RINNO

Deep Renovation Market Briefing

Theo Lynn
Manan Guliani
Antonia Egli

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Introduction

The building sector is a cornerstone of both economic activity and environmental impact. It accounts for a significant share of global energy consumption and greenhouse gas emissions. In this context, the concept of deep renovation has emerged as a pivotal strategy for achieving ambitious climate and energy goals. As policymakers, industry stakeholders, and building owners increasingly recognise the urgency of decarbonising the built environment, deep renovation stands out as a critical pathway for sustainable development and long-term resilience.

This market briefing provides an overview of the deep renovation landscape, starting with a clear definition and categorisation of the measures that underpin deep renovation. It highlights the multiple benefits associated with this transition, including economic growth, job creation, improved building quality, occupant wellbeing, and significant reductions in energy use and carbon emissions. A detailed PESTLE analysis explores the political, economic, social, technological, legal, and environmental factors shaping the market across Europe. The role of deep renovation within the European Union's broader decarbonisation strategy is examined, alongside key enablers such as financing mechanisms, regulatory frameworks, and innovative delivery models. The briefing concludes with summary of market trends, emerging technologies, and challenges, offering stakeholders a clear understanding of both the opportunities and constraints influencing the future of deep renovation.

What is deep renovation?

Deep renovation, also known as deep energy renovation, is defined by Recital 16 of EU's Energy Efficiency Directive 2012/27/EU as renovation:[1]

> "...which leads to a refurbishment that reduces both the delivered and the final energy consumption of a building by a significant percentage compared with the pre-renovation levels leading to a very high energy performance."

While the exact quantitative performance reference value has remained ambiguous since the introduction of the concept, at its core, deep renovation combines several renovation measures into one integrated strategy[1]. Although these measures evolve with time, three categories are common.[2] These are:

1. Energy Efficiency: Fabric measures, windows, heating, ventilation and air conditioning (HVAC), air infiltration, lighting and appliances, etc.

2. Renewable Energy: Solar hot water, solar photovoltaic (PV), passive solar, shading, wind, heat pumps and biomass and biogas.

3. Community Energy: Cogeneration (process of generating electricity and heat/steam from one fuel source like natural gas, biogas) and district heating systems.

[1] Agliardi, E., Cattani, E. and Ferrante, A. (2018) 'Deep Energy Renovation Strategies: A real option approach for add-ons in a social housing case study', Energy and Buildings, 161, pp. 1–9.

[2] Bruel, R.; Fong, P.; Lees, E. A Guide to Developing Strategies for Building Energy Renovation; Buildings Performance Institute Europe: Brussels, Belgium, 2013

Benefits of Deep Renovation

The benefits related to deep renovation, include, but are not limited to:

1. Economic Support: it contributes to the area revitalisation, direct and indirect employment opportunities, GDP, property values, export growth, and public finances while also reducing energy costs and exposure to price fluctuations and import costs.

2. Citizen Help: It can help the citizens of an area engage in a more resilient, greener, and digital society by reducing fuel poverty, improving health, and enhancing overall quality of life.

3. Sustainability: By improving energy performance, reducing demolition and waste, and cutting greenhouse gas emissions, it can contribute to environmental protection, fostering more resilient habitats with lower pollution.

4. Innovation: Deep renovation can act as a driver of innovation, encouraging new technologies, improved control systems, and technical progress in related sectors, influenced by both policy and competition.

5. Building Quality: it may also improve building quality through better design, safety, aesthetics, and usability. [3]

[3] Lynn, T. et al. (2021) 'Rinno: Towards an open renovation platform for integrated design and delivery of deep renovation projects', Sustainability, 13(11), p. 6018.

Market Structure and Trends

Buildings and construction play a central role in the climate crisis. According to the UN Environment Programme, buildings were responsible for 34% of global energy demand and 37% of energy and process-related CO_2 emissions in 2022. This is due both to the operational energy used for heating, cooling, and lighting and the embodied emissions from materials like cement, steel, aluminium, and glass. Retrofitting existing buildings offers significant carbon advantages: it emits 50–75% less carbon than demolishing and constructing a new equivalent building.[4] Consequently, deep renovation is globally recognised as a key mitigation pathway for the building sector.

In the EU, building stock is responsible for around 36% of emissions and 40% of energy consumption. Consequently, the EU has positioned deep renovation as a cornerstone of its decarbonisation strategy.[5] The European Green Deal (2019), Fit for 55 Package (2021–2023), and the Energy Performance of Buildings Directive (EPBD) (2024) all form a legislative and financial architecture aimed at triggering a renovation wave across the continent. The Renovation Wave Strategy[6] aims to at least double renovation rates and renovate 35m buildings by 2030. However, the current average renovation rate remains just 1.2% per year, with deep renovations accounting for only a small fraction.[7]

The EU building renovation market was valued at approximately US$956.88 billion in 2021 and was projected to grow to US$1,012.47 billion by 2026, reflecting the region's strategic focus on transforming its building stock to meet energy and climate objectives.[8]

[4] Rosenbloom, E., Magwood, C., Clark, H. and Olgyay, V. (2023) Transforming Existing Buildings from Climate Liabilities to Climate Assets, RMI.
[5] European Commission, 2019. The European Green Deal (COM(2019) 640 final). European Commission.
[6] European Commission, 2020. A Renovation Wave for Europe – greening our buildings, creating jobs, improving lives (COM(2020) 662 final). European Commission.
[7] European Union, 2024. Directive (EU) 2024/1275 of the European Parliament and of the Council of 24 April 2024 on empowering consumers for the green transition through better protection against unfair practices and better information. Official Journal of the European Union, L , 29.4.2024, p. 1–16.
[8] Daedal Research (2022) Europe Building Renovation Market: Size and Trends with Impact of COVID-19 and forecast up to 2026.

Enablers of Deep Renovation

The deep renovation market is shaped by numerous marker drivers, these include:

- Political factors: Obligatory EU climate targets to 2050 under the Climate Law, [9] the EPBD (2024)[7] and EU Green Deal (2019).

- Economic incentives: €86 billion Social Climate Fund (2023)[10] and strong alignment with the SME-construction market and energy savings driving ROI from renovations.

- Increasing public concerns: These include energy poverty and demand for healthy, comfortable homes. Additionally, increase in tenant protections, Energy Performance Certificates (EPCs), and renovation passports.

- Environmental factors: Carbon assessments using EN15978, promotion of circular construction, and EU 2030 targets.

[9] European Commission, 2022. Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions: REPowerEU Plan. COM(2022) 230 final. Brussels: European Commission.
[10] European Commission, 2023a. Commission welcomes adoption of two final pillars of its 'Fit for 55' legislative package, putting EU on track to exceed 2030 targets. Press release IP_23_4754, 9 October 2023. Brussels: European Commission.

Barriers to Deep Renovation Adoption

The deep renovation market faces several persistent challenges that can delay or limit the uptake of energy-saving technologies and large-scale renovation projects. These include:

- Rising construction costs: Inflation, increased material prices, and supply chain pressures are driving up overall project costs, making deep renovation less affordable for many.
- Limited access to financing: Smaller landlords, SMEs, and owner-occupiers often struggle to secure affordable funding despite available incentives, creating inequality in renovation opportunities.
- Skills shortages: A lack of trained professionals and skilled labour slows project delivery, particularly for more complex retrofits involving advanced energy-saving technologies.
- Uneven policy implementation: Variations in how EU renovation directives are applied at the national level create uncertainty for investors, builders, and homeowners.
- Low public awareness and social resistance: Many households remain unaware of the long-term benefits of renovation or are reluctant to face temporary disruptions during construction.

PESTLE ANALYSIS OF THE DEEP RENOVATION SECTOR

Factor	Drivers	Prob.	Impact	Implications and Source(s)
Political	• Binding EU climate targets to 2050 under the Climate Law • European Green Deal (2019) • Revised Energy Performance of Buildings Directive (2024) • National Recovery and Resilience Plans (NRRPs)	High	High	Strong regulatory certainty and long-term vision, particularly on the doubling of renovation rates and mandatory MEPS for worst-performing buildings, will drive renovation demand.
	• Geopolitical tensions (e.g. Ukraine war) • Shifting political priorities across Member States	Uncertain	High	Energy security imperatives accelerate decarbonisation, but national divergence in ambition may pose risks
Economic	• €86 billion Social Climate Fund (2023) • EBPD rent safeguards • Strong alignment with SME-construction market • Energy savings driving ROI from renovations	High	High	Increased financing support for energy efficiency investments and building upgrades, especially for low-income groups. New rent protections and national incentives target vulnerable households, ensuring equitable renovation access.
	• Access to capital for deep renovation • Inflation and construction material costs	Uncertain	High	Despite incentives, high upfront costs remain a barrier; requires bundling of financial and technical services such as one-stop-shops and greater accessibility to financing.
Societal	• Public concern over energy poverty • Demand for healthy, comfortable homes • EU-wide energy poverty definition (2023) • Increased tenant protections, EPCs, and renovation passports	High	High	Strong case for socially inclusive renovation policies; key to securing citizen support. Citizen-facing tools (passports, digital EPCs) and safeguards improve engagement and reduce displacement risk.
	• Low renovation awareness or engagement in certain demographics • Workforce shortages and skill deficits	Uncertain	High	Reports suggest that only 11% of EU buildings are renovated each year, with energy renovation at just 1%, and deep renovation at a mere 0.2%. Social acceptance and skilled labour availability will shape the pace of renovation delivery.
Technological	• Growth in prefabricated and modular renovation systems • Digitalisation (BIM, AI for building diagnostics) • Smart heating and renewable integration	High	High	Technologies enable cost/time efficiencies and performance monitoring; support for digital twin modelling in the revised EPBD supports adoption.
	• Tech maturity for mass deployment • Cybersecurity and smart tech interoperability	Uncertain	Medium - High	Standardisation and regulatory alignment needed to scale innovations and protect users.
Legal	• Fit for 55 Package sets cross-sectoral climate targets • Revised EPBD introduces MEPS, renovation passports, and zero-emission building standards • Phase fossil boiler ban by 2025	High	High	Legal drivers require national and local alignment; permits enforcement across building stock, including private housing.
	• Variability in national implementation • Lag in local regulatory capacity	Uncertain	Medium	Local permitting and compliance gaps can delay impact; capacity-building essential.
Environmental	• LCA disclosure mandatory for new buildings from 2028-2030 • Whole-life carbon assessments using EN15978 • Promotion of circular construction • EU 2030 targets: 55% GHG reduction, 42.5% renewables, 11.7% energy efficiency improvement	High	High	Renovation central to decarbonisation pathway; key to meeting climate targets cost-effectively. Strong new mandates on embodied carbon and material reuse reinforce low-carbon renovation practices
	• Climate resilience, biodiversity, circularity in materials • Embodied carbon regulations emerging	Medium-Uncertain	High	Integrated design and low-impact materials required; growing attention to life cycle assessments and waste minimisation.

Trends in the Deep Renovation Market

Trend	Description
Need for Cost and Time Reduction	Streamlining renovation processes using prefabricated and modular solutions to reduce overall costs, time on-site, and disturbance to occupants. Projects increasingly demonstrate how to deliver deep renovation in a more efficient, scalable manner.
One-Stop Shop Models	The development and uptake of 'one-stop shop' services simplifies the complex renovation journey for homeowners by bundling technical, financial, and administrative support. These models are supported by national measures under the EPBD and NRRP funding.
Shift Towards Customer-Centred and Integrated Services	There is a strong trend toward consumer-friendly, faster, and more reliable services. This includes the use of digital EPCs, renovation passports, and personalised renovation roadmaps to enhance uptake and trust.
Addressing Non-Technological Barriers	Increasing efforts to overcome challenges such as high upfront costs, limited financing access for private owners, fragmented local regulations, and low public awareness. Financial innovations like guarantee schemes and public-private investment blending are gaining traction.
Increased Interest in Innovative Technologies	Rapid growth in prefabricated façade kits, plug-and-play systems, solar-integrated glazing, and low-temperature heating. These solutions support life cycle compliance and are aligned with EPBD and Fit for 55 targets.
Citizen Engagement and Awareness	Stronger emphasis on involving occupants in renovation decisions and improving awareness of energy efficiency benefits. This is especially important in multi-owner buildings and socially vulnerable communities.
Dominance of Shallow Retrofits	Despite policy efforts, shallow retrofits (<30% energy savings) remain common. This is due to high upfront costs, lack of clear performance data, and limited follow-up monitoring. Strategies to shift toward deep renovation are increasingly essential.

Conclusion

Deep renovation is entering a promising phase of scaling and impact, supported by robust EU policy, significant financing, and growing public demand for healthier, lower-cost, and more resilient buildings. Buildings account for a large share of energy use and emissions, and retrofitting offers major carbon savings compared to rebuilds, positioning deep renovation as a central lever for climate targets while unlocking economic growth, jobs, and higher property values.

A wave of innovation through prefabricated and modular solutions, one-stop shop models, and digital tools such as renovation passports and EPCs is reducing cost, time, and disruption, and making projects more consumer-friendly and reliable. Concurrently, financial innovations and blended public–private models are emerging to ease upfront costs and expand access, especially for private owners and SMEs, while citizen engagement is improving trust and uptake in complex ownership settings and vulnerable communities.

Challenges remain like rising construction costs, workforce bottlenecks, uneven national implementation, and the persistence of shallow retrofits but momentum is shifting as integrated, performance-led approaches demonstrate scalable delivery and deeper energy savings. Meeting Europe's 2030 objectives will require accelerating renovation rates, strengthening skills and supply chains, and maintaining predictable policy and market signals.

However, the enabling architecture is now in place, and the market's direction of travel is clear. In sum, deep renovation offers a compelling, near-term pathway to cut emissions, lower bills, and uplift wellbeing, while catalysing innovation and circularity across construction and thus turning today's building stock into tomorrow's efficient, comfortable, and future-proof assets.

ABOUT RINNO

RINNO is a four-year EU-funded research project that aspires to deliver greener, bio-based, less energy- intensive from a life cycle perspective and easily applicable building renovation elements and energy systems that will reduce the time and cost required for deep energy renovation, while improving the building energy performance. Its ultimate goal is to develop, validate and demonstrate an operational interface with augmented intelligence and an occupant-centered approach that will streamline and facilitate the whole lifecycle of building renovation.

For more information, please visit https://rinno-h2020.eu/

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