P2ENDURE
PLUG & PLAY BUILDING RENOVATION

Organisational and activity plan for establishment of the TCP and engagement of stakeholders in e-Marketplace

Deliverable Report D5.1

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P2ENDURE
Plug-and-Play product and process innovation for Energy-efficient building deep renovation

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Colophon

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Publishable executive summary

P2Endure promotes evidence-based innovative solutions for deep renovation based on prefabricated plug and play systems in combination with on-site scanning, robotic 3D printing and Building Information Modelling (BIM), demonstrated and monitored at 10 real projects in four geo-clusters with EU-wide replication potential.

This report constitutes the Deliverable D5.1 "Organisational and activity plan for establishment of the Technology Commercialisation Platform (TCP) and engagement of stakeholders in e-Marketplace" for the P2Endure project and aims to set up actions to create a solid community of stakeholders belonging to TCP.

This report consists in the following Chapters:

- Chapter 1 introduces the TCP and describes its objectives.
- Chapter 2 presents target groups and indicates how to identify new stakeholders.
- Chapter 3 describes the plan for the establishment of the TCP.
- Chapter 4 provides an overview of the opportunities that TCP can offer to the P2Endure technologies.
- Chapter 5 summarises the main outcomes of this report.

List of acronyms and abbreviations

BIM	Building Information Modelling
CHP	Combined Heat and Power
DGS	Dedicated Stakeholder Group
DHW	Domestic Heat Water
ESS	Exploitation Strategy Seminar
EU	European Union
HVAC	Heating, Ventilation and Air Conditioning
ICT	Information and Communication Technology
IEQ	Indoor Environment Quality
LoI	Letter of Interest
PnP	Plug-and-Play
PMV	Predicted Mean Vote
RES	Renewable Energy sources
SMEs	Small and Medium Enterprises
TCP	Technology Commercialisation Platform
TRL	Technology Readiness Level

Contents

1. Introduction

1.1 What is the Technology Commercialisation Platform?

The purpose of the Technology Commercialisation Platform (TCP) is to guarantee a wide impact on replication and market upscaling within P2Endure. The members of TCP come from different EU countries and represent a variety of stakeholders that are interested in applying or marketing the results of P2Endure. On this platform, P2Endure aims to build up a critical mass of building owners, local authorities, retrofitting solutions providers, urban planners, investors, design firms, leading industrial players in pre-fabricated building and technical systems and other supply-chain actors that provide the necessary vehicle for innovative SMEs to take a significant role in the EU and global market networks.

More in detail, the role of TCP consists in:

- Supporting with the formulation of requirements and guidelines for optimal use and implementation of the P2Endure toolset.
- Assessing whether the solutions offered by P2Endure will meet the requirements of energy reduction and affordability, especially through the demonstration cases.
- Assisting the P2Endure consortium in solving barriers to exploitation, e.g. legislative, technical or standardisation issues.
- Playing an active role in the distribution, dissemination, implementation and exploitation of the research results.

P2Endure has a goal of 50 participants to TCP, excluded those who are already consortium members within P2Endure. The coordination of TCP is part of WP5 (Exploitation). RINA Consulting[1] will chair TCP. The TCP members will meet throughout the duration of the project at periodic web conference calls and at two dedicated plenary sessions.
Among the participants to TCP, a core group of stakeholders are also involved in the P2Endure live demonstration projects. This core group is the Dedicated Stakeholder Group (DSG) and its specific goal is to provide products or services that are missing in the consortium and that are necessary for the implementation in the demonstration cases. **DGS consists of a minimum of 10 members.** Reasons for having the members of DSG also members of TCP are their insight and relevant perspective on the demo cases.

[1] http://www.rinagroup.org/en

1.2 Aim of this report

This report aims at defining the activities to set up TCP, from a preliminary engagement of stakeholders to future actions for their full involvement. A preliminary list of potential stakeholders – together with a Letter of Interest template for engaging them – is appended at the end of this document. An Implementation Action plan will be detailed, including proposed dates for meetings, workshops and web conferences. In conclusion, this deliverable will provide a short description of the P2Endure innovative technologies, specifying expectations from TCP and potential inputs to their business models and business plans.

2. P2ENDURE specific Target groups of stakeholders

2.1 Preliminary identification of specific target groups of stakeholders

Proper exploitation of the products and processes developed within P2Endure requires the identification of specific "target groups" involving both technical and non-technical stakeholders. Indeed, the variety of technologies and services that P2Endure can provide can find a match with the needs of specific target groups.

The TCP set up starts from the definition of "target groups" with their related business needs.

Table 2-1 shows a list of target groups and their related business needs.

Table 2-1: Stakeholders to be involved within the TCP, related Target Groups and business needs description

Target Groups	Business needs description
Municipalities	Knowledge of the technical framework for retrofitting in public building sector; Awareness of the possible targets in terms of carbon footprint and energy reduction; Range of possibilities for retrofitting operations in public building sector.
Social Housing	This sector includes a high and diversified number of vulnerable and low-income households. Therefore, costs have primary importance and lack of funding is a major barrier for the energy retrofitting of social housing. Main needs for the social housing segment consist in the following themes: Reduction of the energy use; Improvement of the indoor comfort and health of residents; Cost-effective solutions for retrofitting.
Building owners	Public interest and private investments in housing sector are closely connected even though these two customer segments carry out renovation actions with different purposes. Indeed, whether public owners aim to reduce the rents of the buildings and apartments, private owners expect to increase the value of their properties after retrofitting interventions. However, they have several common needs such as: Reduction of energy bills; Reduction of maintenance costs; Decrease in time for the renovation operations, with low disturbance and cost-effective retrofit.

Construction companies	The construction industry is a fragmented and conservative sector. Unlike other industrial sectors, e.g.IT or medical sectors, the construction sector shows a tendency to use proven materials and well-established methods. Main needs for the construction companies segment include: Reduction of construction costs; Improvement of revenues.
Components and services providers (e.g. measurement on moisture level or thermal properties in existing products)	Technical competence for each application belonging to their specific business i.e. power quality for system integrators and panel builders, etc.

Once they are clearly defined, it is possible to list the names of potential stakeholders belonging to such target groups, as shown in Annex I. These stakeholders will be contacted following the actions described in section 3.1 and asked to sign a Letter of Interest (LoI) – see the template in Annex II - in order to confirm their eagerness to support P2Endure and their willingness to participate to the project activities. It is worth noting that some of the stakeholders listed in Annex I have already signed the LoI during the project proposal preparation stage. These stakeholders - who have also been invited to participate to the 1st Stakeholder group workshop (see section 0) - will receive an update on the project and notification on the forthcoming TCP activities at month 13.

2.2 Actions needed for the identification of new stakeholders

In order to reach a wide range of contacts – both in terms of geographical distribution and of specific industry and sector – it is important that all partners within the P2Endure consortium are actively involved in integrating the list of stakeholders provided in Annex I. Therefore, this section describes the steps that every partner within will have to follow in order integrate the preliminary stakeholders list:

- Analysis of its own list of contacts and engagement of potential relevant stakeholders (according to specifications provided in section 3.1). Two contact list forms (one for TCP and one for DSG) will circulate among partners to be completed at M13 during the GA in Genoa.
- **At least 10 new stakeholders** shall be contacted by each consortium partner by M15. If fewer potential stakeholders are identified, each project partner will carry out a desk research (sources: web, chamber of commerce lists, etc.) of local companies belonging to the target groups identified in order to reach the minimum number of participants to TCP;
- Once identified potential new participants, the consortium partners will list them in a structured document including the TCP participants table, according to their relevant

target group. Each project partner, will have its own version of this table (provided by RINA Consulting) but a master version of the TCP contact list, collecting all the information coming from the consortium, will be stored confidentially by RINA Consulting. This master version of the TCP list will contain the following information:

  - ID (an identification progressive number to identify the specific Stakeholder)
  - Target group
  - Country
  - Stakeholder contact information (title, first name, last name, email address, and phone number - if available)
  - Organisation name and description
  - Involvement in demo projects (if any)
  - P2Endure liaison partner (Partner responsible for the contacts with stakeholder)
  - Status (To Be Contacted, Contacted, On board, Refused)
  - Comments by P2Endure Partner (on the status of the involvement process, motivation on possible refusal, etc.)

- When new potential stakeholders are identified during the project, partners should insert them in their own TCP participants table and forward this information to RINA Consulting to update the master version of the TCP contact list.

3. Activity plan for establishment of the TCP

3.1 Actions for engaging the TCP members

Once identified potential stakeholders, stakeholders shall be engaged and invited to join the TCP community.

In order to engage further stakeholders to the TCP, specific actions shall be tailored according to the different target group they belong to. Nevertheless, it is essential that a common approach among all the P2Endure partners is undertaken when involving new TCP participants. In general, all partners should contact stakeholders personally and using their mother tongue. It also recommended that preliminary information is presented personally and in a synthetic form, possibly accompanied by an official recommendation from the Coordinator.

Table 3-1 summarises the actions to perform to address each identified target groups.

Table 3-1: Target groups involvement actions

Target Groups	Action to be done
Municipalities	Identify the group working on energy efficiency and district retrofitting projects within the municipality; Identify already available contacts with the municipality personnel (potentially interested in P2Endure project) among the P2Endure partners; Schedule a meeting with the identified contact (both physical and remote) to share the informative material, previously agreed within the consortium, in local language and focused on municipalities business needs; If the contact shows to be really interested in the project, propose him/her to sign the LoI; Gather the signed letter (if possible) already during the first meeting or send it by email after the date and take care to collect it signed in the forthcoming days.

Social Housing	Identify social buildings that could benefit from a deep retrofitting intervention; Identify the owner of the building (municipality, private/public building owner, etc.); Identify already available contacts with the personnel of the owner entity among the P2Endure partners; If not available identify the right person to contact within the entity; Schedule a meeting with the identified contact (both physical and remote) to share the informative material, previously agreed within the consortium, in local language and focused on social housing business needs; If the contact shows to be interested in the project, propose him/her to sign the LoI; Gather the signed letter (if possible) already during the first meeting or send it by email after the date and take care to collect it signed in the forthcoming days.
Building owner	Identify buildings that could benefit from a deep retrofitting intervention; Identify the owner of the building (private building owner, construction company, other legal entities e.g. Consortium, etc.); Identify already available contacts with the owner (entity) among the P2Endure partners; If not available identify the right person to contact within the entity Schedule a meeting with the identified contact (both physical and remote) to share the informative material, previously agreed within the consortium, in local language and focused on building owners business needs; If the contact shows to be interested in the project, propose him/her to sign the LoI; Gather the signed letter (if possible) already during the first meeting or send it by email after the date and take care to collect it signed in the forthcoming days.
Construction companies	Identify the group or the single expert on energy efficiency solutions within the company; Identify if there are already available contacts with the company personnel (potentially interested in P2Endure project) among P2Endure partners; Schedule a meeting with the identified contact (both physical and remote) to share the informative material, previously agreed within the consortium, in local language and focused on construction companies business needs; If the contact shows to be interested in the project, propose him/her to sign the LoI; Gather the signed letter (if possible) already during the first meeting or send it by email after the date and take care to collect it signed in the forthcoming days.

Components and services providers (e.g. measurement on moisture level or thermal properties in existing products)	Identify the area of the company responsible for the suppling of energy efficiency solutions; Identify if there are already available contact s with the company personnel (potentially interested in P2Endure project) among P2Endure partners; Schedule a meeting with the identified contact (both physical and remote) to share the informative material, previously agreed within the consortium, in local language and focused on the component suppliers core business areas; If the contact shows to be interested in the project, propose him/her to sign the Letter of Interest; Gather the signed letter (if possible) already during the first meeting or send it by email after the date and take care to collect it signed in the forthcoming days.

3.2 Implementation Action plan

Once established the final structure of TCP, it will be possible to start the TCP activities. These activities will be tailored according to the needs of both the stakeholders and the P2Endure partners. To this extent, a questionnaire addressing the stakeholder requirements and conditions of deep renovation will be distributed and analysed with the goal to define a final agenda for each TCP meeting. The results of this analysis will be included in the value assessment report. The TCP activities will include two large meetings that will occur next to future consortium General Assemblies (GAs), two smaller meetings for the DSG only (again in the proximity of the next GAs) and two webinars. Table 3.2 shows the proposed Agenda for the Implementation Action.

Depending on the number of participants and presenters, presentations of renovation and EEB innovative technologies will be either oral sessions or poster sessions in order to last approximately 2-3 hrs in total. The target number for participants is at least 50 stakeholders. In order to meet this target, all partners are required to collaborate following the actions described in section 2.2. TCP meetings will take place after the Exploitation Strategy Seminar (ESS) given by 3L at month 18 during the GA in Berlin. This will enable participants to the seminar to implement the lessons learnt in the ESS.

Smaller-scale meetings – named “Stakeholder group workshops” - with the DSG members only – will aim to discuss possible collaborations with solution providers and parties responsible for the P2Endure demonstration cases. The target number for participants to Stakeholder group workshops is at least 10 stakeholders. Again, in order to meet this target, all partners will have to follow the actions described in section 2.2. Lastly, two webinars will be organised for TCP members with the goal to advertise P2Endure products and processes and to show the main results achieved within P2Endure. Clearly, this webinars will be open to all partners of P2Endure and to their own contacts, even if they are not directly involved in TCP.

Table 3-2: Target groups involvement actions

Event	Description	Attendees	Proposed date	Proposed location
1st TCP meeting	Presentation of the P2Endure project and of its main outcomes to TCP; First chance for the exploitation of the products developed within P2Endure; First launch of the e-marketplace.	TCP	M18 - GA	Berlin (DE)
2nd TCP meeting	Presentation of the relevant updates of the to a larger and well-established TCP; Second chance for the exploitation of the products developed within P2Endure; Technologies providers will have the chance to join the e-marketplace.	TCP	M36 - GA	To be defined.
1st Stakeholder group workshops	Preliminary discussion on P2Endure products and implementation in the demo site.	Magnettti Building and Municipality of Gdynia	M6	Warsaw (PL)
2nd Stakeholder group workshop	Discussion among stakeholders involved in the demo cases together with companies that could provide services and products not covered by any partner of the consortium.	DSG	M18 - GA	Berlin (DE)
1st Webinar	Presentation of progress and the intermediate results of P2Endure.	All stakeholders	M25	Web conference
2nd Webinar	Presentation of the final results of P2Endure.	All stakeholders	M47	Web conference

4. Opportunities for P2Endure technologies and processes

4.1 Opportunities for innovative technologies

The following section introduces some of the P2Endure technologies with the goal to emphasise their exploitation potential, their foreseen implementation within the project, and the expected benefits from participation to TCP. It is worth noting that the description of technologies has the only purpose to make them immediately recognizable. Information that is more complete is in Deliverables 1.1 "Sets of PnP prefab components for building envelopes", 1.3 "Sets of deep renovation solutions of building HVAC systems", and 1.5 "Techniques, protocols, applications for 3D scanning / geomatics".This section provides a short overview of the following technologies for building envelope retrofitting: EASEE panel, the multifunctional facade panel, the Smart window, Bloomframe® (folding balcony) and the Rooftop retrofit module.

EASEE panel

EASEE panel is a product developed by the Italian company Magnetti Building[2] within the FP7 EU-funded project "EASEE" (Envelope Approach to improve Sustainability and Energy Efficiency in existing multi-story multi-owner residential buildings)[3] – from which the name "EASEE panel" comes from. EASEE panel is a prefabricated insulating panel whose purpose is to reduce the time for retrofitting operations and to guarantee adequate thermal energy savings by reducing the thermal transmittance of the walls. The main benefits associated with EASEE panel consist in its ability to achieve a decrease in U-value in retrofitted façades (results on a test façade show a U-value decrease equal to 68.88%) and to reduce the installation time by 50% in comparison with traditional retrofitting. Moreover, its reduced thickness and high aesthetic properties allow for flexible application to a number of buildings, included those under cultural heritage protection. P2Endure foresees the implementation of the innovative prefab EASEE panels in the pilot buildings in Gdynia (Poland) and Palmanova (Italy).

Smart connectors

Smart connectors are used in combination with PnP prefabricated facades. When used in combination with the EASEE panel, they provide a joining system with outstanding ageing resistance. P2Endure foresees the implementation of the smart connectors in the pilot building in Breda (Netherland). For this product, TCP members can be potential new clients.

[2] http://www.magnetti.it

[3] http://www.easee-project.eu/

Multifunctional facade panel

The solution proposed by Fermacell[4] consists in a versatile prefabricated façade panel with a wooden substructure for high-rise buildings up to 22-meter high. Specific objectives for this façade to achieve within P2Endure concern:

- Versatility and applicability to existing buildings
- Quick installation - especially in urban areas with limited space for material, handling devices, storage in general
- Compliance with current regulations on building physics, comfort and durability
- Integration with heating, ventilation and air conditioning devices according to users' needs
- Horizontal and vertical installation of tubes and ducts (either pre-installed or installed on site)
- Usage of previous knowledge built in past EU research projects.

P2Endure will implement the multifunctional façade panels in the pilot building in Warsaw and Gdynia (Poland).

Smart window

The Smart Window technology – developed by Bergamo Tecnologie[5] (BGTEC) - allows for a significant reduction of annual energy demand thanks to two specific features. On the one hand, the window is fitted with an inner pane of glass coated with a low emissivity layer (low-e) to maximise/minimise solar gains depending on its position (on the outside of the inner glazing or the inside of the outer glazing respectively). On the other hand, the window can rotate – either manually or automatically - of an angle of 180°. This allows users to switch the position of the low-e layer and to let variable amounts of solar radiation into the building at different times of the year. A new version of Smart Window is also under development. This new prototype is based on typical window elements and main idea is to develop simple version of reversible window that does not require electric power for operation. It will be composed of typical locking system and gasket solutions that can be found in market available windows. However, the basic concept of having reversible sash is preserved with all benefits that come from variable position of low-e coating[6]. P2Endure foresees the implementation of the Smart Window in the pilot buildings in Warsaw (Poland), Gdynia (Poland), Palmanova (Italy) and Genoa (Italy).

BGTEC, which is a member of the P2Endure consortium, will attend TCP and DSG meetings in order to promote its product and to be more recognizable around partners dealing with retrofitting actions and energy efficient issues. In particular, expectations from the target groups identified in section 2.1 include establishing connections with authorities and building owners – who can be potential new clients – and with people dealing with new technologies, whose feedback can be valuable in terms of product expectations and future improvements.

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[4] https://www.fermacell.it/

[5] http://www.bergamo-tecnologie.eu/it/

[6] For more information, see Deliverable 1.1 'Sets of PnP prefab components for building envelopes' developed within P2Endure

Bloomframe® (folding balcony)

Bloomframe®[7] is an innovative window that can transform into a balcony in about fifteen seconds. Bloomframe® has been designed by Hofman Dujardin Architects and manufactured by the French manufacturer Kawneer, a global leader for aluminium facades, windows and doors based on the Alcoa window system. These industrial parties have signed a Letter of Interest to P2Endure. Demo Consultants[8] is the liaison point for P2Endure.

The Bloomframe® folding balcony is applicable to both new building and deep renovation projects, but its benefits are clearer in retrofitting projects. Indeed, Bloomframe® allows for creating private outside spaces in buildings in congested urban areas where regular balconies are not allowed or feasible. Furthermore, Bloomframe® has a high insulation rate and a high solar factor, which can help meeting the zero energy target for buildings. Since Bloomframe® has TRL 8+, the only objective for this technology is to find new potential customers or business partenrs for foster commercialisation.

Rooftop retrofit module

The Rooftop retrofit module is a specific solution developed by PANPlus Architectuur[9] (PAN) that consists in adding new dwellings on existing roofs to increase sustainability and lifetime of existing buildings.

If building extension is financially, technically, and legally viable this solution allows to amortise the building retrofitting operations in a shorter time-frame.

The Rooftop retrofit module is made of a steel frame and of 2D façade and floor components, with all the MEP system integrated in the steel structure. The frame is finished with the first layer of external plating, insulation and vapour barrier. All components are assembled on site, where any adaptations to the existing building can be done if necessary. PAN will attend TCP and DSG meetings with the following objectives: to improve the design, to provide their services as an architectural firm, and to establish the execution of the rooftop retrofitting principle. P2Endure will implement the Rooftop retrofit module in the pilot buildings in Tilburg (Netherlands) and will virtually demonstrate in Warsaw (Poland). Actual implementation in Gdynia (Poland) is still under discussion but could be finalised after the completion of the project.

PnP prefab HVAC system

Huygen Installatie Adviseurs[10] (HIA) - partner within the P2Endure consortium – is currently developing a new HVAC approach where all components are integrated into one platform.

The main advantages according to this "HVAC engine" can be summarised as follows:

- Reduction of the installation time and costs (by 40% due to efficient manufacturing and efficient use of labour);

[7] https://www.bloomframe.com/

[8] http://uk.demobv.nl/home_uk?language=uk

[9] http://www.panplus.nl/

[10] http://www.huygen.net/

- Simplified purchasing and logistics process according to the 'one-stop shop concept' where a client receives complete HVAC system from one supplier;
- Ease of installation (just half day) and of maintenance, as each component can be replaced when needed;
- Reduced modules weight compared to traditional components (by 35% due to redesign and combination of functions);
- Integration with renewable energy sources and controlled technologies for heating and ventilation and low temperature emission devices.

Starting from state-of-the-art advanced technologies in the field of HVAC energy generation applications, HIA is currently working out a way to combine such technologies effectively in one unique PnP product. A first result of this work entails the definition of technical requirements for design and implementation of the P2Endure "HVAC engine" in several demonstration buildings. HIA will attend TCP and DSG meeting in order to find out how open the market is to their new HVAC approach and to receive guidance on how to improve it. P2Endure will implement the PnP prefab HVAC system in the pilot building in Breda (Netherlands).

Connection to energy grid and RES production

P2 Endure targets maximum flexibility in power generation (heat and electricity), distribution and usage. Although the integration of power generation devices within building components such as facades and roofs is increasing, these devices are still not able to deliver all required energy at the right time. At the district level, a self-supporting system with different kinds of local generation and storage systems is technically feasible, but the current grid operating systems do not offer the coordination and control for such a network yet. Therefore, dependency on grids that serve as back-up systems remains crucial. In this framework, P2Endure intends to propose innovative solutions for Renewable Energy Sources (RES) and energy grid. Besides promoting the implementation of RES production systems (i.e. PV and thermal systems) in conjunction with building envelope and technical components, P2Endure fosters the development of Combined Heat and Power (CHP) plants associated with centralised storage systems (within neighbour/district configurations) and assisted by control systems to enhance their potential for lowering the shift between RES production and end-user demand. Among the P2Endure consortium, Becquerel Electric[11] will be able to provide consulting and design services to foster RES implantation in deep renovation processes.

Comfort Eye (Indoor Environment Quality control system)

Università Politecnica Delle Marche[12] (UNIVPM) developed the innovative "Comfort Eye" system. Comfort Eye is a low-cost sensing device for real-time monitoring of indoor thermal comfort. This system uses a microcontroller and a set of sensors and embedded algorithms to derive Predicted Mean Vote (PMV) index for multiple subjects occupy different places in space. The advantages of Comfort Eye are non-

[11] http://www.becquerel.it/

[12] http://www.univpm.it/

invasive multipoint measurement, interoperability and ease of integration and installation. Furthermore, the system is able to perform measurements and send data to other devices through different communication protocols (e.g. Bluetooth, ZigBee, Wi-Fi, Modbus TCP/IP, etc.). Therefore, it can easily interact with common HVAC or building management systems through several automation protocols and with users Android applications or via a Bluetooth connection.
P2Endure foresees the implementation of Comfort Eye in the pilot buildings in Ancona (Italy), Palmanova (Italy) and Warsaw (Poland) to test the effectiveness of the P2Endure solutions to achieve the targeted Indoor Environment Quality (IEQ) and building performance. UNIVPM, which is a member of the P2Endure consortium, will attempt to establish new contacts within TCP in order to accelerate time to market for the Comfort Eye.

Thermal and acoustic scanning

UNIVPM will develop quality controls for prefab panels in order to reduce the quality gap between the design and construction phases. In detail, the functionalities investigated within P2Endure will concern thermal bridges detection, thermal transmittance degree, structural integrity diagnosis, acoustic leakages detection, and 3D geometric scanning and reconstruction. To this extent, advanced low cost sensors geo-referencing 3D data will be used in the pilot building in Ancona (Italy).

3D scanning

Several 3D data capturing technologies for condition assessment surveys are currently available on the market. Based on predictive analysis and non-destructive procedures, such technologies allow for quick and effective surveys. However, the acquisition of a large amount of data can be time consuming and the technological integration between different kinds of devices can be challenging. Starting from the results obtained through the H2020 MORE-CONNECT[13] project, P2Endure means to address these issues and to demonstrate 3D scanning in the P2Endure demonstration projects.

On-site 3D printing and robotics

Robot at work-Invela14 (INVELA) provides onsite building renovation innovative solutions based on prefabricated PnP systems in combination with on-site robotic 3D-printing and BIM. The system proposed within P2Endure uses robots that are controlled by an on-site scanning and coordination system. 3D BIM models serve to pre-programme the robots and for on-site processes, thereby minimizing the number of on-site workers and avoiding scaffolding. Additionally, this system works with any material and building type, providing a number of finishing options. P2Endure will test Robot at work in the demo case in Korsløkken (Denmark), creating a 3D façade with a finished mortar surface and a layer of milled Rockwool insulation. The implementation of such technology in the pilot building in Ancona (Italy) is still under investigation. INVELA sees in TCP an opportunity for company branding as well as for finding new international clients or future partnerships in EU.

[13] http://www.more-connect.eu/

[14] http://www.robotatwork.com/

Techniques for 3D scanning and 3D printing for refurbishing façades of historic buildings with rich details

3D scanning and 3D printing can be used for historic buildings retrofitting. 3D scanning serves for digital survey procedures, while 3D printing for the integration of missing parts of decorative elements. P2Endure means to investigate this combination of 3D technologies with the overarching goal of facilitating the analysis and monitoring of cultural heritage. In particular, it focuses on two specific aspects, i.e. precise and fast acquisition of metric data and the opportunity to use these data to build 3D geometrical and physical models.

4.2 Opportunities for innovative processes

TCP can offer significant opportunities for the exploitation of the P2Endure processes, namely the BIM parametric modeller from Technische Universität Berlin[15] (TUB), the mobile inspection tool for building condition assessment and the software for energy monitoring, LCC and asset management from Demo Consultants[16] (DMO), and the e-Marketplace from 3L Architekten[17] (3L).

These processes will be presented at the TCP meetings, highlighting the potential for new businesses. Technologies providers – even those outside the P2Endure consortium – will be invited to join the e-Marketplace in order to sell their own products and enter a wide network of innovative and cutting-edge solutions for deep renovation. Additionally, the e-Marketplace will integrate the BIM product configurator. This way, stakeholders (e.g. designers) will be able to download BIM models of solutions/technologies provided by other stakeholders (e.g. manufactures) and apply them to their own the BIM model.

This process will provide advanced methods for analysing costs and efficiency of the solutions provided, thereby enhancing their competitiveness.

[15] http://www.tu-berlin.de/menue/home/

[16] http://uk.demobv.nl/home_uk?language=uk

[17] http://www.3-l.de/

5. Conclusions

Deliverable 5.1 presented the purpose of TCP and an organisational plan for its establishment. In particular, this document provided a list of target groups, their related business needs and consequential stakeholders to involve. This preliminary list shall be completed with the help of all consortium members following the actions described in section 2.2. To this extent, a short description of all P2Endure solutions is provided in order to facilitate the recognition of the potentially interested stakeholders.
Additionally, section 3.1 of this document contains recommendations on how to engage the TCP members. In conclusion, the Implementation Action Plan is presented in section 0, specifying dates and targets for the forthcoming TCP-related activities.

ANNEX 1 - Preliminary list of stakeholders

Table 0-1: Potential stakeholders to be involved within the TCP.

Name of stakeholder	Business type	Country	Contact person	LoI signed	P2Endure liaison	Target group
HofmanDujardin Architecten BV	Designer and patent holder of the Bloomframe® folding balcony	NL	Michiel Hofman	X	DMO	Components and services providers
Kawneer France SA (an Alcoa Company)	Manufacturer of the Bloomframe® folding balcony	FR	Maria Berrada		DMO	
Fereco	Supplier of prefab lightweight steel structures	BE			PAN	
Robot-at-Work	Start-up SME in establishment, specialised in 3D printing and robotics	DK			INV	
Martiny Automation	Developer of robotics and automation systems	DK			INV	
Studio Termotecnico Tarvis	MEP engineering firm and energy specialist in Udine	IT		X	BEQ	
SCX-Solar	Supplier of prefab integrated solar panels	NL	Ruud van de Voort	X	PAN	
Magnetti Building	Manufacturer of the EASEE panel	IT	Francesco Sonzogni		RINA-C	
Interpanel	Designer of prefab and modular solutions to deal with the room climate factors of light, cool, heat and acoustics in one.	NL	Alexander Buff		DMO	

Façade Leasing pilot project at TU Delft	Research team within the Faculty of Architecture and the Built Environment developing a circular business model based on the use of multifunctional façadesl.	NL	Juan F.Azcare		DMO	
Octatube	Developed a frame solution for façades for building renovation.	NL	Stefan van Uffelen and Tjerk Gorter		DMO	
CAE Nederland BV	Renovation consultant at Tilburg project.	NL	T. Pierik	X	PAN	
Schneider Electric	Developer of connected technologies and solutions to manage energy and process in ways that are safe, reliable, efficient and sustainable.	FR				
Enexis	National grid operator for the reliable and safe delivery of energy.	NL	Jan Peters	X	PAN	
Tauron Polska Energia	Large energy provider	PL	Pawel Poneta	X		
Technische Universiteir Eindhoven-Peer+	Designer of the Peer+ technology.	NL				
Focchi Group	Leading company in the curtain walling sector.	IT				
Name of stakeholder	**Business type**	**Country**	**Contact person**	**LoI signed**	**P2Endure liaison**	**Target group**

Kipp Immobilien GmbH	Project owner of the Soest demo project; real estate owner of buildings subjected to deep renovation	DE			3L	Building owners
Schwimmbad Alt Hürth GmbH	Real estate owner of public buildings subjected to deep renovation and transformation	DE			3L	
Studio la Fortezza	Real estate client / project owner of public buildings subjected to deep renovation and transformation	IT			BEQ	
TIWOS	Local housing association in the Municipality of Tilburg; owner of building stock for potential deep renovation	NL	René van Scherpenisse	X	PAN	
TBV Wonen	Local housing association in the Municipality of Tilburg; owner of building stock for potential deep renovation	NL	Emile Kint	X	PAN	
BJW Wonen B.V.	Real estate client, provider of building/MEP systems and real estate concept developer	NL	J. Kamphuis	X	HIA	
Doevendans BV	Building developer, contractor, investor	NL	Hanneke Doevendans	X	PAN	
Fresh Ideas	Real estate owner and manager interested in deep renovation	NL	Paul Vermee	X	PAN	
VESTIA	Major housing association with very large building stock for potential replication of P2Endure deep renovation solutions	NL	J. Mennink	X	DMO	

Comune di Genova	Local authority; project owner of Genova demo project; potential replication deep renovation for its public building stock	IT			RINA-C	Municipalities
ERAP Marche City of Ancona	Local authority; project owner of Ancona demo project; potential replication deep renovation for its public building stock	IT			UNIVPM	
City Hall Gdynia	City municipality; project owner of the Gdynia demo project; potential replication deep renovation for its public building stock	PL	Marek Stepa	X	FAS	
Eurocities	The network of major European cities	BE				
Munaretto Manlio Srl	Construction and manufacturing firm	IT	Manlio Munaretto	X	BEQ	Construction companies
NBU Nederlandse Bouwunie	Medium-sized building construction company, specialised in developing, constructing and renovating housing, offices and schools; working on zero-energy houses through industrially manufactured facade with the size of a full facade of a dwelling that can be mounted on the existing facade within half-a-day	NL	Floor Verdoorn	X	PAN	

Acciona	Leading construction company	SP			RINA-C	
Name of stakeholder	**Business type**	**Country**	**Contact person**	**LoI signed**	**P2Endure liaison**	**Target group**
Urbannerdam	Consulting firm specialised in collective self-organised housing	NL	Frans van Hulten	X	PAN	Construction companies
Zueblin	Construction Engineering company	DE				
Bouygues Construction SA						
Dragados	Leading infrastructure developers	SP				
CECODHAS	The European Liaison Committee for Social Housing	UK				Social Housing
Housing Europe	Housing Europe is the European Federation of Public, Cooperative and Social Housing	BE				

ANNEX 2 - Letter of Interest template

Letter of Interest
To the attention of:
Mr/Ms. XXX
Company role
Company/authority Name
Country

Subject: Expression of interest of Company/Authority Name
to take part as a stakeholder within the research project P2Endure
in support of demonstration cases and Technology Commercialisation Platform

Dear Dr. Sebastian,
Company/Authority Name in the Country Name herewith expresses our interest in the aim and innovative approach of the research project P2Endure: Plug-and-Play product and process innovation for Energy-efficient building deep renovation, which focuses on the application of prefabricated construction and building service components combined with 3D scanning, BIM modelling and 3D printed components for cost-effective, rapid and low-disturbance renovation. In our role of a Business sector, we are interested to look into the possibilities to provide our support within the project Technology Commercialisation Platform as a part of the integral innovation offer of P2Endure. A successful EU-wide commercialisation of innovative prefab renovation solutions is part of our business commitment. Whenever relevant depending on the suitability of our expert personnel, we are willing to support the implementation of deep renovation projects through the activities organised within the Technology Commercialisation Platform.

We are looking forward to a successful collaboration in P2Endure.

On behalf of Company name
Signature and stamp, if available

Place, date:
Name of person:
Position or role: