



Energy-efficient Buildings contractual Public-Private Partnership (EeB cPPP) 2019 Progress Monitoring Report

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1. Executive summary

The construction sector is crucial to EU environment and energy policies as buildings represent 40 % of total EU energy consumption and generate 36% of greenhouse gases in Europe. There is a crucial need of innovation to deploy energy-efficient and low-carbon solutions in the built environment, to avoid facing in long-lived inefficient buildings assets for decades to come.

The Energy-efficient Buildings (EeB) cPPP is a partnership between the European Commission (EC) and the private sector as represented by the private members of the EeB cPPP Partnership Board and supported by the Energy Efficient Buildings Committee (E2B) of the European Construction, built environment and energy efficient building Technology Platform (ECTP).

The EeB cPPP intends to:

- create and integrate innovative technologies and solutions enabling to reduce energy consumption and GHG emissions in line with the 2020 goals as stated by the EC;
- turn the building industry into a knowledge-driven sustainable business, with higher productivity and higher skilled employees;
- develop innovative and smart systemic approaches for green buildings and districts, helping to improve competitiveness of the EU building industry, with an enhanced user-centric approach.

The EC supported **110 projects** through the EeB cPPP initiative under **FP7**. Within **Horizon 2020**, the EC is now supporting **66 additional projects** selected under the 2014, 2015, 2016, 2017 and 2018 EeB calls. 8 new projects – i.e. 5 Research and Innovation Actions (RIAs) and 3 Innovation Actions (IAs), including one funded at 50% - were selected on the 2018 call under 3 topics.

In the context of the 2019 progress monitoring survey, the whole set of 66 H2020 projects as well as 15 non-completed FP7 projects as of 1st January 2018 - were contacted in February 2019, and up to 5 reminders were sent until the end of March 2019. A 91% response rate was achieved among H2020 projects, and 73% of the 15 non-completed FP7 projects validated their questionnaire.

Key analytics of the overall projects' portfolio composition are as follows:

- **Average duration per project: 42,8 months for H2020** (43,3 months for both FP7 & H2020);
- **Average EU funding per project: 4 711k€ for H2020** (4 926k€ for both FP7 & H2020);
- 17 of the 66 H2020 projects are already completed

The following trends are further observed in relation to cluster allocations of the overall portfolio:

- For both FP7 and H2020, the most important technology clusters are **Technology Building Blocks** (respectively 23% of the projects in FP7 and 25% in H2020) and **Energy performance monitoring & management** (respectively 30% of the projects in FP7 and 24% in H2020).
- **BIM, Data and interoperability** becomes the third most important cluster with 16% of the projects; this is significantly higher than in FP7 (6%).
- **Design** remains the cluster with the lowest number of projects (4% in H2020, 6% in FP7).
- The percentage of H2020 Projects dealing with **ICT** (9%) has slightly increased compared to last year.

In terms of external dissemination and communication activities, the association organised in November 2018 its **8th ECTP conference in Brussels**, gathering 170 stakeholders from the whole construction value-chain and representatives of the European Commission who shared their

experience and discussed how the EU construction industry is shaping a high-tech Sustainable Built Environment. The 7th edition of the **EeB PPP Project review** – a comprehensive directory of all EeB PPP projects – was released. All ECTP committees including the E2B committee released their **Position Paper for the 9th Framework Programme**, namely Horizon Europe, covering the period 2021-2027. ECTP also released a 2018 updated edition of the **EeB PPP Promising Technologies Brochures** that showcase successful technologies with a high market potential identified among the EeB PPP projects.

ECTP and its board members contributed to **around 20 events** since the last Progress Monitoring Report (over a period from May 2018 to March 2019). Notable events include for instance participation to the [2018 EU Sustainable Energy Week](#); contribution to a DG GROW Construction2020 workshop; participation to the [SET Plan Working Group 3.2](#); contribution to the [INDTECH Conference](#); and an exhibition at the [EU Industry days](#).

The overall progress of the EeB cPPP is currently in line with the contractual commitments. Current progress on monitored KPIs is particularly promising given the early stage of implementation of a significant part of the H2020 projects. **2019 progress monitoring results are demonstrating an overall increase compared to the previous PMR on almost all monitored KPIs, both on those common to all cPPPs and on those specific to the EeB cPPP. It must be underlined here that no single decrease is to be observed among KPIs between 2018 and 2019!**

EeB cPPP projects are mobilising private investment with an **average leverage factor of 6,86 for large industrial organisations and of 2,28 for RTOs**; they enable the creation of new job profiles for the construction industry in relation to innovative technologies; and they generate a substantial impact (job creation and increased turnover) on SMEs that benefit from the EeB cPPP funding. The share of participation of SMEs in EeB cPPP projects has progressed from 28% (FP7 baseline) to 34% in H2020.

The whole set of H2020 projects reported a total of **260 developed new systems and technologies**, as well as **104 non-technological innovations**. A **38.4% reduction of energy use** and a **40% reduction of CO2 emissions** is expected by the end of the projects. An average of **5.8 submitted scientific publications per project** was reported, and **6 spin-offs** have already been launched to exploit the innovative outcomes of the projects. H2020 projects reported already **24 patent applications** and 85 expected by the end of the projects.

The EeB cPPP has a strategic positioning, as it represents the EU focal point of a scattered industry and transforming sector, and it provides a barometer of R&I activities in the EU for the Built Environment sector. It is an **instrument** to embrace the complexity of actors, challenges and innovation needs in a comprehensive and systemic way – being a pan-European ecosystem: it is Inclusive of **all (scattered) stakeholders** (Researchers, industrialists, owners, legislators, financiers, users associations, etc.), in a **multi-disciplinary** and open approach – linking the whole value chain from innovators to users/citizens, integrating different industries; and it transforms construction innovation in products and services, in turn serving European transitions, welfare and job.

2. Introduction

2.1. What is the challenge?

The construction sector is crucial to EU environment and energy policies as buildings use 40 % of total EU energy consumption and generate 36% of greenhouse gases in Europe. While the replacement rate of existing stock is very small (1-2% per year), the construction sector is on the critical path to decarbonise the European economy by 2050. This is a unique opportunity for sustainable business growth provided that products and related services for both new and refurbished buildings are affordable and of durable quality. Yet, the sector is highly fragmented (over 95% SMEs) and sensitive to economic cycles. As such there is a crucial need of innovation to deploy energy-efficient and low-carbon solutions in the built environment, to avoid facing in long-lived inefficient buildings assets for decades to come.



Figure 1 - EeB Challenge (European Commission, DG Research and Innovation, 2017)

2.2. What is the Energy-Efficient Buildings (EeB) cPPP?

The Energy-efficient Buildings (EeB) cPPP is a partnership between the European Commission (EC) and the private sector as represented by the Energy Efficient Buildings Committee (E2B) of the European Construction, built environment and energy efficient building Technology Platform (ECTP).

The multiannual EeB cPPP roadmap¹ is the document containing the research and innovation priorities of the private sector, which are essential inputs for the design of the research work programmes by the EC and the E2B Committee of the ECTP. To improve transparency, this partnership is based on a contractual agreement between the EC and the industry partners. This roadmap is currently under

¹ Energy efficient Building - Multi-annual roadmap for the contractual PPP under Horizon 2020 – December 2013 - ISBN 978-92-79-31239-7 -

http://e2b.ectp.org/fileadmin/user_upload/documents/E2B/0_EeB_PPP_Project-Reviews_Roadmaps/Eeb_cPPP_Roadmap_under_H2020.pdf

renewal with the ongoing preparation over 2019 of the ECTP Strategic and Innovation Research Agenda (SRIA) targeting the 2020-2030 period and the next Horizon Europe Framework Programme.

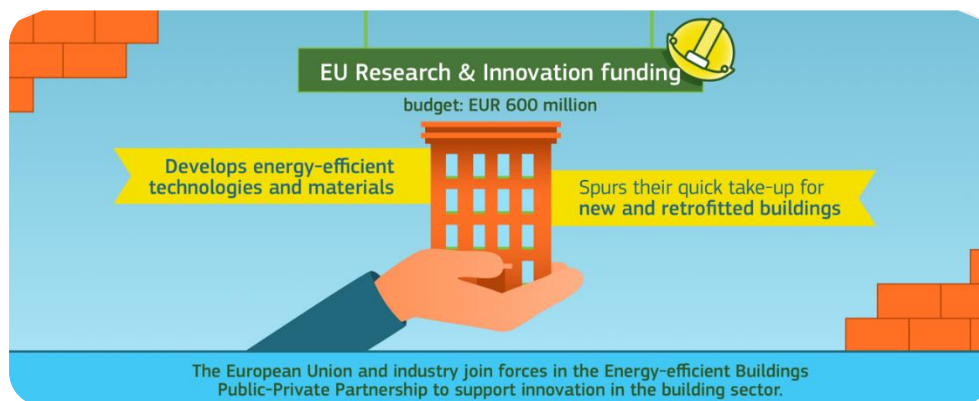


Figure 2 - EeB PPP Partnership ambition and funding (European Commission, DG Research and Innovation, 2017)

2.3. What results and benefit can we expect?

The EeB cPPP intends to:

- create and integrate innovative technologies and solutions enabling to reduce energy consumption and GHG emissions in line with the 2020 goals as stated by the EC;
- turn the building industry into a knowledge-driven sustainable business, with higher productivity and higher skilled employees;
- develop innovative and smart systemic approaches for green buildings and districts, helping to improve competitiveness of the EU building industry, with an enhanced user-centric approach;
- to contribute to the challenges as identified through UN Sustainable Development Goals²

The principal **key quantitative objectives** of the EeB cPPP are:

- to **increase private investment** in research & innovation **up to 3% of turnover by 2020**;
- to **create 10 new types of high-skilled** jobs implemented through knowledge transfer and training;
- to develop the appropriate set of technologies to **reduce energy and CO2 by 50% and by 80%** respectively compared to 2010 levels;
- to present **at least 100 demonstration buildings and districts**, which are expected to be retrofitted with ICT-based solutions and monitored **to reduce up to 75% energy use**.

2.4. Aim of the annual Progress Monitoring Report

The aim of the annual Progress Monitoring Report (PMR) is to provide a critical analysis of the EeB cPPP progress in the implementation of its multiannual roadmap, a summary of progress achieved on KPIs common to all cPPPs and KPIs specific to the EeB cPPP and an overview of the general progress of the PPP since its inception.

This 2019 edition implements a simplified structure (which was already implemented in the 2018 edition) following the EC recommendation from the mid-term review of the contractual public private partnerships (cPPPs) to enhance readability of the PMR. This PMR is a public document available through the ECTP website³.

² <https://www.un.org/sustainabledevelopment/sustainable-development-goals/>

³ European Construction, built environment and energy efficient building Technology Platform (ECTP) website: <http://www.ectp.org>

3. Main activities and achievements during 2018

3.1. Implementation of the calls for proposals evaluated in 2018

The EC supported **110 projects** through the EeB cPPP initiative under **FP7**. Within **Horizon 2020**, the EC is now supporting **66 new projects** selected under the 2014, 2015, 2016, 2017 and 2018 EeB calls.

8 new projects – i.e. 5 Research and Innovation Actions (RIAs), and 3 Innovation Actions (IAs) including 1 funded at 50%, were selected on the 2018 call under 3 topics (Table 1 below).

Table 1- Projects selected under the 2018 EeB cPPP call

Topic	Topic identifier	Type of action	Projects
Building information modelling adapted to efficient renovation	LC-EEB-02-2018	RIA	BIM4REN
			BIM4EEB
			BIMERR
			BIM-SPEED
			ENCORE
ICT enabled, sustainable and affordable residential building construction, design to end of life	LC-EEB-06-2018	IA (50%)	SPHERE
Decarbonisation of the EU building stock: innovative approaches and affordable solutions changing the market for buildings renovation	LC-SC3-EE-1-2018	IA	StepUP
		IA	DRIVE 0

In the context of the 2019 progress monitoring survey, the whole set of 66 H2020 projects, as well as a set of 15 FP7 projects which were not completed as of 1st January 2018, were contacted in February 2019, and up to 5 reminders were sent until the end of March 2019. The 2019 PMR survey campaign was closed on March 25th, 2019.

A **91% response rate** was achieved among H2020 projects, while 73% of the 15 contacted FP7 projects completed the questionnaire. For earlier FP7 projects, the data which they provided in the earlier survey was used for calculating the baseline.

One of the new projects selected on the 2018 call (see Table 1) – StepUP – did not complete its questionnaire because it was still in the Grant Agreement preparation phase at the time of the survey. For the fourth consecutive year, the dedicated online survey tool⁴ - which was developed by ECTP in the context of the EeB-CA2⁵ Coordination and Support Action – was used. The performance of the tool is improved every year with additional pre-filled data and quality control mechanisms, which makes the overall process easier for project coordinators.

Looking at the overall projects' portfolio composition, the following key analytics are observed:

- **Average duration per project: 42,8 months for H2020** (43,3 months for both FP7 & H2020);
- **Average EU funding per project: 4 711k€ for H2020** (4 926k€ for both FP7 & H2020);
- 25% of the H2020 projects (17 out of the 66 projects) are already completed.

The multiannual EeB cPPP roadmap presents a segmentation of the EeB value chain, which was further adapted and developed in the context of the EeB-CA2 CSA project, resulting in the definition of 7 technology clusters (see Figure 3).

⁴ EeB online progress monitoring tool: <http://eeb-monitoring.ectp.org>

⁵ Energy Efficient Buildings Cluster Activities Coordination Action: <http://www.e2b-clusters.eu>

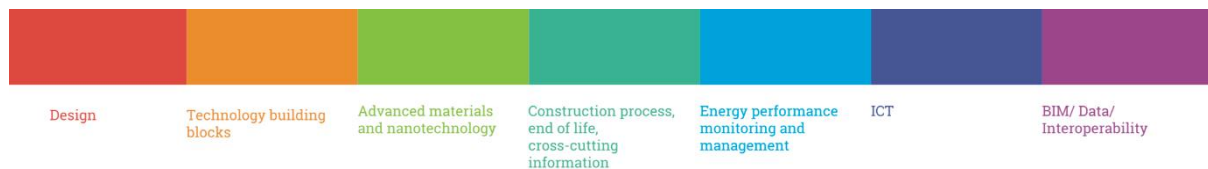


Figure 3: Segmentation of the value chain into technology clusters from the EeB-CA2 CSA project

Based on this segmentation, each project is allocated to a primary technology cluster (mandatory), and a second technology cluster (optional) as illustrated in Table 2. Project coordinators are given the opportunity to select and/or update the most relevant cluster(s) for their project in the context of the annual progress monitoring survey.

Table 2 - Projects allocation per EeB technology cluster

Technology cluster		Design	Technology Building Blocks	Advanced materials and nanotechnology	Construction Processes, end-of life, cross-cutting information	Energy performance monitoring & management	ICT	BIM, Data, and Interoperability
FP7 (110 projects)	1 st cluster	12	29	9	13	43	2	2
	2 nd cluster	2	21	16	7	22	29	10
	Total	14	50	25	20	65	31	12
	%	6%	23%	12%	9%	30%	14%	6%
H2020 (66 projects)	1 st cluster	3	24	10	5	10	2	10
	2 nd cluster	2	7	5	7	19	9	10
	Total	5	31	15	12	29	11	20
	%	4%	25%	12%	10%	24%	9%	16%

The following trends are observed in relation to cluster allocations of the overall portfolio:

- For both FP7 and H2020, the most important technology clusters are **Technology Building Blocks** (respectively 23% of the projects in FP7 and 25% in H2020) and **Energy performance monitoring & management** (respectively 30% of the projects in FP7 and 24% in H2020).
- **BIM, Data and interoperability** becomes the third most important cluster with 16% of the projects; this is significantly higher than in FP7 (6%).
- **Design** remains the cluster with the lower number of projects (4% in H2020, 6% in FP7).
- The percentage of H2020 Projects dealing with **ICT** (9%) has slightly increased compared to last year.

Looking at the latest 8 projects selected on the 2018 call (Table 1), the most represented cluster is **BIM, Data and interoperability**. This confirms the growing trend in this category which was already observed last year. The original segmentation of the EeB value chain presented in the original multiannual EeB cPPP roadmap (2013) is well covered in a holistic way by the EeB PPP projects portfolio, with is a slight shortage on the 'Design' cluster.

3.2. Mobilisation of stakeholders, outreach, success stories

The following section provides an overview of major stakeholders' events organised in 2018.

2018 ECTP Conference

The 8th ECTP Conference took place at the Centre for Fine Arts in Brussels on November 13-14, 2018. More than 170 stakeholders from the whole construction value-chain and representatives of the European Commission shared their experience and discussed how the EU construction industry is shaping a high-tech Sustainable Built Environment. 9 parallel sessions over the two days of the conference covered a wide range of topics, innovation and market foresight trends addressed by the five ECTP Committees. The full conference report is [available on the ECTP website](#).

Publication: EeB PPP Project Review 2018

The 7th edition of the EeB PPP Project Review was published⁶ in May 2018. This yearly publication of the E2B committee highlights current results and achieved or potential impact of the EeB cPPP Projects portfolio. The projects demonstrate scientific and technological excellence, across all levels, from early stage conception to demonstration of almost ready-to-market innovations. They illustrate the diverse innovation approaches and importance of embracing all aspects of the building / construction sector.

Publication: ECTP Position Papers for Horizon Europe

ECTP and its Committees including E2B developed their [Position Papers](#) for the 9th Framework Programme covering the period 2021-2027, Horizon Europe. At a time of brainstorming what is to be the future RDI over the next 10 years, the common views and objectives developed in the scope of ECTP have to serve as a starting point for future networking and R&D cooperation that will develop solutions helping to overcome societal challenges and to ensure that the construction industrial sector will, in the long-term, secure its competitiveness and sustainability, whilst the built environment (both buildings and infrastructures) will provide secure, safe and smart living places for all citizens in Europe. As such, the renewed ECTP moto is: *"Making Europe the most comfortable place in the world"*.

Publication: EeB PPP Technology Brochures 2018

ECTP released a 2018 updated edition of the [EeB PPP Promising Technologies Brochures](#) that showcase **successful technologies with a high market potential** identified among the EeB PPP projects. The brochures focus on 5 topics: Advanced Materials Solutions; HVAC & Lighting Solutions; Energy Building Systems; Monitoring & Diagnostic Methodologies; Urban & District Scale Solutions.

Events and meetings contributions

ECTP contributed to **around 20 events** since the last Progress Monitoring Report (over a period from May 2018 to March 2019). Each event represents an opportunity:

- to raise awareness about the EeB cPPP, its objectives and its projects portfolio;
- to gather stakeholder feedback so as to influence and fine-tune the future EeB cPPP roadmap;
- to push forward the EeB cPPP research priorities in interrelated sectors (e.g. ICT, Transport, Smart cities, etc.);
- to convince new stakeholders from interrelated sectors to join ECTP and its EeB committee.

Notable events over the past period include for instance participation to the [2018 EU Sustainable Energy Week](#); contribution to a DG GROW Construction2020 workshop; participation to the [SET Plan Working Group 3.2](#); contribution to the [INDTECH Conference](#); and an exhibition at the [EU Industry days](#). A further detailed list of events is presented in the appendix.

Cooperation and partnerships

- ECTP has signed [two Memorandum of Understanding](#) (MoU) with **FEHRL** and **ENCORD**:
 - With **FEHRL**, Forum of Europe's National Road Research Centres, the MoU underlines both the need and the will to cooperate more intensively between academia and industry, in order to build a common approach for the future transport infrastructures in Europe.
 - With **ENCORD**, European Network of Construction Companies for Research and Development, the MoU formalises the basis for an enhanced future cooperation between the 2 organisations. ECTP and ENCORD will together promote innovation, share knowledge

⁶ 2018 EeB PPP Project Review: www.ectp.org/fileadmin/user_upload/documents/E2B/0_EeB_PPP_Project-Reviews_Roadmaps/EeB_PPP_Project_Review_2018.pdf

and raise the needs of RD&I in buildings, networks and transport infrastructures towards key European stakeholders.

- Cooperation with **EffiBUILDING** established in 2017, has been continued, with ECTP selected most promising technologies and prototypes referenced within the Effibuilding database.
- Support was provided to **CoolingEU**, a forum that brings together stakeholders representing the European cooling sector to promote a more efficient and cleaner cooling supply.
- ECTP is a member of **AIOTI**, the Alliance for Internet of Things Innovation and collaborates for establishing the vision of WG13 focused on Smart Buildings.
- A partnership was established with the International conference and tradeshow **World Sustainable Energy Days 2018**.
- The European Technology Platform **ManuFuture** released its new Vision 2030 document, with some contributions from ECTP Members.
- Regular contacts with other initiatives have been continued in particular with the European Steel Technology Platform (**ESTEP**), the Fuel Cells & Hydrogen Joint Undertaking (**FCH JU**), and the Big Data Value Association (**BDVA**).

Eventually, a significant cooperation effort with the European Commission has been undertaken to work on the content of this Periodic Monitoring Report and in particular on the KPIs specifications.

Outreach

The above-mentioned activities have been further promoted through ECTP communication channels. Their impact and outreach can be measured as follows:

- The ECTP website registered 40k+ page views over 2018;
- its specific EeB committee sub-section registered 14k+ page views over the same period;
- the EeB project database⁷ is the 3rd most consulted page after the landing page.
- As of April 29th, 2019, the ECTP Twitter account⁸ has 830+ followers.
- As of April 29th, 2019, the official ECTP E2B Committee LinkedIn group⁹ has 950+ members.
- The ECTP E2B Committee YouTube channel¹⁰ was updated in April 2019 with a selection of 70+ recent videos from EeB projects.

3.3. Governance

The private side of the EeB cPPP Partnership Board is formed by 20 members and 10 substitute members. In 2019, the changes in its composition were as follows:

- For **members**:
 - New representative (same organisation):
 - *Christophe LEVY*, LAFARGEHOLCIM;
 - *Laurens TAIT*, ARUP.

The updated Partnership Board members list is provided in the appendix.

⁷ ECTP EeB projects database: <http://www.ectp.org/index.php?id=29>

⁸ ECTP Twitter account: <https://twitter.com/ECTPSecretariat>

⁹ ECTP E2B LinkedIn group: <https://www.linkedin.com/groups/3744557>

¹⁰ ECTP E2B YouTube channel: https://www.youtube.com/channel/UC8LjrepSBN_apQNuFNeufig/featured

4. Monitoring of the overall progress since the launch of the EeB cPPP

4.1. Achievement of the goals of the EeB cPPP

A qualitative analysis of the EeB cPPP project portfolio was conducted and delivered in March 2017 in the context of the EeB-CA2 Coordination and Support Action¹¹. This included for each of the 7 technology clusters (Table 2) a detailed analysis of the state of the art and current practices, the identification of main challenges, and eventually the definition of future priorities and recommendations and their impact. The analysis was based on the earlier work conducted in the CSA which included an in-depth assessment of the technologies developed by the EeB projects through the involvement of external experts, which resulted in the identification of a selection of most promising innovations¹². An updated summary of the current progress in the implementation of the EeB Multi-annual roadmap is presented below for each technology cluster.

Target areas fully or partially addressed

- **Design:** EeB projects well addressed the development of design tools based on model-based CAD approaches and interoperable interface, improved design accuracy applied with demo districts with the engagement of different stakeholders, and libraries of reference integrated within the tools themselves.
- **Technology Building Blocks:** EeB projects addressed the development and integration of tools and methods to maximize user acceptance of adaptable envelopes, techniques to minimize Volatile Organic Compound (VOC, SVOC), envelopes improving natural light and ventilation in buildings and full scale demonstrations of adaptable envelope integration, smart building envelopes, innovative PV components, building and district level thermal storage, heating systems and storage at building and district levels, heat and power systems at building and district level, low GHG refrigerants, benchmarking and calculation tools, sensors and smart consumption displays for BEMS. Several projects funded under the EeB-05-2017 call are well addressing the introduction of Plus Energy houses within districts. Also 2 new projects funded under EeB-6-2017 call are addressing the development and improvement of storage solutions for thermal energy based on thermo-chemical and phase-change materials.
- **Advanced Materials and Nano Technologies:** EeB projects best addressed the development of super insulating materials and components, improved technical properties for organic materials, advanced low CO2 concrete, modular mass customized envelope solutions and full-scale demonstrations of adaptable envelope integrations.
- **Construction Process, End of Life and Cross Cutting Information:** EeB projects best addressed the development and integration of standardized self-testing sensors/meters and energy performance verification procedures as well as full scale demonstration of deep building refurbishment based on mass customized envelopes. The Stunning CSA funded under EeB-08-2017 call is addressing the development of mechanisms to raise public awareness, set regulations, codes and practices, fiscal and financial tooling incentives to support EeBs.
- **Energy Performance Management and Monitoring:** EeB projects best addressed the development of monitoring tools for envelope and energy equipment performance, legal/societal/environmental performance indicators at EU level, self-diagnosis subsystems for conditional maintenance, virtual reality approaches to diagnosis; energy performance monitoring systems at district level, monitoring tools able to discriminate additional criteria

¹¹ http://www.ectp.org/fileadmin/user_upload/documents/E2B/EeB-CA2/EeB-CA2_D6.2_v2.pdf

¹² EeB PPP Promising Technology Brochures:

http://www.ectp.org/fileadmin/user_upload/documents/E2B/0_EeB_PPP_Promising_Techno_Brochures/EeB_PPP_Promising_Technology_Brochures.zip

from overall building energy performance, standard protocols for use-value measurements of energy efficiency in buildings.

- **BIM, Data and Interoperability:** EeB projects well covered the development of enhanced BIM models and ontologies to describe interfaces of building and district projects, BIM tools able to merge building models and construction process management and certification methodologies, approaches to enforce long term legal and contractual validity of BIM.
- **ICT:** EeB projects well covered key areas which the EEBERS CSA project clustered as integration technologies, energy management & trading, tools for EE design & production management, intelligent and integrated control (at building level) as well as user awareness & decision support.

Target areas still to be addressed

- **Design:** this cluster still needs addressing the definition of approaches to enforce the long term legal and contractual validity of building information models, along with the provision of accessible, high quality and trustworthy data, especially in a context of Big Data development. Also related is the fact that planning process improvement implies shared data, practices and tools with proper training and education, along with the development of Integrated Project Delivery (IPD): chosen project delivery methods can compromise the design and integrated planning approach in renovation projects is a success factor for optimization and innovation with limited risks. Eventually, decentralized and circular approaches for building and usage practices need to be considered at early design stage for an effective sustainability, with the engagement of involving all stakeholders within a collaborative and risk share approach, allowing cost-efficient solutions from an LCA perspective.
- **Technology Building Blocks:** This cluster still needs to address areas such as: the development of strategies to identify economic construction procedures for reuse of structures and procedures to determine the structural load capacity of existing structures accurately, which are easy to use and cost-efficient; technologies and methods to understand and maximise user acceptance, Mass manufactured prefabricated modules, flexible lighting system using LEDs or OLEDs. Demonstration is needed for adaptable envelopes, modelling district energy consumption and building interactions systems and protocols to optimize energy storage and production at district level, new testing procedures to measure material performances, harmonize test procedures and efficiency labelling schemes. Some monitoring aspects such as: standardized functionalities for sensors and actuators, robust, resilient and reconfigurable sensor network: building embedded sensors; Interoperable smart meters. The two new projects selected under the SC3-EE1-2018 call will be addressing part of these challenges through the demonstration of innovative approaches and affordable solutions changing the market for buildings renovation.
- **Advanced Materials and Nano-technologies:** this cluster is key in supporting the European leadership in the development of pilot components for buildings retrofitting addressing key challenges as complexity, weight control and overall retrofitting costs. The technology readiness level of promising solutions needs to be scaled up addressing both insulation as well smart functionality and storage. Some key areas include for instance: the development of chemical coupling agents and binders, low-CO₂ advanced concrete, materials for draining, testing procedures to measure material performances, basement insulation, mass manufactured prefabricated modules, the demonstration of photo-catalyst or other de-polluting techniques to minimise the Volatile and Semi-volatile Organic Compound, semi permeable insulation membranes and pigment.
- **Construction Process, End of Life and Cross Cutting Information:** this cluster still needs to address some areas such as: techniques to measure the contribution of each critical component in energy efficient construction; the development of innovative construction processes to provide workers with safer and healthier environment and also systems to control

in parallel work done by different experts; prefabricated solutions and mobile factories composed by portable manufacturing facilities, placed near the construction site, including tracking systems; waste collection, separation and reaction techniques in order to increase the reuse of the building waste into recycled composites and optimal re-usability or recyclability of different types of products; probabilistic tools to model/predict the ageing performance of zero energy building; models and experimental tests capable of assessing the ageing properties of construction materials and components; comparison among member state in relation to energy labelling and its effect.

- **Energy Performance Management and Monitoring.** Within this cluster the target areas that still need to be addressed is related to the enlargement of the European network of usage-value measurement and monitoring laboratories.
- **BIM, Data and Interoperability and ICT:** The target areas which could be linked to the clusters BIM and ICT are horizontal and therefore have been partially addressed. They still deserve efforts to have a proper framework of enabling technologies. The Building Information Modelling tools (BIMs) developed so far are addressing mainly new buildings of all types. There is a need to deploy tool kits for existing buildings which can be easily used by several stakeholders, including construction companies, architects, service providers. As far as ICT systems are concerned, solutions and user-centric -technologies are crucial for performance monitoring and management of highly energy efficient buildings, enabling guaranteed performance contracts. 6 of the newly supported projects under the EeB-2018 call (see Table 1) are now focused on addressing these two technology clusters and their challenges.

4.2. Progress achieved on KPIs.

This section provides a summary of the progress achieved on KPIs which are common to all cPPPs and on those which are specific to the EeB cPPP. Further details are provided in the appendix.

Common cPPPs Key Performance Indicators

Mobilised private investment

To evaluate mobilised private investments and calculate the leverage factor, this year again **ECTP implemented an “organisation-based” approach.** This approach provides more meaningful and consistent results than the “project-based” approach through the regular questionnaire which is used to compute the other KPIs presented in this report. This year, the approach was facilitated by the development of a dedicated online questionnaire implementing the latest guidelines related to the leverage factor calculation provided by the European Commission. Thanks to this new development, it was possible to extend data collection to a larger scale compared to last year: the new online questionnaire was sent to **all ECTP members being involved in at least one H2020 EeB project.** Gathered values are exploitable for 15 organisations. Data have been anonymised and are presented in Table 3, Table 4, Table 5, Table 6 and Table 7 below.

Caption for Tables 3, 4, 5, 6 and 7	
A1	Direct contributions from your organisation as predetermined in your project (co-funding – value from your Grant Agreement)
A2	Additional investment or resources spent your organisation for the execution of the cPPP project, beyond the direct contributions under A1 (these are typically due to shortfalls in fixed overheads for a project, infrastructure costs not covered by direct funding, consumables and maintenance costs, equipment costs, additional personnel costs, other costs)
B1	Additional investment or resources spent as a follow-up to the activities and results related to your cPPP project (e.g. to exploit or scale-up results) and that are not supporting directly its execution. This can include additional funding mobilised thanks to your cPPP project such as venture capital, other public funding, etc.

B2	Additional investments or resources spent that support the objectives of the EeB cPPP and that have been triggered/encouraged by the existence of the cPPP, but that are not following up activities or results of your cPPP project as such (hence, not counted in A1, A2 and B1).
A	Direct leverage = A1 + A2
B	Indirect leverage = B1+B2 - Up to 4 years after your cPPP project(s) was(were) completed

Table 3 - Leverage factor – Research and Technological Organisations

	RTO1	RTO2	RTO3	RTO4	RTO5
Organisation total EU funding	1 517 000 €	4 279 501 €	5 106 575 €	449 967 €	2 237 913 €
A1	318 003 €	3 662 060 €	0 €	0 €	0 €
A2	60 000	991 375 €	5 361 905 €	755 359 €	1 270 773 €
B1	0	991 375 €	40 000 €	200 000 €	0 €
B2	2 750 000	1 500 000 €	2 603 921 €	0 €	5 350 000 €
Leverage factor	2,06	2,72	1,57	2,12	2,96

Average leverage factor RTOs: 2,28

Table 4 - Leverage factor – Large industrial organisations

	LARGE IND 1	LARGE IND 2	LARGE IND 3	LARGE IND 4
Organisation total EU funding	742 872 €	1 708 501 €	174 662 €	3 484 447 €
A1	318 373 €	142 957 €	46 406 €	599 039 €
A2	10 181 937 €	780 000 €	128 795 €	0 €
B1	0 €	2 475 580 €	0 €	0 €
B2	0 €	2 500 000 €	714 210 €	16 039 920 €
Leverage factor	14,13	3,45	5,09	4,78

Average leverage factor Large Industrial organisations: 6,86

Table 5 - Leverage factor – SMEs

	SME1	SME2	SME3	SME4	SME5	SME6
Organisation total EU funding	1 754 178 €	1 913 678 €	923 275 €	1 248 625 €	1 447 535 €	662 467 €
A1	656 396 €	668 722 €	231 781 €	535 125 €	191 653 €	0 €
A2	0 €	0 €	130 000 €	20 000 €	0 €	134 580 €
B1	0 €	1 000 €	0 €	40 000 €	2 000 €	0 €
B2	220 000 €	2 781 882 €	0 €	150 000 €	0 €	0 €
Leverage factor	0,50	1,80	0,39	0,60	0,13	0,20

Average leverage factor SMEs: 0,6

Table 6 - Average share in A | Direct leverage

Average share in A - Direct leverage	RTOs	Large IND	SMEs
1. Own funds (%)	55	66,5	85
2. External private funding (%)	0	0	0
3. EU public funding (%)	35,2	33,5	15
4. Non-EU (other: national / regional) public funding (%)	9,8	0	0

Table 7 - Average share in B | Indirect leverage

Share in B - Indirect leverage	RTOs	Large IND	SMEs
1. Own funds (%)	43,4	75	100
2. External private funding (%)	33,6	0,6	0
3. EU public funding (%)	3	0	0
4. Non-EU (other: national / regional) public funding (%)	20	24,3	0

The above panel of organisations is involved in 39 different H2020 EeB projects and is therefore well representative of the overall current portfolio of 66 H2020 projects. The average leverage factor observed for **large industrial organisations (6.86)** and **RTOs (2,28)** is higher than the average leverage factor of **SMEs (0.6)**, which can be obviously explained by the higher amount of their internal available resources to support internal R&D. On the other hand, the average **share of 'own funds'** for both direct and indirect leverage is the highest for SMEs (respectively 85% and 100%).

New skills and/or job profiles


Number of new skills and/or job profiles created (or forecasted within a reasonable timeframe in the future) in your project

A selection of relevant answers from 13 H2020 projects is presented in Table 8 below. It shows that the EeB cPPP is well on track to achieve its target of 10 new types of high-skilled jobs creation, especially in relation with innovative technologies for the construction sector (e.g. BIM, BIPV, CIM, Low Carbon Buildings, 3D printing, Smart Grids, etc.).

Table 8 - Nature of new job profiles / skills created in selected H2020 projects

Project	Nature of new job profile created
4RinEU	<ul style="list-style-type: none"> Design-for-assembly deep renovation system integrator/engineer Building data manager Building RES integration advisor, through optimization tool (possible subject for a MOOC)
ENCORE	<ul style="list-style-type: none"> Computer Vision and BIM Specialist Expert in the field of artificial intelligence and cybernetics for large-scale experimental testing Expert in holonic management of construction processes and application of advanced AR/MR tools in the management of building renovation actions Expert in force control of UAVs in interaction with the environment (residential buildings) Expert in energy efficiency and energy simulation in buildings, with deep understanding of legislation, renewable energies and 3D modelling software
Energy Matching	<ul style="list-style-type: none"> Energy harvesting, sharing and use in smaller districts including calculation tools advanced control Skills related to the new BIPV products design and development; Skills related to the innovative nature of the system proposed in EnergyMatching and its influence for the overall BIPV product (frameless integration system, click & go technology, installation and maintenance) Real estate EE advisor -for achieving nearly-zero-energy building with lowest possible costs Solar mounting engineering – assisting architects and solar facade companies in the design process for the facade; Solar Energy Facade Sales advisor
HEART	<ul style="list-style-type: none"> The relevant new-technology and ICT dimension of the project may promote entry into employment of young and innovatively skilled professionals. (...) The development of systemic solutions that integrate aspects typically treated within different sectors (e.g. envelope and technological systems) greatly facilitates the advent of a new generation of multidisciplinary SME contractors and technicians.
HOLISDER	<ul style="list-style-type: none"> Software Engineer: Contribution to the development, testing and evaluation of the services developed by HYPERTECH in the project, namely: behavioural profiling, demand flexibility & visual analytics tools
INSITER	<ul style="list-style-type: none"> Advisor/Trainer for self-quality assurance in construction Specialist for laser, thermal and acoustic measuring during construction Specialist in re-modelling of BIM for self-instruction for construction workers
ISOBIO	<ul style="list-style-type: none"> Coating formulation researcher; focused on developing new additives that provide fire retardancy and water repellence to bio-derived material
MODER	<ul style="list-style-type: none"> Expert on social impacts of district level refurbishment City information modeller Visualisation expert; District level simulation expert; Project delivery expert Activator: Expert in early phase preparations in a district level project
P2Endure	<ul style="list-style-type: none"> BEM specialist who performs BIM-to-BEM energy simulations to determine most energy efficient renovation strategy. 3D printing specialist/assistant who sets up the building site for 3D printing and operates the robot on-site by Guided User Interface (GUI), which is being developed within P2ENDURE
Plug-N-Harvest	<ul style="list-style-type: none"> Plug-n-Harvest will promote the creation of interesting, high technology new jobs in the areas of building construction, energy management and the renewable energy sector (...).
RE4	<ul style="list-style-type: none"> CDW manager CDW-based products designer CDW-based materials developer
Rennovates	<ul style="list-style-type: none"> Jobs related to smart grid control, ICT integration in the built environment and analytics. Smart grid platforms need to be implemented and operated, smart technology needs to be implemented.
Stunning	<ul style="list-style-type: none"> Low energy retrofit design consultants. Administrator of the Knowledge Sharing Platform (Renovation Hub: renovation-hub.eu) developed within STUNNING


Number of new curricula (university courses)

KPI trend	Unit	2019 PMR value	2018 PMR value	FP7 baseline
 Steady	Curricula per project	1.9	2	1.2

H2020 projects reported a total of **67 newly created curricula** (35 inputs out of the 66). This makes an average of around 1.9 new curricula per project, which is very close to last year PMR and higher than the FP7 baseline of 1,2 curricula per project.


Impact on SMEs

Share of participation of SMEs

KPI trend	Unit	2019 PMR value	2018 PMR value	FP7 baseline
 Steady	Percentage of SMEs within the consortium	34%	35%	28%


The share of participation of SMEs in EeB cPPP projects **has progressed from 28% (FP7 baseline) to 34% in H2020**. There are eight H2020 projects with a share of SMEs higher than 50%. The highest share is reported by the **HEAT4COOL** project with its 9 SMEs within a group of 13 partners.

Age of companies

KPI trend	Unit	2019 PMR value	2018 PMR value	FP7 baseline
 Steady	Age of companies	19	19	21.4


The average age of the companies benefitting from the cPPP funding is **19 years** (inputs from 167 SMEs), the youngest being only 1 year old in **BIM-SPEED**, and the oldest being 105 years old in **EENSULATE** and **RenoZEB**. SMEs participating in FP7 were slightly older with an average of 21,4 years (inputs from 129 SMEs).

Current size of companies (number of employees)

KPI trend	Unit	2019 PMR value	2018 PMR value	FP7 baseline
 Increasing	Number of employees	33	32.1	28.5

The average staff headcount of participating SMEs in H2020 is **33 employees** (inputs from 174 SMEs), slightly higher than in FP7 with 28,5 employees (input from 123 SMEs).


Estimation of the increase in turnover in SMEs participating in your project

KPI trend	Unit	2019 PMR value	2018 PMR value	FP7 baseline
 Increasing	% Increased turnover	59.4	49.7	n.a.

H2020 projects reported an **actual average increase in turnover of 4 412 806€ and 59,4%** for their SMEs (38 inputs out of the 66), and an expected increase of **6 439 307€ and 81,9%** (36 inputs out of

the 66) by the end of their project. Most important growths are reported by **EENSULATE** (value of the increase) and **HIT2GAP** (percentage of the increase) projects, both in terms of actual and expected figures. **These figures are higher than in the previous PMR** (e.g. reported actual average increase of 49.7%). This increase might be explained by the strong innovative nature of the participating SMEs and their rapid growth, in particular in Innovation actions that are well suited to valorise SMEs assets.

Estimation of the increase in number of employees for SMEs participating in your project

KPI trend	Unit	2019 PMR value	2018 PMR value	FP7 baseline
 Increasing	Actual average increase in number of employees	10.3	6.6	n.a.

H2020 projects reported an actual average increase of **10,3 employees** for the SMEs (37 inputs) participating in their project, and an expected increase of **18,7** by the end of their project (37 inputs). **HIT2GAP** and **RenoZEB** reported the higher figures with respectively 35 (actual) and 96 (expected) increase in number of employees for their participating SMEs. These values are significantly higher than in the previous PMR (actual increase of 6.6 employees; expected increase of 15.2 employees by the end of the project). This significant increase might be explained in a similar way than the increase in turnover (see above KPI).

Type of involvement and staff growth by age range

Table 9 below shows the type of actions (RIA, IA or CSA) that SMEs are involved in and their average percentage of staff growth according to their age ranges.

Table 9 - Impact on SMEs: type of involvement and staff growth

SMEs – age range		0 to 3 years	4 to 10 years	11 years and more
Type of action	RIA	3	14	43
	IA	2	29	71
	CSA	0	2	3
Increase (%) in the number of employees	Average actual	158%	26%	12%
	Average expected by the end of the project	528%	51%	20%

Case studies

Below are a few examples of how EeB PPP projects are generating an impact for their participating SMEs are presented below:

Invela (Denmark) participation in the H2020 projects **More Connect** and **P2Endure** led to the creation of the Spin-off company **Robot At Work** (www.robotatwork.com). Robot At Work will hire 3-5 new staff members this year. As a result of **More Connect**, the company has developed a totally new robot platform consisting of aluminium based linear framework for hard on-site environment ready to perform various different kinds of tasks in the building sector. Also, as a result of **P2Endure**, it has developed an intuitive easy-to-program software interface. The cutting-edge intuitive tablet-based software gives the opportunity to quickly setup the platform by programming the robot directly from drawings in Fusion 360, Autodesk, and REVIT without prior robotic education and training. Optimized to give the end-user minimal time spent programming and maximum up-time on-site. Robot At Work is at the moment commercializing 3 different solutions towards the building sector based on the new robot platform. We have gained private investment securing future growth and the concept is patent-pending. *Author: Finn Christensen*


R2M Solution (Italy): Through its participation in **BUILT2SPEC**, R2M has hired 3 new staff members and launched Milan-area services related to digital construction, which include drone inspections, Matterport surveys and their linkage to construction management platforms often in support of sustainability certifications. The project software platform from VRM Technology has been brought into Italy and is being customized to and considered for use as the underlying management platform for one of Italy's certification programs by which project documentation must be aggregated, managed and stored. If selected, the project would see replication across an initial 200 large-scale commercial projects already under development. **BUILT2SPEC** has been briefed several times within Green Building Council Italia events and R2M provides company training and seminars to company decision makers on technologies to digitalize construction processes. Indeed, the HoloLens results from **BUILT2SPEC** were a highlight of R2M's activities at the 2019 MIPIM exposition in Cannes where various decision makers from the real estate sector had the opportunity to inspect a virtual model of the R2M booth for inconsistencies in its design versus actual state. The knowledge and activities conducted in **BUILT2SPEC** are timely for R2M as Italy is now in the implementation phase of the "decreto BIM" which mandates the use of BIM for large public projects today and in the future – all public projects. As a next step building upon the work done in **BUILT2SPEC**, R2M is involved in research related to BIM analytics (BIM Bots) that can be used to mine various information within BIM models such as how a structure maps to various certification protocols. This work is now in progress in a new research project called **BIM4REN** (BIM based tools for fast & efficient renovation). *Author: Thomas Messervey*

Thanks to its participation to the **ZEROPLUS** Project, **SolarInvent (Italy)** developed a new configuration of its own "freescoc" HVAC technology for integration into the building façade. This brought new interest and commercial opportunities and the possibility to participate other EU research calls. The new configuration will be also demonstrated this year in the **MEREZZATE+** project in collaboration with Polytechnic of Milan. In addition, SolarInvent could expand its contacts and partnership with relevant industrial partners in the building sector which have demonstrated their interest to adopt and commercialize the product at the end of the industrialization phase. These activities have generated a turnover of 30k€ in 2018 and will generate an additional turnover of 60k€ within the year 2019. *Author: Pietro Finocchiaro*

Anerdgy (Switzerland) products aim to combine function, design and energy in the area of outdoor building technology. The **ZEROPLUS** project enabled us to participate on real case building construction projects and we gained experience in different countries with their local regulation rules, workflows, insurance policies, ... This experience & reference project will enable us to roll out our MRE product across Europe and create additional business in the range of ~50-100Mio€ & ~20 jobs in the future. *Author: Sven Koehler*


Significant innovations

New systems and technologies

KPI trend	Unit	2019 PMR value	2018 PMR value	FP7 baseline
 Increasing	Number of new systems and technologies	4.26	3.8	3

H2020 projects reported a total of **260 new systems and technologies developed** (excluding incremental improvements) (61 inputs out of the 66). This represents an average of **4,26 new systems and technologies per project**, which is an increase compared to the previous PMR (average of 3,8). This is also higher than the FP7 baseline (average of 3). **RE4, TOPAS** and **InnoWEE** reported the highest figures with 10 new systems and technologies each.

70% of the developed new systems and technologies (FP7 + H2020) both apply to new buildings and for renovation of existing buildings.


KPI trend	Unit	2019 PMR value	2018 PMR value	FP7 baseline
 Increasing	Average current TRL of the new systems and technologies	5.7	5.3	6.5

The **average current TRL of the H2020 new systems and technologies is 5.7**, while the average expected TRL at the end of the projects is **6.9**. This is an increase compared to the previous PMR (current average TRL of 5.3 and expected of 6.9). The FP7 baseline shows an average current TRL of 6.5, and 6.6 expected by the end of the projects.

In terms of current H2020 TRLs, the highest cluster is “**Construction Processes, end-of life, cross-cutting information**” (value 6.1); while the lowest clusters are “**Advanced materials and nanotechnology**” and “**ICT**” (value 5.4 for both).

In terms of expected H2020 TRLs by the end of the projects, the highest clusters are “**Design**” and “**BIM, Data, and Interoperability**” (value 7.2 for both); while the lowest cluster is “**ICT**” (value 6.4). A further detailed analysis of the TRLs for each technology cluster is presented in the appendix.


Non-technological innovations

KPI trend	Unit	2019 PMR value	2018 PMR value	FP7 baseline
 Increasing	Number of non-technological innovations	1.7	1.5	0.9

In addition to the above new systems and technologies, 61 H2020 projects also reported a total of **104** non-technological innovations (e.g. innovative methodology, innovative business model, etc.). This represents an average of **1,7 non-technological innovation per project**, which is higher than the average reported in the previous PMR. This is also higher than the FP7 baseline of 0,9 non-technological innovation per project.


Specific Key Performance Indicators for the EeB cPPP

Contribution to the reduction of energy use

KPI trend	Unit	2019 PMR value	2018 PMR value	FP7 baseline
 Increasing	% of achieved energy use reduction	25.9	18.7	31.6

In terms of reduction of energy use, H2020 projects reported a **25,9% reduction achieved** in their project results (34 inputs out of 66), and a **38,4% reduction expected** by the end of the project (47 inputs out of 66). This is a **significant increase** compared to the previous PMR where a 18,7% reduction achieved had been reported. Among the best performing H2020 projects in relation to this KPI, **MORE-CONNECT** declared an 80% energy reduction achieved, followed by **4RinEU**, **MODER**, **Pro-GET-OnE**, and **Rennovates** with a 60% reduction achieved in their project results.


Contribution to the reduction of CO2 emissions

KPI trend	Unit	2019 PMR value	2018 PMR value	FP7 baseline
 Increasing	% of achieved CO2 emissions reduction	23.6	13.1	29.7

In terms of reduction of CO2 emissions, H2020 projects reported a **23,6% reduction achieved** in their project results (30 inputs out of 66) which is a significant increase compared to the previous PMR, and a **40% reduction expected** by the end of the project (42 inputs out of 66).

The best performing project in relation to this KPI is **MORE-CONNECT** which declared an 80% reduction achieved in its project results, followed by **OptEEemAL** (70%), **4RinEU** (60%) and **Pro-GET-OnE** (60%).


Contribution to the reduction of waste

KPI trend	Unit	2019 PMR value	2018 PMR value	FP7 baseline
 Increasing	% of achieved reduction of waste	12.1	6.9	7.9

In terms of reduction of waste, it is worth mentioning that only 32% of the H2020 projects (21 inputs out of the 66) provided a reply to this question. Those projects reported a **12,1% reduction achieved** in their project results, and a **23,8% reduction expected** by the end of the project. This is an increase compared to the previous PMR where respectively 6,9% of reduction achieved, and 20,6% of reduction expected had been reported.


The best performing project in relation to this KPI is **RE4** which declared a 65% reduction of waste achieved in its project results, followed by **INSITER** with 60%.

Contribution to the reduction in the use of material resources

KPI trend	Unit	2019 PMR value	2018 PMR value	FP7 baseline
 Steady	% of achieved reduction in the use of material resources	6.8	6.9	8.6

In terms of reduction in the use of material resources, H2020 projects reported a **6,8% reduction achieved** in their project results (22 inputs out of 66), and a **18,7% reduction expected** by the end of the project (27 inputs out of 66). The best performing project in relation to this KPI is **RE4** which declared a 65% reduction in the use of material resources achieved in its project results.


Demonstration sites

KPI trend	Unit	2019 PMR value	2018 PMR value	FP7 baseline
 Steady	Average number of demo sites per project	3.8	3.6	2.8

There is an **average of 3,8 demo sites** per H2020 project, which makes a total of **230 demonstration sites**. **BIM-SPEED** reported the highest figure with 14 demonstration sites.


Patents

Patent applications

KPI trend	Unit	2019 PMR value	2018 PMR value	FP7 baseline
 Increasing	Average expected number of patent applications	2.2	1.9	1

H2020 projects reported **24 patent applications submitted** (44 inputs out of 66), and **85 expected** by the end of the projects (38 inputs out of the 66). The average expected number of patent applications in H2020 is therefore of **2.2** per project, which is slightly higher than in the previous PMR (average of 1,9). The best performing project in relation to this KPI is **ZERO-Plus** which declared already 10 patent applications (11 expected by the end of the project).

Patents awarded


KPI trend	Unit	2019 PMR value	2018 PMR value	FP7 baseline
 Increasing	Average expected number of patents awarded	1.6	1.2	0.5

In terms of patents awarded, H2020 projects reported **12 patents already awarded** (39 inputs out of 66), and **57 expected** by the end of the projects (35 inputs out of the 66). The average expected number of patents awarded in H2020 is therefore of **1,6** per project, which is higher than the baseline achieved in FP7 (average of 0,5 per project). This is also higher than in the previous PMR (average of 1.2). **Zero-PLUS declared already 10 patents (&/or registered designs) awarded, while BUILT2SPEC and P2Endure** both declared already 1 patent awarded. **Zero-PLUS** is expecting 11 patents awarded by the end of its project, **EnergyMatching 7**, and **SCORES 6**.

One example from **Zero-PLUS** is its MRE-light product (Application number: 005812203; Date of application: 2018-10-29; Title: Solarmodulträger; Beneficiary: **Anerdgy AG**) which is about the potential combination of a PV panel & drainage system as one assembly unit. This is a key element to be able to install PV panels on a roof edge towards the façade. Without this no PV panel can be installed on a roof edge in pitched position. *Author: Sven Koehler, Anerdgy*

Standardisation activities and contributions to new standards


Number of activities leading to standardisation

KPI trend	Unit	2019 PMR value	2018 PMR value	FP7 baseline
 Increasing	Average number of activities leading to standardisation	2.3	1.8	0.6

There is an average number of **2,3** activities leading to standardisation in H2020 projects (42 inputs out of 66). This is significantly higher than the FP7 baseline (average of 0,6 activity per project). This is also higher than in the previous PMR (average of 1,8 activities).


The best performing project in relation to this KPI is **BRESAER** which declared 39 activities leading to standardisation as part of their project.

Number of working items in European Standardisation Bodies

KPI trend	Unit	2019 PMR value	2018 PMR value	FP7 baseline
 Increasing	Number of working items	8	5	6

8 working items in European Standardisation Bodies have been declared by the H2020 projects (37 inputs out of 66), 2 of them belong to the **GELCLAD** project.


Number of pre-normative research files - prEN - under consultation in European Standardisation Bodies – ESBs

KPI trend	Unit	2019 PMR value	2018 PMR value	FP7 baseline
 Steady	Number of prEN under consultation in ESBs	2	2	3

2 prEN under consultation in ESBs have been declared by the **HOMESKIN** and **INNOVIP** H2020 projects (33 inputs out of 66). A total of 3 prEN were declared by FP7 projects.


Trainings for a higher quality workforce

Number of dissemination events, seminars, conferences organised in your project

KPI trend	Unit	2019 PMR value	2018 PMR value	FP7 baseline
 Increasing	Number of dissemination events, seminars, conferences	739	512	2068


739 dissemination events (seminars, conferences, etc.) have been reported by the H2020 projects (57 inputs out of 66). The best performing project in relation to this KPI is **ACCEPT** which reported 100 events. The FP7 baseline is 2068 events (inputs from 98 FP7 projects).

Number of participants in dissemination events organised in your project

KPI trend	Unit	2019 PMR value	2018 PMR value	FP7 baseline
 Increasing	Number of participants in dissemination events	46 038	21 181	n.a.

The above 739 dissemination events were attended by **46 038 participants** (58 inputs out of 66). The best performing project in relation to this KPI is **EXCEED** which declared that it has gathered 9 125 participants through its events.


Promotion of Entrepreneurship - Number of Spin-offs and Start-ups as result of your project

KPI trend	Unit	2019 PMR value	2018 PMR value	FP7 baseline
 Steady	Number of spin-offs and start-ups	6	6	16

6 spin-offs and Start-ups (see appendix) are resulting from the H2020 projects (61 inputs out of 66). This is unchanged compared to the previous PMR. One company (**Robot At Work**) is associated to 2

different projects. A total of 31 Spin-offs and Start-ups are expected to be launched by the end of the H2020 projects (55 inputs out of the 66). **EENSULATE** declared that it intends to launch 5 Spin-offs. The FP7 benchmark provides a reference to 16 Spin-offs created (95 inputs from FP7 projects).

Scientific (peer-reviewed) publications

KPI trend	Unit	2019 PMR value	2018 PMR value	FP7 baseline
 Increasing	Number of scientific publications per project	5.8	4.6	11.7

H2020 projects reported an average of **5,8 submitted scientific publications per project** (56 inputs out of 66), representing a total of 325 submitted publications. This is lower than the FP7 baseline of 11,7 submitted publications per project. However, this is higher than the average declared in the previous PMR (4,6 per project). The best performing project in relation to this KPI is **OptEEmAL** which declared a total of 30 scientific peer-reviewed publications.

4.3. Evolution over the years

As outlined in the earlier section, 2019 PMR figures are demonstrating an overall increase compared to the previous PMR on almost all monitored KPIs, both on those common to all cPPPs and on those specific to the EeB cPPP.

This increase is sometimes significant when it comes to the average increase in number of employees for participating SMEs, as well as on the achieved actual reduction of energy use, CO2, and waste.

When compared to the FP7 baseline, all indicators are showing a global positive trend, sometimes very significant (for instance on the number of activities leading to standardisation). Only the indicator which relates to the number of scientific (peer-reviewed) publications is currently lower than the FP7 baseline (although significantly growing compared to last year’ PMR). This can be explained by the greater emphasis that H2020 EeB projects dedicate to increase their commercial exploitation impacts rather than on the dissemination of their scientific excellence, and the higher targeted TRLs.

Qualitative view on current strengths of the cPPP

- The overall progress of the EeB cPPP is currently in line with the contractual commitments.
- Current progress on monitored KPIs is promising given the early stage of implementation of a significant part of the H2020 projects.
- There are effective value chains which intimately interconnect large companies and SMEs, with the latter providing a substantial contribution in terms of jobs created and increased turnover with impact on local economies.
- Public entities are participating in the EeB cPPP with a significant role in the demonstration and validation of project results.
- There are well established clustering activities that will increase the visibility of the EeB cPPP results, and that will enable benchmarking across projects and stakeholder engagement whilst optimising the use of the EC funding
- Most projects are now familiar with the fact that they have to contribute every year to the annual progress monitoring effort (high response rate), thereby leading to more accurate and meaningful overall results.

Qualitative view on current weaknesses of the cPPP

- Original estimates in terms of impact and additional investments provided by EeB cPPP proposals should be refined and updated before they get contractual, perhaps as part of a short negotiation stage before signing the Grant Agreement.
- One potential activity that could be promoted to increase the impact of the cPPPs is the establishment of a stable dialogue with technology users, typically building owners and promoters of rehabilitation and construction (private and public). The expected outcome would be to increase technology and new processes adoption and increase the replication of projects beyond the cPPP. The interaction with potential clients and investors would support the involvement and investment of industrial companies in technology development.
- Explicit link between H2020 and European Innovation funds (ERDF, ESIF, EIB, etc.) should be made, as well as with structural funds so as to ease access to financial support for industrial demonstrations. This phase of solution scale-up definitely presents a high-risk profile while requiring higher investments than lower TRL stages. It corresponds to the so-called “Valley of Death”, responsible for many market failure or un-ability to industrialize. Ensuring a smooth transition from H2020-like to ERDF or Innovation Fund-like support by mutualizing assessment criteria or easing the blending of support mechanism would definitely promote innovation. Support mechanisms are today independently managed, having their own selection criteria and time line, as well as requirements, which makes it very hard, especially for innovative companies to benefit from these.
- cPPPs shouldn't be considered in a stand-alone mode, which can favor a silo approach. Favoring common work between cPPPs is a potential way of progress. As an example, call for proposals should jointly be reviewed across different cPPPs, which would encourage cross-cutting approaches and, finally, the delivery of more innovative products, anticipating final customers' needs. The European Commission has a key-role to play in stimulating this cross cPPPs collaborations.

5. Outlook and lessons learnt

The built environment affects the quality of life and work of all EU-citizens. The construction sector is today on a critical path to help decarbonise the European economy by 2050. In the specific case of buildings, one must keep in mind key figures: people spend around 80-90% of their time in buildings, buildings consume about 40% of global energy, 25% of global water, 40% of global resources, and they emit approximately one third of greenhouse gases emissions (36% of greenhouse gases in Europe). Yet, buildings also offer the greatest potential for achieving significant change: energy consumption in buildings can be reduced by 30 to 80% using proven and commercially available technologies.

The Public-Private Partnership (PPP) on Energy-efficient Buildings launched in December 2008 under the European Economic Recovery Plan managed to attract a high industrial participation and helped innovate the building sector. Under Horizon 2020, the contractual PPP (cPPP) on Energy-efficient Buildings aims to develop affordable breakthrough technologies and solutions at building and district scale, facilitating the road towards future smart cities. It also largely supports the increase of large-scale pilots and demonstrators, which is crucial in a context of further exploitation and spread of the Research & Innovation outcomes. The European Commission (EC) supported 110 projects through the EeB cPPP initiative under FP7. Within Horizon 2020, the EC is now supporting 66 new projects selected under the 2014, 2015, 2016, 2017 and 2018 EeB calls. 8 new projects were selected on the 2018 call.

This Progress Monitoring Report provided a critical analysis of the EeB cPPP progress in the implementation of its multiannual roadmap, a summary of progress achieved on KPIs common to all cPPPs and KPIs specific to the EeB cPPP, and an overview of the general progress of the PPP since its inception. The response rate to the annual progress monitoring survey was high, reaching 91% for the H2020 projects. **2019 progress monitoring results are demonstrating an overall increase compared to the 2018 PMR on almost all monitored KPIs, both on those common to all cPPPs and on those specific to the EeB cPPP.**

EeB cPPP projects are mobilising private investment with an **average leverage factor of 6,86 for large industrial organisations and of 2,28 for RTOs**, they enable the creation of new job profiles for the construction industry in relation to innovative technologies, and they generate a **substantial impact on SMEs (job creation and increased turnover)** that benefit from the EeB cPPP funding. The whole set of H2020 projects reported a total of 260 developed new systems and technologies, as well as 104 non-technological innovations. A 38,4% reduction of energy use and a 40% reduction of CO₂ is expected by the end of the projects. An average of 5.8 submitted scientific publications per project was reported, and 6 spin-offs have already been launched to exploit the innovative outcomes of the projects. H2020 projects reported already 24 patent applications submitted, and 85 expected by the end of the projects.

The report highlighted that the progress of the work is in line with the contractual KPIs targets.

The private part of the cPPP represented by ECTP is continuously dedicating its resources to raise awareness about the EeB cPPP, its objectives and its projects portfolio. It also facilitates clustering between the projects in order to enhance their impact, mutualise resources and favour synergies. Every year ECTP is publishing its annual EeB PPP Project Review, a publication of its E2B committee which highlights current results and achieved or potential impact of the EeB cPPP Projects portfolio. The next edition is to be published in June 2019 and will be made available on the ECTP website.

Appendix

- Offline version of the 2019 progress monitoring questionnaire
- Comprehensive list of events attended by ECTP-E2B (since the previous PMR)
- Updated partnership board members list
- Detailed common cPPP KPIs and specific EeB cPPP KPIs
- Spin-offs and Start-ups resulting from H2020 EeB projects
- Analysis of the TRLs for each technology cluster

EeB cPPP Progress Monitoring – 2019 Questionnaire

Foreword

Dear Project Coordinator,

The European Commission (EC) supported 110 projects through the EeB PPP initiative under FP7. Within Horizon 2020, the EC is now supporting 66 new projects selected under the 2014, 2015, 2016, 2017 and 2018 EeB calls. Your project is part of this portfolio.

One of the commitments in the contractual agreement between the EC and ECTP consists in **monitoring the impacts and exploitable outcomes** generated by the projects supported under this framework. In this respect, **both the European Commission and ECTP ask for and support your commitment to the provision of quality information for this monitoring.**

In addition, please note that the content provided through this questionnaire will **directly support dissemination and communication activities of your project.** Indeed, this content is being exploited to publish the 2019 edition of the annual **EeB PPP Project Review [booklet](#)** but also to feed official ECTP media channels such as the [EeB Committee website](#), the [EeB Committee official YouTube channel](#), etc. Thus, your cooperation is essential and very much appreciated.

Jurgen TIEDJE

Head of Unit " Advanced Manufacturing Systems and Biotechnologies"



Co-Chairman of the EeB PPP Partnership Board

Antoine ASLANIDES

ECTP Steering Committee Member
E2B Committee Executive Board Member



Co-Chairman of the EeB PPP Partnership Board

Guidelines

- This questionnaire has been pre-filled for your project with data previously collected in the context of the EeB PPP Project Review 2018 preparation and/or from the 2018 monitoring questionnaire. **Please check those pre-filled data and amend or update them when necessary.**
- The monitoring questionnaire is divided into 4 parts:
 - 1° Project Key Information
 - 2° the Key Performance Indicators (KPI) common to all cPPP
 - 3° the specific KPIs for the EeB PPP
 - 4° miscellaneous
- If you feel a question is not relevant for your project, please **leave it blank** (do not put '0').
- We ensure you all actions related to guaranteeing the confidentiality of all personal or individual data inserted in the questionnaire will be put in place.
- For any question or concern, please contact:
 - Alexis DAVID**
 - ECTP Project & Policy Officer
 - alexis.david@ectp.org
 - tel: +32 2 227 27 35

1- Project Key Information

1. Project Identification

Project acronym *			
Project name * Maximum number of characters, spaces included : 150			
Start date (e.g. May 2013) *		Status *	<input type="radio"/> Ongoing
Duration (months) *			<input type="radio"/> Completed
Total budget (€)*			
Project website *			

2. Coordinator details

Name	
Organisation	
Country	
E-Mail:	
Phone number:	

3. If you wish, details on another contact point, preferably in charge of exploitation and/or dissemination activities

Name	
Organisation	
Country	
Role in the project	
E-Mail:	
Phone number:	

4. Select the clusters your project should belong to

First Technology Cluster * (1 choice only, mandatory)	Second Technology Cluster (1 choice only, optional)
<input type="radio"/> Design	<input type="radio"/> Design
<input type="radio"/> Technology Building Blocks (envelope, energy equipment, structure)	<input type="radio"/> Technology Building Blocks (envelope, energy equipment, structure)
<input type="radio"/> Advanced Materials & nanotechnology	<input type="radio"/> Advanced Materials & nanotechnology
<input type="radio"/> Construction process, end of life, cross-cutting information	<input type="radio"/> Construction process, end of life, cross-cutting information
<input type="radio"/> Energy performance monitoring & management	<input type="radio"/> Energy performance monitoring & management
<input type="radio"/> ICT	<input type="radio"/> ICT
<input type="radio"/> BIM/Data/Interoperability	<input type="radio"/> BIM/Data/Interoperability

5. Project Description

<p>Description * Maximum number of characters, spaces included: 420</p> <ul style="list-style-type: none"> If the description is pre-filled, please update it to reflect the latest progress of your project. Focus your description on innovative aspects of your project, expected or achieved impacts and exploitable results. 	
--	--

- | | |
|--|--|
| <ul style="list-style-type: none">• Do not copy generic project objectives from your proposal. | |
|--|--|

* This content will be published in the 2019 EeB PPP Project Review booklet (see [2018 edition](#) for examples)

2- Common cPPPs Key Performance Indicators

6. Mobilised private investment

This question is of a particular importance for evaluating the impact of the EeB cPPP.

You are required to contact your project partners in order to gather their individual inputs to the questions below. With regards to **B2**, we recommend advising your project partners to gather this input from the LEAR (or another relevant legal/financial representative) of their organization.

You are then invited to provide in the table below an aggregated estimate for your cPPP project based on these individual inputs.

	Actual value (€) (February 2019)	Expected value by the end of your project (€)
Direct leverage (A = A1 + A2)		
A1: Direct contributions from project partners as predetermined in your project (co-funding – value from your Grant Agreement)		
A2: Additional investment or resources spent by project partners for the execution of your cPPP project, beyond the direct contributions under A1 (these are typically due to shortfalls in fixed overheads for a project, infrastructure costs not covered by direct funding, consumables and maintenance costs, equipment costs, additional personnel costs, other costs)		
Please estimate share in A of : 1) Own funds (%) : 2) External private funding (%) : 3) EU public funding (%) : 4) Non-EU (other: national / regional) public funding (%) :		
Indirect leverage (B=B1+B2) (data to be provided by completed projects only)	Actual value – up to 4 years after your cPPP project was completed (€)	

B1: Additional investment or resources spent as a follow-up to the activities and results related to your cPPP project (e.g. to exploit or scale-up results) and that are not supporting directly its execution. This can include additional funding mobilised thanks to your cPPP project such as venture capital, other public funding, etc.	
B2: Additional investments or resources spent that support the objectives of the EeB cPPP and that have been triggered/encouraged by the existence of the cPPP, but that are not following up activities or results of your cPPP project as such (hence, not counted in A1, A2 and B1).	
<p>Please estimate share in B of:</p> <ol style="list-style-type: none"> 1) Own funds (%): 2) External private funding (%) : 3) EU public funding (%) : 4) Non-EU (other: national / regional) public funding (%) : 	

7. New skills and/or job profiles developed in the project

Number of new skills and/or job profiles developed in your project	
Number of new curricula (university courses)	
Have you been facing issue to staff your project with adequate job profiles & skilled resources? Please provide details.	

8. Participation of SMEs and impact

Total number of project partners in your project	
Number of SMEs participating in your project	

	SME age
SME 1	
SME 2	
SME 3	
SME 4	

	SME size (number of employees)
SME 1	
SME 2	
SME 3	
SME 4	

		Actual value of the increase (€) (February 2019)	Actual percentage of the increase (%) (February 2019)	Expected value of the increase by the end of your project (€)	Expected percentage of the increase by the end of your project (%)
Estimation of the increase in turnover in SMEs participating in your project	Total amount (€) / Average % for all SMEs				
SME 1	(Name)				
SME 2	(Name)				
SME 3	(Name)				
SME 4	(Name)				

		Actual value of the increase (February 2019)	Expected value of the increase by the end of your project
Estimation of the increase in number of employees for SMEs participating in your project	Total amount for all SMEs		
SME 1	(Name)		
SME 2	(Name)		
SME 3	(Name)		
SME 4	(Name)		

9. Significant innovations

This KPI concerns all developed foreground, tangible and intangible assets that have a marketable or at least an exploitable value, including products, processes, instruments, methods and technologies.

	Actual value (February 2019)	Expected value by the end of your project
Number of significant innovations developed in the project		

Please provide details about the significant innovations developed in the project	
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3- Specific Key Performance Indicators for the EeB c PPP

10. Contribution to the reduction of energy use and CO2 emissions

		Actual value (February 2019)	Expected value by the end of your project
Contribution of your project to the reduction of energy use	Average % achieved in your project results		
Contribution of your project to the reduction of CO2 emission	Average % achieved in your project results		

11. Contribution to the reduction of waste

		Actual value (February 2019)	Expected value by the end of your project
Contribution of your project to the reduction of waste	Average % achieved in your project results		

12. Contribution to the reduction in the use of material resources

		Actual value (February 2019)	Expected value by the end of your project
Contribution of your project to the reduction of material resources	Average % achieved in your project results		

13. New systems and technologies

Number of systems and technologies developed by your project (excluding incremental improvements)	
<i>This refers only to the new systems and technologies, developed within the cPPP projects which are clearly beyond the current state of the art and not only new at the level of the beneficiary, nor only at the level of the cPPP project itself. Purely incremental improvements are not to be taken into account.</i>	

	Short description of each new system and technology (description & progress beyond the state of the art & how the innovation contributes to EeB cPPP objectives)	Current TRL (February 2019)	TRL expected by the end of your project	Envisaged exploitation
		<i>See TRL definitions at the end of the document</i>		<i>Public exploitation means open source, open data, and/or results available for free on a public website.</i>
1				<input type="radio"/> Commercial <input type="radio"/> Public <input type="radio"/> Scientific / Academic <input type="radio"/> Still to be defined <input type="radio"/> No exploitation
2				<input type="radio"/> Commercial <input type="radio"/> Public <input type="radio"/> Scientific / Academic <input type="radio"/> Still to be defined <input type="radio"/> No exploitation
3				<input type="radio"/> Commercial <input type="radio"/> Public <input type="radio"/> Scientific / Academic <input type="radio"/> Still to be defined <input type="radio"/> No exploitation
4				<input type="radio"/> Commercial <input type="radio"/> Public <input type="radio"/> Scientific / Academic <input type="radio"/> Still to be defined <input type="radio"/> No exploitation
5				<input type="radio"/> Commercial <input type="radio"/> Public <input type="radio"/> Scientific / Academic <input type="radio"/> Still to be defined <input type="radio"/> No exploitation

14. Project results taken-up for further investments (into higher TRLs)

	Actual value (February 2019)	Expected value by the end of your project
Number of project results taken-up for higher TRLs using additional investments		

15. Non-technological innovations

Number of non-technological innovations developed by your project		
<p><i>This refers to non-technological innovations developed within the EeB cPPP projects which are clearly beyond the current state of the art. Examples of non-technological innovation include methodologies, business models, services, etc. (technological innovations must be listed in Q10 of this questionnaire).</i></p>		
Short description of each non-technological innovation	Progress beyond state of the art	Envisaged exploitation
		<p><i>Public exploitation means open source, open data, and/or results available for free on a public website</i></p>
		<input type="radio"/> Commercial <input type="radio"/> Public <input type="radio"/> Scientific / Academic <input type="radio"/> Still to be defined <input type="radio"/> No exploitation
		<input type="radio"/> Commercial <input type="radio"/> Public <input type="radio"/> Scientific / Academic <input type="radio"/> Still to be defined <input type="radio"/> No exploitation
		<input type="radio"/> Commercial <input type="radio"/> Public <input type="radio"/> Scientific / Academic <input type="radio"/> Still to be defined <input type="radio"/> No exploitation

16. Demonstration sites

Number of demo sites in your project	

17. Patents

	Actual value (February 2019)	Expected value by the end of your project
Number of patent applications		
Number of patents awarded		

18. Standardisation activities and contributions to new standards

	Actual value (February 2019)	Please provide a short description or reference
Number of activities leading to standardisation		
Number of working items in European Standardisation Bodies		
Number of pre-normative research files – prEN - under consultation in European Standardisation Bodies – ESBs		

19. Trainings for a higher quality workforce

	Actual value (February 2019)
Number of dissemination events, seminars, conferences organised in your project	
Number of participants in dissemination events organised in your project	

20. Promotion of Entrepreneurship

	Actual value (February 2019)	Expected value by the end of your project
Number of Spin-offs and Start-ups as result of your project		

	Name	Website
Spin-off 1		
Spin-off 2		
Spin-off 3		

21. Publications

	Actual value (February 2019)
Number of submitted scientific (peer-reviewed) publications	
Number of published scientific (peer-reviewed) publications	

22. Promotional videos

		Actual value (February 2019)
Number of promotional videos		
<i>Please reference only high quality promotional videos which are shorter than 5 minutes.</i>		
Video 1	http://	
Video 2	http://	
Video 3	http://	

23. Success story

At this stage, do you consider your project can be presented as a success story in terms of achieved impact ?	<input type="radio"/> Yes <input type="radio"/> No
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Thank you! Your questionnaire is now completed. You can come back to this questionnaire to fine-tune and/or amend your answers **until February 22d 2019**.

If you have any question or concern, please contact Anne-Claire Bruant at anne-claire.bruant@ectp.org or at +32 2 400 10 68.

On behalf of ECTP, we thank you for your time and valuable contribution. We kindly invite you to join ECTP – Energy Efficient Buildings Committee official LinkedIn group at <https://www.linkedin.com/groups/3744557>

Definition of Technology Readiness Levels (TRL)

HORIZON 2020 – WORK PROGRAMME 2014-2015 General Annexes

Extract from Part 19 - Commission Decision C(2014)4995

Where a topic description refers to a TRL, the following definitions apply:

- TRL 1 – basic principles observed
- TRL 2 – technology concept formulated
- TRL 3 – experimental proof of concept
- TRL 4 – technology validated in lab
- TRL 5 – technology validated in relevant environment (industrially relevant environment in the case of key enabling technologies)
- TRL 6 – technology demonstrated in relevant environment (industrially relevant environment in the case of key enabling technologies)
- TRL 7 – system prototype demonstration in operational environment
- TRL 8 – system complete and qualified
- TRL 9 – actual system proven in operational environment (competitive manufacturing in the case of key enabling technologies; or in space)

Comprehensive list of events attended by ECTP-E2B (since the previous PMR)

Name of the Event	Date	Place	Short description	Targeted stakeholders	ECTP contribution (who & what)	Number of attendees
PPP Photonics Annual Meeting 2019	27/03/2019	Brussels, Belgium	Focus on Horizon Europe and presentation of the new European photonics roadmap to the EC	Industry & Research stakeholders, EC and EP, national and regional public authority representatives	Alain Zarli, Presentation of EeB PPP	Around 300
SET Plan Temporary Working Group 3.2.	13/02/2019	Brussels, Belgium	PED Stakeholder meeting (side event at the JPI Urban Europe Policy Conference)	Member states and cities	Paul Cartuyvels co-chairing and contributing to IP	Around 30 (estimated)
Various meetings with DGs (DG Research & Innovation, DG ENERGY, DG GROW...) in preparation of Horizon Europe	2018	Brussels, Belgium	Presentation of ECTP & PPP vision and development on Horizon Europe	EC officers + ECTP	Alain Zarli + Members of the Presidium	4-6
EU Industry Days	5-6/02/2019	Brussels, Belgium	Demonstrate how EU industrial policy benefits European citizens and provide input for future policy making	Stakeholders from industry, trade unions, national and regional authorities, and civil society	Alain Zarli	Around 1800 over the 2 days
SET Plan Temporary Working Group 3.2.	29/01/2019	Brussels, Belgium	PED Programme Stakeholder online meeting	Member states and cities	Paul Cartuyvels co-chairing and contributing to IP	Around 30 (estimated)
Meeting on the PMR review & future of partnerships	26/11/2018	Brussels, Belgium	Assess the EeB PPP achievements & & prepare next PMRs	EC Members, Private sector of the cPPPs	Alain Zarli	Around 25
ECTP Conference	13-14/11/2018	Brussels, Belgium	See conference report	Stakeholders from the whole construction value-chain and EC Members	ECTP President, Committee Chairs and SecGen	170
INDTECH Conference	29-31/10/2018	Vienna, Austria	Joint workshop by SPIRE, EeB and FoF & ECTP/EeB participation to session 3.4 "Co-programming partnerships"	Stakeholders from the construction sector	Alain Zarli	Around 1100
SET Plan Temporary Working Group 3.2.	22/10/2018	Brussels, Belgium	KO meeting for Implementation Plan on Smart Cities	Member states and cities	Alain Zarli	Around 30 (estimated)
Meeting on the PMR review & future of partnerships	01/08/2018	Brussels, Belgium	Assess the cPPPs achievements & prepare next PMRs	EC, Private sector of the cPPPs	Alain Zarli	Around 20
Meeting on the PMR review & future of partnerships	10/07/2018	Brussels, Belgium	Assess the cPPPs achievements & prepare next PMRs	EC, Private sector of the cPPPs	Alain Zarli	Around 25

The Construction Industry journey to enable the EU energy, climate and sustainability objectives: committed to a European Low-Carbon Built Environment	27/06/2018	Brussels, Belgium	Organized at the EP by ECTP with support from MEPs Ramón Jáuregui and Eider Gardeazabal	Industry, research institutions, associations, federations, and all stakeholders involved in R&I in the BE	Emmanuel Forest, Antoine Aslanides	Around 100
Accelerating the clean energy transition: The strategic contribution of zero Buildings & neighbourhoods	27/06/2018	Brussels, Belgium	Organized at the EP by NTNU with support from MEP Massimiliano SALINI	Local/regional/national authorities, Building professionals & occupants	Alain Zarli	Around 25
EC event 'Industry, Partnerships - a new impetus' (new format for the cPPPs Infodays)	26/06/2018	Brussels, Belgium	Discuss the EC instruments supporting future RDI over the next 10 years	Industry, research institutions, and all stakeholders involved in RDI	Emmanuel Forest (Intervention for EeB PPP), Alain Zarli	Around 350
DG GROW - Construction2020 Ws	08/06/2018	Brussels, Belgium	Presentation of the ECTP & PPP vision for 2020-2030	Industry & Research stakeholders, EC and EP, national public authority representatives	Alain Zarli	Around 50
EU Sustainable Energy Week	5-7/06/2018	Brussels, Belgium	Opportunity to present ECTP and the EeB PPP	European energy stakeholders	Anne-Claire Bruant	Around 400
Smart-readiness indicators for Buildings	28/05/2018	Brussels, Belgium	3rd stakeholder meeting	Experts	Anne-Claire Bruant	Around 80
ConWEEB Workshop - Converting construction waste into EEB	24/05/2018	Brussels, Belgium	Present innovative solutions for CDW	Professionals / Experts from Construction / Building sector	Anne-Claire Bruant	Around 50
EU Green Week	21-25/05/2018	Brussels, Belgium	High-level conference and partner events	Government, business and industry, NGO, academia	Anne-Claire Bruant	100

Updated Partnership Board members list (as of 08th April 2019)

EeB cPPP Partnership Board Members proposed by ECTP E2B Committee (version 2019/04/08)

MEMBERS				
NAME	FIRST NAME	ORGANISATION	EMAIL ADDRESS	NATIONALITY
ADAN	Olaf	TNO BUILT ENVIRONMENT	olaf.adan@tno.nl	Dutch
ARTELT	Christian	HEIDELBERGCEMENT	christian.artelt@heidelbergcement.com	German
ASLANIDES (CO-CHAIRMAN)	Antoine	EDF - ELECTRICITÉ DE FRANCE	antoine.aslanides@edf.com	French
BIGNOZZI	Maria	CENTRO CERAMICO	maria.bignozzi@unibo.it	Italian
BONILLA	Javier	ACCIONA Construcción	franciscojavier.bonilla.diaz@acciona.com	Spanish
BOUDJABEUR	Samir	TATA STEEL UK	samir.boudjabeur@tatasteel.com	British
BRUMANA	Raffaella	POLITECNICO DI MILANO (POLIMI)	raffaella.brumana@polimi.it	Italian
CARTUYVELS	Paul	BOUYGUES SA / BOUYGUES CONSTRUCTION	pcartuyvels@bouygues.com	Belgian
GÖTTIG	Roland	FRAUNHOFER IBP	goettig@tum.de	German
JORDAN	Sabina	ZAG	sabina.jordan@zag.si	Slovenian
LEVY	Christophe	LAFARGEHOLCIM	christophe.levy@lafargeholcim.com	French
MIERES	Juan Manuel	SOLINTEL	jmieres@solintel.eu	Spanish
PEREZ	Juan	TECNALIA	juan.perez@tecnalia.com	Spanish
PINTO-SEPPÄ	Isabel	VTT	Isabel.Pinto-Seppa@vtt.fi	Finnish
SEGARRA	Miguel	DRAGADOS	mjsegarra@dragados.com	Spanish
TAIT	Laurens	ARUP	Laurens.Tait@arup.com	French
VYNCKE	Johan	ECCREDI	johan.vyncke@bbri.be	Belgian
ZACH	Juliusz	MOSTOSTAL WARSZAWA S.A	J.Zach@mostostal.waw.pl	Polish
ZANGANI	Donato	RINA CONSULTING	donato.zangani@rina.org	Italian
ZARLI	Alain	CSTB	alain.zarli@cstb.fr	French
SUBSTITUTE MEMBERS				
NAME	FIRST NAME	ORGANISATION	EMAIL ADDRESS	NATIONALITY
AGIRRE	Imanol	MONDRAGON CORPORATION	iagirre@lksgroup.com	Spanish
AHO	Ilari	UPONOR CORPORATION	Ilari.Aho@uponor.com	Finnish
BURGUEÑO MUÑOZ	Antonio	FCC CONSTRUCTION	ABurgueno@fcc.es	Spanish
CAROSIO	Stefano	UNIVERSITA DI PADOVA	stefano.carosio@unismart.it	Italian
KERRIGAN	Ruth	IES	ruth.kerrigan@iesve.com	Irish
MJÖRNELL	Kristina	RISE Research Institutes of Sweden	Kristina.Mjornell@ri.se	Swedish
REVEL	Gian Marco	UNIVERSITA POLITECNICA DELLE MARCHE	gm.revel@staff.univpm.it	Italian
SADORGE	Jean-Luc	POLE FIBRES-ENERGIVIE	jean-luc.sadorge@fibres-energievie.eu	French
SCHREUDER	Niels	AGC GLASS EUROPE	Niels.Schreuder@eu.agc.com	Dutch
WURTZ	Etienne	CEA	Etienne.Wurtz@cea.fr	French

Detailed common cPPP KPIs and specific EeB cPPP KPIs

Part 1 - Common Priority Key Performance Indicators

	Key Performance Indicator (KPI)	Value in March 2019	Baseline at the start of H2020 (latest available)	Target (for the cPPP) at the end of H2020	Comments
1	Mobilised Private Investments	<p>Leverage factor:</p> <ul style="list-style-type: none"> Large Industrial Org.: 6.86 RTOs: 2.28 SMEs: 0.6 <p>(Input by association - based on inputs from 15 ECTP member organizations – 5 RTOs, 4 Large Ind., 6 SMEs, <i>involved in 39 projects</i>)</p>	n/a	From the CA: Leverage Factor: 4	
2	<p>New skills and/or job profiles</p> <ul style="list-style-type: none"> Number of new skills and/or job profiles created (or forecasted within a reasonable timeframe in the future) in your project 	<p>1091 (cumulative)</p> <p>23,2 per project</p> <p>(Input by Association – Based on inputs from 47 projects)</p>	<p><i>Reference to FP7 results</i></p> <p><i>(Input by Association – Based on inputs from 80 projects)</i></p> <p><i>8,1 per project</i></p>	From the CA: 10	
	<ul style="list-style-type: none"> Number of new curricula (university courses) 	<p>67 (cumulative)</p> <p>1,9 per project</p>	<p><i>Reference to FP7 results</i></p> <p><i>(Input by Association – Based on inputs from 73 projects)</i></p>		

		(Input by Association – Based on inputs from 35 projects)	<i>1,2 per project</i>		
3	Impact of the EeB cPPP on SMEs	4,6 per project (Input by Association – Based on inputs from 61 projects)	<i>Reference to FP7 results</i> <i>(Input by Association – Based on inputs from 104 projects)</i> <i>3,8 per project</i>	From the CA	
	<ul style="list-style-type: none"> • Total number of SMEs participating in your project 				
	<ul style="list-style-type: none"> • Share of participation of SMEs in EeB cPPP projects 	34% (Input by Association – Based on inputs from 61 projects)	<i>Reference to FP7 results</i> <i>(Input by Association – Based on inputs from 99 projects)</i> <i>28%</i>		
	<ul style="list-style-type: none"> • Age of company 	19,7 (Input by Association – Based on inputs from 167 participating SMEs)	<i>Reference to FP7 results</i> <i>(Input by Association – Based on inputs from 129 participating SMEs)</i> <i>21,4</i>		

<ul style="list-style-type: none"> Current size of company (number of employees) 	<p>33</p> <p>(Input by Association – Based on inputs from 174 participating SMEs)</p>	<p><i>Reference to FP7 results</i></p> <p><i>(Input by Association – Based on inputs from 123 participating SMEs)</i></p> <p>28,5</p>		
<ul style="list-style-type: none"> Estimation of the increase in turnover in SMEs participating in your project 	<p>Actual increase</p> <p>4 412 806 € per project</p> <p>59,4%</p> <p>(Input by Association – Based on inputs from 38 projects)</p> <p>Expected increase by the end of the project</p> <p>6 439 307€ per project</p> <p>81,9%</p> <p>(Input by Association – Based on inputs from 36 projects)</p>	<p><i>Reference to FP7 results</i></p> <p><i>(Input by Association – Based on inputs from 36 projects)</i></p> <p>2 286 634 €</p> <p><i>(Input by Association – Based on inputs from 56 projects)</i></p> <p>-96%</p>		
<ul style="list-style-type: none"> Estimation of the increase in number of employees for 	<p>Actual increase</p> <p>12,9</p>	<p><i>Reference to FP7 results</i></p>		

	SMEs participating in your project	(Input by Association – Based on inputs from 37 projects) Expected increase by the end of the project 21,2 (Input by Association – Based on inputs from 38 projects)	<i>(Input by Association – Based on inputs from 53 projects)</i> 9,5		
4	Significant Innovations <ul style="list-style-type: none"> Number of systems and technologies developed by your project (excluding incremental improvements) 	260 (cumulative) 4,3 per project (Input by Association – Based on inputs from 61 projects)	<i>Reference to FP7 results</i> <i>(Input by Association – Based on inputs from 102 projects)</i> <i>3 per project</i>	From the CA : 40	
	<ul style="list-style-type: none"> Number of non-technological innovations developed by your project 	104 (cumulative) 1,7 per project (Input by Association – Based on inputs from 61 projects)	<i>Reference to FP7 results</i> <i>(Input by Association – Based on inputs from 98 projects)</i> <i>0,9 per project</i>		

Part 2 - Specific Key Performance Indicators for the cPPP

	KPI domain	Key Performance Indicator (KPI)	Value in March 2019	Baseline at the start of H2020 (latest available)	Target (for the cPPP) at the end of H2020	Comments
1	Contribution to the reduction of energy use and CO ₂ emissions	Contribution of the PPP projects to the reduction of energy use in the area of the PPP	Actual value 25,9% (Input by Association – Based on inputs from 34 projects) Expected value by the end of the project 38,4% (Input by Association – Based on inputs from 47 projects)	<i>Reference to FP7 results</i> <i>(Input by Association – Based on inputs from 78 projects)</i> 32,7%	From the CA : 50%	
		Contribution of the PPP projects to the reduction of CO ₂ emission in the area of the PPP	Actual value 23,6% (Input by Association – Based on inputs from 30 projects)	<i>Reference to FP7 results</i> <i>(Input by Association – Based on inputs from 69 projects)</i>		

			Expected value by the end of the project 40% (Input by Association – Based on inputs from 42 projects)	31,2%	80%	
2	Contribution to the reduction of waste	Contribution of the PPP projects to the reduction of waste in the area of the PPP	Actual value 12,1% (Input by Association – Based on inputs from 21 projects) Expected value by the end of the project 23,8% (Input by Association – Based on inputs from 23 projects)	<i>Reference to FP7 results</i> <i>(Input by Association – Based on inputs from 42 projects)</i> 7,7%	From the CA	
3	Contribution to the reduction in the use of material resources	Contribution of the PPP projects to the reduction of material resources in the area of the PPP	Actual value 6,8%	<i>Reference to FP7 results</i> <i>(Input by Association – Based</i>	From the CA	

			<p>(Input by Association – Based on inputs from 22 projects)</p> <p>Expected value by the end of the project</p> <p>18,7%</p> <p>(Input by Association – Based on inputs from 27 projects)</p>	<p><i>on inputs from 38 projects)</i></p> <p><i>8,6%</i></p>		
4	Demonstration sites	Number of demo sites in the projects	<p>230 (cumulative)</p> <p>3,8 per project</p> <p>(Input by Association – Based on inputs from 60 projects)</p>	<p><i>Reference to FP7 results</i></p> <p><i>(Input by Association – Based on inputs from 91 projects)</i></p> <p><i>2,9 per project</i></p>	<p>100 demo sites</p> <p>10.000 dwellings</p>	
5	Trainings for a higher quality workforce	Number of dissemination events, seminars, conferences organised in your project	<p>739 (cumulative)</p> <p>13 per project</p> <p>(Input by Association – Based on inputs from 57 projects)</p>	<p><i>Reference to FP7 results</i></p> <p><i>(Input by Association – Based on inputs from 98 projects)</i></p>		

7	Publications	Number of submitted scientific (peer-reviewed) publications	224 (cumulative) 4,6 per project (Input by Association – Based on inputs from 49 projects)	<i>Reference to FP7 results</i> <i>(Input by Association – Based on inputs from 85 projects)</i> <i>11 per project</i>		
		Number of published scientific (peer-reviewed) publications	325 (cumulative) 5,8 per project (Input by Association – Based on inputs from 56 projects)	<i>Reference to FP7 results</i> <i>(Input by Association – Based on inputs from 85 projects)</i> <i>11,7 per project</i>		

Part 3 - Contribution to Programme-Level KPI's

	Key Performance Indicator	Definition/Responding to question	Type of data required	Value in March 2019	Baseline at the start of H2020 (latest available)	Target (for the cPPP) at the end of H2020	Comments
1	Patents		Number of patent applications.	<p>Actual value:</p> <p>24 (cumulative)</p> <p>0,5 per project</p> <p>(Input by Association – Based on inputs from 44 projects)</p> <p>Expected value by the end of the project:</p> <p>85 (cumulative)</p> <p>2,2 per project</p> <p>(Input by Association – Based on inputs from 38 projects)</p>	<p><i>Reference to FP7 results</i></p> <p><i>(Input by Association – Based on inputs from 100 projects)</i></p> <p><i>1 per project</i></p>	H2020: 3 patent applications per €10 million funding	

			Number of patents awarded	<p>Actual value:</p> <p>12 (cumulative)</p> <p>0,3 per project</p> <p>(Input by Association – Based on inputs from 39 projects)</p> <p>Expected value by the end of the project:</p> <p>57 (cumulative)</p> <p>1,6 per project</p> <p>(Input by Association – Based on inputs from 35 projects)</p>	<p><i>Reference to FP7 results</i></p> <p><i>(Input by Association – Based on inputs from 89 projects)</i></p> <p><i>0,6 per project</i></p>		
2	Standardisation activities (project level)		Number of activities leading to standardisation	<p>96 (cumulative)</p> <p>2,3 per project</p> <p>(Input by Association –</p>	<p><i>Reference to FP7 results</i></p> <p><i>(Input by Association – Based on inputs from 73 projects)</i></p>	No target	

				Based on inputs from 42 projects)	<i>0,6 per project</i>		
	Contributions to new standards (PPP level)		Number of working items in European Standardisation Bodies.	8 (cumulative) 0,2 per project (Input by Association – Based on inputs from 37 projects)	<i>Reference to FP7 results</i> <i>(Input by Association – Based on inputs from 64 projects)</i> <i>0,1 per project</i>		
			Number of pre-normative research files – prEN - under consultation in ESBs	2 (cumulative) 0,1 per project (Input by Association – Based on inputs from 32 projects)	<i>Reference to FP7 results</i> <i>(Input by Association – Based on inputs from 64 projects)</i> <i>0,1 per project</i>		
3	Operational performance	Time-to-grant		Data from the EC			

Spin-offs and Start-ups resulting from H2020 EeB projects

H2020 Project	Number of Spin-offs and Start-ups as a result of the project	Spin-off name	Activity	Exploited result from the EeB project
MORE-CONNECT	2	Recreate ¹³	AR/VR technology	n/a
P2Endure	1	Robot at work ¹⁴	Robotic technology for 3D printing of façade layers	n/a Development of 3D printing robotics and its Guided User Interface (GUI) demonstrated on Korsløgken demo case in Denmark
EENSULATE	1	Solace ¹⁵ – Housing Affordable and Accessible for all	Use of the system for the insulation of buildings walls	High-efficiency insulation system
Pro-GET-OnE	1	n/a		
LaWin	1	Flachglas Entwicklungs GmbH	To develop, hold and acquire intellectual property (currently the patents described below that result from LaWin project) and to commercialize patents, IP and new products (as of today it is teaming up with partners to prepare funding and operations for the next steps to commercialize and prepare production of the LaWin results.	The company has registered for 50% of 2 patents and for 100% of another patent. Currently the spin-off has 1 employee and is teaming up with partners to prepare funding and operations for the next steps to commercialize and prepare production of the LaWin results.
BUILT2SPEC	1	Build Test Solutions ¹⁶	Testing and performance verification solutions in the built environment sector	The PULSE product is based on IP licensed from University of Nottingham, linked to their participation to Built2Spec. Air pulse airtightness technology and test for buildings (innovative, fast, lower cost, low skill, for quick quality assurance and compliance checks)

¹³ www.recreate.nl

¹⁴ www.robotatwork.com

¹⁵ www.solace.house

¹⁶ <http://buildtestsolutions.com/pulse>

Analysis of the TRLs for each technology cluster

		AVG value for all WGs		AVG value for each of the 7 WGs	Min value for each of the 7 WGs	Min project(s) acronym(s) for each of the 7 WGs	Max value for each of the 7 WGs	Max project(s) acronym(s) for each of the 7 WGs
Current TRL (February 2019)	WG1	5,7		6	4,1	ReCO2ST	7	New TREND – OptEEmAL – Pro-GET-OnE
	WG2			5,7	4	Plug-N-Harvest	7,2	ECO-Binder – ZERO-Plus (EE)
	WG3			5,4	4	HEAT4COOL	7,2	ECO-Binder
	WG4			6,1	4,2	Greeninstruct	8	MODER
	WG5			5,5	1,7	ENCORE	8	MODER
	WG6			5,4	3	EXCEED	7,1	BUILT2SPEC
	WG7			5,9	1,7	ENCORE	7	IMPRESS – New TREND – OptEEmAL – Pro-GET-OnE
TRL expected by the end of your project	WG1	6,9		7,2	6	BuildHEAT	9	Pro-GET-OnE
	WG2			6,9	5,5	LAWN	8,2	4RinEU
	WG3			6,6	5,5	LAWN – TESSe2b	7,7	ENVISION
	WG4			6,5	5,8	VEEP	8	MODER
	WG5			7	5	EXCEED	8,7	REZBUILD
	WG6			6,4	5	EXCEED	7	MOEEBIUS
	WG7			7,2	6	ENCORE – INSITER	9	Pro-GET-OnE