European Partnerships under Horizon Europe
Built4People

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1   General information

1.1   Draft title of the European Partnership

Built4People | People-centric sustainable built environment

1.2   Lead entity (main contact)

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1.4   Summary (max 500 characters)

The Built4People partnership provides a cross-cluster structure bringing together public and private sectors to nurture Research and Innovation pathways based on a holistic view of the design, creation, operation, renovation and recycling of the built environment. It provides a comprehensive framework and objectives to shape a fully sustainable and high-quality living and working environment, infrastructure for active mobility and clean energy solutions of the future, mitigating climate change and adapting to it through increased resilience for the benefit of all end-users.

2   Context, objectives, expected impacts

2.1   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 and natural landscapes. A holistic approach to the built environment is needed to integrate all its elements in a harmonious and sustainable way. R&I, spatial design (governance) and quality architecture are therefore key tools to improve the environment in which we all live, work and relax.

A Sustainable Built Environment, including responsible decisions and actions when creating and transforming the built environment, can help accomplish many targets linked to sustainable growth, energy and climate action, circular economy, digitalisation, high-quality architecture, heritage preservation, health & wellbeing and employment. Figure 1 below illustrates how the built environment (although building-focused, this figure equally applies to the whole built environment) has a direct positive impact on more than half of the UN Sustainable Development Goals (9 of the 17 goals). It must be emphasized here that the built environment has to be understood as much more than a collection of buildings, which

1

includes infrastructures related to the needs of our societies (recreation, transport, energy, water, air quality…).

Figure 1: *How buildings (and the whole built environment) are connected to the 17 UN Sustainable Development Goals*

At EU level, increasing renovation rates and dramatically improving energy performance of buildings is among the top priorities. As well as directly contributing to EU climate and energy goals, a high performing build environment can help fight energy poverty, improve indoor &outdoor health and wellbeing, and deliver many other benefits. The need to reduce the lifecycle impacts of the built environment is also emerging. This includes extraction of materials, manufacturing of products and equipment, transport and assembly from the side of materials, and planning, design, construction, operation, maintenance, renovation and end of life management (recycling or repurposing) for buildings and infrastructures.

Problem: The built environment is responsible for 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. Construction and deconstruction/demolition waste are one of the heaviest and most voluminous (25%-30%) waste streams generated in the EU.

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.

Buildings will be the major enabling elements of the energy transition through activation of the energy demand side as buildings 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 energy services and business models based on the aggregated demand-side assets to play a role in the energy system and market. The connection between buildings and electromobility solutions will grow as a strategic evolution: it will represent the principal location for recharging all vehicles.

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.

Critically, embodied emissions 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.

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 Elect Ursula von der Leyen's priorities, set out in July 2019. The Green Deal also tackles the route towards a net zero emissions economy by 2050 and will include a flagship housing renovation plan[1]. It will be looking again at the construction industry and how decarbonisation can be achieved.

Alongside the transformation that is required to enable us to help deliver the Green Deal, there is another massive transformation taking place in the construction industry. This is as part of the Fourth Industrial Revolution. Construction is undergoing digitalisation and industrialisation. The latter is a natural and complementary transformation, which will benefit from many of the new technologies of the former. 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.

One example of this is the use of Big Data, which is collected through IoT sensors. Such data is expected to bring important changes including to set the foundations for the proliferation of AI applications in the sector. The use of Digital Twins will also open up new ways of working, interacting and exploitation of infrastructure.

Digitalisation and industrialisation of construction both present opportunities and challenges. The opportunities come from the potential of these new technologies to solve many of the problems in our built environment and to create new solutions and services, which will directly benefit our citizens. The challenges arise partly from the pace of the transformation, but also from the need for new research, new processes, technologies and business models.

Currently many Europeans are suffering severe consequences of living and working in unhealthy buildings, indeed, some 100,000 deaths a year are attributed to exposure to pollutants found within households. And a staggering 800,000 deaths are attributed to outdoor air pollution, which is largely driven by the use of fossil fuels for mobility and for heat in the built environment.

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[1] https://www.euractiv.com/section/energy-environment/news/housing-renovation-plan-will-be-flagship-of-european-green-deal/?utm_source=EURACTIV&utm_campaign=1414ca0a2b-RSS_EMAIL_EN_Daily_Update&utm_medium=email&utm_term=0_c59e2fd7a9-1414ca0a2b-114973663

By designing, constructing and upgrading our buildings and infrastructure in a way that enhances health benefits and eliminates sources of air pollution, we can create a built environment that brings wellbeing and prosperity to people.

An essential challenge of the energy transition is 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 by providing: distributed energy generation from renewable sources, thermal or electric energy storage, flexibility through load shifting and reduced system capacity needs through energy efficiency.

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 EPBD, and EED, RED. Under FP7 and Horizon 2020, energy performance of buildings was supported by the EeB PPP. 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 impacts on technology development and energy efficiency, did not address the role of buildings in the energy transition of the built environment in its full scope, neither did it address sufficiently the non-technological barriers of the challenge. There is a need to deliver a truly integrated and holistic, people-centric and sustainable approach to the design, construction, operation, maintenance, rehabilitation and recyclability of buildings and the built environment, including infrastructure, based on full-scale demonstrations of technologies, and their integration into the built environment and their integration into the socio-economic environment driven by the user perspective.

The EU's infrastructure is in desperate need of repair, renewal and reinforcement against not only wearing out in time but also due to the increasing threats posed by climate change and vandalism (terrorism, cyberattacks when it comes to energy infrastructure, etc.). The EU economy relies on its infrastructure to support existing productivity and competitiveness and future growth. It was demonstrated for instance demonstrated that significant fuel could be saved by providing better roads. Lessons learned from previous research have also shown for instance that recycling plastic in asphalt destroys the circularity of the asphalt itself. Furthermore, infrastructure needs to adapt to the digital age, and this requires considerable investment as well as research.

The Built4People partnership will address the shortcomings of its predecessor by building on its strong foundation, by bringing together the whole value chain to radically accelerate progress on this more holistic agenda for a people-centric sustainable built environment.

The main drivers for creating such a new Partnership, based on what has already been achieved by the EeB PPP, are related to: climate change, clean energy transition, climate emergency and the need for resilient structures, circular economy, adapting to demographics and urbanisation trends, benefiting from digitalisation, increasing competitiveness, social wellbeing and cohesion.

- The clean energy transition of the EU is on the move, steered by the recently adopted Clean Energy for all Europeans Package, towards renewable-intensive, more flexible and efficient energy systems with a high degree of digitalisation and an active demand-side. In order to meet our climate and energy targets, there is a need to greatly increase the rate at which existing buildings are renovated to use less energy,

but to do so in a manner which not only but which also facilitates occupied site transformation and dramatically decreases intervention costs, taking into account buildings life cycle (intervention design, execution, operation, maintenance…)

- Tackling climate change, as well as other environmental issues (raw material scarcity, pollution, biodiversity loss, resilience to natural hazards, ageing and disruptors…), implies rethinking the way we design, manufacture, build and maintain our built environment, as well as manage its end of life. It also refers to a better integration of natural resources, be it for materials, energy or water, supported by smart management. In this context, the partnership will have to capitalize on the results from H2020 projects on Nature Based Solutions (NBS) and foresee further innovations around this approach.
- EU's population and its related expectations are changing. On the one hand, the EU population is ageing, leading to the necessary adaptation of the built environment and related services. EU's citizens are also better informed and empowered, driving the industry towards more customised offers and services, and the public administration to evolve toward more participative urban development processes. Stakeholders' expectations are becoming primarily focused on services rather than simple ownership.
- Global urbanisation and Smart Cities trends also apply to the EU. This stresses the need to address adaptability and agility of the built environment but through innovative urban planning and architecture solutions, as well as so challenges linked to privacy and data ownership. Beyond usual construction quality criteria, citizens are expecting comfort, better air/ indoor environment quality, easy mobility and connectivity as well as clean energy to be available as a service. Increasing concerns regarding housing affordability requires us to rethink how we can finance the transition towards climate-neutral, sustainable and a more circular building sector while keeping the appeal of the sector as a secure investment.
- The digital transformation of both the built environment and of the industry that creates and maintains it requires not only investment, but also research in order to ensure an effective transition, which optimises the use of new technologies for the benefit of the construction industry, EU citizens and the EU economy.
- In order to radically accelerate progress and deliver new industrialized processes, qualified staff will be essential along the entire value chain. Digitalization offers new possibilities for education, training and qualification, changing the shape of traditional jobs. Optimizing the collaboration along the value chain, ending up with digital building passports offers opportunities to speed-up processes, to improve the quality of construction and to provide valuable information for later refurbishments as well as end-of-life solutions. Industrialized processes will also need a rethink of procurement and business models, which are currently aligned with more traditional design and construction methods, as well as acting as a barrier to the uptake of innovative sustainable buildings.

Only little information is currently available documenting buildings users' needs and expectations. Some H2020 projects have been investigating them (e.g. TripleA-reno) but the results remain limited within the project silos.

Summing up the problem as described above, while continuing to develop building and infrastructure specific solutions, it is time to widen the scale, from single to multiple buildings and their interaction with the district and the city, from technologies' development to

technologies' integration in systems and in their socio-economic environment, from energy efficiency to self-sustainability, from built environment as consumer of resources to built environment as producer of resources, from passive to active with connected properties and features.

Concerning infrastructure, we need to move from badly maintained to predictively maintained infrastructure, from disconnected infrastructure that is not planned systematically to integrated and connected infrastructure that supports buildings and transport systems as well as utilities and civil protection measures. Transport infrastructures will have to ensure smooth mobility for all citizens thanks to a balanced access between all types of vehicles and also pedestrians. And a holistic citizen-centric urban planning strategy should be developed to address interdependencies, i.e. the impact of land uses in the mobility demands, or the layout of the streets in the energy demand of buildings.

Key issues to be addressed by Built4People are the following:

1. Complexity: The built environment is a complex and multi-faceted system, an interconnected complex value chain interconnected with 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 required aspects (energy and climate goals efficiency and sustainability, accessibility, safety, recyclability/reuse, demolition, noise, environmental impact, innovation and resilience, etc.) in an integrated manner. Built cultural heritage (buildings as well as quarters) is also an identity factor of the European society, rendering it necessary to customise any intervention in order to preserve its cultural value.

2. Limited renovation rates: An acceleration of the renovation of buildings cannot be achieved using traditional design and construction methods, business and financing models. For example, tripling the rate of renovation would currently imply tripling the construction workforce and associated budgets, and tripling the amount of materials used and waste generated. The large-scale renovation programmes of the future that will help us deliver on energy and climate targets require a completely new way of designing and constructing buildings. In parallel, new procurement, business and financing models need to be developed. While performance contracting has showed promising results for large scale projects using traditional design and construction methods, barriers are still to be removed to allow financing, scaling-up the size of projects to target the entire building/ built environment stock and overcome the ultra-fragmentation of the sector; to train and build-up capacities and workforce, accelerate permitting and, most importantly, to simplify the information and process for owners / occupants to proceed. Besides cost considerations, the overall sector must develop new business models to give pan-European access to renovation operations.

3. Fragmented value chain and sector: The lack of integration of the built environment value chain is recognised as a significant barrier. The buildings sector is dominated by small and micro enterprises. Similarly, the building stock, especially housing, is heterogeneous and fragmented. This has two main negative consequences for the EU and its businesses: the lack of a common, largely adopted vision and of collective R&I action for the built environment,

as well as a limited uptake of innovation in the sector. Similarly, the building stock itself, especially housing, is heterogeneous in terms of typologies, materials used, and quality of construction. Multiple ownership of (and even within) buildings and infrastructure, different types of tenancies, and a multitude of often local regulations mean that our built environment is considerably fragmented. Industrial symbiosis – i.e. win-win collaborations - is to be developed between different players in the value chain.

4. High construction and renovation costs: Today's solutions for renovation are still costly, one of the reasons being the wide variety of building typologies which means that each renovation project is essentially unique. Current design and construction processes are cumbersome, slow and labour- and resource intensive. Multiple ownership of (and even within) a building as well as of the infrastructure means that our built environment is considerably fragmented. High energy performance buildings require a very high standard of construction. 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, in particular built heritage.

5. Infrastructure maintenance, repair and upgrade: This covers a particular problem, which is the result of years of neglect and lack of investment. Much of Europe's existing infrastructure is getting old, not only because of the years of service without being properly maintained, but also due to the complex modernization of transportation and industry. Infrastructure maintenance, repair or upgrade is vital, not only to ensure that the infrastructure in question continues to be fit for purpose and safe, thus avoiding closure, but because functioning infrastructure is vital to the European economy. The existing infrastructure can also be adapted to fulfil new roles and objectives (e.g. clean energy, EV charging) for the local communities and the society as a whole. Without it, business and industry cannot operate effectively, people's working lives and education is impacted and access to vital public services is impeded. Very often lack of infrastructure maintenance sacrifices safety. Therefore, the use of new ways of managing infrastructure, such as through predictive maintenance, self-repairing infrastructure and eventually Artificial Intelligence need further investment and some of these need further research before they can be widely applied in the industry. When the upgrades of the existing infrastructure are made, these new features should be enabled to harvest multiple benefits from the existing built environment.

The co-programmed Built4People partnership will build on previous initiatives (e.g. in particular the EeB PPP on buildings with extensions to districts, 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, etc.). The current political context (EU Green Deal, Clean Energy for all Europeans Package, Circular Economy Action Plan, Digital Europe, New Industrial Strategy, Revised 2050 roadmap etc.) also pushes to address a broader R&I scope which includes a holistic model to manage trade-offs all along the life cycle of the 3 pillars of sustainability, including infrastructure recycling, associating and involving a large panel of stakeholders and communities. The partnership will focus on the interactions between buildings/built environment and the other sectors, like energy and transport, to positively contribute to fulfilling decarbonisation and sustainability objectives by these sectors. The active involvement of the public sector will be key (e.g. in relation to public procurements and their leading role in achieving a sustainable built environment by 2050, including decarbonisation as foreseen in the EPBD). It will foster market uptake of innovative products, solutions and processes.

2.2   Common vision, objectives and expected impacts

EU's "Accelerating clean energy in buildings" report underlines the need for a renewed partnership 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".

Research and innovation investments to improve the competitiveness of a user-centric, sustainable built environment 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 and life-cycle 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 Built4People partnership's common vision is high quality, low impact and highly resource efficient built environment for all citizens. It is reached through a fully decarbonised and circular approach that will contribute to reach EU sustainability targets (including other sectors like e.g. energy or transport). B4P will foster a sustainable society by facilitating the adoption of more sustainable lifestyles and economic models. These will increase quality of life, cultural diversity, respect for heritage, individual and collective well-being, social justice and cohesion, and economic efficiency.

Key objectives & impacts

For this vision to become true, the Built4People partnership will focus on the following key objectives and expected impacts:

1.   Decarbonisation and Circularity

Objective: Contribute to the achievement of decarbonisation of EU building stock by 2050, in line with the EPBD, and support the transition to net-zero life, and have at least 40% less embodied carbon with significant reductions in the product and construction stage. 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. This requires industry and policy action to support circular principles that maximise the utilisation of assets, resources and materials and support recovery and reuse at end of life.

Rationale: As one of the most resource consuming sectors in Europe, buildings and infrastructure construction must be at the heart of the transition to a circular economy. Europe's transition to a circular economy will help address key societal challenges including population growth, urbanisation/urban sprawl and resource scarcity. In order to achieve systemic change, the industry must be fully equipped with the right guidance and tools to fully embrace the transition. As climate change and resource use are closely linked, the

deployment of circularity must be accelerated for its carbon emissions reduction potential. This potential can be achieved, for example, by optimizing the material that is needed to produce a building product, by reducing extraction and manufacture of new materials through maximising utilisation of existing assets, deploying new circular business models such as product as service offers, as well as ensuring that better recycling facilities are located closer to renovation sites or by mobile facilities separating and compacting demolition waste fractions already on site. The adaptive reuse of existing (heritage) buildings is also a way to preserve the environment and biodiversity by saving land, energy and materials. Wider implementation of digital solutions like BIM for conception of buildings and infrastructures will also drastically reduce demand for materials. Implementation and Innovation on Nature Based Solutions like biomaterials will also guarantee higher recyclability and therefore better circularity.

Expected Impacts:

- Supporting tangible progress towards the objective and the longer-term energy, climate and environment EU objectives aiming at the full decarbonisation of the building stock across the whole life cycle.
- Transition from a linear to a Circular Economy.
- Increased resource efficiency in the urban environment.

2. Health and wellbeing

Objective: 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 addition, the growing needs of the services that the built environment has to offer to different demographic groups should be explored (ex. accessibility, silver economy, diverse cultural backgrounds, digitalisation).

Rationale: It is imperative that we turn the sector's health impact around from detrimental to beneficial by eliminating exposure to harmful toxins such as volatile organic compounds, particulates, combustion fumes and biological contaminants, such as damp/mould. Furthermore, built environment design using innovative products and processes can contribute to create a liveable environment and to upgrade the quality. As part of the built environment cultural heritage must be respected as it can also contribute to residents' quality of life and community-building. The built environment value chain has a distinct role not only as employer, but also as provider of homes, workspaces, infrastructures for everyone. Interventions in the Built Environment should be indicated by the abovementioned principles: provide adequate housing and dignity to all, ability to commute and accessibility, safety, recreation spaces fit for different cultures, genders, age groups.

Expected Impacts:

- Improved built environment leading to a better quality of living for people as citizens and economic actors (consumers-prosumers) and improved social cohesion.
- Increased health and productivity in the workplace through improved indoor air quality, access to daylight and better acoustic and thermal comfort.
- Increased use of data to improve people's lives and to measure and report benefits.

3. Clean energy and mobility

Objective: The overarching driver is the ambition to achieve climate neutrality in Europe by 2050 entailing decarbonisation of the energy and transport sector by 2050 at the latest, while

ensuring long-term environmental sustainability of the economy. Buildings and infrastructure must actively contribute to the achievement of the decarbonisation and sustainability objectives in the energy and transport sectors.

Rationale: The built environment can be the driving force of the transition towards a more efficient and renewables-based energy system that maximise the use of locally available resources. This transition to a decentralised and decarbonised energy system with a greater use of digital technologies will enable buildings and infrastructure to become active elements in the energy system by optimising energy consumption, distributed generation and storage and vis-à-vis the energy system. It will also trigger new business opportunities and revenue streams for upgraded, innovative energy services which valorise energy savings, self-generation, storage and flexible consumption.

Clean energy and mobility technologies and business models need to be massively deployed in buildings and infrastructure. This is the precondition to deliver on the EU decarbonisation objectives as energy and transport related activities cause the largest part of greenhouse gas emissions in the EU – the energy sector representing 54 %, the transport sector 24 % of EU greenhouse gas emissions[2].

Expected Impacts:

- Enabling a smarter, more decentralised and flexible energy system.
- Contribution of the built environment to the decarbonisation of energy and transport sectors.

4. Value and cost

Objective: Deploy tools and approaches that foster productivity increases across the sector. Provide an investor-friendly framework, integrating sustainability principles to property valuations and risks ratings (beyond LCC), while showing enough flexibility to adapt and be updated regularly.

Rationale: Reduce exposure of infrastructure and buildings to financial, environmental and economic risks. Sustainable buildings and infrastructures are cost effective and help to create and maintain value, but this can only be realised and unlocked with the right financial and investment framework. Financing mechanisms must consider not just capital investment costs but the whole lifecycle cost (LCC) to fully account for the benefits of improving environmental and social performance and lowering running costs. The climate crisis and the societal efforts to tackle it expose buildings and infrastructure assets to risks. These risks are financial, such as the rising cost of energy to fuel them; environmental, such as more frequent extreme weather events; and regulatory, such as the introduction of more stringent energy performance standards, in response to environmental and economic drivers. The value of a building is thus strongly linked to many aspects such as quality, adaptability, resilience, location and availability of sustainable transport options.

Expected Impacts:

- Increase the competitiveness of the EU Construction Industry.
- Use of data to facilitate improvements in processes and productivity. Use of Artificial Intelligence to process these data.
- Increased commitments and action from asset owners and lenders to decarbonise property and infrastructure investment portfolios.

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[2] https://ec.europa.eu/eurostat/statistics-explained/pdfscache/1180.pdf

5. Resilience

Objective: Systematically account for resilience when locating, designing and operating buildings and infrastructure. Integrate incentives for resilience performance over the lifetime of the assets, for instance in building insurances. Increase flexibility and adaptability of the built environment to allow all Europeans regardless of age or physical ability to participate in a flourishing society.

Apply also common sense and forgotten solutions to building resilience, such as moving electrical equipment from the cellar to the attic in flooding areas. Architectural design solutions can already mitigate solar overheating for instance. Improve resilience of buildings and infrastructure so they are future-proof and can withstand dramatic changes in climate, but also existing and new methods of terrorism. Particular attention needs to be paid to cybercrime and as new crimes will inevitably spawn from smart buildings and the potential access to data that is generated, further research is required here.

Rationale: Europe needs a built environment that is resilient against climate-induced changes, such as increased extreme weather, seismic activity and terrorism and other crime, when considering climate, but also social and demographic changes (ageing society, urbanisation...). This is vital to ensure communities and individuals continue to flourish socially and economically and protection of lives.

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.

6. Water & Biodiversity

Objective: "Renature" EU urban environment by supporting green and blue infrastructure. Develop and favour natural processes for the built environment operation (indoor air quality, water filtering and reuse, cooling...). Promote and adopt indicators, benchmarks and limits for water consumption rates.

Biodiversity and the natural environment are central to human well-being, providing food, clean air, water and space for recreation. Changes to our built environment can disrupt this delicate balance. Water scarcity is affecting at least 11% of EU's population, while only 7% of water consumed in buildings is reused. Construction and renovation of buildings and infrastructure must be carried out in a way that does no harm to, and actually enhances, our natural environment.

Rationale: Preserve and restore our natural environment in all phases of the lifetime of buildings and infrastructures. Fully integrate green public spaces and (urban) landscapes in the development and maintenance of the built environment. Ensure sustainable use of water resources.

Expected Impacts:
- Reduce (or prevent increase in) risk of water shortages.
- Increased deployment of water harvesting and recycling measures in the built environment.

7. Just transition

<u>Objective</u>: Eliminate energy poverty, develop skills, training, trades and professions for a sustainable built environment. Reduce the gap between urban and rural communities regarding the transition.

The transition to a low carbon, circular economy will have far reaching social and economic impacts. It should ensure adequate warmth, cooling, lighting and the energy to power appliances for guaranteeing health and a decent standard of living for all. Although it is clear that these impacts will be overwhelmingly positive, the transition will have a cost and collateral damage. The sector must act to mitigate the risk of negative transition impacts such as job losses, and support those who may be most vulnerable to them. As an example, the implementation of energy efficiency directives and renovation strategies should include measures to help retrain those currently working in high carbon intensity industries to enable them to benefit from these new job opportunities. The transition to decentralised and decarbonised energy system based on local energy sources and clean energy technologies deployed in buildings and infrastructure should ultimately lead to better energy security and affordability while creating new business opportunities. Ensuring a sustainable future for Europe requires investment, which is often channelled where there is a market interest. Affordability challenge should be an opportunity to seek innovative and cost-effective solutions to ensure market uptake. Transformation of the built environment must be supported by policies that target all citizens, including green financing models.

<u>Rationale</u>: Ensure a transition of the built environment which benefits to all of Europe's citizens, mitigating negative impacts and protecting the most vulnerable.

<u>Expected Impacts</u>:
- 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.
- Increased capacity and productivity of the EU construction ecosystem value chain to implement incoming innovations.
- Demonstrable transfer of labour from carbon intensive industries to low carbon, circular employment opportunities.

8. Socially and ethically sustainable built environment

<u>Objective</u>: The partnership should position the Built Environment as a service to all the people. This means adequate housing, (physical and digital) accessibility, demographic challenges, health, evolution and job opportunities, integration of migrants and gender matters, digitalisation and ethics, quality of life, affordability of housing, participatory governance and decision making, inclusive public spaces, preservation and valorisation of cultural heritage and diversity. In addition, other social challenges can be triggered linked to ethics and privacy.

For instance, a challenge relates to how information for the Built Environment can be created, stored and updated in an ethical and safe manner that stays relevant for policy makers, stakeholders and users alike for the whole lifecycle, giving them also the possibility for future flexibility and adaptability.

<u>Rationale</u>: Ensure that digitalisation is meant to be a lever for the achievement of environmental, social, cultural and economic sustainability and not a goal on its own.

<u>Expected Impacts</u>:
- Preserving the European identity through its cities and cultural heritage.

12

- Respectful approach to the built environment, including heritage, spatial design and natural landscapes.
- Enhanced civic engagement, empowerment, participation and co creation.

Reaching these objectives and related impacts requires an intervention logic which is described hereafter.

Intervention logic

Led by business and industry representation, public sector and civil society action, the process of enabling this bold change within our sector will be supported and shaped by the Built4People partnership through a coherent approach that uses multiple levers to drive the transition:

- **Collaborate**: At the heart of the partnership and critical to the holistic transition it aims to support, is mutually beneficial, cross-sector collaboration, engaging with all stakeholders to unlock impact, scale-up solutions and overcome market barriers.
- **Innovate**: Develop and refine innovative solutions to the challenges outlined, leveraging digital solutions and the fourth industrial revolution to increase productivity and foster a more connected 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.
- **Improve productivity**: Alongside the digital transformation, learn from other industries and replicate industrial processes that can be used in the construction industry, to not only produce faster, but using less materials, reducing down time and errors and improving circularity.
- **Communicate**: Demand from citizens, businesses and policy makers is a crucial driver of change and can only be fully realized by a drastic increase in the awareness amongst all stakeholder groups of the critical role of the built environment in securing a sustainable, prosperous, low carbon future for all Europeans.
- **Rate / Certify**: 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 and financial tools 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.
- **Educate**: The market must have capacity to deliver solutions to achieve a sustainable built environment at mass scale. 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.
- **Advocate**: Strong and long-term policy and regulatory frameworks are needed to ensure industry, architects, designers and craftsmen invest in the capacity and the skilled staff needed to deliver efficient, healthy and decarbonised buildings and infrastructure. Policy must align with local/regional/national level roadmaps for implementing European and global goals across all impact areas of the built environment. The role of SMEs must be considered carefully, as SMEs represent the backbone of Europe's construction sector.
- **Finance**: Significant amounts of investments are needed to finance the transition to a sustainable, low carbon, healthy built environment. Financial products and instruments are needed that will channel this investment and enable rapid and large-

scale deployment of solutions. Common standards are key to support performance-based lending and build capital market assurance in industry direction.

The Partnership will seek to promote research and innovation approaches, through the Horizon Europe programme and beyond, that address multiple levers of change. To achieve this the Partnership's core focus can be categorised into 3 main pillars, that are in close connection to each other:

1) Identifying EU R&D priorities and investment needs

The first role of the partnership will be to assess the current and future R&D priorities of the built environment based on stakeholders' inputs, EU and national/regional R&D initiatives, high-level studies on the built environment, and existing SRIAs (e.g. the ECTP one). This assessment will be carried out in line with Horizon Europe and other EU programmes priorities in the different foreseen clusters. After this exercise, the Partnership will assess the investments needs in order to reach those priorities. Based on this holistic assessment, the B4P Partnership will provide a unified roadmap with prioritised actions and implementation instruments for an EU R&D roadmap on the built environment.

In order to accompany the R&D roadmap, B4P will also conduct a permanent market analysis needed to identify current future 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 R&D roadmap, so that the identified priorities can match the market expectations.

2) Acting as a one-stop-shop for innovation delivery in the Built Environment

B4P will act as a one-stop-shop to deliver innovation in the built environment. First, B4P partnership will act as a centre of expertise, gathering and providing access to top-level expertise on technologies, markets, and policies. Second, the partnership will assess and provide recommendations on blending funding and financing instruments to boost R&D as well as facilitate market uptake. Finally, B4P will stimulate collaboration by bringing companies, research centres, citizens' organisation together.

3) 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 which are at the very heart of the Partnership. 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 by continuously exploiting the knowledge gathered in the innovation nurturing activity, supporting the creation of sectorial living labs and Digital Innovation Hubs (DIHs), regional platforms, etc. both for the core construction activities and the end-users of the built environment. Empowering construction actors as well as built environment' end-users to use new technologies is also part of this activity.
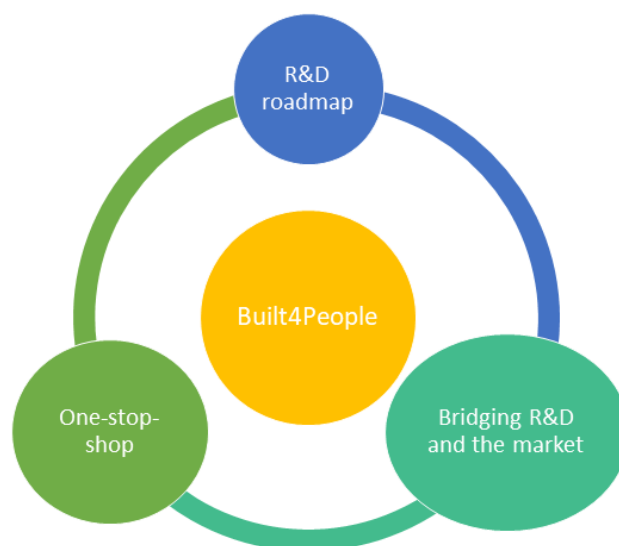
Figure 2: *Built4People - Targeted fields of intervention*

The ECTP Association has elaborated a Strategic Research and Innovation Agenda, published in November 2019 (see its Executive Summary in the Appendix). It is suggested to use this SRIA, together with other strategic documents from stakeholders as a starting point to elaborate a Built4People Partnership roadmap starting 2020.

More specifically, starting from the already available Vision produced by ECTP, the following actions will be launched:

•	Definition and reality-check updates: a workshop will be organised with all relevant stakeholders, in order to ensure that all main aspects are included and agreed upon by the enlarged partnership. Feedback from end-users will be sought. This should be done at the start of the Partnership (Month 1).

•	R&D roadmapping: this R&D Roadmap will lead to a Strategic Research and Innovation Agenda for a people-centric and sustainable built environment (Month 6).

•	Yearly prioritisation: the SRIA will be covering the seven years of duration of the Partnership, with a detailed focus on the priorities for the first two years. Each year, an update will be produced, which also considers the results of the projects launched in previous years.

Further inputs will be provided through the following important reports / sources:

•	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

- o 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[3]
  - o SET Plan Action 5- Energy Efficiency in Buildings Implementation Plan[4]
- Strategic Themes – ECREDI
- 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)5
- Circular Economy Action Plan 2.0
- Common Implementation roadmap for Renewable Heating and Cooling Technologies6

As has been outlined in section 2, 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 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 dollar market opening up in emerging economies[7], 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 2.1 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[8]. 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 is especially concerning taking into consideration that firms in the construction sector are the most likely to be at or above full capacity (69%), 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[9].

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

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

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

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

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

[7] 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

[8] 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

[9] 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

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.

The previous Horizon2020 Framework Programme for the sector, which focussed only on energy efficiency through the EeB cPPP, had a planned budget of €600 million. Moreover, based on a regular (yearly-based) assessment by ECTP, EeB cPPP projects have been mobilising private investment with an average leverage factor of 6,86 for large industrial organisations and of 2,28 for RTOs (*figures from 2019 EeB cPPP Progress Monitoring Report - considering a selected representative sample of organisations participating to EeB funded projects*).

The proposed new Built4People partnership has a much broader scope with a much 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 report has shown 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 PPP 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 a budget of €1.9 billion is needed.

Inspired from the previous EeB cPPP, the B4P Partnership intends to develop Key Performance Indicators for control and monitoring. Besides those specific to projects, which already showed effectiveness, it is suggested to develop additional ones adapted to the B4P framework. This will be done in parallel to the elaboration of the previously mentioned roadmap in 2020. To name a few, private investments, alignment / additionality with National Programs, clusters effectiveness and market uptake will thus be carefully monitored, providing feedback for a reliable and powerful steering of the partnership.

By focussing on the creation of a number of interconnected, comprehensive value chain clusters across multiple Member States, the Built4People 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 on a scale that cannot be achieved via individual projects. The clusters will also provide market access and expertise to Horizon Europe projects but can also influence and support national research and innovation programmes and wider R&D within the sector, as well as influencing future national policies. In this way, the clusters

will be a proof of concept for the transformational, whole value chain approach of the Partnership and will encourage wider adoption of such an approach to other parts of the industry.

The clusters established through the partnership will be flexible and adaptable in terms of their structure 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 Built4People SRIA will be an open, live and dynamic resource, that will shape the innovation agenda for the sector, well beyond the organisational and temporal boundaries of the partnership.

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

2.3   Necessity for a European Partnership

The partnership will serve as a vehicle to integrate R&I outputs from different parts of Horizon Europe, in particular from Cluster Climate, Energy and Mobility, Cluster Digital, and Industry and Space- Materials – Developing Circular industry. It will also develop R&I inputs specific to built environment for further deployment activities driven by the Missions or other programmes (e.g. LIFE). Other relevant clusters include Health, Culture, creativity and inclusive society, and Food, bio-economy, Natural Resources, Agriculture and Environment. The partnership will also support the missions "Climate Neutral and Smart Cities" and "Adaptation to climate change including societal transformation" and link with JPI Urban Europe partnership on positive energy districts in urban environment, and the Covenant of Mayors Europe initiative.

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 as well as the mission on Climate Neutral Smart cities.

The Built4People Partnership is contributing to key policy objectives. This contribution is detailed in Table 1 below, gathering the main pieces of legislation the partnership is addressing.

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 understand and control their heating bills.	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.
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*	The partnership will develop and achieve broadcast communication on the procurement aspects in relationships with the EU BIM Task

	Group[10], e-procurement, innovation partnerships and competitive dialogue	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.
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'	The Masterplan sets out how EU industry can become climate-neutral while staying	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

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[10] www.eubim.eu/

2050 Masterplan	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.	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.

Table 1: Built4People contribution to policy objectives.

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 already identified, future legislation and policy initiatives should also benefit from the Built4Europe partnership.

Finally, the Partnership will contribute to exploit the potential of standards and standardization processes for the effectiveness and efficiency of research and innovation. First, the Partnership will contribute to the transfer of research results and outcomes of innovation activities into the standardization process by contributing to their elaboration and improvement. Second, the Partnership will identify the main standards used in the built environment and, thus, raise awareness of their benefits in the research and innovation process. Third, Built4People will aim at boosting the uptake of innovation and research outcomes by the market, using standardization as enabler. Fourth, 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.

Acting at an EU level is of paramount importance for achieving a transformation of the build environment, which starts by having on board all the necessary stakeholders, developing the right clusters & networks in the frame of an efficient governance.

The Built4People 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, construction companies, system suppliers, material manufacturers, ICT companies, spatial planners, investors, financiers, consumer associations, property federations, facility managers, energy service companies, local authorities, government agencies, NGOs.

The SET-Plan is bringing together representatives of the Commission, 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), including Smart cities and communities (IG 3.2).

The Built4People Partnership will carry out market surveys and 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.

Moreover, 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 deliver a common European network aimed at aligning the use of Building Information Modelling in public works spatial planning etc.).
The B4P partnership is already attracting many stakeholders, with high commitment levels as demonstrated through the elaboration of the present document. It is nevertheless too early to list each and every B4P members. Figure 3 is schematically representing how stakeholders are already covering the entire value chain of the build environment. Foreseen workshops and consultations will allow to deliver a more accurate picture in the near future.

Figure 3: *Built4People - Schematic representation of stakeholders*

- **Construction value chain**: all potential actors involved in the lifecycle of a building/infrastructure. Thus, this category would include product manufacturers, equipment and machines manufacturers, large and small contractors, engineers, architects, installers, demolition companies, reuse agencies, etc.
- **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, heritage stakeholders, etc.

In order to ensure the geographical 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.

A co-programmed partnership is – for the considered partnership area – the most efficient, flexible and effective approach to ensure the necessary level of commitment 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.

The partnership will gather the necessary expertise from different fields and will be the most efficient, flexible and effective approach to ensure the necessary level of commitment of the 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 the stakeholders (both public and private) will first consist of engaging in a continuous dialogue to agree on R&I priorities and effectively implement a common R&I roadmap. In addition, the private sector will endorse the feedback from the partnership to evolve practices, in particular to move towards a holistic approach to design and construction, and contribute to R&I financing (e.g. through adequate co-financing rates).

3   Planned Implementation

3.1   Activities

Figure 4 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.
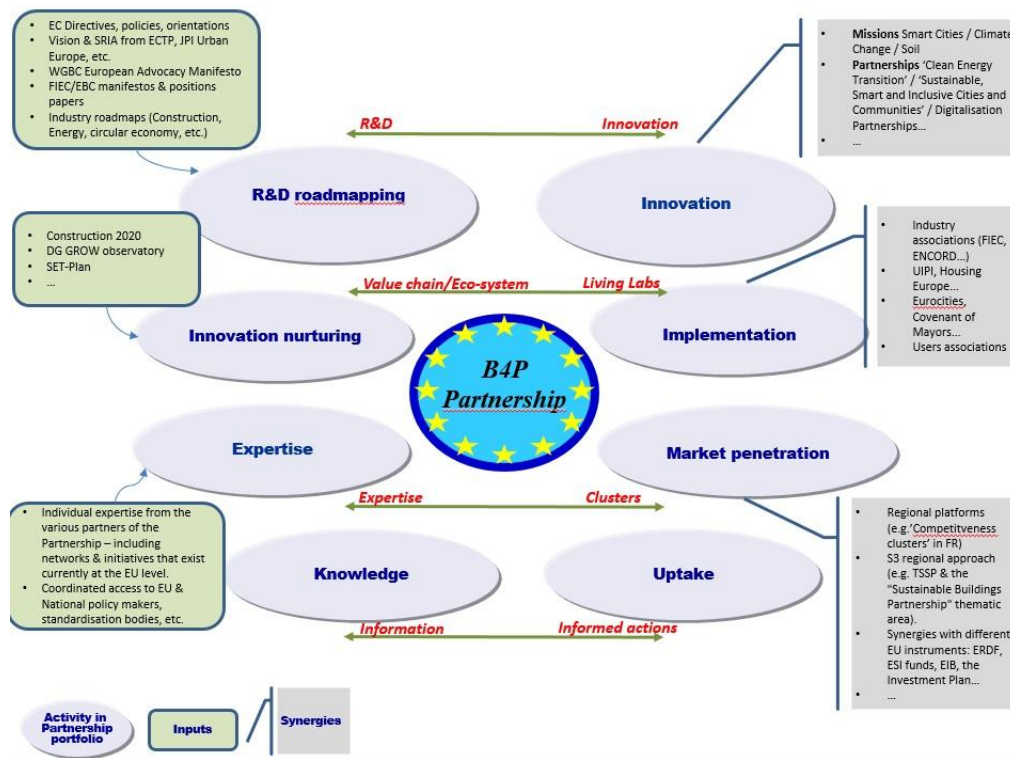
Figure 4: *Built4People - Activities*

Knowledge & competencies activities

R&D roadmapping: Based on stakeholders' inputs, the B4P Partnership will provide a unified roadmap with prioritised actions and implementation instruments for an EU R&D.

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.

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

Knowledge: 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.

These four knowledge & competency driven actions will serve another four impact-oriented activities of the B4P Partnership, namely:

Impact activities

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.

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.

Market penetration: This activity 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.

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.

In terms of coordination, it is intended to implement

- Regular meetings with the European Commission to 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.
- Coordination meetings & surveys with projects coordinators to monitor implementation and results. The definition of cross-projects objectives is envisaged to increase the added-value, while favouring mutual nurturing and sharing.
- Coordination meetings with National Contact Points to link with National Programs, as described in the Governance scheme suggested in this document.
- Dissemination meetings with Mission Boards, especially the so-called "100 smartcities" mission, to facilitate the adoption of innovations through piloting activities.

Ensuring coherence and additionality with National programs is key. ECTP has engaged national stakeholders in most Member States during the preparation of its SRIA through the involvement of national multipliers, namely National Technology Platforms and Liaison Points. The Built4People Partnership will further strengthen this relationship and have a dedicated committee of Member States National Contact Points (see Governance scheme here below).

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 at Program Committees meetings, allowing direct exchanges and coordination with National Contact Points.

3.2 Resources

B4P is intended to be a co-programming partnership:

- The first commitment of the partners, among which the private ones, is about sharing their own visions & roadmaps for the build environment. This requires revealing strategic priorities and to enter into a continuous collaborative working scheme on pre-competitive activities. Moreover, because of the overall and coordinated approach to tackle challenges, all the different stakeholders in the supply chain are involved, with a chance for aligning their own strategic research plans with the national and EU research perspective, and the Partnership offers the opportunity of maximizing the private and public investments, and potentially activating a multiplicative replication effect, and a

potential snowball effect on the market. The B4P Partnership is to act as a driving force, allowing easy benchmarks and opportunities, while having a clear multiplying effect towards the entire ecosystem. It will also represent a R&I marketplace between researchers and industries, leading to fruitful collaborations: it is also possible to tight existing relations between complementary stakeholders in the supply chain, or to create new business opportunities between different stakeholders (i.e. SME suppliers with large end-users such as contractors, etc.). Not a single company nor a single European country alone would be able to mobilise such dynamics to contribute to reach an EU level target.

- The second commitment consists in bringing into projects the necessary resources to add to the European Commission's funded part. 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.

- The third level of commitment, through dissemination and market uptake activities, will 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 impact the B4P partnership intends to generate at level of the market and built environment fields.

- The fourth level of commitment, as described earlier in this document (see table 1), resides in supporting policy implementation, providing practical and real-field experience and feedback to policy makers, at EU and National levels. Identifying hurdles & barriers, as well as successful business models and market opportunities, and communicating & disseminating them, will contribute to an efficient EU policy framework.

- The fifth level of commitment of the B4P partners is aiming at unlocking additional investments for the build environment. Because of an enlarged and diversified set of interested stakeholders, including asset owners and managers as well as insurance companies and financial bodies, the B4P partnership is definitely committed to reduce the gap between developers and investors, giving the latter 1st hand results and visibility on the sector and its vibrant innovation ecosystem.

- The sixth level of commitment is to favour 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. The participation of governments is crucial, but nevertheless the last decades have demonstrated that the private initiative must play a key role in the implementation of European Directives (e.g. the EPBD and the EED). The B4P partnership will seek to stimulate the Real Estate market towards green investments, taking into account that nowadays most house owners as well as real estate investors still do not find the business logic of the energy efficiency principles to be applied in their assets. To stimulate the participation of Real Estate industry a better understanding of the benefits is required, with a new top down approach, where new methodologies of developing business from the investor side create "a pull force" to motivate the creation of innovative and holistic energy and resource-efficient solutions for the Built environment.
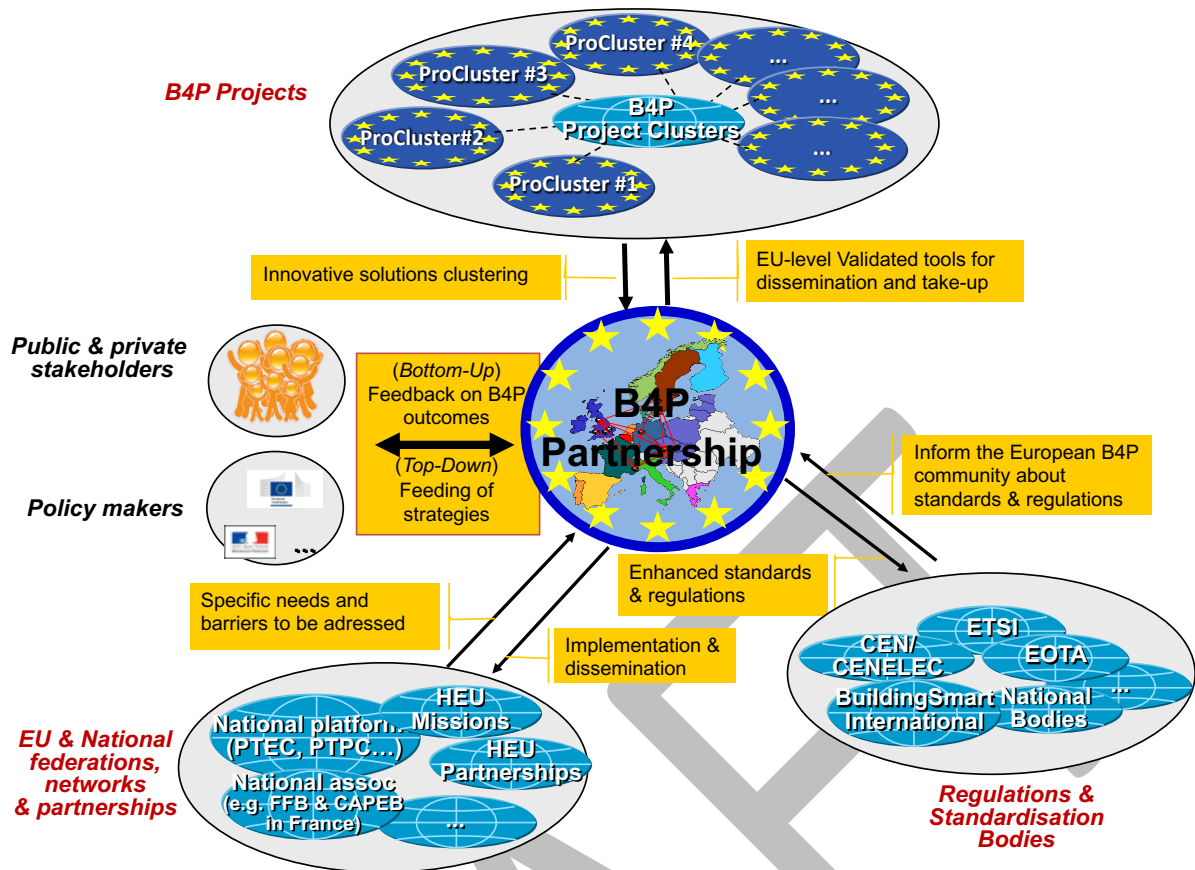
Figure 5: *Built4People – Stakeholders links.*

3.3 Governance

The B4P partnership will be formed by different governing structures helping to ensure a consolidated programme, supporting a clear vision and objectives. Revisited and updated on a regular basis, these elements will facilitate the continuous development of a technology and innovation roadmap, as well as support to market transfer, to deliver sustainable solutions to Europe. Priorities from the Partnership roadmap will be endorsed by both private and public stakeholders taking into account a comprehensive vision from industry along the value chain, including academics (universities & RTOs), industry and SMEs, represented by their respective associations, and on the public side, the European Commission (EC) supported by the representatives from the Members States (MS).
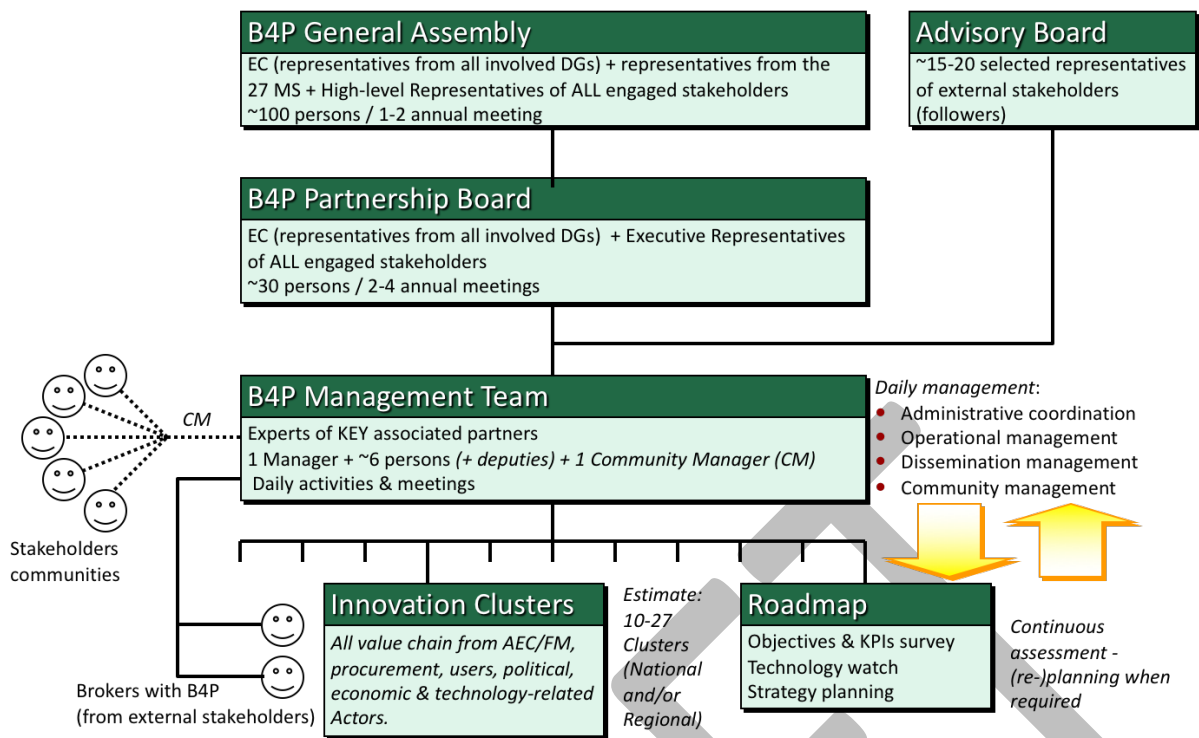
Figure 5: *Built4People – Management*

The role of the governing structures are as follows:

- The **B4P General Assembly** will have a role of advising at a high-level operational level, for instance about providing regular information regarding market trends and evolution, refining and updating estimates in terms of impact and additional investments to be deployed, fine-tuning the KPIs of the partnership, etc. Another example is advising about clustering of projects around common challenges and barriers. This assembly is not to pilot or manage the partnership, but to validate and make proposals to improve the overall operation of the partnership, as well as to influence the strategic and roadmapping orientations of the partnership.

- The **B4P Partnership Board** will be in charge of identifying, on some bi-annual basis, the main orientations of the partnership (e.g. for the 1-2 years to come) and validating the execution and outputs from the B4P Management Team (*see below*) in charge of implementing the Board decisions. The Board should be in charge as well of working out continuous improvement of the partnership for greater success of the partnership collaborative approach, including identifying bottlenecks and/or targets of common global interest, e.g.:

  o Better definition of IPRs and protection in case of conflict of interests as well as avoiding overlap on exploitation interests between parties;

  o Promotion of support from EC to the development of exploitation agreements between partners that could stimulate collaborative work;

  o Support to the development of cross-cutting approaches between industry "silos", stimulating innovation by mutual fertilization and experience sharing;

  It is anticipated that the B4P Partnership Board will include the EC and associations being involved in the definition of this Partnership, but with mechanisms (either answering to demand from other associations to join, or related to the identification by the ongoing Board to extend itself by new members who will reinforce the capacity of the partnership in terms of domain/technology coverage and expertise) to extend this Board in the course of the Partnership

life. In addition, it is anticipated that the Board may invite advisers (see *'Advisory Board'* below), in particular from MS, to participate in Board meetings so as to extend an agreed upon common collaborative approach and follow-up.

- The **B4P Management Team** will be formed by a core team of associations who will put at disposal (full time or part time – *also depending on the level of potential funding of the Partnership – see 'Funding' sub-section below*) the partnership manager as well as people responsible for the various domains of competencies (R&D innovation, impact, Public policies, etc.). These actors will form the team in charge of managing on a continuous basis the operation of the partnership (including all meetings with other instances of the partnership), and applying rules set and decisions taken by the B4P Partnership Board. The B4P Management Team will also be in charge of:
  - o Providing a regular assessment of the R&I development (by HEU projects) regarding the partnership KPIs, as well as the progress with respect to strategy planning and roadmap so as to suggest adequate revisions of the objectives and even more roadmap, still ensuring the partnership vision; It will, in liaison with the B4P Partnership Board, accommodate changes and re-orientations, which are experienced by the Partnership as a natural movement because of the industry representation within the management bodies, and the evolution of the market and innovative technologies.
  - o Interacting with the innovation clusters (see 'innovation clusters' sub-section).
- The **Advisory Board** (AB) will be formed by a set of 15-20 representatives of external associations, other Partnerships, potential Missions of interest and potential other EC initiatives (e.g. from Construction2020 or its successor, or the SET-Plan, but also potentially the EIT/KICs, Interreg programs, etc.). Typically, each thematic related to a sectorial value chain is currently addressed through different strategic agendas (and related projects), which it more difficult to integrate the strategies of all the stakeholders in the value chain and driving the changes to make the market deployment of the R&I project results easier, including standards, regulations, end-users awareness, to name a few. The role of the Advisory Board will be in particular to ensure more links between different initiatives (whatever their nature) and the partnership, this ensuring improvements towards cross-silos actions and development. The Advisory Board will be defined at the start of the partnership, and its structure revisited every 2 years based on an assessment of its completeness and operationality – it will foster close relationships with the other initiatives, in particular those represented in the AB, to jointly address key challenges for market uptake and share best practices.

Innovation clusters

The B4P partnership will nurture a set of National or Regional innovation clusters, to promote and support the deployment, demonstration and market transfer of output assets from the R&I projects in regions, with potential impact at a National level. The minimum targeted number of clusters will be between 10 and 15 clusters, but 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 erection 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, a potential new cluster would complete some sort of

application form, demonstrating that it meets the defined set of criteria. The <u>B4P Management Team</u> 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 <u>B4P Partnership Board</u> who will ultimately take the decisions about which cluster applications are approved. Representatives from all Member States will be invited for this selection process in the B4P PB. Moreover, it is intended to consider additional waves of call of clusters - from 2023 onward, based on a first mid-term review and assessment of the initially selected clusters under operation.

It is intended that each of the 10-15 - or 27 in case of an objective of (at least) one cluster per EU countries – identifies a person responsible of the interactions with the partnership (broker), who will itself act as a kind of broker between the HEU funded projects and the clusters, at least in liaisons' inception and further follow-up.

<u>Partnership funding</u>

This specific point is to be further discussed - only preliminary suggestions are introduced below.

Various ways of funding, that are not mutually exclusive:

- 'in-kind' funding by some associations in terms of human resources (should be only part of the funding, as the associations are paid by their members not only for the Partnership…);
- 'in-kind' funding by the EC & MS providing with support to meetings, workshops and communication;
- Complementary funding by EC (through CSA or EC tender);
- Support to the Partnership by HEU funded projects through some reserve budget (but which tasks and under which conditions…?).
- Other…?

A description of the involvement of the Commission in the preparation and implementation of the Partnership will be developed after larger consultation.

3.4   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. This broad, open and transparent approach will be guaranteed in the establishment of the proposed Partnership by launching public calls for interests in participating in the Advisory Board and the Innovation Clusters of the proposed Partnership. The process will be managed in close cooperation with the European Commission. 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 are duly taken into account. When relevant, the Partnership will involve international partners when this does not conflict with European Union's policies. 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 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 stimulate the participation of new partners and actors in the definition of common priorities and their participation in the partnerships itself or its activities (including eligibility for funding) will be elaborated in a later version of the present paper.

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, 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 recruitment policy which is dynamic and agile 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 particular point will be elaborated in the next phase.***

An overall SRIA covering the seven years of duration of the Partnership will be produced at Month 6 with a detailed focus on the priorities for the first two years. Each year, an update will be produced, which also considers the results of the projects launched in previous years. ***Ensuring the consulting process and integration of priorities for relevant stakeholders needs further consultation and work, which will be carried out at a later stage.***

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

This SRIA has been endorsed by the following associations:
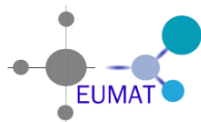
The European Construction, built environment and energy efficient building Technology Platform (ECTP) is a leading membership organisation promoting and shaping the future of the Built Environment and Construction sector in Europe.

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.

ECTP GOALS 2050

Clean built environment and cities	**Built for and with the people**	**Prosperous Construction ecosystem**
Make the built environment CO2-neutral, resource efficient and high-performing over its whole life cycle	Provide a service-oriented built environment that enables every European to live better and more sustainably	Make Europe a worldwide reference in sustainable and digitalised construction ecosystem

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[11] 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[12] 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 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.

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[11] 2030 climate & energy framework: 40% cuts in greenhouse gas emissions (from 1990 levels), 32% share for renewable energy, 32.5% improvement in energy efficiency.

[12] 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)

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.
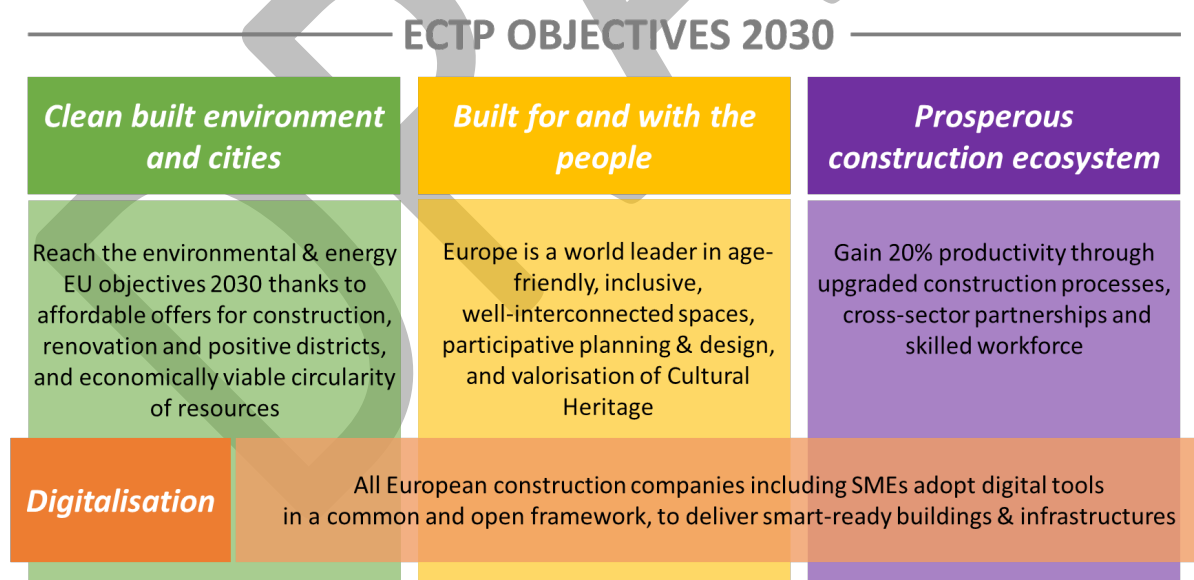
ECTP OBJECTIVES 2030

Clean built environment and cities	Built for and with the people	Prosperous construction ecosystem
Reach the environmental & energy EU objectives 2030 thanks to affordable offers for construction, renovation and positive districts, and economically viable circularity of resources	Europe is a world leader in age-friendly, inclusive, well-interconnected spaces, participative planning & design, and valorisation of Cultural Heritage	Gain 20% productivity through upgraded construction processes, cross-sector partnerships and skilled workforce

Digitalisation	All European construction companies including SMEs adopt digital tools in a common and open framework, to deliver smart-ready buildings & infrastructures

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[13] (IDDS) become mainstream procurement options
- □ Reduction of the skills gap by a factor 3

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[13] *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.

☐ 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).

Research and Innovation priority areas, per objective

Objective	R&I priorities
Clean built environment and cities	**1.1** Energy renovation of buildings and upgrading of infrastructures **1.2** Positive energy building blocks & districts, integrated with the urban networks **1.3** Life Cycle Approach and Circular Economy
Built for and with the people	**2.1** Participative and dynamic built environment **2.2** Inclusive and affordable built environment **2.3** Healthy and comfortable built environment **2.4** Living cultural and historical built environment
Prosperous construction ecosystem	**3.1** Cleaner, faster, safer and more cost-effective construction, retrofitting & commissioning processes **3.2** Improved resilience and adaptability of the built environment **3.3** New contractual processes and partnerships for the construction sector **3.4** Educational tools increasing the attractiveness and skills of the industry's careers
Digitalisation	**4.1** Smart operation and maintenance of buildings & infrastructures **4.2** BIM & Digital Twins for value chain integration, with focus on SMEs **4.3** Data privacy and security **4.4** Better integration of the built environment with the urban space and mobility

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.