

The Construction sector – a competitiveness asset for Europe

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Europe faces economic and social challenges, including high energy and housing prices, infrastructures costs, water deprivation, growing urbanisation, loss of competitiveness, slow economic growth and high exposure to climate change impacts. Innovation in construction supports housing and infrastructure durability and affordability, mitigates climate change, reduces energy and water consumption, and decreases European dependency on energy and critical raw materials. Responsible for about 50% of all extracted materials and 40% of energy use and emissions, the built environment (construction sector + use phase of buildings) plays a critical role in the European decarbonisation, circularity and competitiveness context.

Technological leadership and innovation allow boosting economic growth and leverage a clean and digital transformation in construction, whilst contributing to the European Green Deal and the Clean Industrial Deal objectives. The construction sector offers a huge leverage to deliver a maximum of benefits for all Europeans through a circular, digital and affordable built environment:

- A European future-proof and durable built environment must be nurtured through three main transformational areas: circular practices, digital technologies, and affordability models considering the entire lifecycle (upfront costs, capital and operational expenditure, end-of-life), in coherence with both policy and industry strategies suitable all over Europe.
- Decarbonisation, as energy- and resource-efficiency, are at the heart of construction and renovation activities since many years. Industry stakeholders constantly work on integrated innovative solutions to reduce energy demand, mitigate the climate crisis, build nature-based solutions and increase circularity of construction processes and materials, leveraging on life cycle assessments for decision making and innovative methods and tools for upskilling the workforce.
- With housing and infrastructure costs rising across the EU and too many Europeans struggling to find an affordable place to live, there is a need to develop new approaches for innovation. All stakeholders must be involved (material & products producers, asset owners and users, architects and designers, contractors, researchers and innovators, investors and insurers, public authorities) to address operational and business models, to attract the necessary public and private investments towards a climate-neutral economy and to assure a 'Just Transition' with affordable sustainable housing, targeting energy poverty and vulnerable consumers.

New dynamics and shifting priorities have emerged and the sector faces a mosaic of critical issues to answer to. The main ones are the implementation of the revised Energy Performance of Buildings Directive (EPBD), climate adaptation and circularity priorities, the implementation of the forthcoming EU Affordable Housing Strategy and the European Strategy for Housing Construction, as well as the Clean Industrial Deal objectives. The EU Competitiveness Compass sustains a Research & Innovation (R&I) pillar, which we regard as instrumental to support the sector on the implementation of these numerous challenges. Strong European research and innovation actions and programmes are a main vehicle for facilitating cross-border and cross-sectoral European scientific and innovation-led cooperation. Innovation must emerge through pan-European collaboration, in particular when Europe needs to strengthen its position and reduce dependencies from third countries.

This context enforces the requirement of more integrated R&I, and valorisation of its results so as to deliver innovative assets on key topics to achieve the ambitious global goals of the construction and built environment, hence opening a new era in terms of:

- Smart, circular and modular technology integration for decarbonisation (cleantech) and all-resources efficiency towards affordable housing and energy for people. The aim is to accelerate market acceptance and uptake for advanced solutions and financial/social tools for affordable, energy-efficient and safe housing in Europe for all. These include renovation and regeneration in urban areas as well as the transformation of residential and non-residential buildings.
- New approaches regarding people-centred operational/business models, experimental co-creation, engagement practices where applicable for industrialised and modular construction (on-site/off-site), minimising the use of virgin raw materials, and leveraging on advanced materials and circular economy. The overall goal must be to ensure affordability for all European citizens.
- Innovative models and tools supporting full Life-Cycle Analysis (LCA) and Life-Cycle Costs (LCC) optimisation for European Transport Infrastructure. Along with the need to adapt to new mobility schemes and the exposure to more extreme weather events, this requires innovative comprehensive models to guarantee resilience of the infrastructure from a life-cycle perspective (from design to renovation, dismantling and reuse).
- Digitalisation of construction. Construction data lakes, BIM, smart buildings, generalised digital twins and pervasive AI offer a large potential to increase productivity when being applied in a pragmatic and streamlined manner. Additionally, novel approaches like geospatial technologies and digital twins supporting human experts can increase the resilience of European territories through the delivery of monitoring, early-warning and first-response systems to the effect of extreme weather events such as floodings, heatwaves, earthquakes, etc.
- Integration of new technologies like aerial and robotic systems, enhancing real-time monitoring of material usage, emissions, and structural integrity in construction and industrial settings. Their precision and efficiency minimise fuel consumption, lowering the overall carbon footprint of construction. These capabilities support robust carbon accounting for the future EU ETS integration by generating verifiable emission data, and facilitate compliance with CBAM through transparent supply chains.
- Increasing the skills of the labour force. New forms of training and qualification in the construction sector must address the challenges of the digital and green transitions across Europe.
- Supporting the implementation of specific sectoral regulations and policy objectives. Some of the most salient ones are as the EPBD, the SRI (Smart Readiness Indicator), the EU-taxonomy for sustainable activities and Whole-Life-Cycle Global Warming Potential reporting for buildings.

Policy Proposals for a strong Research & Innovation Framework for the Construction Sector

To boost innovation and to strengthen the competitiveness of the European construction sector, a well-resourced and stable European Research and Innovation Framework Programme (FP) is key. It must reiterate the importance of collaborative research, leverage upon experiences and knowledge gained in previous FPs, and clearly focus on the market uptake of new developments, especially in regards of novel low-carbon materials and circular solutions. The construction sector has dealt with scattered and fragmented innovation initiatives, often lacking appropriate resources, and a common platform, in face of the large challenges and the existing innovation gap. There is a need to:

- **Accelerate the market uptake (valorisation/upscaling) of research results** by better involvement of economic operators. The role of public-private collaborations (e.g. the current Build4People (B4P) European Partnership) is crucial to answer critical challenges and to mobilise the entire innovation value chain in the next planning period (post-2027 MFF). We advocate that the B4P European Partnership should capitalize on its critical mass and continue its work under the next MFF. Implementing strategic links with the national and regional levels can enhance the coordination and clustering approach for European R&I projects (and along national & regional ones) as well as the networking and cross-collaboration of many national, regional or local R&I ecosystems. This is particularly important considering the more fragmented market structure of the construction sector, where the majority of entities are SMEs.
- **Streamline and consolidate different funding instruments** across all technological readiness levels (TRLs) in a portfolio approach for the construction sector. The spectrum must cover building innovation pipelines along the entire value chain, with a focus on TRL 7-8. Traditionally, fewer, and

dispersed, resources are allocated to R&I in the fragmented construction sector compared to other sectors.

- **Increase synergies with strategic sectors** to which priorities are interlinked and dependent on the innovation and productivity of the construction sector as, for example, transport and logistics infrastructures (road, rail, maritime), energy infrastructures, sustainable urban planning, preparedness and protection of critical infrastructure as well as reconstruction of disaster areas.

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