

Plug-and-Play product, process and sensing innovation for Energy-efficient Building Deep Renovation

P2ENDURE



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DURATION
48 months



Deep Renovation Joint Workshop P2ENDURE TCP Event

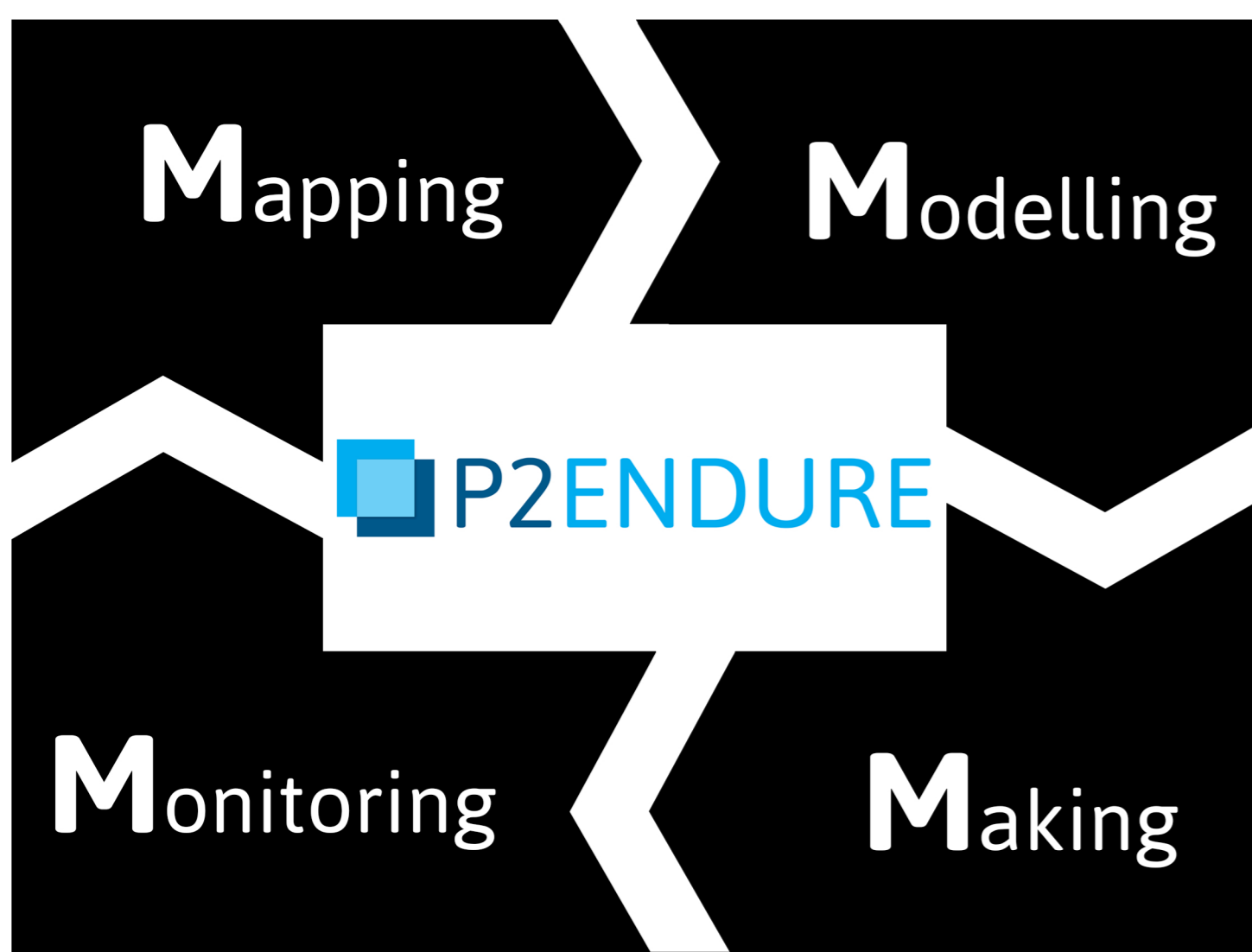
Project Summary

The **P2ENDURE project** aims to provide scalable, adaptable and ready-to-implement prefabricated Plug-and-Play (PnP) technologies for deep renovation of building envelopes and technical systems. These innovative solutions are applicable to transform non-functioning or sub-optimal public and historic buildings into dwellings and are applicable for the widest range of building typologies, i.e. public buildings, residential buildings, and transformation projects. The main innovation of P2ENDURE comprises PnP prefab systems enabled by 3D printing, innovative sensing technologies, such as laser scanning, thermal scanning and IEQ monitoring, also integrated with BIM.

P2ENDURE presents a proof-of-performance of the optimised PnP renovation techniques by implementing 10 large-scale and live demonstration projects that represent the main deep renovation typologies and real market demand in 4 EU geo-clusters. www.p2endure-project.eu



BIM-based Innovative Process and Tools for Building Deep Renovation



The **4M modular process** is a stepwise approach for preparing and implementing the deep renovation of buildings making use of PnP based innovative deep renovation products, followed by real monitoring of the resulting performance improvements. The main stages of the modular process are:

Mapping: detailed technical plan and economic feasibility report for deep renovation, as a starting point for the renovation design.

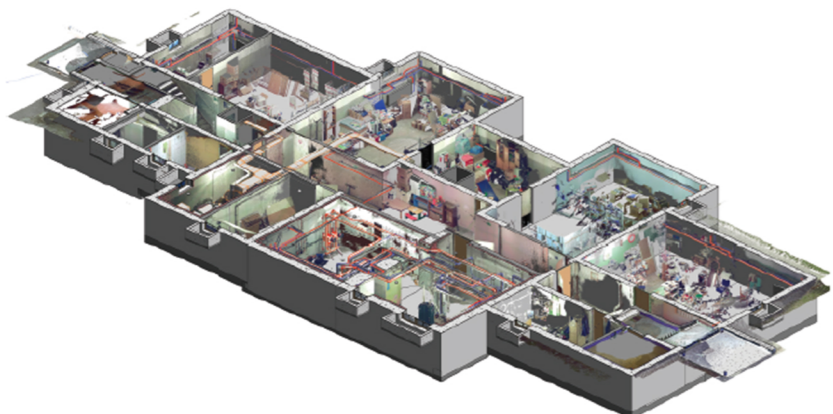
Modelling: deep renovation design ready for execution with advanced Building Information Modelling (BIM) and Building Energy Modelling (BEM) of the existing buildings and deep renovation designs.

Making: deep on- and off-site renovation activities with improved, tested and implemented innovative PnP based deep renovation products.


Monitoring: monitor and guarantee the high-quality execution of the construction works, and to monitor the Indoor Environmental Quality and Energy performance after deep renovation.

Mapping

3D Laser Scanning and building survey for detailed mapping of the existing situation (indoor and outdoor). Conversion of point cloud to BIM.

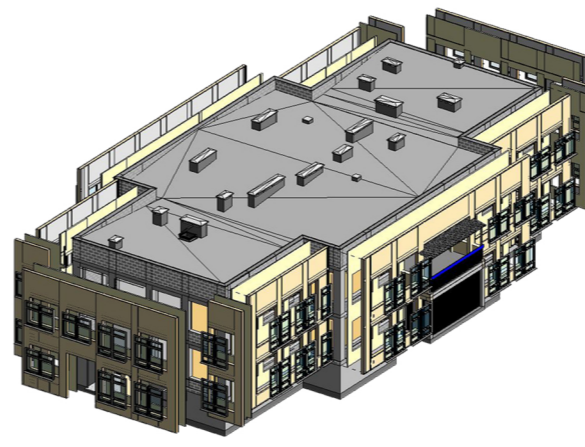


Data Collection for building auditing, using DEMO RE Suite tool on smart devices for simplified operation. Use of sensor networks for comprehensive mapping.

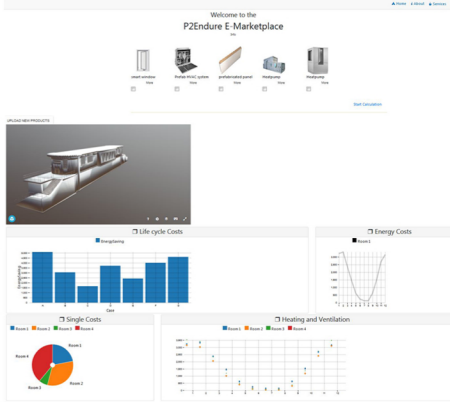


Modelling

BIM Modelling of the As-Is building, BIM-to-BEM process for semi-automated conversion to energy model for accurate performance assessment.




Renovation Design with PnP solutions as prefabricated panels, smart windows and HVAC engine with E-Marketplace and Parametric Modeller.



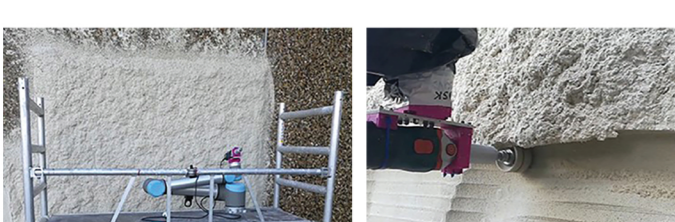
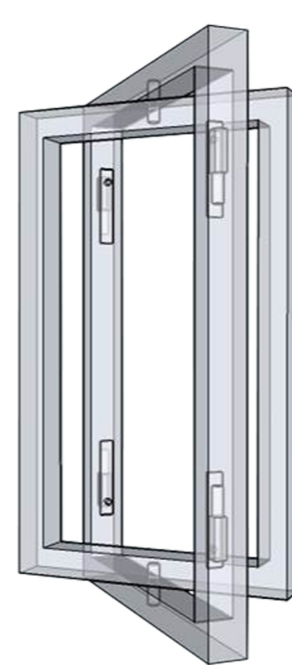
Making

Off-site renovation activities with prefabrication of Fermacell panels from BIM design, ready for installation on site.

Fabrication of smart windows: a reversible system for improved performance.




On-site renovation activities with innovative techniques as 3D printing and robotics.

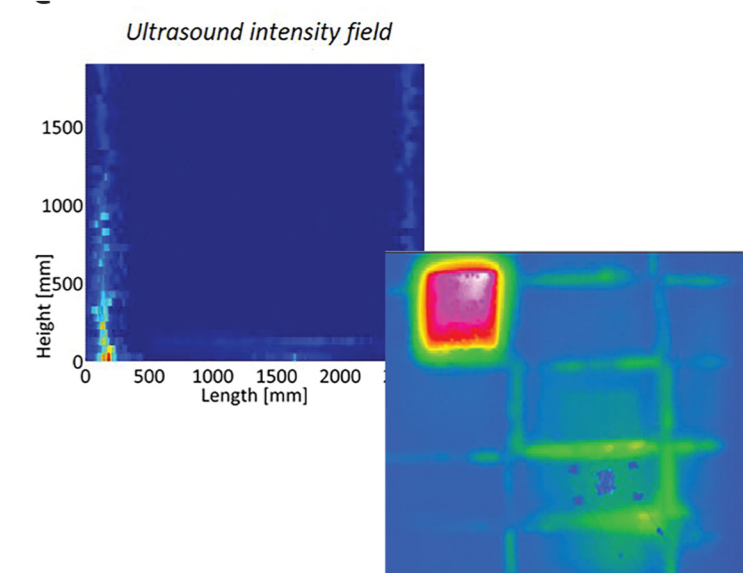



Monitoring

Comfort Eye for IEQ monitoring and assessment, monitoring thermal comfort according to ISO7730 and IAQ. Patented solution from UNIVPM



Performance Verification of the renovated building for guaranteed compliance with the design. Acoustic and thermal scanning of the envelope for leakages and thermal bridges detection.



Acknowledgments

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