RINNO: Transforming Deep Renovation through an Open Renovation Platform

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CESI Ecole d’Ingénieurs
Head Specialised Master Project Management with BIM and Digital Twins Programme

ESTP Paris
AI, BIM, GIS, and other modelling systems

IRSTEA
ActiSurTT Project: Vehicle safety for off-road environments. AI and Human-Machine Interfaces.

PNR MINnD
Interoperable Information Model for Sustainable Infrastructures

GeoFuse
Multi-Source Geo-Information Fusion

ACCLIMAT
Adapting cities to climate change: A systemic modelling approach
The RINNO Project

A €5m Horizon 2020 project that aims to accelerate the rate of deep renovation in energy inefficient buildings around Europe, resulting in:

- Significant primary energy savings
- Decreased time and cost of deep renovation efforts
- Reduced environmental impact
The RINNO Consortium

RINNO is a joint effort of 17 partners from 10 countries, including 10 industrial partners, 6 academic and research partners, and 4 project end-users:

- **Basic / Applied Research**
  - CERTH-ITI, CIRCE, VTT, Northumbria University

- **Technology Providers**
  - Pink, K-FLEX, Ekolab, Greenstruct

- **Construction Methods**
  - Bouygues, RINA-C

- **Business Modelling**
  - REGENER, RINA-C

- **Dissemination & Communication**
  - Dublin City University, European Green Cities

- **End Users**
  - Bouygues, Avedøre Boligselskab, HPHI, NAPE
The EU building stock currently accounts for a major portion of energy consumption and greenhouse gas emissions:

- 40% of the EU’s energy consumption and 36% of greenhouse gas emissions can be attributed directly to the EU building stock.
- 11% of Europe’s population still experiences energy poverty due to poor building quality and thermal inefficiency.
- The European Commission estimates that approx. 75% of the EU’s existing building stock has poor energy performance.
What is deep renovation?

Deep Renovation is a renovation that captures the full economic energy efficiency potential of all improvement works to existing residential buildings that leads to a very high energy performance and significant energy savings.
Deep renovation assumes the use and combination of multiple simultaneous renovation measures

- Fabric measures
- Windows
- Heating, Ventilation and Air Conditioning (HVAC) plant

- Solar Hot Water
- Solar Photovoltaic (PV)
- Passive Solar
- Shading
- Wind
- Heat Pumps
- Biomass
- Biogas

- Air infiltration
- Lighting
- Appliances

- Co-generation
- District Heating Systems
There are a wide range of rationales and benefits associated with deep renovation

**Economic**
Deep renovation may act as an economic stimulus across the deep renovation value chain

**Societal**
Deep renovation may help citizens participate in a more resilient, greener and digitalised society and function more fully in society

**Energy Security**
Deep renovation may contribute to greater energy security

**Catalytic**
Deep renovation may act as a catalyst for other innovations, substitute technologies or processes and improved control techniques in direct and indirect sectors

**Environmental Sustainability**
Deep renovation may contribute to mitigating adverse environmental impacts and building a resilient habitat for existing and future residents

**Opportunistic**
Deep renovation may differentiate a building and may make it a more attractive place to live, work or visit, when compared to other buildings

**Quality**
Deep renovation may improve building quality and increased range, quality and efficiency of service delivery

**Accessibility**
Deep renovation may contribute to improved accessibility
A number of factors contribute to non-adoption and resulting under-performance, unnecessarily high energy use levels and costs.

**Human**
- Social norms and habits
- Lack of information on alternatives
  - Split incentives
  - Lack of instruction
  - Short termism
  - Disturbance

**Organisation**
- Top management commitment
  - Finance
- Competent people
  - Fit-for-purpose infrastructure

**Technology**
- Feasibility or technical suitability of specific technologies
- Integration of technologies

**External Environment**
- Building and environmental standards, policies and regulations
- Borrowing capacity
- Market barriers
RINNO will deliver a set of processes that when working together provide a system, repository, marketplace and enabling workflow process for managing deep renovation projects from inception to implementation.
To deliver these processes, RINNO will employ:

- **Innovative technologies**, including building envelope solutions, reusable energy sources, hybrid and storage solutions;

- **Novel processes**, including off- and on-site industrialization and optimization;

- **Collaborative financing business models** based on crowd equity, crowdlending, and energy performance contracting.
Deep renovation projects require an integrated design and delivery software-based platform

Full-life Cycle
Multi-stakeholder
Modular
Open Collaboration
Algorithmic
Scalable
Secure
The RINNO Stepwise Renovation Framework

1. External UI
2. Planning & Design Assistant
3. Multi-sensor Network
4. Retrofitting Manager
5. Building Lifecycle Renovation Manager
6. Renovation Workflow & Transactions Manager
7. Renovation Repository
8. Phase 1: Planning & Design
9. Phase 2: Retrofitting
10. Phase 3: Operation & Monitoring
11. Phase 4: End of Life
RINNO technologies and processes will be tested at four locations, each with different environmental, societal, technical, and financial parameters.

Success will be evaluated based on:

- Reduced energy consumption;
- The adoption and use of renewable energy sources;
- Thermal performance;
- Renovation time and effort and comparative cost;
- Stakeholder satisfaction measures.
A multi-owner residential building constructed in 1949:

- Solar panels to cover the electricity demand of common areas.
- Hybrid ventilation and thermal insulation from recycled materials.
- Improved thermal comfort, reduced energy use, and lower costs.

Pilot Site: Rajszew, Poland
Pilot Site: Avedøre Stationsby, Denmark

2,500 multi-family flats and terraced houses built in 1976:

- New roofs and insulation, fitted with electro mobility chargers.
Pilot Site: Moschato–Tavros, Greece

Multi-family residential building constructed in 1970:

- Renovated according to Passive House Premium standards.
- To become the first EnerPHit Premium building in South-Eastern Europe.
Pilot Site: Lille, France

30 multi-family residential apartments:

- Optimisation of energy, indoor air quality and comfort monitoring.
- Integration of renewable sources and efficient energy production systems.
- Active involvement of tenants through votes on work amount and rent increases.
Thank You