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Introduction to P2ENDURE

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

• Start date: 1 September 2016
• Duration: 48 months
• Partners: 16 (8 SME, 5 IND, 2 HES/RES, 1 PUB)
• **Main mission of P2Endure:**
  Give evidence of the innovative added value of Plug-and-Play solutions for deep renovation

• **Technical goals:**
  – Implement a new 4M Methodology for PnP deep renovation
  – Ensure the readiness of PnP solutions (building envelope and MEP retrofits)
  – Configure and use supporting ICT tools (BIM, BEM, software tools)
  – Demonstrate in real deep renovation projects
• **Measureable indicators of achievement:**
  – At least 60% energy saving (more energy-efficient compared to before renovation)
  – At least 15% cost saving (cheaper compared to traditional renovation techniques)
  – At least 50% time saving (faster compared to traditional renovation techniques)
### New systems, technologies and non-technological innovations

#### 1. Integrating and optimising PnP prefab systems and on-site 3D technologies for deep renovation:

<table>
<thead>
<tr>
<th>PnP prefab systems and on-site 3D technologies</th>
<th>PnP components for building envelopes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PnP technical systems</td>
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<tr>
<td></td>
<td>On-site 3D technologies</td>
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</tbody>
</table>

#### 2. Implementing PnP and on-site 3D innovations through 4M modular processes and ICT tools:

<table>
<thead>
<tr>
<th>Modular processes and ICT tools for deep renovation</th>
<th>4M modular processes: Mapping – Modelling – Making – Monitoring</th>
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<tbody>
<tr>
<td></td>
<td>e-Marketplace value-chain integration &amp; local factory for district logistics</td>
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<td>BIM-based lifecycle information management</td>
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</table>

#### 3. Demonstrating and upscaling the innovative products, processes and tools in real projects:

<table>
<thead>
<tr>
<th>Evidence-based deep renovation solutions with performance monitoring</th>
<th>Deep renovation of public and historic buildings</th>
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<tbody>
<tr>
<td></td>
<td>Deep renovation of residential buildings and districts</td>
</tr>
<tr>
<td></td>
<td>Transformation of public and historic buildings to dwellings</td>
</tr>
</tbody>
</table>
• Deep renovation of nursery building in Genoa, IT

– **Data collections** for building auditing using DEMO RE Suite mobile inspection tool for simplified operation

– **BIM modelling** of the As-Is building
• Deep renovation of nursery building in Genoa, IT

– Renovation Design with PnP solutions as smart windows and HVAC engine with e-Marketplace and BIM parametric Modeller

– Results of BIM-to-BEM process for semi-automated conversion to energy model for accurate performance assessment
• Nursery building in Warsaw, PL
  – Lightweight **PnP panels** (Fermacell)

• Residential building in Odense, DK
  – Robot for **3D printing** on-site (Invela)
- Renovation activities: fabrication and implementation of smart windows from Bergamo Tecnologie – a reversible system for improved performance
4M - MAKING

- Student housing in Enschede, NL

- Prefabricated bathroom units

12/02/2019 www.buildheat.eu
• Nursery building in Warsaw, PL

- 3D Point Cloud from laser scanning
- PnP rooftop retrofit solution (PANplus Architecture)
- PnP façade retrofit solution (Fermacell)
– **Comfort Eye** from Università Politecnica delle Marche for IEQ monitoring and assessment, monitoring thermal comfort according to ISO7730 and IAQ
More info about P2Endure:
www.P2Endure-project.eu