energy

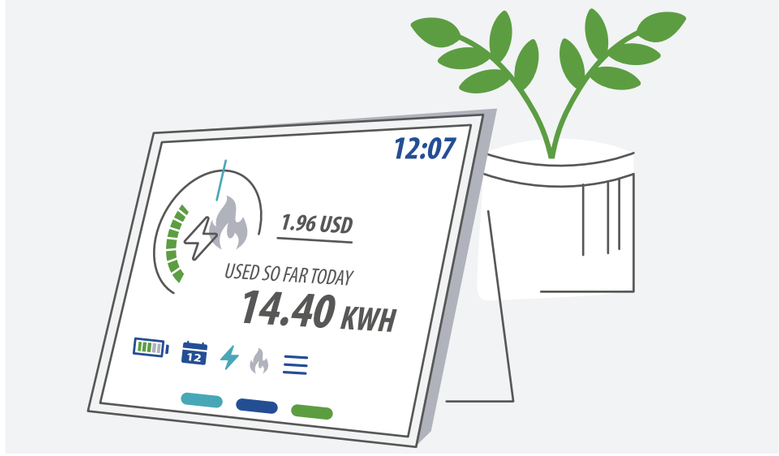
KEY AREA: **BUILDING OPERATIONS**

WHY IT IS IMPORTANT

The proper operation of buildings has often been neglected. Having buildings that can generate and store renewable electricity on site and that are operated efficiently and having building users with adequate information and incentives to optimize their energy consumption are as important as having highly energy-efficient new or renovated buildings. Technical options for optimized building operations alone have the potential to reduce energy consumption by more than 10 per cent, and changing the behaviour of users can provide a similar reduction.

5. KEY MEASURE 5.
USE ENERGY INFORMATION AND BEHAVIOUR CHANGE TO DRIVE ENERGY EFFICIENCY

Being aware of individual energy consumption is a first step towards behaviour change. Programmes to encourage people to save energy have relied largely on technological interventions and decision-making driven by economics: consumers will save energy to save money. Energy-consumption behaviour is not always rational, however, and can benefit from nudges and neighbourhood competitions designed to encourage households to be more energy-efficient.



Information about household electricity consumption is a first step towards behaviour change and household electricity savings.

EXAMPLE: VIDYUT RAKSHAKA INITIATIVE

Vidyut Rakshaka, a joint initiative of WRI India and TIDE in Bangalore and Chennai, gives consumers customized recommendations to conserve electricity based on electricity use information they share voluntarily. The reports compare a household's electricity use against use in their neighbourhoods. Each household is given an energy savings goal corresponding to their current and historical consumption patterns and comparisons with similar households. Reports contain recommendations to encourage curtailment (for example, switching off appliances when not needed), maintenance (such as regular checks of refrigeration and air conditioners) and efficiency (replacing incandescent bulbs with LEDs, for instance). Participants receive regular feedback on their performance against the goals.

Lessons and implications:

- Latest results indicate a cumulative savings of 7 per cent in average monthly consumption of electricity among 60 per cent of participants
- Being aware of energy consumption is a big step, and many who signed up for energy-saving applications had no information about their previous consumption trends or seasonal changes
- The most important nudge was neighbourhood benchmarking, where consumers found out how they performed with respect to their neighbours, a comparison that adds a certain social pressure
- In emerging countries where an increase in per-capita consumption is to be expected, such programmes can play an important role in instilling and reinforcing energy-saving behaviours in the long term

Further resources:

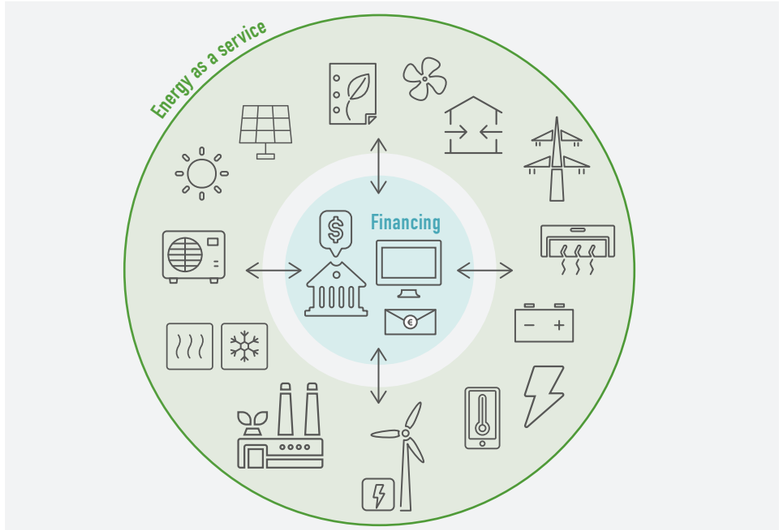
- VidyutRakshaka - TIDE India (tide-india.org)
- WRI: How behavioural science can boost household energy efficiency

SPECIFIC CHALLENGES

Systems and procedures that systematically identify opportunities for increased efficiency are still not mainstream. Technologies for efficient building operations are largely underutilized due to high costs and lack of information on their benefits and use. Behavioural change is generally difficult to achieve, and efforts to raise awareness related to the efficient use of energy or to provide regular information on individual energy consumption are uncommon.

6. KEY MEASURE 6.
PROMOTE FINANCING FOR ENERGY EFFICIENCY

The increasing need for energy goes together with increasing investment needs for energy-efficient technologies. Despite the obvious economic benefits of efficiency measures, underinvestment in energy efficiency persists due to high upfront technology costs, capital constraints and information barriers. New business models help to overcome current barriers that hinder investments in energy-efficient equipment.



Innovative financing solutions – such as Energy as a service – that allow customers to implement energy efficiency projects with no upfront capital expenditure help address the underinvestment in energy efficiency.

EXAMPLE: COOLING AS A SERVICE

Demand for cooling is rapidly increasing and the average efficiency of today's cooling systems is low. Cooling as a Service (CaaS) models are innovative solutions for the cooling of buildings. They place the ownership and operation of cooling equipment with a service provider rather than the building owners or users. Consumers pay for the use of the cooling they receive, rather than investing in the physical product or infrastructure that delivers the cooling. Such models can help reduce cooling over-consumption by building users while pushing suppliers and operators to achieve the most efficient cooling solutions.

Lessons and implications:

- CaaS models eliminate maintenance costs and capital investments for energy users, lower their energy consumption and costs, help achieve personal energy efficiency targets and serve as an example for other energy users
- CaaS models are particularly successful in public facilities – municipal buildings, universities, schools and hospitals – where economies of scale increase efficiency, and where public sector CaaS combines leadership by example with efficient use of public funds
- CaaS can be applied at different scales – from individual buildings to citywide district cooling systems that provide high-quality, extremely reliable utility service, just like water or power

Further resources:

- Cooling as a Service Initiative

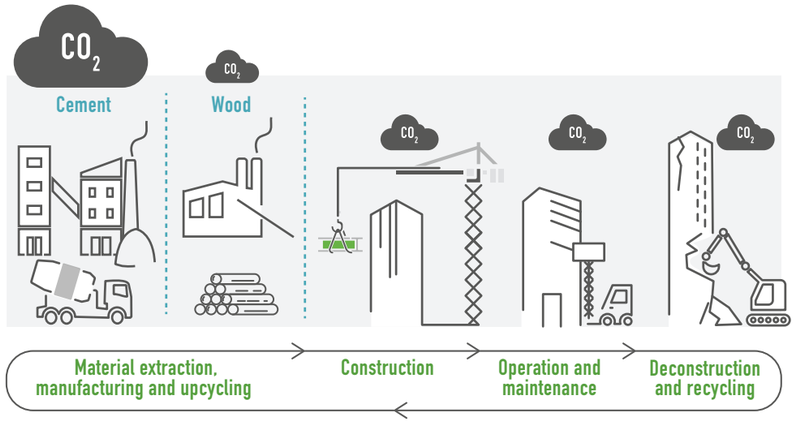
KEY AREA: **BUILDING MATERIALS**

WHY IT IS IMPORTANT

The construction and demolition of buildings accounts for about one-third of global material flows. Steel, cement, bricks and non-certified wood are some of the building products associated with major CO_2 emissions, and demand for these products is rising. Materials extraction and processing of concrete alone is expected to contribute to 12 per cent of global greenhouse gas emissions in 2060 (OECD 2019). In buildings with average performance, embodied energy represents between 10 and 20 per cent of the life cycle carbon footprint. In highly efficient buildings, its share can exceed 50 per cent.

7. KEY MEASURE 7.
ENABLE EASY ACCESS TO INFORMATION ON THE CARBON FOOTPRINT OF MATERIALS

Improving efficiency in the use of materials, minimizing embodied greenhouse gas emissions of building materials and closing material cycles will be key to decarbonizing construction. Thinking carefully about a circular economy means considering the post-deconstruction lives of buildings and materials so they do not end up as waste (Iyer-Raniga and Huovila 2021). Transparency and enhanced knowledge about embodied carbon over the life cycle of building materials empowers investors, designers and consumers to make informed decisions.



The carbon footprint of materials encompasses the total greenhouse gas emissions caused over the whole life cycle of the material – from material extraction, manufacturing and upcycling through construction, operation and maintenance to deconstruction and recycling.

EXAMPLE: CARBON CALCULATORS FOR CONSTRUCTION MATERIALS

Embodied carbon calculator tools such as the Embodied Carbon in Construction Calculator Tool (EC3) or One Click LCA are based on environmental product declarations and are used to enhance knowledge and calculate upfront embodied carbon emissions associated with the production of building materials. The EC3 tool makes data from environmental product declarations easily accessible and comparable for building professionals, project owners, material manufacturers and policymakers. It allows assessment, benchmarking and reductions in embodied carbon, and can be implemented in both the design and the procurement phases of a construction project. Quantification is an important first step to achieving a net-zero building sector.

Lessons and implications:

- Life cycle assessments underlying carbon calculator tools are critical to understanding the full implications of material choices, and vital to efforts to decarbonize buildings and infrastructure
- Carbon calculator tools do not replace, but complement life cycle assessments by focusing on carbon embodied in materials
- EC3 tool pilot results have demonstrated that the ability to compare products allows for substantial reductions in embodied carbon to be realized
- Carbon calculator tools provide policymakers a trusted resource for setting embodied carbon procurement policy and building codes or shaping actions to promote the production and use of green building materials

Further resources:

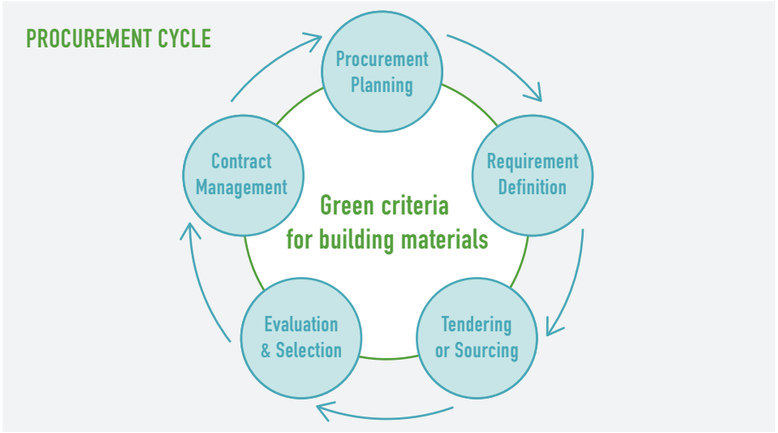
- EC3
- One Click LCA

SPECIFIC CHALLENGES

Decarbonizing building materials requires concerted action along multiple dimensions: from lowering the demand of material through efficient design, establishing circular material flows, and promoting the use of low-carbon materials, to maximizing energy efficiency in manufacturing and switching to less carbon-intensive sources of energy. Materials must meet performance standards across the range of functions they fulfil (static function, insulation and comfort), and finding low-carbon solutions that meet the standards for all those functions is challenging.

8. KEY MEASURE 8.
DEVELOP PUBLIC PROCUREMENT POLICIES THAT INCENTIVIZE MATERIALS WITH LOW CARBON FOOTPRINTS

Public procurement constitutes a high-impact policy arena for achieving deep decarbonization in the infrastructure and building sectors. Public procurement represents a substantial proportion of government expenditures – for example 12 per cent of GDP and 29 per cent of government expenditures in OECD member countries (OECD 2017). Infrastructure assets are the largest area of public spending and the carbon impact of these assets is significant during all the stages of the life cycle.



Green public procurement of building materials integrates green criteria at all stages of the public procurement cycle. It is a powerful tool for driving innovation and decarbonization of the buildings and construction sector.

EXAMPLE: BUY CLEAN CALIFORNIA ACT

Developed to address climate change through the power of procurement, the Buy Clean California Act targets the embodied carbon of construction materials used in infrastructure projects such as roads, bridges and public buildings. Environmental Product Declarations are required for certain materials (steel, glass or mineral wool insulation) specified in plans for state building projects. Beginning 1 July 2021, contracts will require eligible construction materials to have a global warming potential equal to or lower than a level established by state standards. Educational programmes and easy-to-use tools provide parties involved in state-funded building projects the information they need to have a better understanding of the embodied carbon in materials.

Lessons and implications:

- Government leadership in zero-carbon procurement encourages adoption of low-carbon technologies and materials at scale
- Progressive procurement policy frameworks are driving private sector and industry action by setting ambitious but feasible requirements that create market incentives and an attractive business case for manufacturers and suppliers of low-carbon building materials
- Accompanying new legislation with awareness and education materials is crucial to ensuring that new laws and requirements are adopted quickly

Further resources:

- Buy Clean California Act
- WorldGBC: Bringing embodied carbon upfront
- C40 Cities: Clean Construction Declaration

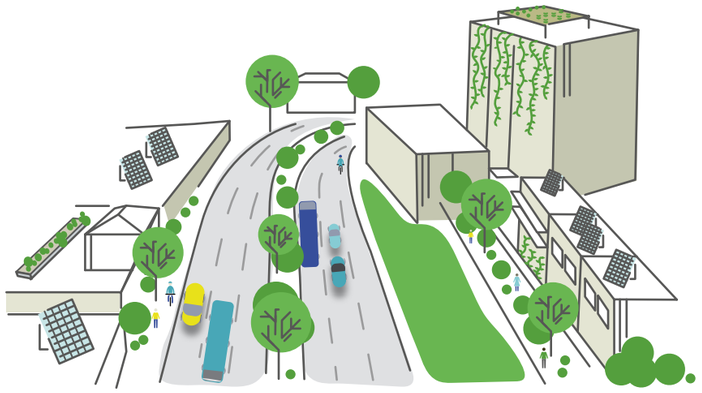
KEY AREA: **RESILIENCE**

WHY IT IS IMPORTANT

In urban areas, risks related to climate change – such as rising sea levels, storm surges and heat stress – are increasing. As cities grow, the area of artificial, impermeable surfaces increases and exacerbates existing short-term risks such as floods or long-term risks such as heat island effects. With half of the world's population living in urban areas, many of them in low-lying coastal cities, the resilience of settlements and buildings is becoming a pressing issue. Actions for improving resilience typically provide multiple co-benefits, while many solutions to decarbonizing the building sector also strengthen resilience.

9. KEY MEASURE 9. INTEGRATE NATURE-BASED SOLUTIONS INTO URBAN PLANNING, BUILDINGS AND CONSTRUCTION

Nature-based solutions – green corridors, green roofs, urban tree canopies and permeable pavements and other green infrastructure – have a variety of climate-related benefits, particularly in urban areas. They reduce extreme heat and the impacts of flooding, prevent erosion and increase carbon sequestration. The co-benefits include better air and water quality, which contribute to the quality of life of urban dwellers and to the building sector's sustainability in a comprehensive way.



Nature-based solutions on and around buildings enhance the resilience of settlements and buildings as they reduce extreme heat and the impacts of flooding, and increase carbon sequestration.

EXAMPLE: GREEN CORRIDORS IN MEDELLÍN AND SKY GARDENS IN SINGAPORE

The Green Corridors Initiative of the city of Medellin creates networks of greenery across the city via 30 green corridors that connect existing green spaces, improve biodiversity and reduce the urban heat island effect. Areas for high traffic and pedestrian use were prioritized for early corridor development. The municipal government is paying for installation and maintenance and for capacity-building of volunteer urban gardeners to help maintain plantings.

Singapore is investing in green facades and sky gardens, using space on buildings to improve heat resiliency, and aiming to double its current sky garden coverage to 200 hectares by 2030. The uptake of these nature-based solutions in Singapore is driven by the Landscaping for Urban Spaces and High-Rises (LUSH) policy, a set of building regulations that requires on-site greenery equivalent to the size of the site being developed. The LUSH policy ensures that green space and shading are integrated as the city develops.

Lessons and implications:

- Adopting a combination of green urban cooling solutions, such as green roofs and street trees at city scale can reduce outdoor air temperatures to up to 3°C
- The economic benefits of nature-based solutions – such as net energy savings, increased property values and enhanced ecosystem services – outweigh the costs of installation and maintenance
- A combination of locally tailored instruments and activities such as urban cooling strategies, green roof regulations, incentives for tree planting, expanding urban forestry efforts or greening municipally owned assets can drive the uptake of nature-based solutions in building and construction

Further resources:

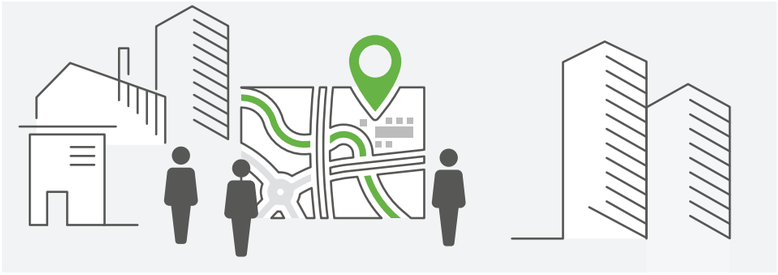
- ESMAP 2020: Primer for Cool Cities

SPECIFIC CHALLENGES

Enhancing resilience of the built environment requires interventions at a range of scales from urban planning to individual buildings. Urban systems need to be addressed in a holistic manner, considering the complex nature of cities' functions and structures. Design standards for buildings and building materials will have to change in order to withstand the new weather conditions and to reduce climate-related risks. Given the lifespan of a building, solutions need to be flexible and suitable for changing climate conditions.

10. KEY MEASURE 10. DEVELOP INTEGRATED RESILIENCE STRATEGIES AND PLANS FOR THE BUILT ENVIRONMENT

The careful consideration of resilience promotes a holistic view of urban systems, embracing the interconnected and complex nature of cities' spatial configurations, physical assets, socioeconomic functions and organizational structures (UNEP/GlobalABC 2020). Integrated risk assessment and long-term resilience strategies can ensure that the adaptation of existing buildings and the integration of resilience into new construction occur in a comprehensive manner. They empower stakeholders to set strategic targets and implement projects that will enable communities to adapt when faced with multiple natural and human-caused shocks or chronic stresses.



An integrated resilience strategy involving multiple stakeholders is a core tool that guides cities through the process of building resilience.

EXAMPLE: ACCRA RESILIENCE STRATEGY

Accra, the capital of Ghana, is facing rapid urban expansion and is highly vulnerable to floods, the collapse of infrastructure and buildings, fires due to electrical faults and illegal power connections, and disease outbreaks resulting from poor sanitation and waste management. This situation creates complex challenges for the local government and calls for an integrated approach to infrastructure planning and the provision of services. Accra's resilience strategy, released in 2019, puts forward a number of integrated, cross-cutting initiatives to tackle interconnected risks. An incentive programme encourages developers to integrate renewable and energy efficiency technology into commercial buildings, and is expected to contribute to sustainable energy future that accommodates both climate and population pressures. A Chief Resilience Officer leads the strategy, and ensures that the city applies a resilience lens, that resources are leveraged holistically and that projects are planned for synergies.

Lessons and implications:

- By incentivizing renewables and reducing energy demand on the national grid, the Accra resilience strategy contributes to decarbonization of the building sector and enhances resilience in the electricity system
- The resilience strategy ensures that a set of integrated solutions benefits all those living and working in the city
- Mainstreaming resilience within city governance is a long process consisting of the establishment of a dedicated resilience team, a comprehensive resilience assessment and a continuous resilience dialogue involving a wide range of stakeholders

Further resources:

- Accra Metropolitan Assembly/100 Resilient Cities 2019: Accra Resilience Strategy
- UNFCCC 2021: Human Settlements – Climate Action Pathway
- GlobalABC/OID 2021: Buildings and Climate Change Adaptation: A Call to Action

ABOUT THE GLOBAL ALLIANCE ON BUILDINGS AND CONSTRUCTION (GlobalABC)

Founded at COP 21, the GlobalABC is the leading global platform for governments, the private sector, civil society and intergovernmental and international organizations to increase action towards a zero-emission, efficient and resilient building and construction sector. Concretely, our objectives are:

- To be a global advocate for the importance of the sector for global climate action, to provide a common language for discussion among decision makers and to be a catalyst for action by leading actors in the buildings and construction sector
- To provide a neutral and trusted platform for setting targets for decarbonization, tracking progress and actions and sharing knowledge and good practices
- To provide key measures for countries to adopt, helping them set priorities in their own strategies based on their particular situations

The GlobalABC works on the basis of voluntary collaboration in five areas in which members are invited to take part: 1. Awareness and education, 2. Public policies, 3. Market transformation, 4. Finance, and 5. Building measurement, data and information.

GlobalABC BUILDING ROADMAPS

The GlobalABC flagship initiatives are the Global Roadmap for Buildings and Construction and the Regional Roadmaps for Buildings and Construction for Africa, Asia and Latin America. The roadmaps outline a common vision for decarbonizing the buildings and construction sector and support the development of national or subnational strategies and policies, including Nationally Determined Contributions. They focus on targets and timelines needed to achieve a zero-emission, efficient and resilient building stock by 2050 in eight key areas: urban planning, new buildings, existing buildings, building operations, appliances and systems, materials, resilience, and clean energy. For each of these key areas, targets for policies and technologies, and key enabling actions in the short, medium, and long terms are recommended.

GlobalABC FLAGSHIP PRODUCTS

- Global Status Report 2020
- Global Roadmap for Buildings and Construction 2020-2050
- Regional Roadmap for Buildings and Construction in Africa 2020-2050
- Regional Roadmap for Buildings and Construction in Asia 2020-2050
- Regional Roadmap for Buildings and Construction in Latin America 2020-2050
- A Guide for incorporating Buildings Action in NDCs 2018