Non-paper by co-chairs

This non-paper is prepared by co-chairs under their own responsibility and thus has no formal status. It aims to facilitate discussion among participants on sub-topics of third global dialogue under the Sharm el-Sheikh mitigation ambition and implementation work programme.

Lifted verbatim from IPCC AR6 WGIII Chapter 9 Buildings[1]

Global greenhouse gas (GHG) emissions from buildings were in 2019 at 12 GtCO2-eq, equivalent to 21% of global GHG emissions that year, out of which 57% were indirect emissions from offsite generation of electricity and heat, 24% direct emissions produced onsite and 18% were embodied emissions from the use of cement and steel.

Drivers of GHG emissions in the building sector were assessed using the SER (Sufficiency, Efficiency, Renewables) framework. Sufficiency measures tackle the causes of GHG emissions by avoiding the demand for energy and materials over the lifecycle of buildings and appliances. Sufficiency differs from efficiency in that the latter is about the continuous short-term marginal technological improvements, which allows doing less with more in relative terms without considering the planetary boundaries, while the former is about long-term actions driven by non-technological solutions (i.e., land-use management and planning), which consume less in absolute term and are determined by biophysical processes.

Sufficiency addresses the issue of a fair consumption of space and resources. The remaining carbon budget, and its normative target for distributional equity, is the upper limit of sufficiency, while requirements for a decent living standard define the minimum level of sufficiency. Sufficiency[2] measures can limit the demand for energy and materials over the lifecycle of buildings and appliances.

In most regions, historical improvements in efficiency have been approximately matched by growth in floor area per capita. Implementing sufficiency measures that limit growth in floor area per capita, particularly in developed regions, reduces the dependence of climate mitigation on technological solutions.

Bottom-up studies show a mitigation potential up to 85% in Europe and North America and up to 45% in Australia, Japan and New Zealand, compared to the baselines by 2050, even though they sometimes decline. In developing countries, bottom-up studies estimate the potential of up to 40–80% in 2050, as compared to their sharply growing baselines.

The development, since the IPCC Fifth Assessment Report (AR5), of integrated approaches to construction and retrofit of buildings has led to the widespread adoption of zero energy/ carbon buildings in all climate zones.

The decarbonisation of buildings is constrained by multiple barriers and obstacles as well as limited flow of finance. The lack of institutional capacity, especially in developing countries, and appropriate governance structures slow down the decarbonisation of the global building stock.

[1] https://www.ipcc.ch/report/ar6/wg3/chapter/chapter-9/

[2] A set of measures and daily practices that avoid demand for energy, materials, land and water while delivering human well-being for all within planetary boundaries {WGIII Annex I}

Policy packages based on the SER (Sufficiency, Efficiency, Renewables) framework could grasp the full mitigation potential of the global building stock. Low ambitious policies will lock buildings in carbon for decades as buildings last for decades if not centuries. Building energy codes is the main regulatory instrument to reduce emissions from both new and existing buildings.

Actions are needed to adapt buildings to future climate while ensuring well-being for all. The expected heatwaves will inevitably increase cooling needs to limit the health impacts of climate change.

Well-designed and effectively implemented mitigation actions in the buildings sector have significant potential for achieving the United Nations Sustainable Development Goals.

COVID-19 emphasised the importance of buildings for human well-being. However, the lockdown measures implemented to avoid the spread of the virus have also stressed the inequalities in the access for all to suitable and healthy buildings, which provide natural daylight and clean air to their occupants.

Lifted verbatim from Global Alliance for Building and Construction, Global Status Report for Buildings and Construction[3]

Executive Summary
Buildings and construction sector in review

Since the 2022 Global Buildings Status Report, the construction sector has seen significant changes. Post-pandemic recovery has spurred construction activities, driven by eased supply chain disruptions and a rebound in housing demand. However, inflation and global interest rate hikes have tempered growth, particularly affecting developing countries like China, Mexico, Indonesia and India.

Looking forward to 2024, the focus must be on tangible emission reductions, enhancing building performance, increasing renewable energy use and addressing housing and energy access disparities. Despite the complexities, strategic partnerships can facilitate the shift to an efficient, resilient and whole life net-zero carbon global building stock.

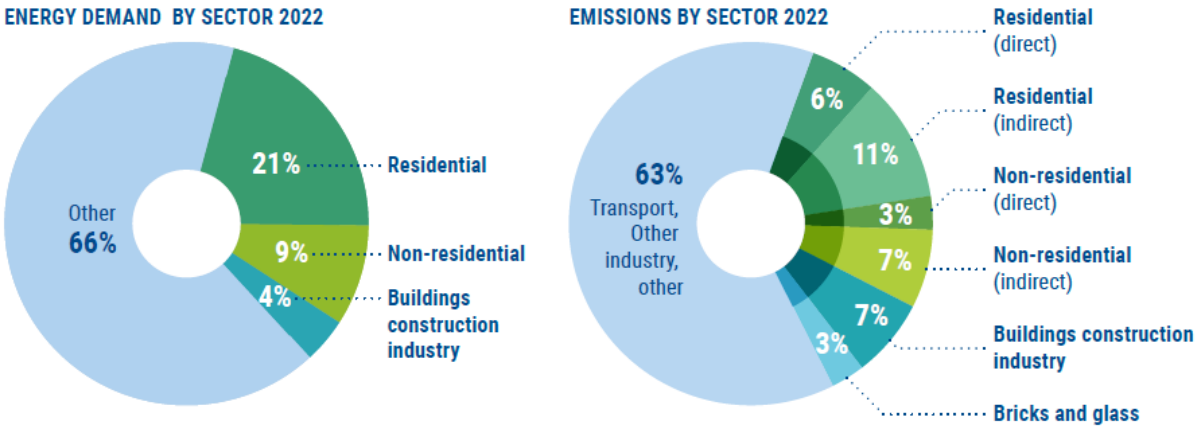
Global buildings and construction status

In 2022, the global buildings sector was a major energy consumer, accounting for 30 per cent of the final energy demand, primarily for operational needs like heating and cooling. Including the energy for producing construction materials, this figure rose to 34 per cent. Energy demand in the sector has grown by just over one per cent annually, with electricity use in buildings increasing from 30 per cent in 2010 to 35 per cent in 2022 of total final energy demand, in parallel with a shift towards renewables.

CO2 emissions from building operations and construction reached new highs in 2022, making up 37 per cent of total global CO2 emissions to just under 10 gigatonnes (Gt) CO2, due to emissions from buildings operations and material production. This reflected a growth in indirect emissions related to electricity use to 6.8 GtCO2, while direct emissions from buildings have declined slightly to three GtCO2. The production of materials used in the construction process for cement, steel and aluminium added a further 2.5 GtCO2, with brick and glass production contributing around 1.2 GtCO2. Energy intensity per square meter improved by 3.5 per cent from 2021 to 2022, thanks to better building codes and fabric performance, especially in colder climates. However, a significant number of countries are still lack building energy codes.

[3] https://www.unep.org/resources/report/global-status-report-buildings-and-construction

Figure 1 Share of buildings in total final energy consumptions in 2022 (left) and share of buildings in global energy and process emissions in 2022 (right)



(Source: IEA 2023a. Adapted from 'Tracking Clean Energy Progress')

Notes: Buildings construction industry refers to materials used in construction, including concrete, steel and aluminium. Other materials shown separately.

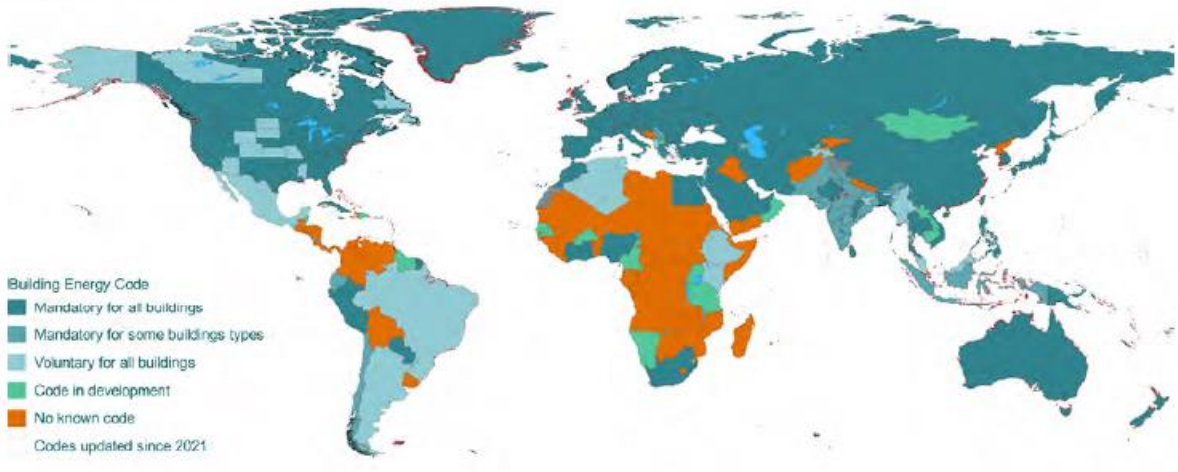
Sustainable buildings and construction policies

The global policy environment for building sustainability is diverse and evolving. While some nations lack comprehensive strategies for emissions reduction, an increasing number are implementing regulations to not exceed the 1.5°C global temperature increase threshold.

By 2023, the global number of building codes has grown to 81 for residential and 77 for nonresidential structures, with 80 per cent being mandatory. However, over 30 per cent of these codes have not been updated since 2015, potentially falling short of high-performance standards. With 80 per cent of floor area growth by 2030 expected in developing economies, many lack stringent energy codes, presenting an opportunity for improved enforcement.

Under the Paris Agreement, governments are expected to enhance their commitments every five years through their NDCs. As of December 2023, 194 countries and the European Union have submitted NDCs, with 48 updates since 2022. However, only 11 updates expanded on building related actions.

Figure 2 Global building energy codes by type and status



(Source: IEA 2023)

Note: Countries with dark 'red' outline have adopted updated building energy codes since 2021.Investment and financing for sustainable buildings

Transitioning to net-zero buildings necessitates strategic use of policy and financial tools. By using policy tools, such as capacity development, mandates and incentives in collaboration with financial tools, such as grants, equity instruments, risk mitigation tools, contracts, asset finance models and others, investment barriers in energy-efficiency and low-carbon technologies can be overcome.

Global investment in building energy efficiency rose by approximately 14 per cent in 2021, to US$285 billion. The increase was largely driven by public investment and Europe's response to energy insecurity. The investment is expected to drop to US$270 billion in 2023. Nevertheless, energy efficiency investments offer a way to mitigate risk exposure to energy cost volatility and reduce emissions at the same time. Despite the projected reduction in efficiency spending, investments are increasingly being directed towards technologies that enable net-zero carbon-ready buildings. However, the lack of knowledge around energy efficiency investment remains a barrier to adopting strategies that reduce perceived risks associated with these investments.

Innovations in business cases for renovation and green building construction industry

The construction sector has among the lowest productivity within the global economy. It needs to boost building decarbonization to address climate challenges, requiring innovative business models. These models enhance renovation efficiency and cost effectiveness through central planning and coordination. For instance, an approach in Germany has achieved a deep renovation of a building into a climate-neutral structure in just 22 working days.

Standardizing best practices within building types and climate zones is crucial for scalability and replication. Digitalization, including 3D scanning and printing, is key for understanding and simulating renovation solutions, enabling thorough planning and prefabrication of components, thus saving time, materials and workforce.

Start ups are emerging as centralized solution providers, offering services from 3D scanning to on-site renovation coordination. They also handle the installation of solar photovoltaic (PV) systems, combining the roles of renovation and traditional energy service providers.

However, these new construction business models need supportive government policies. For example, in the Netherlands, owners can charge tenants a fee for net-zero energy standard renovations when energy bills go down. In Germany, solution providers benefit from feed-in tariffs for installed solar-PV. These innovative models demonstrate a promising path for future renovation practices, proving that innovation in the construction sector is achievable and successful.

Nature-based solutions and biophilic design

Nature-based solutions (NbS) and biophilic design are increasingly used in architecture and urban planning to promote sustainability. NbS aims to harmonize human-made structures with nature, leveraging ecosystem functions for climate regulation, water purification and habitat creation. An NbS approach can enhance air and water quality, support biodiversity, and mitigate urban heat islands. However, the United Nations Environment Programme (UNEP) reports that investments in NbS are still low compared to activities that harm nature. NbS technologies like green roofs and constructed wetlands offer sustainable alternatives to traditional infrastructure, improving urban resilience against extreme weather.

Implementing NbS requires a multidisciplinary approach, with the International Union for the Conservation of Nature setting global standards. Biophilic design, meanwhile, fosters a connection with nature using natural materials, light and ventilation, and by designing spaces for nature interaction. This approach improves well-being, productivity and learning, particularly in healthcare settings. The Biophilic Cities Network and resources like the World Green Building Council's 'Circular Built Environment Playbook' exemplify global efforts to incorporate these principles, aiming to reduce energy, water usage and waste.

Recommendations for policy and decision makers

For governments, the urgent need is to develop and enforce climate action roadmaps for buildings and construction, with 161 nations still pending. Building energy codes must be strengthened to enhance efficiency, and despite economic hurdles, investment in building decarbonisation should increase. Policies should also aim to reduce embodied carbon through sustainable practices and materials and promote retrofitting to significantly reduce energy consumption.

Private sector actors are encouraged to integrate climate action roadmaps, channel investments into energy-efficient and net-zero carbon buildings and undertake retrofits to lower emissions. They should also be mindful of their social impact, promoting justice and equity regarding access to and affordability of housing.

Researchers and NGOs play a crucial role in supporting the creation of climate action roadmaps with evidence-based research. They should collaborate in developing data frameworks to support decarbonisation, raise awareness with media and through strategic communications and push for policy changes. Cross-sectoral collaborations are vital to enhance the decarbonisation impact.

These steps are critical for realigning the buildings and construction sector with global climate goals, ensuring a sustainable and resilient future.