Draft proposal for a

European Partnerships under Horizon Europe

Built4People | People-centric sustainable built environment

Version June 2020

Summary

The partnership brings together the whole value chain to accelerate people-centric innovation in the built environment that drives the transition towards a sustainable society and economy, relying on the active engagement of its partners and a European network of Innovation Clusters. The three General Objectives are: Scientific (generate holistic innovation towards sustainability), Economic (revitalise the sector through decarbonisation and sustainability transition) and Societal (induce lasting behavioural change towards sustainable living).

About this draft

In autumn 2019 the Commission services asked potential partners to further elaborate proposals for the candidate European Partnerships identified during the strategic planning of Horizon Europe. These proposals have been developed by potential partners based on common guidance and template, taking into account the initial concepts developed by the Commission and feedback received from Member States during early consultation[1]. The Commission Services have guided revisions during drafting to facilitate alignment with the overall EU political ambition and compliance with the criteria for Partnerships.

This document is a stable draft of the partnership proposal, released for the purpose of ensuring transparency of information on the current status of preparation (including on the process for developing the Strategic Research and Innovation Agenda). As such, it aims to contribute to further collaboration, synergies and alignment between partnership candidates, as well as more broadly with related R&I stakeholders in the EU, and beyond where relevant.

This informal document does not reflect the final views of the Commission, nor pre-empt the formal decision-making (comitology or legislative procedure) on the establishment of European Partnerships.

In the next steps of preparations, the Commission Services will further assess these proposals against the selection criteria for European Partnerships. The final decision on launching a Partnership will depend on progress in their preparation (incl. compliance with selection criteria) and the formal decisions on European Partnerships (linked with the adoption of Strategic Plan, work programmes, and legislative procedures, depending on the form). Key precondition is the existence of an agreed Strategic Research and Innovation Agenda / Roadmap. The launch of a Partnership is also conditional to partners signing up to final, commonly agreed objectives and committing the resources and investments needed from their side to achieve them.

The remaining issues will be addressed in the context of the development of the Strategic Research and Innovation Agendas/ Roadmaps, and as part of the overall policy (notably in the respective legal frameworks). In particular, it is important that all Partnerships further develop their framework of objectives. All Partnerships need to have a well-developed logical framework with concrete objectives and targets and with a set of Key Performance Indicators to monitor achievement of objectives and the resources that are invested.

Aspects related to implementation, programme design, monitoring and evaluation system will be streamlined and harmonised at a later stage across initiatives to ensure compliance with the implementation criteria, comparability across initiatives and to simplify the overall landscape.

[1] https://www.era-learn.eu/documents/final_report_ms_partnerships.pdf

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Strategic R&I Agenda (SRIA) development timeline:
26 May- 05 June : broad EU-level stakeholders consultation on the first draft
05 June – 15 June : consultation of the Commission services
03 June – 17 June: national stakeholders consultation via the NCPs network
22 June- first draft ready for the internal discussions and for setting funding priorities for the first two years
Second half of the year- final version ready for launching the Partnership

CONTENTS

1 CONTEXT, OBJECTIVES, EXPECTED IMPACTS

This chapter (section 1.1) first introduces the context for the creation of the envisioned partnership, the problem to address, while underlining related barriers. Then (section 1.2) the vision, objectives and expected impacts of the envisioned partnership are introduced.

1.1 CONTEXT AND PROBLEM DEFINITION

Context: The built environment sits at the crossroads of many policies and is a necessary vehicle to achieving a growing number of objectives and targets. This is due to the sheer dominance of the built environment in the landscape, as well as its economic value and omnipresence in human activity. The built environment includes not only buildings and infrastructure, but also heritage sites, public spaces. A holistic approach to the built environment is needed to integrate all its elements in a harmonious, inclusive and sustainable way. R&I, spatial planning and quality architecture are therefore key tools to transform and improve the environment in which we all live and to achieve a better environmental sustainability and climate neutrality across the built environment value chain and the buildings and infrastructure life cycle.

Responsible decisions and actions, when creating and transforming the built environment, can help accomplish many targets supporting sustainable growth, including energy transition and climate action, circular economy, digitalisation, high-quality architecture, heritage preservation, health & wellbeing, accessibility, inclusiveness and employment. Figure 1 below illustrates how the built environment has a direct positive impact on more than half of the UN Sustainable Development Goals (9 of the 17 goals). The built environment has to be understood as much more than a collection of buildings. It does also include infrastructures and other elements related to the needs of our societies. Such a widely defined built environment has not only the direct impact on climate and environment, but also features the level of sustainability and climate neutrality in the society and economy (e.g. by encouraging behavioural change or green businesses).

***Figure 1**: How buildings (and the whole built environment) are connected to the 17 UN SDGs.*

The need for an extended partnership: much of Europe's leadership on the energy performance of buildings can be attributed to the robust and ambitious policy framework in place, notably the Energy Performance of Buildings Directive (EPBD)[2], the Energy Efficiency Directive (EED)[3], and the Renewable Energy Directive (RED)[4]. This framework provides solid foundations for the uptake of technology and socio-economic innovation from EU research and innovation programmes. Under FP7 and Horizon 2020, energy performance of buildings was supported by the Energy-efficient Buildings (EeB) PPP[5]. The PPP succeeded in advancing the TRL of a number of solutions for the buildings sector, with a focus on components, materials and technologies. However, the PPP, targeting the technology development, did not address the role of buildings and infrastructure in the societal and economic transition to environmental sustainability and carbon neutrality. There is a need to develop a truly integrated, holistic and people-centric approach to the design, construction, operation, maintenance, rehabilitation and recyclability of buildings and the built environment that will drive the sustainable transition in the society and economy. This will require expanding the scope from the current mostly **use stage energy efficiency** approach towards **a holistic approach** integrating the whole life cycle of the built environment and incorporating the rest of the dimensions of sustainability: material and resource efficiency and circularity, climate resilience, social and industrial sustainability and a digital dimension encompassing the whole life cycle.

The **Built4People partnership** will address the shortcomings of its predecessor by building on its strong foundation, bringing together the whole value chain to radically accelerate progress on the more holistic R&I agenda for a people-centric sustainable built environment. The partnership will work across disciplines and life cycle stages, and across various scales, from building, block of buildings, and district, and bringing components and modules to city and wider regional and national levels. The partnership will build on the results developed in the previous initiatives (in particular the EeB PPP, but also FoF outcomes on construction as manufacturing, SPIRE outcomes on resource and energy efficiency, EIP Smart Cities on methodologies & action clusters, EGVI PPP on sustainable road transport, BBI on bio-based solutions, construction demolition waste protocol and guidelines, material recovery targets and BAMB project, environmental performance through LEVELs and environmental performance of construction products and integrated life cycle digital models etc.). The partnership will focus on the interactions between buildings/built environment and the other sectors, like industry, energy and transport, to positively contribute to decarbonisation and sustainability objectives of these sectors. It will foster market uptake of innovative products, solutions and processes. For this, the active involvement of end-users will be crucial to consider their needs, expectations, aptitudes and financial capacity and ensure high potential of innovation for producing lasting change in society and economy towards sustainability.

Problem: The built environment is responsible for a significant share of our consumption of energy and resources: 50% of all extracted materials, 30% of water consumption, 40% of energy consumption and 36% of CO2 emissions in the use phase. At the same time, the embodied carbon in the built environment has been estimated to 10-12 % of total carbon emissions in several member states.

[2] Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings, https://eur-lex.europa.eu/legal-content/FR/ALL/?uri=CELEX%3A32010L0031

[3] Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32012L0027

[4] Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2018.328.01.0082.01.ENG&toc=OJ:L:2018:328:TOC

[5] http://e2b.ectp.org/

Construction and deconstruction/demolition waste are one of the heaviest and most voluminous (25%-30%) waste streams generated in the EU. This overall problem can be considered along the following perspectives and corresponding **challenges**:

- **Energy efficiency**: the EU has boldly led global action on energy efficiency in buildings and neighbourhoods over the past decades relying on ambitious policies. Europe's building and construction industry and the energy sector are mobilising to deliver a new generation of nearly zero- energy buildings from 2021. The recently adopted Clean Energy for all Europeans Package is a major step towards carbon neutrality. It has put the EU on an ambitious track for 2030 on renewables and energy efficiency, also ensuring that energy consumers are empowered and can reap the benefits of the clean energy transition. This endeavour will be taken further as part of the European Green Deal[6], which also paves the route towards a net zero emissions economy by 2050 and will include a flagship initiative on buildings renovation (the "renovation wave") in order to increase renovation rates.
- **Decarbonisation**: the Paris Agreement requires the building and construction sector to decarbonise globally by 2050, if we wish to avoid the catastrophic impacts of a +2 degree rise in temperature. The built environment will be a major enabling element of the clean energy and decarbonisation transition through activation of the energy demand side as buildings and districts can provide distributed renewable energy generation, thermal or electric storage, flexible consumption and energy efficiency that can be valorised in terms of reduced system capacity needs. Smart technologies and data economy will accelerate this process by developing the enabling digital ecosystem for the new clean energy services and business models based on the aggregated demand-side assets to play a role in the redesigned energy system and market. The connection between buildings and electromobility solutions will grow as a strategic evolution: buildings will represent the principal location for recharging all vehicles. This will be changing the role of buildings from passively consuming energy to optimising the delivery of all the necessary functions while actively adapting to the energy system needs.
- **Resource efficiency and circular economy**: high consumption of resources and embodied emissions cumulate across the lifecycle of the built environment. They arise not only from buildings but also from the infrastructure, which is needed to supply buildings with utilities such as power, water and drainage as well as the transport infrastructure to enable mobility of citizens and goods. The EU's infrastructure, similarly to buildings, is in desperate need of repair, renewal and reinforcement against not only wearing out in time but also due to the increasing threats including those posed by the climate change. To meet the renovation challenge of buildings and infrastructure without trade-offs in terms of an increase in emissions and resources use, truly holistic solutions and approaches must be developed taking the life-cycle perspective and considering the entire value chain. Lessons learned from previous research have shown for instance that recycling plastic in asphalt destroys the circularity of the asphalt itself. Tackling climate change and environmental stress (raw material scarcity, pollution, biodiversity loss, resilience to natural hazards…) implies rethinking the way we design, manufacture, build and maintain our built environment, as well as manage its end of life.

  For this reason, the EU set out ambitions to move towards radical resource efficiency and circular material flows in its previous Circular Economy Action Plan. It is now ramping up the efforts with a new Circular Economy Action Plan proposed in the Green Deal, announced in European Commission President Ursula von der Leyen's priorities, set out in July 2019.

[6] https://ec.europa.eu/info/sites/info/files/european-green-deal-communication_en.pdf

- **Industry transformation towards sustainability**: Alongside the transition that is required to deliver the Green Deal, there is another massive transformation taking place in the construction industry, which can contribute and accelerate sector decarbonisation and increased environmental sustainability. As part of the Fourth Industrial Revolution, the construction industry is undergoing digitalisation and industrialisation. The transformation is not limited to the digitalisation of machines and use of new automated processes that can be undertaken by robots and drones. A huge factor in the transformation is the rapid proliferation of and major role that is increasingly played by data.
  Digitalisation and industrialisation of construction both present opportunities and challenges for climate and environment and are obvious enablers for transforming the sector to lower its environmental and carbon footprint. The opportunities come from the potential of these new trends to solve many of the environmental or climate-related problems in our built environment and to create new sustainable solutions and services, which will directly benefit the EU citizens and which will foster green economy. The challenges arise from the environmental and carbon footprint of these new trends (e.g. the increase of energy use caused by the digital solutions and data).
- **Citizen engagement towards sustainabilit**y: to accelerate and achieve the transition towards low carbon and sustainable living through the transformation of our building stock and built environment, it is crucial to have citizens on board and make sure that the transition is accepted and feasible for all. This requires additional efforts to promote highly energy and resource efficient solutions that are offered on the market at reasonable costs. This also requires to re-design the built environment to encourage sustainable behaviour, rationalise construction, mass-market the offer of sustainable products and solutions as well as increase the availability of trained professionals to deliver quality construction and installation of sustainable solutions achieving the designed performance. Finally, this implies to better integrate and understand the human factor in research and innovation as well as carefully consider end-user needs and expectations (in terms of comfort, health, well-being or accessibility). People-centric approach must translate into end-users involvement in design, development and demonstration of innovation to ensure high potential for social acceptance and effectiveness of the solutions to achieve sustainability objectives and to ensure that possible barriers to the use of these solutions, in particular by persons with disabilities and older persons who can experience accessibility issues, are well taken into accounts.

Barriers

To address the problem and its underlying challenges, the following barriers will have to be considered:

1. Complexity: The built environment is a complex, multi-faceted system and a value chain involving many economic sectors. It is linked to various societal challenges and is subject to multiple policy objectives, targets and regulatory frameworks, which are not necessarily coordinated. This leads to an inherent complexity and sometimes conflicting objectives relating to technology innovation and product development (e.g. contradictions between the need for massive renovation programmes and the need to reduce construction and demolition waste). This issue is becoming even more critical with the development of digital technologies, which are radically altering the capabilities of buildings and infrastructure and disrupting the traditional value chains. This makes it difficult to address all the necessary priorities (energy and climate goals efficiency and sustainability, affordability, accessibility, safety, recyclability/reuse, circularity, demolition, noise, environmental impact, innovation and resilience, etc.) in an integrated manner.

2. Highly distributed construction value chain and building stock:. The construction sector is mainly composed by SMEs, with 94% of its enterprises having up to nine employees[7]. This is linked to limited investment to R&I. Additionally, construction projects are of high complexity involving many different professionals and in order to achieve sustainability across the lifecycle of assets better information flow and collaboration is required. Industrial symbiosis and circular economy relationships – i.e. win-win collaborations - need to be developed between different players in the value chain.. Lastly, the building stock itself, especially housing, is heterogeneous in terms of typologies, materials used, architectural style and year of construction, requiring often local and custom-made solutions. This need is reinforced by multiple ownership of (and even within) buildings and infrastructure, different types of tenancies, and a multitude of often local regulations. .

3. Low rate of replacement and large stock of existing buildings and local infrastructure: Due to the historical and cultural value of the built environment in Europe, the turnover and replacement rate of the existing stock is low. 80% of today's buildings will still be in use by 2050. The built cultural heritage (buildings as well as their immediate surrounding, quarters) is an identity factor of the European society, rendering it necessary to customise any intervention in order to preserve its unique cultural value.

Upgrading and modernisation of the existing built environment to adapt it to new societal trends and needs remain therefore the constant challenge in Europe. The existing local infrastructure can also be adapted to fulfil new roles and objectives (e.g. clean energy, EV charging, data collection and support to the automated driving) for the local communities and the society as a whole. Well-functioning local infrastructure is vital for the development of the local economy, new services and business models.

4. Limited renovation rates and high construction and renovation costs: The ambitious policy objectives for the buildings renovation to deliver on energy and climate targets require step change in the way we finance, organise and carry out the renovation works. New procurement, business and financing models need to be developed that fit industrialised processes. Performance contracting has showed promising results for large-scale projects even if, in many cases, these still use traditional design and construction methods. Barriers are still to be removed to mobilise investments, in particular incentives are needed for SMEs and private owners in the residential sector, as well scaling-up the size of projects to target larger proportions of the building/ built environment stock and overcome the ultra-fragmentation of investments. In addition, actions are needed to train and build-up capacities and skills of the workforce, accelerate permitting and, most importantly, to simplify the information and process for owners / occupants to proceed. Finally, people's expectations, motivations, needs, aptitudes and financial capacity should be further researched and better integrated in the renovation process.

Today's solutions for renovation are still costly, partly due to the wide variety of building typologies and ownerships, which results in each renovation project being essentially unique. Design and construction processes are complex and labour- and resource intensive. In addition, high energy performance and sustainable buildings require a very high standard of construction and renovation. Investments in energy efficiency and the integration of renewables may have a long payback time, thereforethe cost element of the technologies and systems proposed should be better factored in during the research and innovation phase including overall life cycle cost analysis. Solutions and works must be standardised to allow economies of scale, reliable performances and workforce expertise while at the same time overcoming decision-making fragmentation and adapting to the peculiarities of each built element, notably built heritage.

[7] JRC (2019). Digital Transformation in Transport, Construction, Energy, Government and Public Administration.

1.2 COMMON VISION, OBJECTIVES AND EXPECTED IMPACTS

The Built Environment as the driver towards sustainable living and green economy

The role of buildings in transforming the European society and economy toward sustainable and carbon neutral operation has been recognised in the European Green Deal Communication, which has also confirmed the need for establishing this related R&I partnership under Horizon Europe[8].

The European Commission's report "Accelerating clean energy in buildings"[9], published as part of the Clean Energy for All Europeans Package[10], also underlines the need for a joint R&I action by stating that "the EU is already a global leader in innovation systems for buildings. Integrating energy efficiency, renewables, storage and connecting to digital and transport systems through buildings allows further expanding on this leadership and making the most of the favourable regulatory framework". Further to energy and decarbonisation aspects, research and innovation investments to improve the competitiveness of the sector are more than ever needed for Europe to compete in the international market and support the delivery of a prosperous, modern, competitive and climate-neutral economy by 2050. Beyond technological solutions, the partnership must also encompass socio-economic advances to address non-technological barriers to the market. The associated vision is to deliver an integrated and holistic, people-centric (e.g. in terms of accessibility[11]) and lifecycle oriented approach to the design, manufacturing, construction, procurement, operation, maintenance and repair, renovation and end-of-life management of the built environment.

Overall Vision
The B4P partnership's common vision is high quality, low carbon and highly energy and resource efficient built environment driving the societal and economic transition towards sustainability. It is reached through a user-centric, holistic, life cycle-based and circular approach to innovation that will contribute to achieving EU sustainability targets (including in related sectors such as energy and transport). B4P will foster a sustainable society by facilitating the adoption of more sustainable lifestyles and economic models while improving quality of life, respect for heritage and cultural diversity, individual and collective well-being, social justice and economic prosperity.

[8] Communication on The European Green Deal, chapter 2.2.3. Mobilising research and fostering innovation, COM(2019) 640 final

[9] Annex to the Communication "Clean Energy for All Europeans", COM(2016) 860 final. Available at https://europa.eu/!wY69xM

[10] See https://ec.europa.eu/energy/topics/energy-strategy/clean-energy-all-europeans_en

[11] On this point, it is worth noting that the EU and all its Member States are party to the UN Convention on the Rights of Persons with Disabilities that contains clear obligations to make the built environment accessible for persons with disabilities. Hence the opportunity to ensuring accessibility when renovating buildings for energy efficiency or other purposes.

Key general and specific objectives

For this vision to become true, the B4P partnership will focus on the following key objectives as introduced in the following objectives tree:

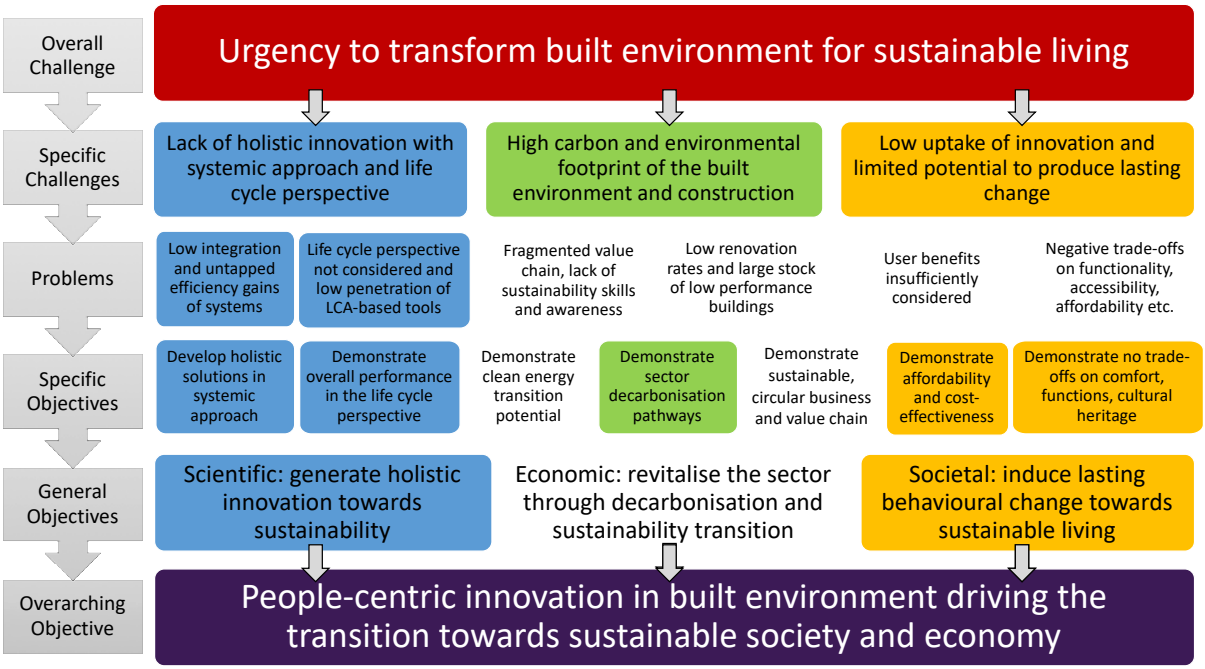

Figure 2: B4P- challenges, problems and objectives

The three specific challenges and associated problems are synthesised in the tables below, as well as the general objectives, their associated specific objectives and a preliminary identification of the Key Performance Indicators.

Challenge: **Lack of holistic innovation with systemic approach and life cycle perspective.**
The inherent complexity and fragmented nature of the sector hinder a holistic approach to innovation. Problems: The main barrier is low integration of various technologies developed in the value chain involving many economic sectors working towards multiple policy objectives, targets and regulatory frameworks, which are not necessarily coordinated. This makes it difficult to address all the necessary priorities in an integrated manner. In addition, resource and energy efficiency gains remain untapped when assessing the overall system performance instead of single-technology/single-product approach. Finally, a lifecycle perspective supported by Life Cycle Analysis (LCA) would allow to improve the overall impact of innovative solutions on environment and climate.

Challenge: **High carbon and environmental footprint of the built environment and construction.**
The built environment and related construction processes are together responsible for up to half of Europe's greenhouse gas emissions. Problems:

Buildings emit greenhouse gases and other pollutants during their operational lifetimes, and additionally when they are constructed and demolished. Traditional design and construction processes follow a linear "take, make and waste" model. Over a quarter of the EU's waste comes from construction and demolition.[12] The construction sector is one of the most resource consuming sectors in Europe - it accounts for approximately half of all extracted materials, and a third of water consumption.[13] The construction industry delivers a complex product within a highly fragmented SME-based sector. 95% of its 3.3 million companies have less than 20 employees that are often not a skilled work force and in need of a new mindset, practice and tools. This makes it difficult to develop a common vision for the sector's decarbonisation and sustainability, exacerbated by a lack of awareness and a skills gap (including digital) that are limiting performance-based approaches. Companies struggle to seize opportunities for greening their business operations through adoption of innovative sustainable solutions and circular business models. Potentially innovative solutions that might reduce embodied emissions and the environmental and climate impact of buildings face numerous barriers: a lack of reliable data, a lack of qualified/trained people who can adopt the solutions developed, and business models and contracts that are not adapted to sustainable ways of designing and delivering built works.

The built environment suffers from low renovation rates and a large stock of poorly performing buildings and infrastructure. The industry needs to accelerate innovation pathways to massively transform the built environment with the particular focus on the "repair", "reuse" and "renovate" rather than on new products manufacturing. The ageing European built environment faces challenges of degradation, lack of resilience to natural disasters, as well as the need to substantially upgrade its operations to meet the energy sector decarbonisation challenge. However, this should not take place without also shifting to a circular economy and addressing embodied emissions and environmental impacts.

Challenge: **Low uptake of innovation and limited potential to produce lasting change.**

The sustainable built environment should be adapted to citizen's needs and wishes. Innovative models to enable community-led urban development need to be explored. Although many innovative technological and socioeconomic solutions have been developed in the last decade, they have not been fully implemented in practice, which is hindering the adaptation of the built environment to new uses, challenges and requirements related to climate change and sustainability.

Problems:

Innovation in the buildings and construction sector often lack a user-centric approach, as the feedback loop goes through many intermediary stages and understanding of user needs is poor.

Yet, end-user engagement and empowerment is crucial both for creating the demand for sustainable solutions in the built environment and for these solutions to produce the lasting behavioral change towards sustainable living.

Sustainable low-carbon alternatives in comparison to traditional solutions may often be substantially more expensive, less convenient, lacking service ecosystem, distribution channels or creating trade-off in terms of altered functionality or performance. They are often not adapted to the existing building stock and its architectural constraints (e.g. cultural heritage). Finally, they may

[12] See https://ec.europa.eu/environment/waste/construction_demolition.htm

[13] See https://ec.europa.eu/environment/eussd/buildings.htm

not provide adequate additional benefit from the user perspective to motivate the replacement of the existing solutions and could not respond fully to user needs in terms of accessibility (e.g. persons with disabilities or elderly people).

General objectives:

Scientific objective: **Generate holistic innovation towards sustainability.**

Specific objectives:

Developing holistic solutions that break "technological silos" in the built environment, achieving high overall system sustainability performance and aiming to lower the carbon and resource intensity across the life cycle, whilst mainstreaming life cycle assessment (LCA) and LCA-based approaches.

Developing solutions that enable or increase interactions of building with networks or increase sectors integration considering the building as the networks node. For example, integration of building & transport infrastructure enables energy efficiency and decarbonisation pathways.

KPIs:

- % of energy or other resource efficiency improvements / gains triggered by innovation compared to best performing solutions already available on the market, demonstrated using LCA or LCA-based approach
- GHG emissions reduction across the lifecycle of the innovation comparing to best performing solutions already available on the market, demonstrated using LCA or LCA-based approach
- % of investment in innovation increased in the construction sector to achieve at least the EU average inter-sectoral ratio by the end of the Partnership
- % of new and renovated built assets linked to partnership projects and clusters that are compliant with the EU and global climate goals

Economic objective: **Revitalise the sector through decarbonisation and sustainability transition.**

Specific objectives:

Demonstrate profitability and job creation potential of the new sustainable and circular business models and value chains, which can be triggered by the innovation in the construction sector and in the other sectors (energy, transport).

Demonstrate sector decarbonisation pathways across all the players in the value chain.

Demonstrate industrialization potential and economies of scale, as well as applicability to a large share of the EU buildings stock/infrastructure.

Develop strategies, methods and tools to adapt skills, culture and way of working as well as end-user interaction and engagement to the opportunities arising from the new solutions.

KPIs:

- Number of new sustainable services and business models brought into the market and developed as a consequence of the Partnership
- GHG emissions reduction achieved across the value chain
- Energy and resource efficiency achieved across the value chain
- Number of people trained across the whole value chain in the deployment of innovative sustainable technologies, systems and methods

Societal objective: **induce lasting behavioral change towards sustainable living.**

Specific objectives:

Demonstrate cost-effectiveness of innovative solutions for all the actors across the value chain and its affordability for the end user and mainstream life cycle costing approaches.

Orientate and demonstrate innovation to achieving specific outcomes for the users (the end user regardless their age or ability or any user in the value chain, e.g. installer) in terms of functionality, comfort, convenience, accessibility, health, wellbeing, social equity – alongside any broader emissions and resource goals.

Demonstrate preservation and enhancement of architectural elements that represent cultural / historical value, and encourage community-centric urban development.

Develop strategies, solutions and tools to reduce time to market of the new low-carbon, sustainable technologies.

Reduce time to market of innovation by using national platforms & resources as multipliers that will ensure the replication of the actions supported at the EU level through policies or demonstration projects in National initiatives and using National funds in order to multiply the effect and impact of the EU actions.

Engage the actors across the whole value chain (clients and investors, architects, engineers, developers and contractors, suppliers and manufacturers etc.) as well as policy makers and civil society in the design, development and implementation of the new solutions, so that user-centric approaches become reality.

KPIs:

- % of innovations with performance validated in real life conditions through post occupancy evaluation involving end users
- % of innovations that are successfully commercialized and brought to market, as a demonstration by value chain actors of the added value of the innovation in their business operation
- At least, 20 % of the projects under the umbrella of the partnership have an innovation community (national platform, regional clusters or citizens networks) or a recognised structure that involves local communities in decision-making processes, either within its consortium or closely linked
- At least, 20 % of the projects under the umbrella of the partnership have public bodies within its consortium
- The public procurement of innovative solutions is increased by 50 % at the end of HEu, with regards to the beginning of the program and/or at least 20% of projects under the Partnership can demonstrate changes in public procurement policies to promote or require adoption of sustainable innovations at local, regional or national level
- Due consideration of accessibility in all projects
- At least 25 % of the projects under the umbrella of the partnership include training activities for the construction workforce or other relevant actors in the value chain

Intervention logic

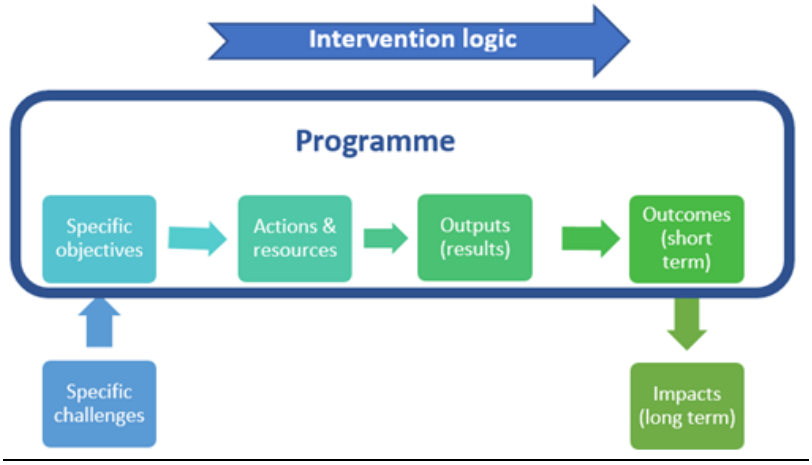

Figure 3: intervention logic scheme

With respect to the 7 main specific objectives, defined based on the assessment of the specific challenges and problems a set of expected outputs has been identified. These outputs, understood as results or deliverables of funding activities, will lead to achieving the set of specific outcomes, understood as short-term impacts directly triggered by the intervention within the programme duration. These outcomes will contribute in a longer term (beyond the programme duration) to achieving key societal, economic and environmental impacts listen in the following section.

Specific Objective A: Develop holistic solutions in a systemic approach		
Outcome 1	Substantial energy or resource efficiency gains triggered by systemic innovations for application in the built environment	
	Output 1.1	Breakthrough systemic and integration-ready (packaged) solutions for more sustainable buildings or infrastructure across the whole life cycle, including embodied and operational impacts
	Output 1.2	Comprehensive and validated methodologies and tools for the assessment of the built environment (as an integrated system of systems) performance in terms of resource efficiency
	Output 1.3	Integrated and cross-sectoral planning and management for sustainable built environment, including district-level energy planning
	Output 1.4	National implementation plans for the EU Sustainable Finance Action plan and the EU Green Taxonomy for buildings
Outcome 2	Increased economic activity for the actors integrating the systemic innovation solutions and a shift to mainstreaming life cycle costing approaches.	
	Output 2.1	Certified, industrialised and market-ready multifunctional (passive & active) prefabricated turnkey packages (component or system)
	Output 2.2	Sets of proven cost-effective, market-ready packages delivering buildings and infrastructure which are aligned to long term EU and global sustainability goals
	Output 2.3	Demonstrated new optimal circular value chains through construction & supply-chain clusters and living labs
	Output 2.4	Evidence-based policy recommendations, guidance and best-practice to EU and Member States towards flexible policy objectives and regulatory frameworks

	Output 2.5	Evidence-based innovation investment schemes and tools towards built environment owners and users to assess innovation integration business case and profitability
	Output 2.6	Tools for life cycle costing approach to evaluate the business case for innovative sustainable and circular solutions.

Specific Objective B: Demonstrate overall performance in the life-cycle perspective		
Outcome 3	Increase the overall impact of built environment innovative solutions on environment and climate – decreasing carbon footprint and increasing carbon handprint	
	Output 3.1	Novel and multifunctional materials with improved life cycle, along with material labelling according to lifecycle performance
	Output 3.2	Tools and methodologies to simplify the holistic assessment of environmental and social impacts of materials, components and processes during the design and delivery stages of built environment projects.
	Output 3.3	Solutions for anticipating (estimate / compute) and recording the future requirements for deconstructions and re-use of built assets (e.g. relocation loads, thermal insulation, re-use and reparability of components).
	Output 3.4	Protocols and associated tools for testing and certification of materials and components for reuse with non-destructive or minimum invasive testing.
	Output 3.5	Methodologies and tools for zero-carbon works – including requirements and business-models supporting the transition to zero-carbon civil works vehicles and protocols.

Outcome 4	Increase the resilience of the built environment to protect and enhance social, environmental and economic value in the future	
	Output 4.1	Designs, materials and solutions to improve resilience, preparedness & responsiveness of the built environment to disruptive events
	Output 4.2	New standards and tools to integrate data on future climate conditions and risks (adaptation to climate change) into all aspects of decision making along the built environment value chain.
	Output 4.3	Rich and open datasets for LCA in the construction sector, with clear methodologies and guidance for applying multicriteria decision-making techniques (such as reference service life of buildings and their components, end of life scenarios)
	Output 4.4	Tools and guidance to support, and to demonstrate the value of, wider deployment of social impact tracking and ESG reporting for all actors in the built environment value chain.

Specific Objective C: Demonstrate clean energy transition potential		
Outcome 5	ENERGY DEMAND: reduce consumption, increase flexibility to accommodate more renewables, give the benefit to citizens by paying less, reduce energy poverty	
	Output 5.1	Solutions for stronger democratic participation, energy citizenship and new energy communities => Smart energy consumption in the built environment
	Output 5.2	Smart products and energy management systems for more flexible demand. Solutions for additional flexibility on the demand side, including demand response and local storage.
	Output 5.3	Sector integration solutions arising from electric mobility, integrating the charging point and the battery of the vehicles in the local power system.
	Output 5.4	Targeted, holistic solutions for retrofitting existing buildings that enable them to take full advantage of the benefits of demand response approaches
Outcome 6	INCREASED LOCAL PRODUCTION: buildings and districts as producers of energy and owners, citizens and communities as elements of the local energy system producing energy and beneficiaries of the energy (local) value chain.	
	Output 6.1	Guidance and business models (demonstrations/pilots) integrating individual owners and energy communities as beneficiaries and part of the value chain. Prosumers should directly receive value for the produced energy, with more and more real-time based systems and pricing.
	Output 6.2	Energy management systems and storage solutions for positive energy buildings and retrofits supporting grid flexibility and coupling solutions for electricity and heating.
	Output 6.3	Market and regulatory ready solutions for micro-grid to share self-produced energy within blocks buildings
	Output 6.4	Market and regulatory ready solutions to harness local heat sources, e.g. from excess heat, for close-by buildings and districts

Outcome 7	ENERGY TRANSITION BOOST: supply and integrate in the built environment, in a sustainable way, the needed supporting network infrastructure for the energy transition, both for stationary and transport sectors.	
	Output 7.1	Evidence-based guidance and demonstration of built environment solutions to create the infrastructure and support business cases for the private sector as e.g. recycling, electrification, district energy, transport and storage of CO2, refilling stations for H2, charging stations for electric cars, energy storage
	Output 7.2	Smart financing and new business models for the integration of RES (e.g. shared ownership, energy communities), and interactions built environment networks - including raising awareness and building up skills in the construction and supply value chain

Specific Objective D: Demonstrate sector decarbonisation pathways		
Outcome 8	Towards built environment as a CO2 sink for the future through increased deployment of circular and nature-based solutions and effective integration with the bio-economy	
	Output 8.1	Digital solutions providing a GHG compass over the overall life-cycle of the building / infrastructure
	Output 8.2	Large-scale demonstrators of multi-usage & dynamic buildings and infrastructures showing deep reconfiguration capabilities
	Output 8.3	Development and measures to accelerate and scale up the adoption of digital certifications and databases (such as Energy Performance Certificates, Smart Readiness Indicator[14], building logbooks) with longer commissioning and condition-based maintenance to replace maintenance contracts
	Output 8.4	Digital tools to raise awareness on environmental impact and on reduction pathways for all stakeholders, from companies to citizen, through public authorities and contractors

Specific Objective E: Demonstrate sustainable, circular business and value chain		
Outcome 9	New business opportunities with reduced risk for investors, opening the supply chain to reused/repaired products, reuse/refurbish buildings, demolitions and urban mining. (product manufacturers, re-certification, deconstruction, trading etc.)	
	Output 9.1	Frameworks for multiple CDW (*Construction & Demolition Waste*) reuse technical and economic viability at regional level (CDW streams, protocols and guidelines), with e.g. exchange platforms and services
	Output 9.2	Support for new market actors as recycling and material handling companies (including urban mining companies), on-line trading service providers, etc., with new instruments (financing, green procurement, labelling, standards, BREFs & guidelines) to stimulate the integration of CDW (and other waste) business in the construction ecosystem, with better valuation of externalities of waste management and better understanding of local resource streams
	Output 9.3	Digital solutions that support and ease the re-use of buildings, infrastructure and components throughout the whole lifecycle (Reusable BIM) – including BIM objects for the new building design equally sourced from the product manufacturers and second-hand material dealers
	Output 9.4	Sector coupling – for instance innovative routes to recycle/upcycle waste and residue streams from one industry to the other (e.g. use by-products for producing new construction materials
	Output 9.5	New start-ups with people-in-value-chain perspective services. Enabling real-time services – relying on buildings and infrastructure data, and acting as data providers and support for data generation for people everyday activities

Specific Objective F: Demonstrate affordability and cost-effectiveness

[14] As defined in the Energy Performance of Buildings Directive (2018/844/EU):

Outcome 10	Affordable and feature-adapted built environment for users and inhabitants	
	Output 10.1	Products designed to survive harsh conditions / disruptive events in several lifecycles
	Output 10.2	Solutions for smart and responsive buildings exploiting an improved knowledge of user experience (Building as a Service)
	Output 10.3	Building solutions, along with business models and investment/economic decision tools, to support multifunctional buildings optimising multi-usage and space as a service-oriented solutions
Outcome 11	Value for building owners, and increased flow of capital investment and long-term finance into built environment as a sustainability asset	
	Output 11.1	Socio economic studies to understand barriers at end user level for demand and investment, along proven marketing and awareness raising campaigns
	Output 11.2	Demonstrated and replicated set of financing and incentive mechanisms and packages created and tested on local scales, to make renovation/adaptation affordable and with proved RoI
	Output 11.3	Tools to streamline ESG reporting and disclosure of performance on investments in built environment assets at portfolio level

Specific Objective G: Demonstrate no trade-offs on comfort, functions, cultural heritage		
Outcome 12	Demonstrated and/or certified built environment with regard to expected or agreed user-centric functions and characteristics	
	Output 12.1	Innovative solutions for technical quality control, standardization and certification of innovative materials, components and integrated BE
	Output 12.2	Socio-economic valuation methods for buildings and infrastructures renovation with consideration of accessibility issues.
	Output 12.3	Advanced tools and guidance to improve smart readiness in the built environment
Outcome 13	Demonstrate enhanced health, wellbeing and inclusiveness through improved indoor and outdoor environment	
	Output 13.1	Materials, products and designs that demonstrably improve key public health metrics
	Output 13.2	Tools and guidance to measure and evaluate building and system performance against key public health metrics and key social and cultural value indicators such as accessibility for persons with disabilities.
	Output 13.3	Methodologies and tools for sustainability-integrated performance contracting for the built environment
Outcome 14	Demonstrate low carbon, resource efficient, open, accessible and inclusive solutions for conservation and embellishment of cultural heritage built environment assets	
	Output 14.1	Low carbon and durable materials, component packages and standardised solutions (well integrated to the local environment) for retrofitting cultural heritage (low tech, bio-based, locally sourced, or innovative materials compatible with traditional materials)
	Output 14.2	Strategies and tools for the adaptation of cultural heritage to long-term current and new uses while maintaining its cultural value,

		including sustainable solutions for improved resilience, durability and safety of historical assets and new business models for private/ end-user investment in cultural heritage for a better preservation and restoration of cultural BE assets
	Output 14.3	New ecodesign standards/requirements for heritage maintenance and retrofitting (including LCA and BIM)
	Output 14.4	New technologies to allow an increase accessibility and inclusiveness of cultural assets and sites for all (virtual reality, augmented reality), along with innovative approaches to foster a better understanding by citizens of cultural heritage and its sociocultural value

Key societal, economic and environmental impacts

1. **Decarbonisation, clean energy and mobility**

Goal: The overarching driver is the ambition to achieve climate neutrality in Europe by 2050 entailing decarbonisation of the EU building stock, in line with the EPBD[15], and contribution to decarbonisation of the energy and transport sectors.

Expected Impacts:

- Tangible progress towards the objective and the long-term energy and climate EU objectives aiming at the full decarbonisation of the building stock across the whole life cycle.
- Achieving at least 40% less embodied carbon with significant reductions in the product and construction stage.
- Enabling a smarter, more decentralised and flexible energy system based on more efficient energy use and renewable energy generation.
- Contribution of the built environment to the decarbonisation of the transport sector by supporting clean mobility.

2. **Resources efficiency and circularity**

Goal: Achieving a circular construction sector that optimises the use of resources and results in zero waste to landfill, which facilitates the use of secondary materials from construction and demolition waste and promotes design for reuse practices.

Expected Impacts:

- Transition from a linear to a circular economy in buildings and construction.
- Increased resource efficiency in the built environment.

3. **Health and wellbeing**

Goal: A healthier, more sustainable built environment will bring wellbeing and prosperity to people. To achieve this, the entire built environment must decrease the use of fossil fuel-based heating and transportation and new construction and renovation should be designed to promote healthy lifestyles for all citizens in non-toxic environment.

Expected Impacts:

- Improved built environment leading to a better quality of living for people as citizens and economic actors.

[15] EPBD - Energy Performance of Buildings Directive (2018/844/EU)

- Increased health and productivity in the workplace and home through improved indoor air quality, access to daylight and better acoustic and thermal comfort.

4. Value and competitiveness

Goal: Fostering productivity increases and rationalisation across the sector. Development of an investor-friendly framework, integrating sustainability principles to property valuations and risks ratings (beyond LCC) with enough flexibility to be updated regularly. Development of new approaches, business models and financing mechanisms to scale up buildings renovation for example by applying district/neighbourhood approach to achieve economies of scale, while preserving the cultural identity of building and infrastructure stocks.

Expected Impacts:

- Increased competitiveness of the EU construction industry and real estate sector.
- Increased capacity and productivity of the EU construction ecosystem value chain to implement incoming innovations. Increased long-term value, profitability, sustainability and overall investments performance and investor confidence.

5. Resilience

Goal:

Improve resilience of buildings and infrastructure so they are future-proof and can withstand dramatic changes in climate and other threats like seismic activity, terrorism, cybercrimes etc. but also adapt to social and demographic changes (ageing society, disabilities, urbanisation…).

Expected Impacts:

- Reduction in built environment exposed to physical risks from changing climate.
- Increased deployment of sustainable approaches to climate adaptation including passive functions, sustainable drainage and flood prevention measures and seismic protection.
- Inclusive and accessible buildings that remain usable by all people regardless of age and disability.

6. Water & Biodiversity

Goal: Bring nature back into EU built environment by supporting green and blue infrastructure, and provide ecosystem services. Develop and favour natural solutions in the interventions in the built environment operation, such as green roofs that can serve for insulation, water collection and resource generation, greening the internal parts of building blocks in EU cities, increase vegetation in streets and green walls against urban heat waves.

Biodiversity and the natural environment are central to human well-being, providing food, clean air, water and space for recreation. Construction and renovation of buildings and infrastructure must be carried out in a way that does no harm, but rather actually enhances our natural environment.

Expected Impacts:

- Reduced (or prevent increase in) risk of water shortages through increased deployment of water harvesting and recycling measures in the built environment.
- Restoration of biodiversity and natural ecosystems in the built environment.
- Symbiotic operation of buildings/infrastructure with natural environment
- Reduction of urban heat waves
- Increase of available green spaces (m2/person) in urban centres

7. Social inclusion, cultural value and just transition

Goal: Ensure a transition towards decarbonised and sustainable built environment, which benefits to all of Europe's citizens, preserve its cultural heritage and architecture, protects the most vulnerable

groups and mitigates negative impacts of the transition by creating new job and business opportunities.

Expected Impacts:

- Promotion of the economic and social development of rural areas to ensure better access to services and infrastructures, increased virtual and physical connectivity.
- Affordable and accessible buildings ensuring adequate warmth, cooling, lighting and the energy to power appliances for guaranteeing health and a decent standard of living for all.
- Respectful approach to the built environment, including heritage, spatial design and natural landscapes to preserve European identity.
- Enhanced citizen's engagement, empowerment, participation and co creation.
- Reduced costs of the transition for citizens by ensuring the affordability of new and renovated building stock.
- Creation of higher added value jobs and development of the local economies positively overweighting the socio-economic costs of the transition to climate neutrality and sustainability.

Reaching these objectives and related impacts will follow the intervention logic, which is described in the section above. It will be based on the detailed roadmapping of R&I activities (figure 4 presents the roadmap of R&I activities for the specific objective 'Develop holistic solutions in a systemic approach').

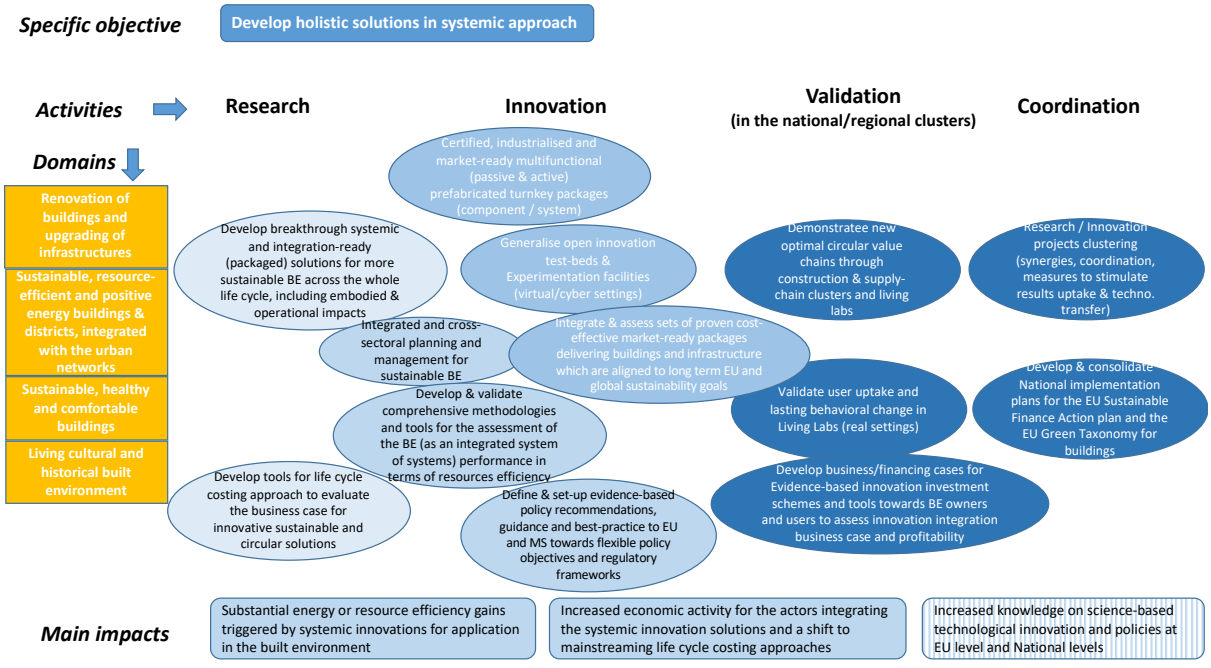

Figure 4: Road-mapping of R&I activities to address the specific objective 1: 'Develop holistic solutions in a systemic approach'

The ECTP Association has elaborated a Strategic Research and Innovation Agenda (SRIA), published in November 2019 (see its *Executive Summary* in the Appendix 1). It is suggested to use this SRIA, together with other strategic documents from stakeholders as a starting point to fine-tune and finalise a B4P Partnership roadmap starting from 2020 onward.

The activities presented in figure 4 are to be considered in global national and regional stakeholders ecosystems (to be the breeding-grounds where innovation clusters can nurture – *see section 2.3, 'Innovation clusters' sub-section*), as introduced in the figure below

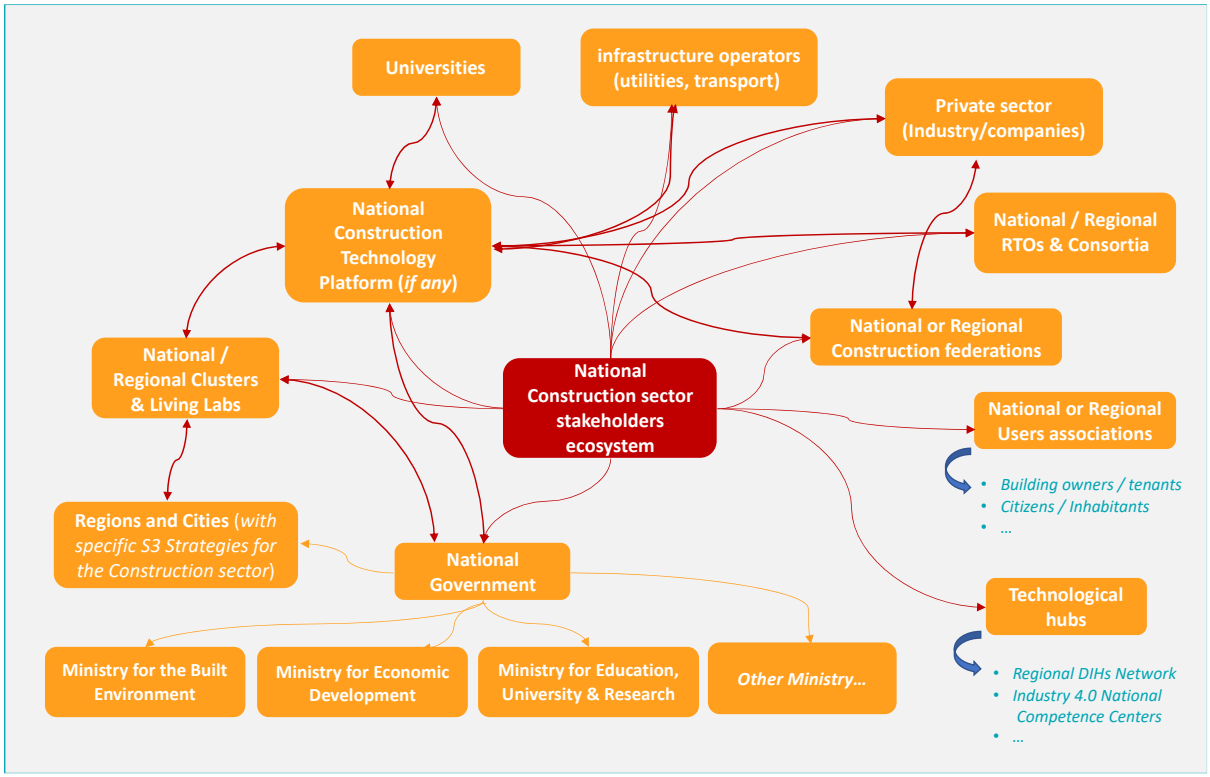

Figure 5: National and regional ecosystem in which B4P R&I activities should be considered

It is to be expected that most of the activities under the B4P Partnership will be undertaken by many types of organisations (universities, RTOs, large companies, SMEs, associations / federations, representatives from national and regional clusters, etc.) grouped in project consortia formed in response to the calls launched under the Partnership umbrella.

It aims to create a number of interconnected, comprehensive value chain clusters in Member States and regions, and the B4P Partnership will help to trigger transformational change in the research and innovation ecosystem both at national and at sector level. The clusters will enable closer integration of the value chain, bringing together diverse actors from different sectors at a scale and (long-term) duration that cannot be achieved via individual projects. The clusters will also ease market access and provide market expertise to Horizon Europe projects but can also support national research and innovation programmes and wider R&D within the sector, as well as informing future policies. In this way, the clusters will be a proof of concept for the transformational, whole value chain approach of the Partnership. It is also expected that clusters will better engage with citizens - considering that with different focus for different clusters, such an engagement may have different forms and target different profiles.

Links with other programmes and initiatives

Such links are essential and indeed imperative to ensure a better coordination of the demand from the B4P area towards other industry domains (e.g. materials or manufacturing), as well as bringing to other domains the innovation from the built environment required to achieve impact in these domains, e.g. in the ongoing urban transition or the positive impact of smart buildings in the clean energy transition.

The table below presents the some related R&I initiatives and potential interactions that can be envisaged with them.

Domain	Initiative	Potential collaboration with the identified initiative(s)
Resource Efficiency in the Built Environment	Platforms: • EUMAT • Renewable Heating & Cooling (RHC-ETIP) • ETIP PV	identification of technology needs B4P roadmap endorsement Alignment on selected topics to integrate issues / R&D regarding technologies related to these platforms to be considered into the B4P context.
	Partnerships: • Carbon Neutral and Circular Industry (successor of SPIRE) • Made in Europe (successor of FoF) • Circular bio-based Europe (successor of BBI JU) • CET - Clean energy Transition • DUT - Driving Urban Transition	Transformation of the building sector (construction 4.0), industrialization and mass customization, integration of the waste streams of different industrial sectors and the development of circular economy models, new RES energy generation and energy efficiency. The *Circular bio-based Europe* Partnership (predecessor: BBI JU) link is important as the "construction" is now in the core of it due to the priorities of the green deal (like construction, packing, textile and electronics sectors). → Dissemination and promotion of all the items above in buildings. Institutional support, codes, standards. Promotion of the energy-related / smart building market uptake. → Joint workshops to nurture the links between communities of various Partnerships → Align dedicated R&D actions and develop joint calls on associated topics to integrate R&D on common integration issues.
Materials	Emiri, EUMAT	Contribution to building-related part of the EMIRI Roadmap → Joint calls on selected topics to integrate issues related to circular economy and full life-cycle assessment (LCA)
	AMANAC	Knowledge exchange on life cycle assessment (LCA) and life cycle cost assessment (LCCA) related to construction materials
	VERAM	Input to VERAM's vision and roadmap for European Raw Materials in 2050
	Nature-base Solutions (projects cluster)	Knowledge exchange on Nature-based solutions in building, infrastructure, and district levels
	Carbon Neutral and Circular Industry (successor of SPIRE)	Connection with the Association and SPIRE projects through the key ECTP Committee members → Joint calls on selected topics to integrate issues related to circular economy and full life-cycle assessment (LCA)
Cultural heritage	International institutions: • UNESCO • ICCROM • ICOMOS	Institutional support, codes, standards, charts for the conservation of cultural heritage.

	JPIs (*or any of their evolution, e.g. Urban Europe should evolve towards DUT in HEu*): • Cultural Heritage • Urban Europe	Cultural heritage preservation and promotion from institutional perspective. Management of historic cities.
	Initiatives: • Europa Nostra • ViMM	Dissemination and promotion of cultural heritage. Virtual heritage.

Table 1: B4P relationships with main identified initiatives.

Required investment in R&I

It is first worth noticing that, besides R&I investment, the investment needs for the sector are difficult to overstate. The current shortfall in the sector for energy efficiency investment alone is widely acknowledged to be in excess of €100 billion annually. When a more holistic range of issues are brought into scope, this investment need increases significantly. As the biggest consumer of materials, the construction sector is a key driver of the transition to the circular economy, with a direct and profound impact on EU manufacturing. The transition of the one cannot occur without the other. It is estimated that industrial investment will need to rise from around €5 billion per annum to as much as €14 billion per annum by 2030 to deliver deep decarbonisation. Synchronisation and alignment of innovation, policy and market action between these two sectors is critical to ensure effective deployment of that investment and warrants a strong and ambitious research and development budget for the built environment sector

It is worth reminding too that the previous Horizon2020 Framework Programme for the sector in particular focussed on energy efficiency through the EeB cPPP, which was set up with a planned budget of €600 million over H2020. In addition, based on a regular (yearly-based) assessment by ECTP, EeB cPPP projects have been mobilising private investment with an average leverage factor (as identified in 2019) of 6,86 for large industrial organisations and of 2,28 for RTOs (*figures from 2019 EeB cPPP Progress Monitoring Report - based on a selected representative sample of organisations participating to EeB funded projects*).

The proposed new B4P Partnership has a much broader scope with a wider range of potential benefits of achieving the Partnership's vision. This creates a compelling case for a significantly enhanced budget. The elaboration of the ECTP SRIA and particularly of the present reportshows a strong willingness of the stakeholders to collaborate with the European Commission to deliver a strong R&D program for the build environment. The commitment of many players in developing and demonstrating new solutions, as well as ensuring a wide dissemination of results has been revealed in the previous EeB cPPP framework. The level of commitment appears much stronger than before, not only because of the enlarged scope, for which the vast majority of stakeholders are strong supporters, but also because of the need of a radical change in the level of answer to provide for a sustainable EU future. To deliver on the bold vision set out by the Partnership and to help the sector realise its full potential as a solution to the climate crisis, as an economic engine for the region and as a catalyst and enabler of a healthier and more resilient society, it is anticipated that an overall budget of €1.9 billion is needed (including co-funding from Horizon Europe), *according to the Table as introduced in Appendix 4*.

Exit Strategy

One primary objective of the B4P Partnership is to nurture already existing or new clusters, with the ambition of having 1-2 such clusters in each EU27 country. The management of each cluster is financed

by national or regional in-kind contributions mainly, along with potential funding support from local industry players, and with self- sustainability for their own operations. The role of the B4P partnership is to run the infrastructure at a European level that will allow the creation of this network of clusters (and associated eco-systems and facilities) integrating the outcomes of the projects funded by the EC in the context of the innovation agenda for the sector. Hence, while the B4P partnership and the co-funding of the EC will allow to step up the ambitions and widen the portfolio of activities (at European level), the B4P decision making Board will discuss and further agree with its core partners, associated partners and the clusters on the appropriate organisational and business model to ensure the continuity of the network beyond the end of EC co-funding of the Partnership.

The clusters established through the partnership will be flexible and adaptable in terms of their structure, financing and governance. This is key to allowing them to continue to operate beyond the foreseen duration of the Partnership and the Framework Programme. They will be actively engaged in the consultation and market analysis that the Partnership will conduct to inform the ongoing evolution of its SRIA. The B4P SRIA will be an open, live and dynamic document, that will shape the innovation agenda for the sector, well beyond the organisational and temporal boundaries of the partnership: *links between the Partnership and clusters are addressed in section 2*.

In this way, the Partnership will foster, from the outset, a sustained, long-term approach to research and innovation within the sector that continues beyond the phasing out of the Framework Programme funding.

1.3 NECESSITY FOR A EUROPEAN PARTNERSHIP

As it has been outlined in section 1, the construction sector contributes around one tenth of the economy of the European Union, but, as a sector, has enormous potential for realising the environmental and climate goals of all Member States and the whole EU zone. Moreover, as the global market for sustainable buildings doubles in size every three years, with an estimated $23 trillion dollars market opening up in emerging economies [16], the EU's world-leading sustainable built environment sector has a unique opportunity to export its knowledge, expertise, services and solutions. However, many of the same barriers and challenges described in section 1.1 that hold back transformation in the sector - the complexity, fragmentation and the project-based nature of work - are holding back significant investment into R&D. The sector continues to be one of the least intensive in terms of R&D expenditure with around 1% of net revenues allocated[17]. According to the European Commission study "R&D Investments and Structural Changes in Sectors - Quantitative and Qualitative Analysis Policy Recommendations" (2016), business R&D expenditures in the construction sector are rather low in absolute value. This means that there is a crucial need to boost R&D in order to reach the European target to raise overall R&D investment to 3% of GDP. This considering especially that 69% of firms in the construction sector are the most likely to be at or above full capacity of their resources and production, according to the EIB Investment Survey 2019. . By contrast, the European car industry, which supports half as many jobs in the region accounts for almost a third of the EU's total R&D expenditure[18].

Also taken from the "*EeB cPPP contribution to the H2020 interim evaluation*" May 2017, it is explicitly mentioned:

> "*More vertical orchestration along value chains would increase the market and social impact of the H2020 projects. Currently, each thematic related with a sectorial value chain is addressed through different strategic agendas, which makes more difficult integrating the strategies of all the stakeholders in the value chain and pushing the changes to make easier the market deployment of the H2020 project results: standards, regulations, end-users awareness…*".

The points above are especially relevant in the construction sector, where more that 95% are SMEs (it is worth noticing that the relevance of B4P for SMEs is highlighted in the B4P consultation that was launched by the EC in December 2019: around 50% percent of the answer were from SMEs).The high fragmentation of the sector and the very low levels of R&D investment mean that without the coordination offered by a partnership, R&I projects' outcomes would be less widely disseminated and would lead to less diffusion / mass uptake of innovative solutions and new business models.

. Due to the typical "project oriented" approach of the sector and its segmentation into silos, the duplication of efforts and inefficiency should be overcome by a holistic R&D strategy settled by B4P instead of by a project-by-project approach. This translates in the dual role the Partnership can play to deliver holistic R&D in construction and built environment: the capacity of the Partnership providing to the EC a comprehensive set of prioritised R&I actions agreed with the EC and among main

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[16] IFC, 2019, Climate Investment Opportunities in Emerging Markets
https://www.ifc.org/wps/wcm/connect/59260145-ec2e-40de-97e6-3aa78b82b3c9/3503-IFC-Climate_Investment_Opportunity-Report-Dec-FINAL.pdf?MOD=AJPERES&CVID=lBLd6Xq

[17] WEF, 2016, Shaping the Future of Construction - A Breakthrough in Mindset and Technology
http://www3.weforum.org/docs/WEF_Shaping_the_Future_of_Construction_full_report_.pdf

[18] ACEA, 2018, Press Release
https://www.acea.be/press-releases/article/54-billion-spent-on-rd-by-eu-auto-sector-per-year-latest-data-show

associations representing all European stakeholders on one side, and the ability to cluster and coordinate the development of each funded project in a coherent approach – all this grouped under the Partnership banner rather than standalone traditional calls. As such, the Partnership should ensure:

- **Directionality:** a common vision and associated R&I to be achieved by 2027 (/end of last projects),, a set of prioritised topics and calls agreed among associations representing R&I actors as well as beneficiaries of R&I assets, and the full achievement of an overarching aim: the societal transition of Europe towards sustainability through the built environment transformation. This is exemplified in the Objective Tree (*see section 1.2*), with one overarching challenge (sustainability) divided into 3 sub-challenges which then further split in the different problems stemming from the sub-challenges and the specific objectives that will address these problems, all this then converge into three general objectives (scientific, economic and societal/environmental). As such, to achieve the overall B4P aim, there is an obvious need to set up a dedicated roadmap with the specific objectives and timeline breakdown, and a similar procedure is needed to tackle the specific objectives, with the ambition of a multiplying effect thanks to the Partnership. .
- **Additionality** at European and national levels:
    - The partnership will mobilise additional resources from partners in the form of the a direct financial contribution in funded projects following the rules of participation in Horizon Europe, as well as their in kind contribution in the Partnership development and implementation (consultations, networking) as well as additional contribution for activities foreseen in the SRIA and not directly covered by the European Union funding, with a specific focus on the activities related to a wider dissemination and exploitation of results.
    - The partnership will serve as a vehicle to integrate buildings-related R&I from different thematic areas corresponding to different parts of Horizon Europe , in particular from the Clusters *Climate, Energy and Mobility*, and *Digital, Industry and Space*. Other relevant clusters include Health, Culture, creativity and inclusive society, and Food, bioeconomy, Natural Resources, Agriculture and Environment. It will also develop R&I inputs specific to the built environment for further deployment activities driven by the Missions or other programmes (e.g. LIFE), for instance the missions “Climate Neutral and Smart Cities” and “Adaptation to climate change including societal transformation”, the European Innovation Plateform on Smart Cities and Commmunitiespartnership on positive energy districts in urban environment, and the Covenant of Mayors Europe initiative (the links with many of these initiatives are presentedin the table below). Eventually, it will also have strong, maintained and periodically reviewed connections with other Horizon Europe partnerships, e.g. Carbon Neutral and Circular Industry; Made in Europe; AI, data and robotics; Clean Energy Transition; EIT InnoEnergy, EIT Urban Mobility, Smart electrics mobility, Infrastructure and network for efficient multimodal mobility
    - The objective of the Partnership is also to seek cooperation with Member States in order to align and cooperate at a strategic level, as described in Table 2 below. Alignment is already envisaged through the SET-Plan (and in particular the Implementation Groups dedicated to buildings, consumers and districts), as well as with Construction 2020 (including the EU BIM Task Group) and follow-up initiatives, and with national Green Building Councils.

National-level initiatives	*Partnerships interactions*

SET-PLAN	The SET-Plan is bringing together representatives of the EC, stakeholders and Member States. Its objective is to align European and National R&D strategies in the key energy sectors. The partnership will thus establish links with the SET-Plan Implementation Groups (IG) - especially Energy efficiency in buildings (IG 5) and Smart Solution for consumers (IG 3.1), and Smart cities and communities / Positive-Energy Districts (IG 3.2).
Construction 2020 Group	The Partnership will closely work with Construction 2020 (and its future framework) thematic groups in which Member States are represented. In particular, the partnership will liaise with the EU BIM Task Group, a Commission initiative bringing together Member States to promote the use of Building Information Modelling.
WGBC & National councils	In the context of the Partnership, the WGBC will develop links to national/regional clusters. Green Building Councils in many MS also have strong links to national and local authorities. World GBC is in the process of convening national government working groups on sustainable built environment (following a tried and tested approach from the BUILD UPON H2020 project) and, if successful, these would provide an ideal platform for strategic cooperation with the EU-level Partnership.
National plans & Policies on the Built Environment and Smart Specialisation initiatives	The partnership will lead at its very start a thorough survey of National Policies on the Built Environment and of S3 (Smart Specialisation Strategies) and Smart Specialisation pilot platforms (targeting the Built Environment) in the context of the reformed cohesion policy of the European Commission. Below are examples from some European countries and regions: **Spain**: The Euskadi RIS3 2030 of the Basque country and the associated PCTI 2030 (Science, Technology and Innovation Program) already identify Sustainable Cities as one of its seven priorities. It also defines three transversal initiatives, being two of them aligned with the partnership priorities: healthy ageing and circular economy. **Finland**: The Smart Energy Finland Program (2017-2021), by the Finnish Funding and Innovation agency, grants in total a hundred million euros to smart energy solution innovations. This includes financing to Test platforms and ecosystems growth engines of innovation including the all value chain. Some of these as Smart Otaniemi and Flexens, are aligned with the expected impact of the partnership namely regarding increase buildings energy efficiency and optimization of demand response in the energy system. The Business Finland ecosystem "Carbon-neutral and healthy building" , starting 2020, is also very aligned with the partnership objectives, targeting turning new and renovated buildings into healthy and circular net carbon captures over their lifetime. Another relevant initiative, supported by the BF Growth Engine funding, is Platform of Trust a digital platform innovation for construction and real estate business. **France**: End of 2017, a new Investment Plan (*Grand Plan d'Investissement*) over the following five years has been presented. Of the EUR 57.1 billion investment planned, EUR 20 billion will be dedicated to the construction sector – including a Digital Transition Plan, and an Action Programme for Construction Quality and Energy Transition, which also seek to strengthen the digital and energy efficiency skills of

	the workforce, and with new initiatives and action plans to come, fostering energy efficiency renovation works and digitalisation in the construction sector. **Spain:** the Spanish Scientific and Technic Research and Innovation Plan defines eight challenges, being five of eight aligned with the partnership priorities: Clean, efficient and secure energy, Integrated, connected, smart and sustainable transport, Climate change and use of natural resources and raw materials, Digital economy, society and culture, and Security. Interreg Central Europe- S3 Partnership on Sustainable Buildings [19] focusing on: 1) Eco-construction, bioclimatic approaches and insulation of buildings, 2) Renewable energy integration in buildings, 3) Systems of maximum energy efficiency in buildings and cities

Table 2: Potential interactions of B4P with National strategies.

The Built4People Partnership will support and help Horizon Europe projects in carrying out market surveys and mapping / aligning national implementation strategies and plans, bringing closer EU- and National levels. Connecting with the Expert Group on Public Procurement will also contribute to the meaningful collaboration with Member States.

The contribution of B4P Partnership to some key policy objectives and related legislation is detailed in Appendix 3. Beyond policy objectives mentioned, the B4P Partnership is also aiming at sharing, promoting and disseminating best practices, which will be spread and replicated through market uptake efforts, which could in turn stimulate future legislation. While not yet identified, future legislation and policy initiatives should also benefit from the B4P partnership.

Finally, the Partnership will contribute to exploit the potential of *standards and standardization processes* for the effectiveness and efficiency of research and innovation, and this again requires a vision and strategy that must be coordinated at a European level. Firstly, the Partnership will contribute to the transfer of research results and outcomes of innovation activities into the standardization process by supporting their elaboration and improvement. Secondly, the Partnership will identify the main standards (e.g. *BuildingSMART*, as key BIM standardization body) used in the built environment and, thus, raise awareness of their benefits in the research and innovation process. Thirdly, B4P will aim at boosting the uptake of innovation and research outcomes by the market, using standardization as enabler. Finally, the Partnership will promote the use of standards and consider their possible economic impacts as output and performance indicators when evaluating the outcome of research and innovation projects and programmes. These activities will be carried out in close relation with the European Commission and the European and International Standardisation Bodies such as CEN/CENELEC, IEC, EOTA, ISO (*Note: besides specific aspects related to standardisation, the Internationalisation dimension is tackled in the next section 1.4*).

[19] https://www.interreg-central.eu/Content.Node/S3-Partnership-on-Sustainable-Buildings.html

1.4 TARGET GROUPS AND STAKEHOLDERS COMMUNITY

The detailed list of partners and the broader community of stakeholders involved in the B4P partnership proposal development is included in Appendix 5. The list is not exhaustive and it will evolve in time.

As explained in the previous section, acting at EU level is of paramount importance for achieving a transformation of the built environment, which starts by having on board all the necessary stakeholders, developing the clusters & networks to frame an effective governance. The partnership will gather the necessary expertise from relevant fields and will be a most efficient, flexible and effective approach to ensure the necessary level of commitment of the partners (from public and private sectors and the civil society) aiming at creating a cross-sectoral momentum and action underpinned by a common strategic vision. The commitment from partners (both public and private) will first consist of engaging in a continuous dialogue to agree on R&I priorities and to implement a common R&I roadmap, consulting and engaging all stakeholders from the Built environment and associated sectors. In addition, the private sector will endorse the feedback from the partnership to evolve skills and practices, in particular to move towards a holistic approach to design, construction and operation, and will contribute to R&I financing (e.g. through adequate co-financing rates).

The B4P partnership will bring together the entire built environment sector value chain, both supply side and demand side: academics (universities, RTOs), architects and engineers, heritage experts, urban planners, construction companies, system suppliers, material manufacturers, ICT companies, investors, financiers, consumer associations, property federations, facility managers, energy service companies, accessibility experts, local authorities, government agencies, and NGOs.

The B4P partnership has attracted a large and committed stakeholder community, which has already contributed to preparing the present document and followed the partnership workshop organised end of 2019. Figure 3 shows the type of stakeholders involved to date: they cover the entire value chain of the built environment. This community will be further consolidated when the partnership is officially launched, through targeted communication and awareness raising actions.

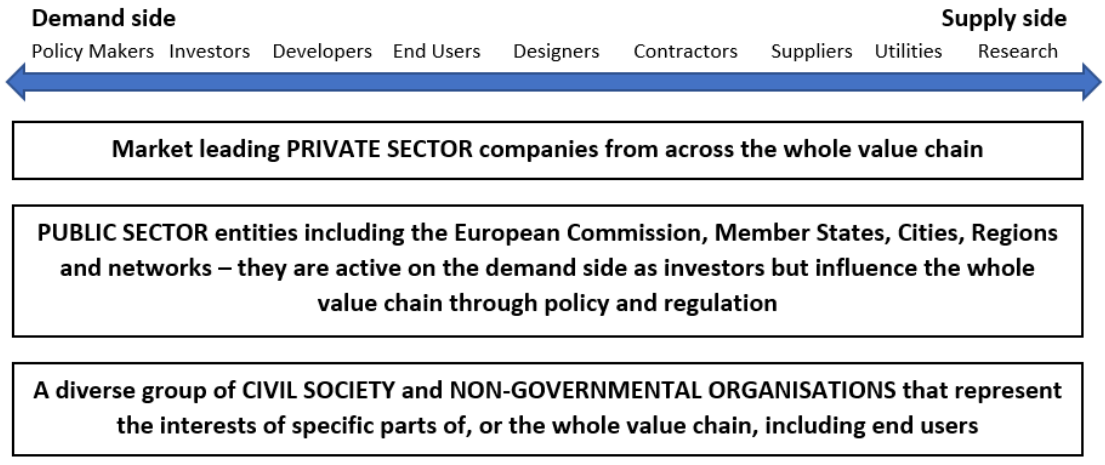

Figure 3: *Built4People - Schematic representation of the stakeholder community*

In a nutshell, the main categories of stakeholders and their role can be summarised as below:

- **Policy makers**: they play a key role in supporting the definition of areas and topics for further R&I, through a coordinated concertation, and in the elaboration of strategic policies and regulations, the latter being a strong driver of the built environment to ensure quality, safety and performance. The European Commission and the Member States will be instrumental ensuring alignment and potential synergies between the partnership and its SRIA and the European and national strategies;
- **Owners and investors**: they represent the demand side / end users of the partnership's outcomes. Cities and Regions play a key role, as well as social housing on the public side, whilst a large majority will be on the private side and formed by owners, implying "investors" for landlords and "end-users" for homeowners; they will as well support the funding for future research and innovation having the appropriate impact on the built environment;
- **Construction value chain**: all potential actors involved in the whole lifecycle of a building/infrastructure. Thus, this category would include product manufacturers, equipment and machines manufacturers, large and small contractors, engineers, architects, installers, accessibility experts, demolition companies, reuse agencies, etc. – each with its obvious role in the Construction value chain and the need to integrate innovation both in their products (at any scale: components, products, buildings, etc.) and their process; as such, they have to play a key role as 'R&I specifiers', based on their fields-scale expertise and feedback;
- **Utilities:** they form an important part of those actors bringing services (now and even more in the future) in the built environment, and will need more and more static and dynamic information from buildings and infrastructures so as to meet expectations of citizens;
- **End-users**: going beyond the previous EeB cPPP, the Built4People Partnership would ensure the involvement of the clients of the built environment "finished product", meaning real estate companies, social and private owners, citizens' associations, organisations representing persons with disabilities and older persons, heritage stakeholders, etc.;
- **Researchers:** European Universities and RTOs, who are major actors in the fields of R&I in Construction and Built environment, supporting the elaboration of the Partnership SRIA, and being in capacity of both developing research and innovative products and systems, but also adapting / customising innovation from other industry sectors (manufacturing, energy, ICT, etc.);
- **NGOs** and representatives of the **Civil Society**: the role of NGOs and civil society networks is central to the transition towards a sustainable built environment. These organisations often work together to drive market transformation and they play a key role in advocating for action from governments and wider industry as well as providing much needed education, training, certifications and communication to the general public. The building and construction sector is currently fragmented in its approach to the transition – it needs NGOs and networks to foster radical whole value chain collaboration to drive collective action.

A co-programmed partnership is the adequate approach to enable commitment and joint action of the public and private sectors and the civil society while minimizing the administrative and management burden for the creation and operation of the partnership. At the same time, it creates a comprehensive cross-sectoral and cross-cluster structure gathering the necessary expertise and resources for addressing the challenge in a holistic manner.

Currently, all ECTP members (representing academics, RTOs, contractors and SMEs) involved in the (FP7 / H2020) EeB cPPP (and for them forming with the EC the EeB cPPP Partnership Board) are involved in the elaboration of this Partnership, through the ECTP association.

In addition, some key stakeholders have joined the **Group of Core partners** involved in the development and future operation of the Partnership, to integrate policies, industry actors vision (through associations and federations), and future experimental facilities and innovation clusters – including FIEC, EBC, CECE, UIPI, Eccredi and EUREC:

Acronym	*Name*	*Web Site*
ECTP	European Construction Technology Platform	www.ectp.org
WGBC	World Green Building Council	www.worldgbc.org
CECE	Committee for European Construction Equipment	www.cece.eu
EBC	European Builders Confederation	www.ebc-construction.eu
ECCREDI	European Council for Construction Research, Development and Innovation	www.eccredi.org
EUREC	Association of European Renewable Energy Research Centers	https://eurec.be/
FIEC	European Construction Industry Federation	www.fiec.eu
UIPI	International Union of Property Owners	www.uipi.com

The Partnership offers a unique opportunity and framework for these core actors to not only join forces but to create a common programme based on a joint vision, work programme and consolidated governance structure. Cooperation (supporting and contributing to joint actions) among these actors aims at contributing to the identification of key issues and R&I priorities, mobilisation of stakeholders, dissemination and exploitation of research results among the various target groups as well as offering evidence for the stakeholder networks' own policies and activities – the Partnership offering a unique opportunity and framework for these core actors to not only join forces but create a common programme based on a joint vision, work programme and consolidated governance structure.

ECTP and WGBC members have also started being active in discussing with their national counterparts in the elaboration of the B4P partnership and in particular the clusters networks. A number of national/regional existing R&I clusters in relation to built environment has been identified in the public survey and stakeholders event in December 2019. The network of . In addition, more than 17 public entities (and 44 R&I organisations, most of them being from the public sector) answered the on-line consultation launched by DG ENER at the end of December 2019. As such, it is the intention of B4P to work out a comprehensive process for approaching all European countries (as well as other associated countries) so as to discuss and associate them in the progress of the Partnership (and its outcomes).

The other stakeholders form the **Group of Target partners**, with the Partnership applying a quadruple helix approach with

- Research organisations: universities, public and private research organisations, across the various disciplines integrated in the Partnership;
- Business entities: infrastructure and service providers, industry, entrepreneurs, social innovators, etc.;
- Local authorities (Cities & municipalities, regions) – with networks such as Eurocities, the Covenant of Mayors, Polis, Civitas, ERRIN, ICLEI …;
- Societal actors: local initiatives and eco-systems that should in particular form the future innovation clusters, including citizens / inhabitants, as well as NGOs.

Internationalisation

Besides the aspects related to standardisation (see section 1.3), relationships with key international bodies and initiatives throughout the world are envisaged, so as to increase the outreach of the Partnership on one side, and to benefit from interactions with and expertise and skills from of recognised world-wide actors.

The **ECTP** is already investigating future relationships with the following associations and initiatives:

- **UN-Habitat** works for a better urban future. Based in over 90 countries, UN-Habitat promotes the development of socially and environmentally sustainable cities, towns & communities. UN-Habitat strives for adequate shelter with better living standards for all.
- **UNECE**: United Nations Economic Commission for Europe.
- **SE4ALL**: Sustainable Energy for All (SEforALL) works with leaders in government, the private sector and civil society to ensure access to sustainable energy worldwide.
- **RILEM:** International Union of Laboratories and Experts in Construction Materials, Systems and Structures.

It is also worth noticing that **WGBC** can play a supporting role here by providing access to their global network of 70 national councils in 5 regions (Africa, Americas, Asia-Pacific, Europe and MENA) with a combined global membership of almost 40,000. WGBC will facilitate work at strategic level with other global organisations and networks like the UN, C40 cities, Global Covenant of Mayors and others and will provide an additional gateway to the world for Europe's market leading sustainable built environment expertise.

Such an internationalization approach intends to leverage on the benefits or Research and innovation in the Construction and Built environment sector, generating a world global initiative and strengthening the Partnership, with recognized Construction research and innovation leaders in various countries world-wide, potentially including Canada, the US, Australia, Russia, Japan, China, Singapore, Africa and South-America. This would lead to opportunities to deepen research ties, pave the way towards enhanced coordination between policymakers, and promote global standards, as well as common values and quality assessment in construction business. Envisaged objectives are about:

- driving research focusing on the uptake and benefits of integration of innovation in Construction and Built environment world-wide – increasing adoption of technologies and innovative solutions and systems;
- supporting the common developments on new standards (including interoperability standards) from European to a world-wide level;
- supporting the exchange of knowledge and data about potential use-cases and pilots beyond Europe, as demonstrations of the well-foundness and added value of integrated innovative solutions and systems – with European and international partners exchanging main findings of the research projects and potentially replicating research outputs and assets in their respective countries.
- Devising about business and financial models that would help and leverage the generalisation of integrated innovation in the built environment.

2 PLANNED IMPLEMENTATION

2.1 ACTIVITIES

Led by business and industry representation, public sector and civil society action, the Partnership will seek to promote research and innovation approaches, through the co-funding from Horizon Europe programme and by pooling additional investments,, that address multiple levers of change. To achieve this the Partnership's main functions and activities can be categorised into 3 main roles, that are in close connection to each other:

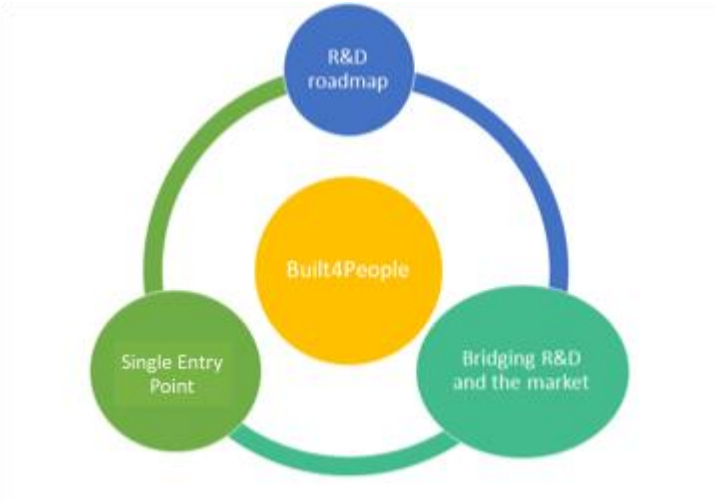

Figure 6: *B4P – 3 main roles*

1) Implementing the Strategic Research and Innovation Agenda and continuously identifying and refining EU R&D priorities and investment needs

The first and primary role of the partnership will be define and implement the research and innovation activities that need to be performed to achieve for the built environment based on the common vision (outlined in this document) and on stakeholders' inputs, EU and national/regional R&D initiatives, high-level studies on the built environment, and other related strategies. This implementation and renewal of the SRIA will be carried out taking into account Horizon Europe and other EU programmes priorities in the different foreseen clusters, in close relationships with the Commission's Directorate Generals and the Agencies. The Partnership will assess the investments needs in order to reach those priorities. Based on this holistic assessment, the B4P Partnership ensure the implementation of a unified multi-annual roadmap, regularly updated (every 2 years) with prioritised actions and activities.

In order to ensure the effective delivery of the R&D roadmap, B4P will also conduct further market analysis needed to anticipate changing needs & demands for innovation both at the level of the "core" construction sector and at the level of the end-users of the built environment (e.g. asset managers, homeowners and tenants). Thus, the market analysis will also be used to feed the review of the R&D roadmap, so that the identified priorities can match the market expectations.

In that sense, B4P aims supporting:

- **Collaboration**: At the heart of the partnership and critical to the holistic transition it aims to support a mutually beneficial, cross-sector collaboration, engaging with all stakeholders to unlock impact, scale-up solutions and overcome market barriers. B4P will stimulate collaboration by bringing companies, research centres, citizens' organisation together
- **Innovation**: Develop and refine innovative solutions to the challenges outlined, leveraging digital solutions and the fourth industrial revolution to increase productivity and foster a more interconnected value chain. Innovation is also needed to creatively rethink business models

to foster far more rapid deployment of existing solutions, which have not yet reached the scale needed.

2) Providing a bridge between R&D and the market

The Partnership will represent a bridge between R&D activities and the market in order to ensure market penetration and uptake. The partnership intends to support technology and innovation transfer by connecting projects from Horizon Europe and other Commission programmes with the market, typically through the specific clusters that B4P intends to help nurturing and networking. This activity is about stimulating the market to uptake R&D innovation as well as delivering targeted messages to different built environment actors. In order to do this, the B4P Partnership will push for joint implementation of solutions, supporting the creation of dedicated living labs, clusters and Digital Innovation Hubs (DIHs), regional platforms, etc. both for the core construction actors and the end-users of the built environment.

Empowering construction actors and end-users to use new technologies is also part of this activity. Private partners will play a major role in the implementation of activities of the partnerships that will accelerate uptake of results.

Hence, B4P aims at supporting:

- Education & training: The market must have capacity to deliver solutions to achieve a sustainable built environment at mass scale. Considering the obvious role of the private partners, this will necessitate ready access and uptake in all markets to resources, educational tools, events and training programmes to build skills and knowledge of all actors along the value chain and to facilitate a just transition where no-one loses out.
- Rating / Certification: Voluntary and mandatory rating tools and certification schemes have successfully driven demand for sustainable buildings and infrastructure in many European markets. Increasing alignment of these with policy tools (e.g. SRI – Smart Readiness Indicator under the EPBD) and finance-related initiatives (e.g. EU taxonomy for sustainable activities) is fundamental to ensure a common understanding of sustainability for the sector and to accelerate the transition through adoption of a common language and metrics.
- Support to regional / local innovation clusters: Scaling up the transformation of our built environment and harvesting the positive impacts of decarbonisation and circularity require specific actions to support, assist and advice users and citizens through their renovation journey and the transition to a low carbon economy. The requires from the Partnership a continuous exchange and collaboration with the network of innovation clusters, including devising a common methodology (or set of guidelines / recommendations) to deal with user-centric laving lab approaches and User Experience.

3) Acting as a Single Entry Point for innovation transfer to the Built Environment

B4P will act as a Single Entry Point to deliver innovation in the built environment and related services. For this aim, B4P partnership will be a centre of expertise, gathering and providing access to information on technologies, markets, and policies. Hence, B4P aims supporting communication towards various private and public stakeholders.

Because of its forward-looking focus and pan-EU representation, B4P represents a key asset for policy-makers to anticipate future regulation needs. The use of clusters, especially with Member States, will also provide insight into EU vs National regulations, supporting further harmonization towards an EU market. The SRIA elaboration process will further identify the needs and allow setting up the appropriate vehicle within the partnership to address the need of forward-looking regulatory framework.

Today's lack of investments in the built environment is recognized by all public & private stakeholders. While addressing R&D and innovation, B4P, with federations of building owners or real estate on board, will rely on its wide range of members to act as a dissemination and exchange platform, and the clustering dimension of the B4P partnership will be used to appropriately contribute to providing innovative approaches and solutions from the projects, including new approaches for deepening investments.

Figure 7 shows the main targeted fields of intervention of the partnership and the bridges it will establish between "knowledge & competencies" focused activities and "impact" focused activities.

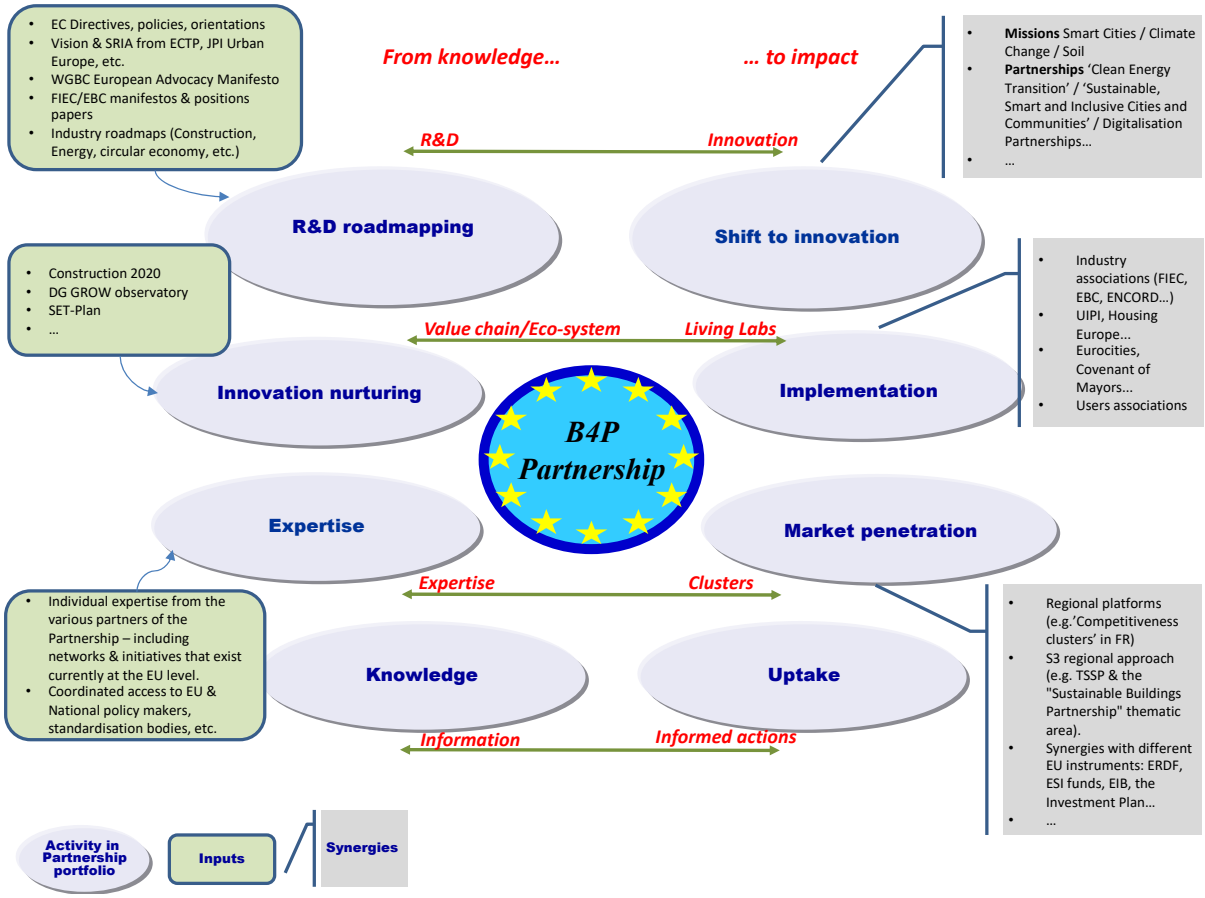

Figure 7: *B4P – Implementation mechanisms*

The B4P partnership is going to use an arsenal of implementation mechanisms to achieve its general objectives (*as identified in section 1.2*) and fulfil the three main roles of the partnership described above:

First role: Implementing the Strategic Research and Innovation Agenda and continuously identifying and refining EU R&D priorities and investment needs

The mechanisms put in place will target the integration of EU scientific and innovation capacities to increase and accelerate the transformation of the built environment and construction sector towards a sustainable European landscape, the creation and capitalisation of knowledge as well as the management of raising new skills and competencies in the field of R&I for the built environment sector:

R&D road-mapping: Based on a common vision agreed by partners and taking into account inputs from consultations of partners and associated stakeholders, the B4P Partnership will ensure a unified and continuously updated roadmap with prioritised actions and activities for the EU-level R&D → Partnership activities:

- Strategy monitoring and global alignment (research, industry, demand-side);
- Coordination with the Commission and national plans / strategies (with Members States);
- Interactions and partnering with related Horizon Europe partnerships, bodies and initiatives.

Innovation nurturing: Identifying future needs & demands (market-side) and promoting technological & non technological solutions (invention-side) to drive innovation, all along the value chain of the construction sector → Partnership activities:

- Requirements and needs identification, clustering and monitoring;
- Definition of calls/topics in relations with the European Commission: RIAs, IAs, CSAs: regular meetings with the European Commission will be organised to ensure define these targeted calls and ensure consistency with traditional calls of Horizon Europe. The Partnership Board would be the adequate body to ensure this coordination and the non-duplication of calls for project.
- Identifying additional activities from Partners side to support the achievement of the objectives. Notably those that are linked to the uptake of results from projects.
- Where relevant, preparation of joint calls with related Partnerships.

Expertise: The B4P partnership will act as a centre of expertise, gathering and providing access to top-level expertise on technologies, markets, and policies → Partnership activities:

- Creation and maintenance of a Database (desk review) of expertise and skills from the Partnership core members, partners and EU-funded R&I projects consortia.
- Entry point for information about Open-Innovation Test-beds & Experimental facilities, and User-centric Living Labs.

Knowledge capitalisation: The B4P Partnership will link and create knowledge access tools to increase knowledge and awareness on best practices, projects reviews, stakeholders' initiatives and monitoring reports → Partnership activities:

- Creation and management of a B4P knowledge hub, which would offer access to:
    - Publications generated by EU-funded R&I projects (conferences, journals, etc.);
    - Information on developed assets, demonstrators and pilots - potentially based on a geo-clustering approach.
-

Second role: Providing a bridge between R&D and the market

Mechanisms are targeted at supporting the competitiveness of the construction industry and bringing new services to market quicker to attract investment into (existing & new) built environment: innovation transfer to market, new business models and investments schemes, and build up skills and expertise in the built environment industry:

Innovation: The B4P Partnership is aiming at managing an R&D and innovation portfolio, bridging from one to the other with real-field implementation instruments or initiatives. This will work both ways, i.e. solutions push but also market pull. Coordination meetings & surveys with projects coordinators will be organised to monitor implementation and results. The definition of cross-projects objectives is envisaged to increase the added-value, while favouring mutual nurturing and sharing → Partnership activities:

- Monitoring (KPI-based) of the portfolio of EU-funded R&I projects;
- EU-funded R&I projects clustering (*see section 1.2, sub-section 'Roadmapping'*).

Implementation: To increase impact, the B4P Partnership will push for joint implementation of solutions by continuously exploiting the knowledge gathered in the innovation nurturing activity, supporting the creation of living labs → Partnership activities:

- Support the alignment of User-centric Living Labs (*see section 1.2, sub-section 'Roadmapping')* with the European-wide B4P vision and strategy;
- Brokerage activities between those Living-Labs and the EU-funded R&I projects.

Market penetration: Supporting tangible market penetration of innovative products, solutions and services is at the very heart of the Partnership. Clustering activities are fundamental when considering the too much scattered construction sector, both on the skills & competencies ("supply") side and the market ("demand") side. National, regional and community levels will be activated to jointly address the issue in a coordinated manner → Partnership activities:

- Support to long-term policy and regulatory frameworks in close interactions with the European Commission, and in relationships with the Members States – including new legislative frameworks and public procurement practices;
- Support (in liaison with the national / regional eco-systems sustaining the innovation clusters) the setting up of national, regional or local initiatives to raise awareness of home and building owners and tenants about the benefits of a people-centric smart built environment while paving the way for financial incentives and business models for buildings and infrastructures renovations and transformations.

Uptake: This activity is about stimulating the market, delivering targeted messages to stakeholders, benefiting also from the clustering activity. Stakeholders' empowerment is part of this activity → Partnership activities:

- Selection, clustering and (support to) the dissemination of best practice initiatives, as well as initiatives from home and building owners – in particular from living Labs / innovation clusters under the B4P partnership umbrella;
- Dissemination (meetings and public events) with Mission Boards, especially the "Sustainable & smart cities" mission, to facilitate the adoption of innovations through piloting activities.

Third role: Acting as a single entry point for innovation transfer to the Built Environment

The main activities for B4P are foreseen as follows:
B4P as responsible for showing / communicating / disseminating at EU-level events, like the European Sustainable Energy Week or the annual European R&I Days.
B4P contributing to results dissemination and sharing good practices and success-stories across members, clusters and their respective audiences.
B4P is responsible for establishing a monitoring of the built environment transition perception across the EU, through an annual on-line consultation based on a set of questions validated by the B4P Partnership Board.
These activities will be tuned to address the specific needs of the different categories of stakeholders targeted (e.g. public authorities, businesses, etc.)

Integration in the R&I landscape

Ensuring coherence and additionality with National programs is key. ECTP has started engaging national stakeholders and initiatives in various Member States in the context of recently started H2020 projects (e.g. the *DigiPLACE* project – GA 856943) as well as during the preparation of its SRIA through the involvement of national multipliers, namely National Technology Platforms and Liaison Points, and the B4P Partnership will further strengthen this relationship.
Moreover, several European associations, whose members are National Associations, have been involved in the elaboration of the present document and committed to become active stakeholders of this B4P partnership. This will contribute to ensure consistency with national and sectorial policies. SRIA updates and progress reports will be presented to Member States in appropriate configurations

(possibly linked to Horizon Europe), allowing direct exchanges and coordination. Also, the partnership aims to establish collaboration with the National Contact Points (*once their structure and role have been defined for Horizon Europe, depending on current negotiations between the Member States and the European Commission*).
Eventually, and as already stated above, specific coordination mechanisms with key 'sister' initiatives will be established, on a peer-to-peer basis, at the start of the B4P Partnership, in order to share objectives and achievements, and in order to maximise the impact and resource efficiency. These mechanisms may include:

- Coordination to fine-tune SRIAs and roadmaps;
- Invitation to the management structure / meetings
- Shared topics / joint calls;
- Coordinated communication and dissemination strategies;
- Common KPIs and measurement methods;
- Potential common promotion of standards

These already identified relevant initiatives (some of them still being under elaboration as potential future Partnerships under Horizon Europe) include (*not exhaustive list*):
EIP Smart Cities and Communities;

- Mission Climate Neutral and Smart Cities;
- Mission Adaptation to Climate Change, including Societal Transformation;
- Partnership Made in Europe;
- Partnership Carbon Neutral and Circular Industry;
- Partnership Transforming Europe's rail Network;
- Partnership Clean Hydrogen;
- Partnership Mobility and Safety for Automated Road Transport;
- Partnership Sustainable, Smart and Inclusive Cities and Communities / Driving Urban Transition;
- Partnership Clean Energy Transition;
- Partnership WATER4All: Water Security for the Planet.

2.2 ESTIMATED RESOURCES

B4P is intended to be a co-programmed partnership. It is expected that private partners should play a major role in the implementation of activities of the partnership and make major contributions in the context of the funded projects. On the other hand, it has to be considered that the partnership must remain attractive to all actors of the value chain: when the academics and RTOs must be strongly backed in their R&I development, it is of paramount importance that the industry and the SMEs, bearing the innovation outputs up to the market and achieving the impact at the end, are supported as well. In case of reduced funding, flexibility should be ensured, allowing the industry and companies to compensate this partial funding e.g. through additional funding from national or regional desks/agencies, or opening up the scope of opportunities to start business cases, and thus potential limited incomes, regarding the set-up of platforms, market places, added-value services, etc.;
Finally, when writing this partnership proposal document, the specific context of a deep economic crisis (as a consequence of the Covid-19 pandemic) is a strong additional argument to tangibly support and fund the European R&I, part of an extended recovery plan, allowing EU to invest into Green Deal compatible solutions while staying competitive in front of the international competition, in particular the USA and China, but Japan, South-Korea, and other raising innovation front-runner countries.

The final commitment of the partners, will depend on the agreed (with the European Commission) **objectives, vision &** Strategic Research and Innovation Agenda. At this stage, the following possible contributions are foreseen:

- **Expert feedback**: **providing input and advice to the Commission** to contribute to the identification of the research and innovation activities to be included in the Horizon Europe Work Programmes.
- **In-kind contributions to projects**: **bringing into projects the necessary resources** to add to the European Commission's funded part, including if and where relevant by tuning funding rates, while ensuring the partnership remains attractive to all players in the value chain. Corporates and SMEs participating to B4P projects will commit to engage time, resources and money to contribute to the achievement of projects directly contributing to the B4P objectives.
- **In-kind contribution for additional activities** carried out by partners (defined in the SRIA, not covered by Union funding): these may include dissemination and market uptake activities and / or research & innovation projects. The aim is to guarantee effective outcomes by **bringing innovations to market**, liaising with market-oriented bodies. Private B4P partners are committed to innovation and guarantee market access to innovative products, thus participating to the impacts of the B4P partnership.
- **Governance**: setting up and operating **proper governance structures**, ensuring (i) an open & transparent process for consulting on the identification of partnership's priorities (ii) well-functioning membership process and assistance to members (iii) a high level of openness and transparency to adequately inform interested stakeholders on the functioning of the partnership, especially towards SMEs. These governance structures will include adequate financing arrangements to support operation activities of the partnership, beyond the work that is foreseen in the SRIA.
- **Monitoring**: putting in place a **monitoring system** which will allow to report on activities and KPIs on a regular basis, for example on an annual basis as has been the case for previous partnerships. The set of KPIs will be defined and validated at the Partnership Board level.

  In addition to these commitments and contributions, it is important to underline the benefits of the partnerships for the sector and related stakeholders, including the European Commission, such as:
  - Supporting policy implementation, providing practical and real-field experience and feedback to policy makers, at EU and National levels. Identifying hurdles & barriers, but also successful business models and market opportunities, and communicating & disseminating them.
  - Contributing to unlocking additional investments for the built environment. Thanks to a broad and committed stakeholder community, including asset owners and managers as well as insurance companies and financial bodies, the B4P partnership will contribute to reduce the gap between developers and investors.
  - Favouring market access to new solutions, liaising with implementing bodies, both at Member States and European levels, providing access to sandboxes and pilot sites, favouring shorter development time and easier access to real-field testing.
  - supporting training, re- and up-skilling of work force.

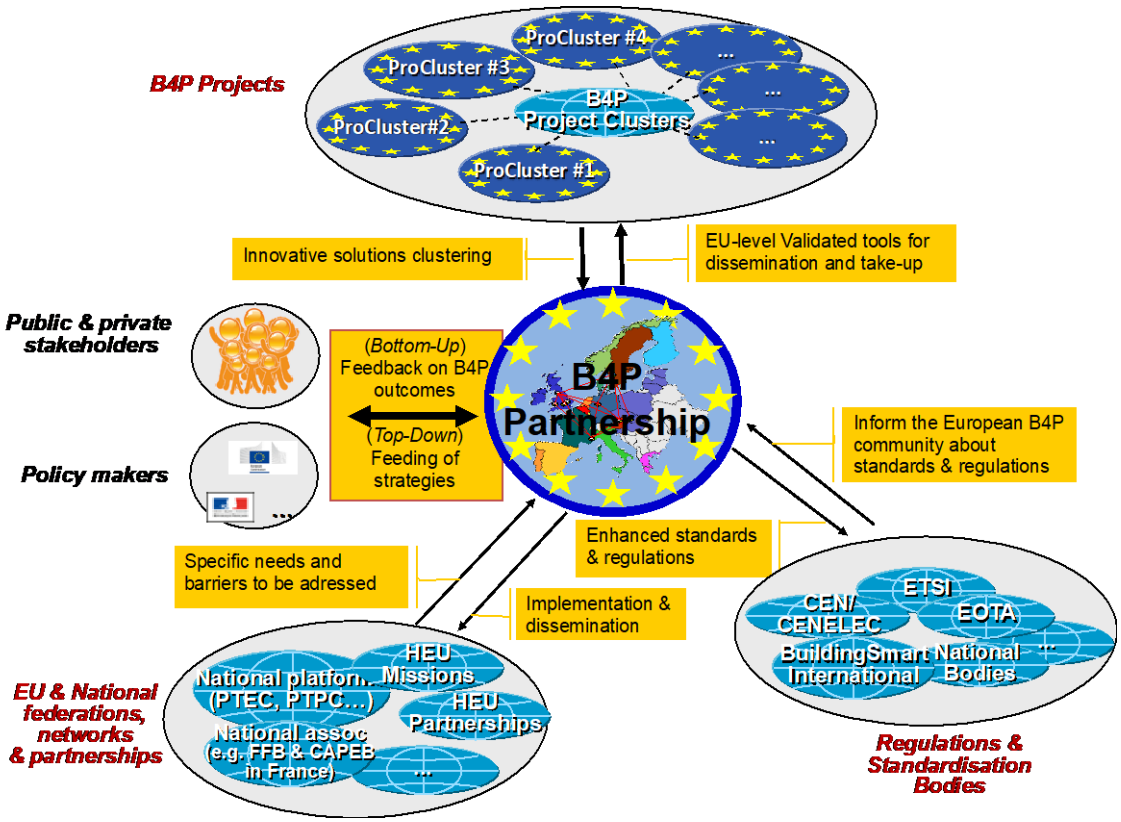

Figure 8: *Built4People – Stakeholders links*

2.3 GOVERNANCE

Governance is key to the success of the partnership. The governance structure should ensure an effective implementation and allow for the participation of all relevant players to decision-making. To this end, a multi-stakeholder, layered management structure is envisioned, as shown below.

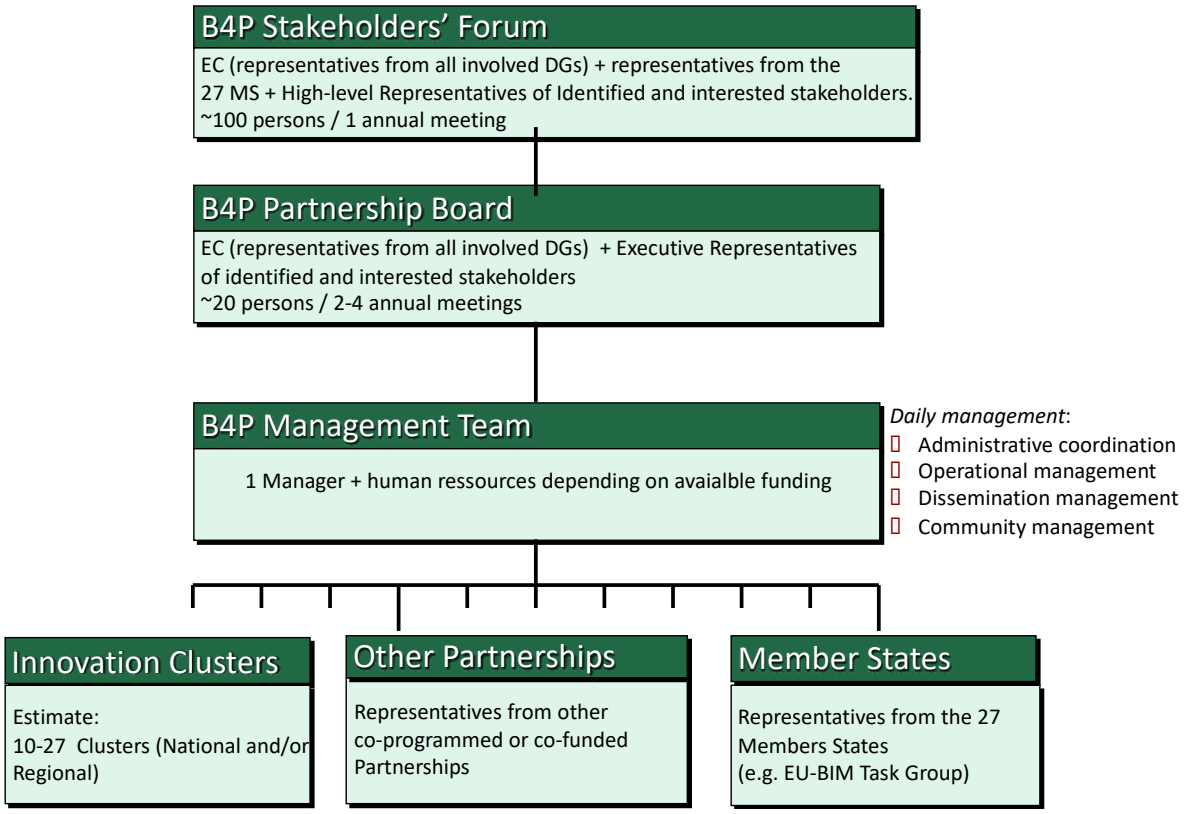

***Figure 9**: Built4People – Management and governance structure*

The role of the governing structures are as follows:

- The **B4P Stakeholder Forum**, with a broad involvement (all stakeholders and member states demonstrating interest in the B4P area and vision) will advise at strategic and operational level and support informed decision-making. The forum will collect and provide regular information regarding market trends and evolution, allowing to refine and update estimates of impact and additional investments to be deployed, to fine-tune the KPIs of the partnership and support their monitoring, etc.. Another example is to advise on clustering of projects as well as innovation clusters / living labs (*see section 1.2, 'Intervention logic'*) around common challenges and barriers. This forum is not designed to pilot or manage the partnership, but to make proposals to improve the overall operation of the partnership, as well as to make recommendations on the strategic and roadmapping orientations of the partnership. Beyond the organisation of an annual meeting, interactions with the Stakeholder Forum will be achieved through thematic workshops, webinars or open consultations.

- The **B4P Partnership Board** will be in charge of strategic steering (alignment with policies and public interest), identifying (typically on a bi-annual basis) the main orientations of the partnership (including recommendations for topics to be included in the HE work programmes) and of monitoring the activities of the B4P Management Team (*see below*) in charge of implementing the Board decisions. The Board will be responsible for monitoring and stimulating the overall progress and operation of the partnership, e.g.:

- Support to the development of cross-cutting approaches between industry "silos", stimulating innovation by mutual fertilization and experience sharing;
- Raise public awareness on B4P results to increase related impact through dissemination and communication actions;
- Foster collaboration with other initiatives, to jointly address key challenges for market uptake and share best practices.
- Invite external advisers or experts to participate in Board meetings to share insights and recommendations and foster interaction with the Member States via appropriate fora.

- The **B4P Management Team** will be formed by a core team of associations who will appoint (full time or part time – *also depending on the level of potential funding of the Partnership – see 'Funding' sub-section below*) a partnership manager as well as staff responsible for the relevant areas of competence (R&D innovation, impact, Public policies, etc.). This team will manage day-to-day activities of the partnership (including all meetings with other instances of the partnership), implementing decisions taken by the B4P Partnership Board, representing the association and reporting on the outputs of the Partnership. The B4P Management Team will also be in charge of:
  - Providing a regular assessment of progress with regard to the partnership's KPIs and strategic planning and road-mapping;
  - Managing interactions with the European Commission and the Agencies, including the organisation of (at least) 2 meetings per year involving the B4P Partnership Board and all interested DGs, and Agencies involved in the implementation of the partnership;
  - Interacting with relevant innovation clusters (see more details below).

Innovation clusters

The B4P partnership will connect to a set of innovation clusters (National or Regional), to promote and support the deployment, demonstration and market transfer of output assets from the R&I projects in regions, thereby increasing impact at local and National level. The minimum targeted number of clusters will be between 10 and 15 clusters, but depending on resources the opportunity of having at least one cluster in each EU country will be assessed.

A comprehensive and formal process will be developed by the Partnership for the selection or creation of these Innovation clusters: it is considered to launch a call for clusters at the start of the Partnership (2021) with an application process to form a cluster, including a well-defined set of criteria for selection. As such, any potential new cluster will have to apply, demonstrating that it meets the defined set of criteria. In setting up clusters, the partnership will strive to have balance in terms of geographical coverage. The B4P Management Team will be in charge of reviewing and checking for compliance, evaluating and ranking the forms submitted from potential clusters throughout Europe, and will submit for approval an evaluation summary report to the B4P Partnership Board who will ultimately take the decisions about which cluster applications are approved. Member States will be involved in the development of the principles and criteria for this selection process. Moreover, depending on resource considerations, additional waves of call for clusters - from 2023 onward – will be considered. This will be based on a first mid-term review and assessment of the initially selected clusters under operation.

A description of the involvement of the Commission in the preparation and implementation of the Partnership will be developed subsequently based on broader consultation.

2.4 OPENNESS AND TRANSPARENCY

Since the very beginning, the proposed Partnership has been drafted in close consultation with representatives from the EU institutions, Member States, construction value chain and end-users. Preliminary actions towards openness and transparency have been undertaken in the preparation itself of this Partnership, in terms of outreach and consultation:

1. A preliminary group of stakeholders has been formed to establish the groundings of this Partnership, including ECTP, WGBC, FIEC, EBC, UIPI, EUREC, ECCREDI, ACE, etc.;
2. A stakeholder meeting, organised on the 12 December 2019, Brussels by the EC with the support of ECTP and WGBC, for stakeholders to discuss the setting up of such a partnership, including a specific proposal document setting out the objectives and scope, and to discuss the relevant EU policy landscape. The event was webstreamed, and all recordings and presentations are available online[20]. Approximately 200 people were registered for the event.
3. A European-level consultation by the European Commission, under the form of an online public survey (defined by the EC based on discussion with ECTP) launched to gather further input from stakeholders regarding B4P, and to ensure the widest possible input to the proposed partnership. The survey was online over the period 17/12/2019 – 15/01/2020[21]. The spectrum of respondents was broad, ranging from European private sector businesses and associations to public authorities, universities and research institutes, professional bodies, and non-governmental organisations.

This broad, open and transparent approach will be guaranteed in the establishment and operation of the proposed Partnership by launching public calls for interests in participating in the Stakeholder Forum and the Innovation Clusters of the proposed Partnership. The process will be managed in close cooperation with the European Commission and the Agencies. Sectoral and geographical coverage will be guaranteed by establishing representativeness KPIs that will allow to evaluate, during the whole life of the Partnership, if all relevant interests and parties across Europe are represented and duly taken into account. When relevant, the Partnership will involve international partners in compliance with applicable European Union regulations. The openness of the Partnership may be restricted to preserve Union' interests, as foreseen by Horizon Europe policies. Any restrictive decision will have to be duly justified and taken into close cooperation with the European Commission.

The comprehensive strategies and plans throughout the lifetime of the Partnership to ensure easy and non-discriminatory access to information about the initiative and dissemination of and access to results (in line with Horizon Europe provisions), and to increase interest and commitment in the participation to the Partnership will be elaborated in the first phase of operation of the Partnership.

As a starting point and during the lifetime of the proposed Partnership, open access to research data will be ensured in line with the principle 'as open as possible, as closed as necessary', as foreseen by the Horizon Europe provisions. Dissemination and access will be guaranteed by ensuring the continuous publication of results on traditional and innovative communication channels, when this does not conflict with Union' interests or any other constraint (e.g. such as data protection rules,

[20] European Commission, "Sustainable built environment research and innovation partnership under Horizon Europe". See https://ec.europa.eu/info/events/sustainable-built-environment-research-and-innovation-partnership-under-horizon-europe-2019-dec-12_en

[21] 181 responses were received specifically over the one month period that the survey was online (17 December 2019 to 15 January 2020).

security rules or intellectual property rights). Any restrictive decision will be taken in close cooperation with the European Commission.

The proposed Partnership will establish a proactive, dynamic and agile recruitment policy to allow a membership constituency responding to the evolution of the sector and the needs of the partnerships throughout its lifetime, across the Union and, where relevant beyond. This policy, which will be detailed at the very start of the Partnership, will in particular include:

- Internal dissemination (of the role, objectives and activities of the Partnership) by the associations already committed to the Partnership
- Regular information to be provided to the EC (all DGs interested in the Partnership), relevant Agencies, and the Member States, for their information and acting as potential dissemination multipliers;
- Potential participation to workshops with interested partners organised at national level;
- Missions to EU Members States who are not yet committed or underrepresented in the Partnership – along with potential national surveys to align with national strategies and programmes and support decision-making on national commitments;
- (HEu) Mid-term online public consultation at European level to raise awareness about achievements and future plans for B4P, in particular regarding the development of innovations clusters and living Labs, so as to widen the B4P community of interest, and to engage more actors in the development of new innovation clusters;
- Identification of new or growing networks (either active in R&I, or professional ones), including 'mirror' organisations at an international level (in various countries like Australia, Canada, US, China, Russia, and in South-America and Africa – with possible modes of interactions and cooperation to be further investigated at the very start of the Partnership.

In order to ensure the geographical and sectoral coverage of the Partnership, representativeness KPIs will be set. This would allow the Partnership to monitor, assess and potentially review its partners' composition in order to ensure that objectives will be met with the highest level of representativeness.

Membership fees, where they apply, will be set to a level that both supports adequately the Partnership's operational activities and allows as broad a participation as possible. In particular, the nature of the organisations (e.g. company, association, governmental and non-governmental organisations, etc.) willing to join the Partnership will be taken into account when establishing the Partnership's membership fees policy.

In addition, and in order to stimulate the participation of new partners and actors [22] in the programming of the partnership, including the definition of common priorities and strategy foresight, and their participation in the partnerships itself or its activities, the following actions are already anticipated:

- An overall SRIA covering the seven years of duration of the Partnership will be ready at the start of the Partnership, with a detailed focus on the priorities for the first two years. Every two years, an update will be produced, which also considers the results of the projects launched in previous years- through a consulting process and integration of priorities for the whole B4P community of stakeholders and targeting relevant stakeholders (researchers, professionals, practitioners, end-users) needs. Professional associations (FIEC, EBC, UIPI…), technological platforms, and other partnerships will be associated to the process;

[22] In particular from related areas, e.g. waterborne and zero-emission transport sectors. Such cross-sector participations could take different forms – e.g. full partnership or punctual / regular participation to activities and events of the partnership.

- Whenever feasible, the partnership will favour joint approaches between clustered EU-funded R&I projects, e.g. through co-design / co-creation of new solutions and approaches to increase the potential towards the market and pave the way towards a wider use of research results;
- Identifying and / or setting up Innovation clusters in a geographically balanced way will be a key mechanism to take advantage and use of R&I projects results from the Partnership. This will be done by teaming-up and engaging clusters' ecosystems to implement, test and assess integrated innovative solutions, and to provide access to the whole B4P community to the results of experimentations, assessment and validation of pilots / living labs.
- Informing EU and national policies in order to promote a conducive and fair legal environment to support innovation in a sustainable built environment;
- Various formats for communication and dissemination will be provided to reach different target groups, e.g.:
    - Dedicated website/portal with projects information updated – targeting most promising outputs and outcome of results;
    - Newsletters and various social media channels;
    - Regular dissemination events and Brokerage event for calls;
    - National or regional brokerage events organised in close collaboration with local offices in charge innovation clusters, platforms, clusters;
    - Dedicated events with policy bodies.

APPENDIX 1 – EXECUTIVE SUMMARY OF THE ECTP SRIA

Strategic Research & Innovation Agenda for construction and the built environment, 2021-2027

This SRIA has been endorsed by the following associations:

The European Construction, built environment and energy efficient building Technology Platform (ECTP) is a leading membership organisation promoting and shaping the future of the Built Environment and Construction sector in Europe.

As such, its members together with other associations from the related sectors elaborated a Strategic Research and Innovation Agenda (SRIA) in order to support the necessary transition of the industry towards more competitiveness and sustainability. The SRIA delivers a **Vision on the development of the built environment until 2050** and defines a set of **mid-term objectives** (to 2030) in order to turn this vision into reality. It gives an overview of the main environmental, societal, technological and industrial challenges to be taken up by our sector in the coming decades and provides a detailed research and innovation plan to address them. **The proposed activities are balanced between technical developments and the integration and scale-up of mature technologies and workflows, and innovations in business models, partnerships, financing schemes and procurement processes.**

Environmental, societal, technological and industrial challenges shall drive the transition of the sector towards more sustainability and competitiveness

The built environment and related industry must take up some critical societal challenges:

- **Climate change** has a direct impact on the built environment, due to increasing natural hazards and evolving climate conditions that impact the performances of buildings and infrastructures. In the perspective of a carbon neutral built environment, renovation processes must speed up;

manufacturing and construction processes must evolve towards lower environmental footprint; and solutions for more sustainable way of lives (energy, mobility) must be fully integrated;
- **Urbanisation** leads to redefine the city, from single buildings to **districts** and their connections and interactions, leveraging on ICT technologies, renaturing concepts, and the valorisation of cultural heritage;
- **The ageing of populations** must lead to rethink the built environment for more accessibility and inclusiveness, from private to public spaces and the connections between them.

In complement, some industrial and technological trends constitute either challenges or opportunities:

- **Ageing infrastructures** must evolve and adapt to new uses and hazards;
- The **industrial (r)evolution** is still to be implemented, by integrating mature technologies (AI, automation, etc) into all processes from design to manufacturing and construction;
- **Digitalisation** is to be generalised in the construction processes and in the built environment;
- **Biobased and advanced materials** must be integrated to achieve more resilience, comfort, health, safety, resource efficiency, and carbon neutrality of the built environment.

Finally, EU policies and regulations are strong drivers towards a more sustainable construction sector.

Resulting from these challenges, the ECTP has formalised a Vision by year 2050 for the built environment and the related industry:

VISION 2050:

A climate neutral built environment enabling the well-being of all EU citizens, provided by a circular, digitalised and prosperous construction ecosystem.

To that end, a detailed plan for Research and Innovation activities is proposed, structured **around three goals to 2050** that respectively address:

- **Sustainability**, by making the built environment CO2-neutral, resource efficient and high-performing over its whole life cycle;
- **Use-centricity**, by providing a service-oriented built environment that enables every European to live better and more sustainably;
- **Competitiveness**, by making Europe a worldwide reference in sustainable and digitalised construction ecosystem.

The next diagram illustrates these three goals 2050.

FIGURE 1 : GOALS FOR THE BUILT ENVIRONMENT AND THE CONSTRUCTION SECTOR

For each 2050 goal, a concrete objective for the time horizon 2030 is set. A fourth, cross-cutting objective focusing on *digitalisation* is added, as a critical *enabler* and success factor for the other 3 objectives. These four objectives are synthesised hereafter.

- Four objectives to 2030 -

1: Clean built environment and cities. **The 2030 objective is, very pragmatically, to reach the environmental and energy objectives 2030 set by the EU,** in its climate and energy framework and related key targets[23] as well as the EU circular economy action plan. This will be met thanks to affordable offers for new constructions and renovation; innovative urban design concepts enabling more sustainable living and mobility patterns; positive energy districts and communities (including historical centres) that are fully integrated in the energy system as active elements; and circularity of resources (including urban mining[24] and urban food production).

2: Built for and with the people. **The 2030 objective is that Europe becomes a world leader in age-friendly, inclusive, well-interconnected spaces, participative planning & design, and valorisation of Cultural Heritage.**

The ambition by 2030 is to take a real advance in the adaptation of buildings and infrastructure to the needs of an ageing population. Urban planning and building design must become fully participative processes in order to integrate at best the user needs while complying with climate and environmental constraints. Citizen involvement shall also become a reference to optimise the operation of built assets and support renaturing processes. The built environment must integrate all knowledge and innovations that can contribute to improve the indoor and outdoor environment quality, and the responsiveness of buildings and mobility infrastructures in view of increased comfort and customised services. New technologies shall be used to increase the accessibility and inclusiveness of the built

[23] 2030 climate & energy framework: 40% cuts in greenhouse gas emissions (from 1990 levels), 32% share for renewable energy, 32.5% improvement in energy efficiency.

[24] Urban mining concerns all the activities and processes of reclaiming compounds, energy, and elements from products, buildings, and waste generated from urban catabolism (Baccini & Brunner, 2012)

assets and take maximum benefit of the cultural heritage. Finally, new business models and financing mechanisms must be invented to make tomorrow's improved built environment within the reach of all European citizens.

3: Prosperous ecosystem. **The 2030 objective is to reach a 20% productivity increase** through upgraded and innovative industrialised construction processes, cross-sector partnerships and skilled workforce. This gain will result from the integration and rationalisation of new materials, technologies, new designs and techniques in the manufacturing and construction processes that will trigger drastic cost reductions; a real step forward in the workforce qualification; and a paradigm shift towards asset management (whole life cycle approach) that will value at best predictive maintenance and resilience of buildings and infrastructures. This transition will require the active support of public authorities with renewed procurement processes that give a real chance to innovation roll out. New business models should emerge in partnership with other sectors in order to offer combined, packaged services.

4: Digitalisation: **The 2030 objective is that all construction companies, including SMEs, in Europe adopt digital tools in a common and open framework, to deliver smart-ready buildings and infrastructures**

Digitalisation of the construction sector is increasingly recognised as a game changer for the sector. With BIM as a front-runner, all key enabling digital technologies and infrastructures need to be integrated in a dynamic way to support the achievement of the other goals. The inclusiveness of this transformation (i.e. embark all the actors of the construction ecosystem -SMEs, citizens) is a prerequisite to ensure the success of digitalization and maximise its positive impact for the value chain and the EU citizens. The **2030 objective** therefore focuses in the progressive **uptake of digital tools by construction companies, in particular SMEs**. Digitalisation will also contribute to a clean energy transition and to a more sustainable living, as buildings and infrastructures will become an active part of the energy system (see objective 1). Data storage, protection and accessibility is another focal point which needs to be addressed carefully.

FIGURE 2 : OBJECTIVES 2030 FOR THE BUILT ENVIRONMENT AND THE CONSTRUCTION SECTOR

In order to define clear indicators towards the successful implementation of the above-described objectives, quantified targets are defined for each objective, as listed below.

Targets 2030 for "Clean environment and cities"

- 3% annual renovation rate in Europe for buildings and infrastructures
- Align with EU 2030 climate and energy targets: 40% CO_2 reduction (vs 1990 levels), 32% share of RES in final energy consumption of buildings, 32.5% energy savings
- Contribute to achieving EU target on 100 carbon neutral cities
- 80% reusable or recyclable materials for new buildings and infrastructures, and for renovation components

Targets 2030 for "Built for and with the people"

- KPIs to measure the implementation of participative approaches in urban planning and design and 15% increase of participative processes in urban planning
- Availability in all EU member states of a common evaluation/ certification framework for age-friendliness performances of buildings
- 50% of building renovations and 75% of new build comply with age-friendly criteria (implementation of previous target)
- Availability in all EU member states of a common evaluation/ certification framework for healthiness and wellbeing of the built environment
- Zero disruption (renovate while in use)
- Zero loss of cultural heritage
- 50% increase in urban food production

Targets 2030 for "Prosperous ecosystem"

- 20% increase in productivity
- 50% reduction in building renovation time at maintained quality and performance level
- 40% reduction in the emissions of the construction process in line with EU targets
- Improve security of workers: 50% reduction in incidents, Zero fatalities
- 30% reduction in repair work; 20% reduction of time & cost of maintenance interventions
- 20% reduction in Cultural Heritage conservation costs
- 20% reduction in vulnerability to natural / man-made aggressions

- □ Integrated Design and Delivery Solutions[25] (IDDS) become mainstream procurement options
- □ Reduction of the skills gap by a factor 3

Targets 2030 for "Digitalisation"

- □ Full interoperability of all systems (BEMS, active components, RES) within new and renovated buildings (Plug & Play)
- □ Full interoperability (with open standards) between different software (e.g. simulation, BIM, 3D printing)
- □ Standardised framework for data management
- □ 50 % EU cultural heritage in BIM model
- □ Public procurements are fully digitalised (BIM based) in all Member States
- □ Full data privacy and security for all EU citizens, including workers
- □ Full integration of infrastructures in BIM (City Information Modelling)
- □ 10% reduction in operational costs of logistics

The table next page provides an overview of the Research and Innovation activities proposed in order to meet the above listed targets: they are structured along the four Objectives 2030 and clustered into ***R&I priority areas***.

The complete SRIA document provides a detailed description each R&I priority area and the different R&I topics which they respectively cover, as well as a proposal of EC funding requirements for the period 2021-2027 (Horizon Europe programme).

[25] *Integrated Design and Delivery Solutions* relates to holistic approach of the construction process, relying on a combination of initiatives such as skill development, process re-engineering, responsive information technology, enhanced interoperability and integrating knowledge management, to reach a radical improvement of performances in the construction industries.

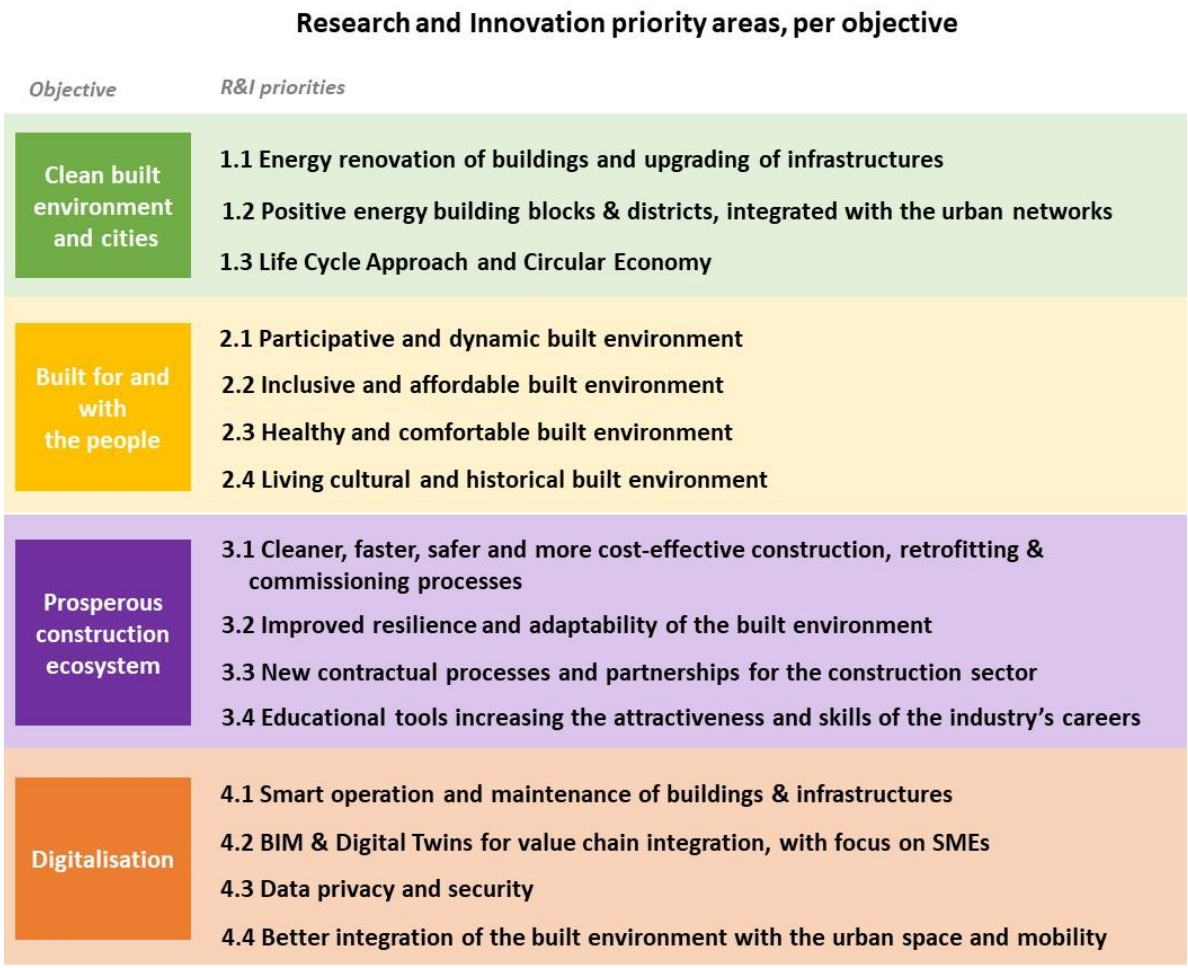

FIGURE 3 : RESEARCH AND INNOVATION PRIORITIES, PER 2030 OBJECTIVE

Innovating in construction and the built environment contributes to social integration, economic growth and climate change mitigation

The construction industry generates **9% of the EU GDP** and around 5% of European workers and employees are directly employed in the construction sector, representing close to **18 million jobs**. 1% growth in the sector turn-over immediately creates close to 200,000 new local jobs in Europe.

Upskilling and innovation in the sector will allow to leverage a large potential for competitive gains and GHG emission and resources savings, also contributing to achieve higher quality and sustainability in all Europeans' way of lives.

APPENDIX 2 – NON EXHAUSTIVE LIST OF REPORTS / DOCUMENTS TO BE CONSIDERED FOR THE ELABORATION OF THE B4P STRATEGIC RESEARCH & INNOVATION AGENDA

- Built Environment non paper, DG GROW
- Clean Energy For All Europeans package including: the revised Energy Performance of Buildings Directive; Commission Recommendation on building renovation (EU) 2019/786) and Commission Recommendation on building modernisation ((EU) 2019/1019), and Annex I Accelerating clean energy in buildings
- Davos Declaration "Towards a High-quality Baukultur for Europe", 2018
- European quality principles for EU-funded interventions with potential impact upon cultural heritage, International Council on Monuments and Sites, 2019
- Member States' expert group on High-quality architecture and built environment for everyone, 2020-2021 as part of EU Work Plan for Culture
- Innovating Cities - to be published Dec 2019, DG RTD
- SET-Plan Implementation Working Group
  - SET-Plan Action 3.2- Europe to become a global role model in integrated, innovative solution for the planning, deployment and replication of Positive Energy Districts[26]
  - SET Plan Action 5- Energy Efficiency in Buildings Implementation Plan[27]
- Strategic Themes – ECCREDI
- WorldGBC Global Strategy and Impact Framework
- WorldGBC Europe Impact Strategy
- Level(s) Collective Vision 2019Implementation Strategy
- 2050 Vision for 100% renewable heating and cooling in Europe (produced by the European Technology and Innovation platform on Renewable Heating and Cooling)[28]
- Circular Economy Action Plan 2.0
- Common Implementation roadmap for Renewable Heating and Cooling Technologies[29]
- Standardisation Mandate 420 on accessibility of the built environment

[26] https://setis.ec.europa.eu/system/files/setplan_smartcities_implementationplan.pdf

[27] https://setis.ec.europa.eu/system/files/set_plan_buildings_implementation_plan.pdf

[28] https://www.rhc-platform.org/content/uploads/2019/10/RHC-VISION-2050-WEB.pdf

[29] https://www.rhc-platform.org/content/uploads/2019/04/RHC_Common_Roadmap.pdf

APPENDIX 3 – B4P CONTRIBUTION TO EUROPEAN POLICY OBJECTIVES

Legislation	Main elements	Partnership awareness & impact
Energy Performance in Buildings Directive	Support massive renovation and modernisation of buildings *in the EU; highly energy-efficient and decarbonised building stocks by 2050.*	Potential impact through coordinated clustering of projects, as well as the erection of regional/national clusters.
	A common European scheme for rating the smart readiness of buildings in Europe.	ECTP has started this year to influence some of its members to provide pilots for 1st assessment of the SRI (Sept-Nov 2019). Such an action to be continued and extended in the course of the new Partnership.
	Due considerations for smart technologies being promoted through requirements on the installation of building automation and control systems.	Coordinate at European level a smart technologies/buildings innovation community in their communication and contribution in terms of lessons learned, success stories and potential market developments, and develop the promotion, experimentation and roll-out of relevant policy initiatives (e.g. SRI).
	Due considerations for health and well-being of building users being promoted through an increased consideration of air quality and ventilation.	The partnership integrates associations that are dedicated to these specific aspects. It will in addition nurture links with key initiatives in the fields, e.g. the Air Infiltration and Ventilation Centre (AIVC), the building and ductwork airtightness platform (TightVent Europe), or the international platform on ventilative cooling (venticool).
Renewable Energy Directive	Considerations for Households and energy communities to become clean energy producers.	The partnership includes representative associations along the whole value chain to make aware and exchange assets owners and tenants, represented by key associations like UIPI.
Energy Efficiency Directive	Protection of the rights of consumers to receive easy and free access to data on real-time and historical energy consumption.	Generalised approach towards energy data management (including privacy and security, and in line with GDPR) promoted by the Partnership.
	Provision of rules on metering and billing of thermal energy by giving consumers clearer rights to receive more frequent and more useful information on their energy consumption, also enabling them to better	Some energy utilities and Energy Service Companies are part of the B4P partnership. Eurelectric also strongly supported ECTP SRIA and asked to be part of the B4P partnership. The heating & cooling sector is also represented in the partnership.

	understand and control their heating bills.	
Regulation and Directive on the Internal Market for Electricity	Provision for more flexibility to accommodate an increasing share of renewable energy in the electricity grid.	Both technology developers, as well as infrastructure operators and utilities, are very active to increase system flexibility. Involving consumers and positioning them at the centre of the energy system is also crucial.
	Potential for Consumers to request a smart meter and a dynamic price contract that allows them to be rewarded for shifting consumption to times when energy is widely available and cheap.	B4P involves all the necessary stakeholders to address this evolution. The EU vs National levels is of particular importance here.
Circular Economy Action Plan 2.0	Identification of Construction as key sector. Work for the incorporation of circular economy and life cycle principles in the design and construction of new and renovated buildings.	The European Commission's Level(s) framework provides a common language on sustainability in the built environment and common metrics for resource use and circularity. The Partnership will ensure that projects build on this and foster market uptake and alignment.
European Framework for Action on Cultural Heritage	Cultural heritage for a sustainable Europe: smart solutions for a cohesive and sustainable future; Cultural heritage for a resilient Europe: safeguarding endangered heritage;	The ECTP was a very active stakeholder in the promotion of cultural heritage during the "European Year of Cultural Heritage" in 2018, being member of the Community of Innovators in Cultural Heritage, promoted by the European Commission. During the H2020 period the ECTP also had a permanent liaison with the JPI Cultural Heritage. The B4P Partnership commitment with the regeneration of the built environment through a circular economy and resources efficiency approach will promote the conservation of the built cultural heritage and its transformation in a social asset from a double perspective: as a service provider (home, working space, public space…) and as an icon of the identity and history of the community.
EU Green Deal, Decarbonisation	Mention 'renovation wave' and circular economy	The objectives of the EU Green Deal can only be achieved if the total impact of the built environment are addressed. The Partnership will directly support this through action on whole life carbon and circularity as well as renovation.
Biodiversity Action Plan	Green Infrastructure providing multi-functions such as resilience to climate change, ecosystem services and habitats for urban wildlife.	The ECTP has already participated to the ThinkNature project (funded by the EC under H2020) having delivered a Nature-based Solutions handbook and platform. The Partnership is to rely on these efforts and others to leverage an initiative dedicated to city policies, business models and technical aspects of re-thinking and implementing nature-based solutions in the Built environment and the cities.

Clean Planet for all	Spatial planning supporting reduced pollutant concentrations.	By taking a whole value-chain approach to transformation, the Partnership will address systemic challenges such as the interplay between the built environment and mobility through spatial planning strategies and the effect of this on climate and health impacts. The connection between EU initiatives and stakeholders and MS and city stakeholders will be key to addressing this issue which is dealt with at national and city level.
Public Procurement Directive	*Organisation of procurement, use of BIM for procurement, reference to the work of the EU BIM Task Group[30], e-procurement, innovation partnerships and competitive dialogue*	The partnership will develop and achieve broadcast communication on the procurement aspects in relationships with the EU BIM Task group on one side, and its links with the EU MS on the other hand.
Sustainable Finance Action Plan and EU Green Taxonomy	The Taxonomy is a tool to reorient capital flows towards sustainable investment. Buildings are identified in the Taxonomy as "a critical cross-cutting issue" with "relevance to the emissions performance of almost all economic activities."	The taxonomy must give a clear signal to the financial sector that sustainable built environment assets must aim for net zero carbon across their whole life cycle in order to comply with the Paris Agreement and a climate neutral Europe. To achieve this the taxonomy metrics and thresholds must be reviewed and updated at regular intervals in the period up to 2050. The Partnership will facilitate this 'Paris-proof' alignment through common benchmarks and decarbonisation trajectories.
New Skills Agenda, Occupational Safety and Health Framework Directive, Professional Qualifications Directive	The Blueprint for sectoral cooperation on skills in Construction, is an industry led initiative meant to prepare the sector for the future skills needs, linked mainly to digitalisation, circular economy and energy efficiency. Equally there is ongoing work in OSH in construction etc.	The Partnership will devise (with expert stakeholders) training initiatives and supporting policy instruments to be put in place - including, educational (both initial university curriculums and Vocational Education and Training) and informative programs as ideal pathways to maximize demand for skills in the Construction sector in domains like Safety and Health, digitalisation, etc..
Urban Agenda for the EU	City led partnerships and initiatives in the areas of Circular Economy, digital and energy transition. Many of the pilots could be improved through R&I and scale up.	The Partnership will connect with policy and market initiatives at multiple levels, helping to foster increased dialogue and cooperation between city, regional, national and EU level efforts. In this it can build on the experience of key stakeholders, such as WorldGBC Europe's BUILDUPON programme, which is collaborating with Covenant of Mayors Cities to develop a multi-level reporting framework for renovation.

[30] www.eubim.eu/

Active Ageing	More accessible and friendly built environment	ECTP participates in the Homes4Life project which develops a vision and a certification scheme for age-friendly living environments. Age-friendly housing has a role to play in meeting at least three of the six headline ambitions for Europe - proposed by the President of the European Commission Ursula von der Leyen - over the next five years and well beyond: a European Green Deal, an economy that works for people, and a Europe fit for the digital age. The Partnership will further push age-friendly housing and built environment as a public policy.
EU Energy-Intensive Industries' 2050 Masterplan	The Masterplan sets out how EU industry can become climate-neutral while staying competitive. It proposes a number of strategies that are closely aligned to the objectives of the B4P partnership and proposes other HEU partnerships that B4P can collaborate with.	The built environment is a key demand-side driver of industrial decarbonisation. Mainstreaming lifecycle thinking and LCA, for example through mass-uptake of the Level(s) will help drive the low carbon transition of heavy industry By involving stakeholders with strong EU and global networks, such as WorldGBC, the Partnership can support competitiveness of the sector.
UN Convention on the Rights of Persons with disabilities	Requires interalia accessibility of the built environment offered or provided to the public	The EU and its Member States are bound by its obligations on accessibility.
European Accessibility Act	Directive on accessibility of products and services	Contains accessibility requirements for the built environment that Member States may decide to use

APPENDIX 4 – ESTIMATE OF TOTAL EC FUNDING REQUIRED FOR THE BUILT ENVIRONEMENT IN HEU (7 YEARS)

Parameter	Value		Source	Comments
R&D investment in construction and Materials, top 1000 EU Companies 2018	**1,88**	**€b/year**	EU Industrial R&D investment scoreboard: https://iri.jrc.ec.europa.eu/data.html	*EU 1000. Definition in EU Scoreboard: "R&D investment in the Scoreboard is the cash investment funded by the companies themselves. It excludes R&D undertaken under contract for customers such as governments or other companies. It also excludes the companies' share of any associated company or joint venture R&D investment. However, it includes research contracted out to other companies or public research organisations, such as universities."*
R&D investment in construction and Materials, extrapolated to all EU companies	2,09	€b/year		*Assuming that EU1000 covers 90% of all EU private R&D expenses. The scoreboard mentions that their study of top 2500 companies worldwide covers 90% of R&D expenses worldwide.*
When excluding R&D on materials not related to construction*	1,42	€b/year	EU Industrial R&D investment scoreboard: https://iri.jrc.ec.europa.eu/data.html	**R&D on materials not related to construction include: materials for batteries, PV cells, applications in biotech & medicine / microelectronic / energy transmission. (Innovation scoreboard). See next table below for the related estimate on "non construction related R&D in Materials"*
Calculation over 7 years	9,94	€b over 7 years		
Expected public funding contribution in % of these R&D expenditures	20%			***If 1€ public funding = 4€ private investment, rate should be 20%***
Overall public funding for construction	1,99	€b over 7 years		
Suggested share of R&D public funding to be addressed at EU scale	75%			
Overall EC funding for construction R&I	**1,5**	**€b over 7 years**		

Estimate R&Di expenses in materials not related to construction sector, 2019 (side calculation for table above)

Parameter	Value		Source	Comments
Worldwide Market value for Advance Materials (projection 2020)	166,7	b€	https://emiri.eu/assets/pdf/technology-market-perspective_en.pdf	The 19,3 value refers to "construction and cross cutting" category in the EU report - a part which should be kept in
Share of Europe in World GDP	20%	%	https://www.imf.org/external/datamapper/PPPSH@WEO/OEMDC/ADVEC/WEOWORLD	
VAMS advance Materials/ EU	33,34	b€		
Average EU R&D intensity	2%		Eurostat	https://ec.europa.eu/eurostat/documents/2995521/9483597/9-10012019-AP-EN.pdf/856ce1d3-b8a8-4fa6-bf0
Estimated R&D expenses in EU Advance materials market (construction and cross-cutting applications excluded)	666 800	M€	https://ec.europa.eu/eurostat/statistics-explained/index.php/R_%26_D_expenditure	

APPENDIX 5 – PRELIMINARY LIST OF PARTNERS AND STAKEHOLDERS

ECTP – The ECTP Secretariat representing all members of the ECTP association, the full list available here : www.ectp.org/organization-database-list/
WGBC represented by GBC Poland and GBC Italy and, in the future, by WGBC Europe
AEICE
AGH University of Science and Technology
Brussels Consulting Kft
Business Management PJH, Light Entrepreneurship with SLP Group Oy/UKKO.fi Service
Cabinet, Ministry of Culture Italy
Carleton University
CDTI - Spanish Innovation Agency
CECE - The Committee for European Construction Equipment
Cesefor
EAE - European Association for External Thermal Insulation Composite Systems (ETICS)
EFIEES (European Federation of Intelligent Energy Efficiency Services)
ETRA
Euroheat & Power/ DHC+ Technology Platform
European Builders Conferedation EBC
European Disability Forum
European Heat Pump Association (EHPA)
European Regions Research and Innovation Network
Fachagentur Nachwachsende Rohstoffe e.V. (Agency for Renewable Resources)
Faculty of Architecture and Landscape Sciences, Leibniz University Hannover
Forest-based Sector Technology Platform
GNE Finance
Housing Agency of Catalonia
ICOMOS
INFLPR
InnoRenew CoE

Karelia University of Applied Sciences
Knauf Insulation
KU Leuven
RICS
selfemployed architect & access consultant, www.designforall.at
SIDiR
Slovak Centre of Scientific and Technical Information (SCSTI)
societat organica
Solar Heat Europe/ESTIF
Stora Enso
Sustainable Towns
UIPI International Union of Property Owners
Universidad Politécnica de Cartagena (UPCT)
University of Belgrade - Faculty of Architecture
University of Venice
Valencia Institute of Building
White arkitekter