Technical goals

- Implement a new ***Methodology for Plug-and-Play deep renovation.***
- Ensure the ***readiness of Plug-and-Play solutions*** (Building Envelope and Technical Systems retrofits).
- Configure and use ***supporting ICT tools*** (BIM, BEM, software tools).
- ***Demonstrate*** in real deep renovation projects.
- **Improve Indoor Environmental Quality** for end users.

Start date: 1 September 2016

Duration: 48 months

Partners: 16, including
8 SME´s
5 Industries
2 Research Organizations
1 Public Body

P2ENDURE

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

Measureable indicators of achievement

- At least ***60% energy saving*** (more energy-efficient compared to before renovation).
  - Implementation of Plug-and-Play prefab solutions for retrofit of building envelopes and technical systems.
  - Energy label improvement through transformation from obsolete public buildings to dwellings.
- At least ***15% cost saving*** (cheaper compared to traditional renovation techniques).
  - Major labour cost reduction through PnP installations.
  - Avoidance of construction failure or rework cost on-site thanks to validated Plug-and-Play solutions.
- At least ***50% time saving and less disturbance*** during deep renovation (faster compared to traditional renovation techniques).
  - 50% faster from production to on-site assembly.
  - Plug-and-Play prefab solutions ready to be implemented without structural changes of the existing building.

More information and contact

For more information, refer to our website ***www.p2endure-project.eu*** where the public deliverables and additional information are found.

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*P2Endure promotes **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 **11 real projects, 2 virtual demonstrators** in 4 geo-clusters with EU-wide replication potentials.*

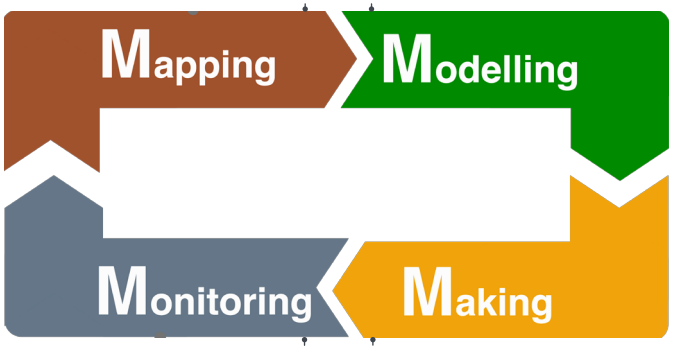
www.p2endure-project.eu

The P2ENDURE 4M process

Stepwise approach for preparing and implementing the deep renovation, followed by real monitoring of the resulting performance improvements.

Purpose: to develop a detailed technical plan and economic feasibility report for deep renovation, as starting point for the renovation design.
'3D scan to BIM' process.

Purpose: to develop the deep renovation design ready for execution.
'BIM to BEM' process.

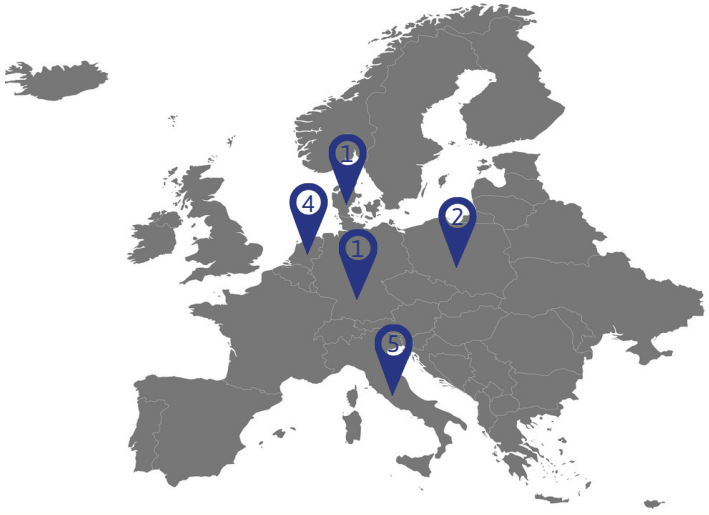


Purpose: to improve, test and implement PnP prefab components for deep renovation and to execute deep renovation activities.

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

P2ENDURE demonstration cases

- Nursery building in Warsaw (Poland)
- Nursery building in Gdynia (Poland)
- Nursery building in Genoa (Italy)
- Residential district in Ancona (Italy)
- Residential district in Utrecht (The Netherlands)
- Residential district in Lekkerkerk (The Netherlands)
- Residential district in Korsløkken (Denkmark)
- Historic building in Reggio Emilia (Italy)
- Historic residential building in Florence (Italy)
- University building in Enschede (The Netherlands)
- Office building in Menden (Germany)
- Historic monastery building in Tilburg (The Netherlands, virtual demonstration case)
- District renovation in Palmanova (Italy, virtual demonstration case)



P2ENDURE Solutions

- **Components for building envelopes**
  - Lightweighted Plug-and-Play façade panels
  - Plug-and-Play façade elements
  - Smart Energy Efficient windows
  - Rooftop retrofitting / Extension module

- **Technical systems**
  - Plug-and-Play bathroom unit
  - Plug-and-Play HVAC system
  - IEQ control systems
  - Connection to energy grid and RES production

- **On-site 3D technologies**
  - On-site 3D printing and robotics
  - 3D scanning (geomatics) - laser and photogrammetry

- **ICT Tools for deep renovation**