

P2ENDURE

PLUG & PLAY BUILDING RENOVATION



Dear {{voornaam}},

This is the fourth and last newsletter of the H2020 P2Endure project, which started in September 2016 and is ending in April 2021. In this newsletter you will find out what are the solutions and final conclusions of this 4,5-year project. Enjoy!

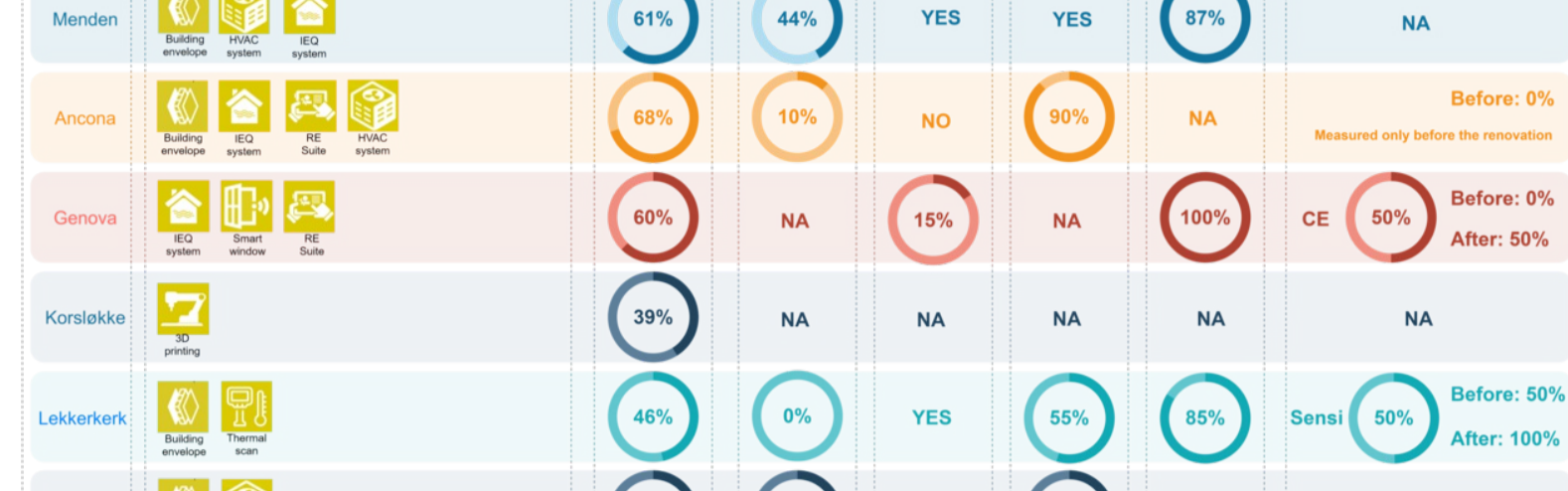
P2ENDURE PROJECT

The project aims to improve the availability and performance of energy saving solutions for deep renovation and transformation of vacant, obsolete, or sub-optimal public buildings into dwellings promoting evidence-based innovative solutions for deep renovation based on prefabricated Plug and Play systems in combination with on-site robotic 3D-printing and BIM demonstrated and monitored at 9 real projects, 2 virtual demonstrators in 4 geo-clusters with EU-wide replication potentials.

DEPLOYED SOLUTIONS

P2ENDURE SOLUTIONS, TECHNOLOGIES AND TOOLS

In the P2Endure project several Plug and Play solutions, technologies and tools have been used, which are categorized in 4 groups: prefab components for building envelope, prefab technical systems, on-site 3D technologies and ICT tools for deep renovation.



P2ENDURE KEY PERFORMANCE INDICATORS

Key Performance Indicators to assess implemented solutions in the demonstration cases are:

- Reduced Net Primary Energy
- Lowered Embodied Energy
- Reduced renovation costs
- Reduced renovation times
- Reduced disturbance during renovation
- Improved indoor environmental quality

Pilot site	Solutions, technologies, tools	Reduced Net Primary Energy	Lowered Embodied Energy	Reduced renovation times	Reduced disturbance during renovation	Improved indoor environmental quality
Tilburg	Smart Window, Prefab Bathroom, IEQ System, Energy Grid	71%	NA	20%	NA	NA
Reggio Emilia	Smart Window, Prefab Bathroom, IEQ System, Energy Grid	90%	NA	Globally	10%	CE 50% Before: 50% After: 100%
Enschede	Smart Window, Prefab Bathroom, IEQ System, Energy Grid	62%	NA	Globally	96%	CE 75% After: 75%
Warsaw	Smart Window, Prefab Bathroom, IEQ System, Energy Grid	60%	2%	15%	52%	CE 60% Before: 40% After: 100%
Gdynia	Smart Window, Prefab Bathroom, IEQ System, Energy Grid	67%	5%	15%	50%	CE 50% Before: 25% After: 75%
Menden	Smart Window, Prefab Bathroom, IEQ System, Energy Grid	61%	44%	YES	YES	87%
Anzono	Smart Window, Prefab Bathroom, IEQ System, Energy Grid	68%	10%	NO	90%	NA
Genova	Smart Window, Prefab Bathroom, IEQ System, Energy Grid	60%	NA	15%	NA	100%
Konstakke	Smart Window, Prefab Bathroom, IEQ System, Energy Grid	39%	NA	NA	NA	NA
Lekkerkerk	Smart Window, Prefab Bathroom, IEQ System, Energy Grid	46%	0%	YES	55%	85%
Utrecht	Smart Window, Prefab Bathroom, IEQ System, Energy Grid	66%	37%	NA	49%	YES

LEGEND

CE= Implementation of Comfort Eye

SENSI= Implementation of indoor sensor SENSi

Netatmo= Implementation of Netatmo sensor network

After= IEQ percentage After renovation

Before= IEQ Before renovation

NA= Not applicable

Reduced disturbance during renovation

The higher the percentage the better reduction in the disturbance

Improved indoor environmental quality

The higher the percentage the better more improvement in IEQ

FACTSHEETS ABOUT PnP SOLUTIONS

What are the most important things about certain PnP solutions? And what impact do they have? Read about it in short factsheets or click on them to learn more and see what potential benefits they have for you!

Aluminium Façade

ENERGY EFFICIENT SMART COMPONENT

- protection against external conditions
- adjustable parameters, shape, size and colour
- optimised installation process
- façade identification system connected to BIM model

Time reduction, Indoor environmental quality, Replicability

Bathroom Module

FULLY FUNCTIONAL & COMPLETE

- adjustable size and design
- equipment preinstalled in a factory
- easy connection to piping through PnP connectors
- fulfilling requirements regarding fire safety and noise reduction

Time reduction, Cost reduction, Indoor environmental quality, Replicability

Cocoonz Façade

FRAMELESS PANELS

- minimised weight
- possible integration with an existing façade
- reduced assemblage and mounting time
- effective insulation in various options

Time reduction, Cost reduction, Energy reduction, Replicability

Rooftop Module

RETROFITTING EXTENSION

- enabling of adding new floor to an existing building
- fast, easy and dimensionally stable solution
- supporting lower energy consumption

Time reduction, Cost reduction, Energy reduction, Replicability

BEAM Façade

MOUNTABLE ON-SITE

- standardised insulation materials
- highly customisable design
- easy and quick installation
- improved comfort and aesthetics

Time reduction, Cost reduction, Indoor environmental quality, Replicability

Fermacell Façade

MULTIFUNCTIONAL & ADAPTABLE PANEL

- prefabricated & highly insulating
- intergrated with other systems
- easy & quick installation
- competitive costs & energy use

Time reduction, Cost reduction, Energy reduction, Replicability

RenoZEB Unit

MULTILAYERED PREFABRICATED COMPONENT DEVELOPED BY Reno ZEB PROJECT

- Demonstrating the potential of integrating plug & play solutions available in the market
- optimised production line, design and installation process
- easy rearrangement and installation
- variety of typologies matching different building's requirements

Time reduction, Cost reduction, Energy reduction, Replicability

Smart Window

ADJUSTABLE & ENERGY EFFICIENT

- reduced heating and cooling costs
- lower CO₂ emissions
- optimal indoor conditions all year round
- easy montage and maintenance

Cost reduction, Energy reduction, Indoor environmental quality, Replicability

DEMONSTRATION CASES

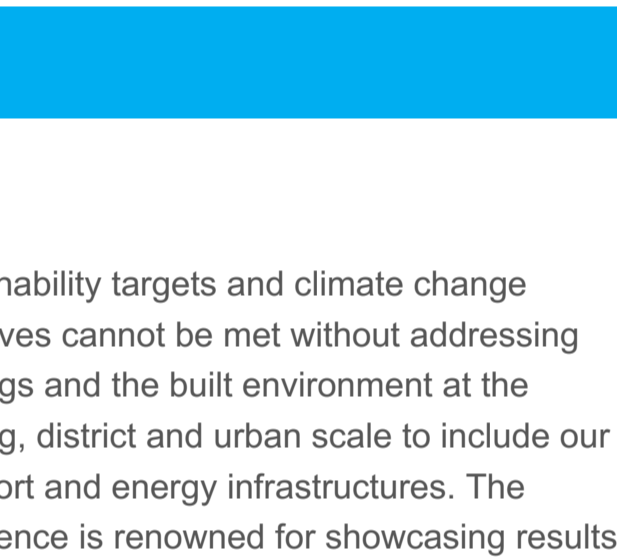
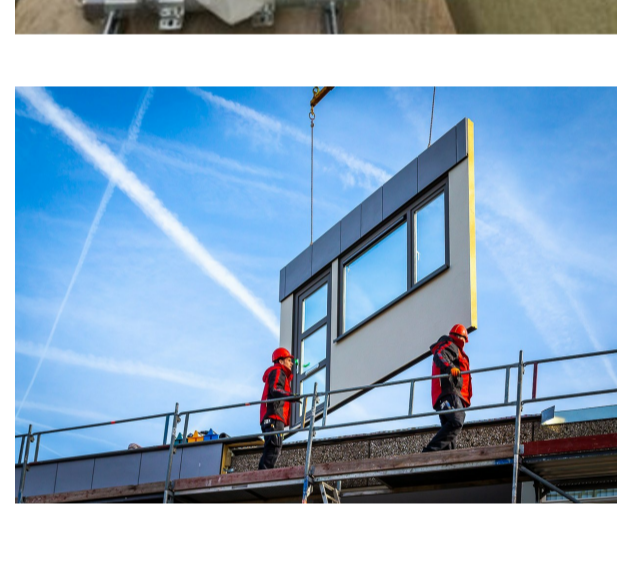
P2Endure solutions were deployed in all of the demonstration sites, of which two of them are virtual ones. Pilot projects include:

- Transformation of public or historic buildings
- Deep renovation of public buildings
- Deep renovation of residential buildings or/and districts



All the demonstration cases finished their renovation works. Overviewing the PnP-solutions we see a wide variety of techniques. Differences are due to building culture and regulations in the different countries. Main lessons learned from the project are:

- Design and data exchange through BIM (4M-process) is necessary to get right data into the factory for pre-fabrication
- The decrease of running time and disturbance for occupants and the environment is a significant advantage!
- There is a need for more PnP-solutions on the market. Architects have a small range of choices that is limiting their design solutions.
- There is a huge potential for robotizing (reducing scarce labor and increasing quality) the pre-fabrication and wall finishing on site.
- The TRL-level of the PnP-product is determined by the TRL-level of all steps in the 4M-process.



MEETINGS AND WORKSHOPS

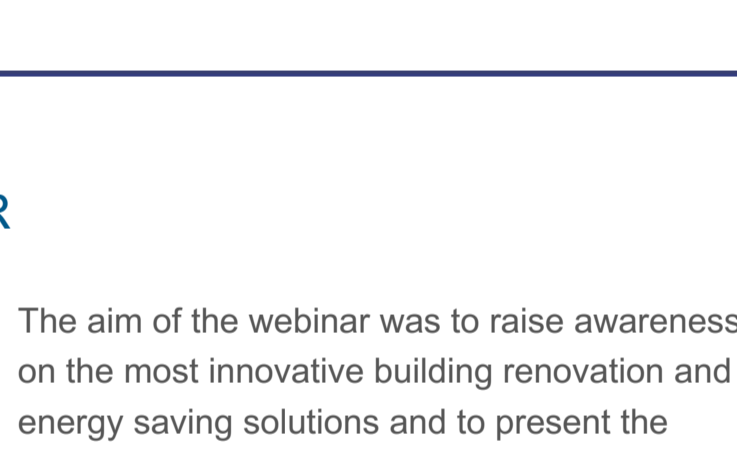
SUSTAINABLE PLACES



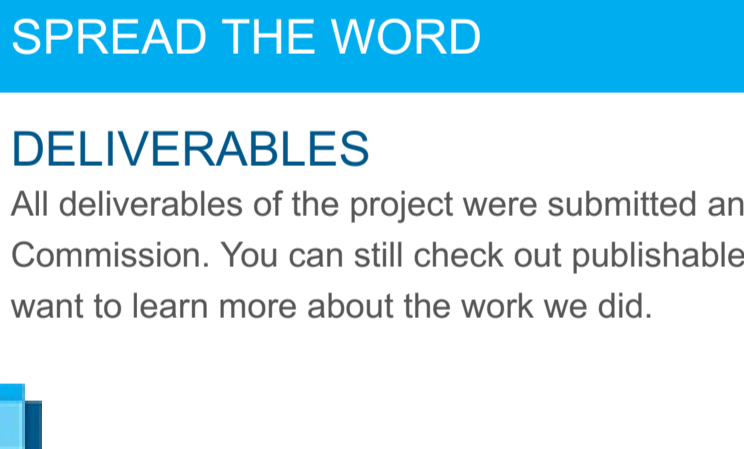
Sustainability targets and climate change objectives cannot be met without addressing buildings and the built environment at the building, district and urban scale to include our transport and energy infrastructures. The conference is renowned for showcasing results coming out of the EU Horizon 2020 Framework Programme via the participation of cutting-edge research and innovation projects, like P2Endure.

EU INDUSTRY DAYS

P2Endure was featured in the main exhibition of the 4th edition of the European Industry Days 2021 which aims to present the Commission's strategic approach to industrial policy and actions to further develop industrial competitiveness in Europe. The event also served as a forum where stakeholders contributing to the European industrial competitiveness showcased their activities, learnt from each other, discussed cross-cutting issues and developed joint visions for the future.



DEEP RENOVATION JOINT WEBINAR



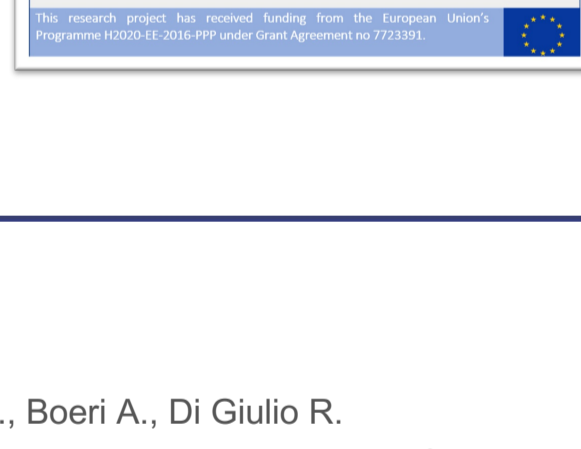
The aim of the webinar was to raise awareness on the most innovative building renovation and energy saving solutions and to present the technologies developed by three innovative projects co-funded by the European Commission in the framework of Horizon 2020 research and innovation programme: P2Endure, ENVISION and EENSULATE

SPREAD THE WORD

DELIVERABLES

All deliverables of the project were submitted and are waiting for the approval from the European Commission. You can still check out publishable summaries of the [deliverables on the website](#) if you want to learn more about the work we did.

DISSEMINATION



PUBLICATIONS

- A joint (peer-reviewed) paper: Piaia E., Turilazzi B., Longo D., Boeri A., Di Giulio R. (2019). [Innovation process and Plug-and-Play technologies for building deep renovation](#) for Techné – Journal of Technology for Architecture and Environment, UniFi Press, Florence (Italy), ISSN 2239-0243
- 'Deep Renovation of the European building stock adopting Plug-and-Play solutions' (2019) E. Piaia, R. Di Giulio, B. Turilazzi, G. Bizzari, L. Ferrari, S. Brunoro . Paper under review; publication expected soon by the RDBC2020 conference (Pennsylvania, USA)
- [A Product-Centric Approach for Assessing the Energy Performance of Solution for Building Renovations](#) (2019) Christoph Bindal-Gutsche, Timo Hartmann, TUB. The paper is now published in the EG- IEG Conference Proceedings and it has been presented during the workshop session on Life-cycle Design Support I (30 June – July 03 2019)
- Sustainable Places SP2019 Conference paper - Schippers-Trifan, O. et al. (2019) [Exploitation of Business Models for Deep Renovation](#). In: The proceedings of the Sustainable Places 2019 (SP 2019). Basel, Switzerland: MDPI, pp. Proceedings 2019, 20,11

PRESENTATIONS

- Sustainable places. Presentation about [Gdynia demonstration case](#)
- 04/12/2019 Lecture for professional group. Theme: Making homes more sustainable requires an integral approach. See the presentation: [CAST & Co](#)
- 6/08/2019 Industrial-KIC conference Berlin, DE. [Presentation by TU Berlin](#)
- 30/06 – 03/07 / 2019 [EG-ICE \(Intelligent Computing in Engineering\) conference](#) in Leuven, BE. See the presentation:
- /06/2019 [Presentation on P2ENDURE](#) during Sustainable Places 2019. Combined presentation of the joint workshop Exploitation of business models for Deep Renovation.
- /06/2019 Industrieauseminar Vienna, AT. Presentation on [Building of knowledge network between various stages of different building renovation projects](#)

END OF THE PROJECT

CONCLUSIONS

In 11 demonstration cases, spread over Europe, 7 PnP Prefab state-of-the-art prototype solutions supported with 3 onsite 3D technologies and ICT tools have been applied. During the 4,5 years duration of the P2Endure project these solutions, technologies and tools have been optimized to a level up to TRL8+ to be applied for holistic deep renovation.

- In the demonstration cases the running time from order to final delivery of deep renovation products is reduced to 50%, compared to a traditional approach, due to more efficient design/engineer solutions and reduction of the production time.
- The time of disturbance for residents, related to on site assembly, is reduced.
- The net primary energy after renovation is reduced to at least 60% in most demonstration cases, resulting in considerable improvement of the indoor environment quality.
- By utilizing BIM-based Augmented Reality (BIM AR) for self-instruction and self-inspection quality gaps between the off-site designed/manufactured and on-site realized/assembled PnP prefab solutions have been prevented.
- Life Cycle Cost (LCC) using PnP solutions is 15% less than the traditional comparative cost of deep renovation.

During the duration of the project a wide range of activities have been applied in order to disseminate the P2Endure outcomes among real-estate clients, end-users, policy makers and industrial partners to facilitate and stimulate value-chain integration of P2Endure innovation. Within P2ENDURE, the wider impacts on replication and market upscaling were guaranteed by a Technology Commercialization Platform (TCP). The local factory concept supported by district-oriented e-Marketplaces will allow innovative talents across Europe to start their own business around deep renovation activities within their districts.

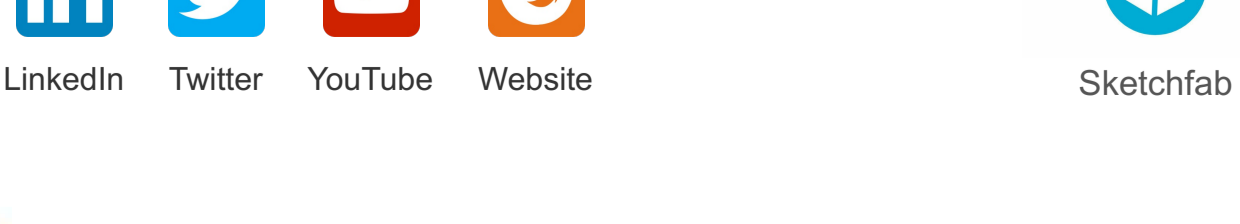
FINAL WORDS FROM THE PROJECT COORDINATOR

When we started this project P2Endure, we did not expect yet that we had rightfully chosen this name. We had to endure, since it took longer than originally planned due to the COVID-19 Pandemic. The journey of the past five years has not been always like we expected beforehand. It has not always been easy along the road. But with such diverse, strong and professional partners in the P2Endure consortium we were always able to challenge ourselves and to deliver innovative Plug and Play solutions in this great team. The extension of the project enabled us to not only come up with these innovative solutions in difficult times, but also to test and monitor them thoroughly. The objective to improve the availability and performance of energy saving solutions for deep renovation and transformation of buildings is needed more than ever. Our solutions can face and contribute the challenges related to the renovation wave, changing ways of living and working sped up by COVID and the climate change. Therefore I can say with pride that we enjoyed working on this project and have been able to contribute to a more sustainable Europe. I would like to express my gratitude to all of those who have contributed.

And if you are interested in concrete application and benefits, don't hesitate to contact us. The project has come to an end, but the application of the solutions has just been started! So let's practice to endure!

Andre van Delft
Director DEMO Consultants

CONSORTIUM



This project is funded under the EU Programme H2020 - EE - 2016 - PPP (Supporting accelerated and cost-effective deep renovation of buildings through Public Private Partnership) under the Grant Agreement Number 723391. The information in this publication does not necessarily represent the view of the European Commission.

This email has been sent to {{email}}.
If you no longer want to receive this newsletter, you can unsubscribe here.
You can also view and edit your subscription.
Please add mija@demov.nl to your address book to ensure our emails continue to reach your inbox.