



# SmarterEPC

## D4.4 De-risking financing of energy efficiency and smartness upgrade measures



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## Document Information

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## Acronyms

| Acronyms | Description                                  |
|----------|----------------------------------------------|
| AI       | Artificial intelligence                      |
| AVM      | Automated Valuation Model                    |
| BACS     | Building Automation and Control Systems      |
| BIM      | Building Information Modelling               |
| CAPEX    | Capital Expenditure                          |
| CRR      | Capital Requirements Regulation              |
| CSRD     | Corporate Sustainability Reporting Directive |
| DR       | Demand Response                              |
| EBA      | European Banking Authority                   |
| EEM      | Energy Efficient Mortgage                    |
| EEMI     | Energy Efficient Mortgages Initiative        |
| EPBD     | Energy Performance of Buildings Directive    |
| EPC      | Energy Performance Certificate               |
| ESCO     | Energy Service Company                       |
| ESG      | Environmental, Social and Governance         |
| EVS      | European Valuation Standards                 |
| GAR      | Green Asset Ratio                            |
| IFC      | Industry Foundation Classes                  |
| IoT      | Internet of Things                           |
| LGD      | Loss Given Default                           |
| LTV      | Loan To Value                                |
| PD       | Probability of Default                       |
| PED      | Primary Energy Demand                        |
| RICS     | Royal Institution of Chartered Surveyors     |
| RWA      | Risk-Weighted Assets                         |
| SFDR     | Sustainable Finance Disclosure Regulation    |
| SRI      | Smart Readiness Indicator                    |

## Executive summary

Europe's transition to climate neutrality requires a profound transformation of the building sector, which remains central to both decarbonisation objectives and the sustainable finance agenda. Improving the energy performance of buildings is not only an environmental priority, but also a financial, social and market imperative. Energy-efficient buildings can reduce household energy costs, improve comfort and resilience to price shocks, support property value, and contribute to lower credit and collateral risk for financial institutions.

This report examines how the **Energy Performance Certificate (EPC)** and the **Smart Readiness Indicator (SRI)** can be operationalised as practical tools to de-risk and scale green finance for building renovation. EPCs provide a structured indication of a building's energy performance, while SRI adds a complementary perspective on a building's capacity to use smart technologies, interact with energy systems and support flexible, efficient consumption. Together, these instruments can improve transparency, strengthen risk assessment and support more informed lending, valuation and investment decisions.

The analysis is framed within the evolving European regulatory landscape, including the EU Taxonomy, the Energy Performance of Buildings Directive, the Corporate Sustainability Reporting Directive, Sustainable Finance Disclosure Regulation, European Banking Authority (EBA) expectations and national schemes. These frameworks increasingly require banks and investors to integrate sustainability, climate risk and energy performance data into their governance, risk management and disclosure processes. As a result, EPC and SRI data are becoming strategic inputs for green mortgages, portfolio monitoring, transition risk assessment and capital allocation.

Green finance cannot scale through isolated initiatives alone. It requires a coordinated ecosystem involving banks, homeowners, public authorities, insurers, construction companies, Energy Service Companies (ESCO), valuers and data providers. Each actor contributes to reducing uncertainty: banks design financial products and integrate climate-related risks; homeowners implement renovation measures; public authorities provide incentives, guarantees and data infrastructure; insurers mitigate performance risks; and valuers translate energy performance into property assessment practices. We highlight the importance of data quality, interoperability and digitalisation. Reliable EPC databases, digital renovation passports, smart meters, building logbooks and AI-enabled valuation models can support better credit decisions, improve ESG reporting and enable portfolio-level analysis. However, barriers remain, including fragmented data access, inconsistent methodologies, limited standardisation and the need for stronger public-private cooperation.

Integrating EPC and SRI into financial and real estate decision-making can help align climate objectives with financial stability. By improving transparency, reducing perceived risk and linking renovation benefits to measurable economic outcomes, these tools can accelerate investment in energy-efficient buildings and support a more resilient, inclusive and scalable green finance market.

# 1. Introduction

Europe's transition to climate neutrality places the building sector at the center of decarbonisation efforts and of the sustainable finance agenda. The revised policy framework is increasingly explicit that scaling renovation and improving building performance are not only climate priorities but also drivers of social outcomes such as energy affordability and resilience to energy price shocks. In this context, the mobilisation of private finance, alongside public support, becomes a necessary condition for achieving renovation targets at scale.

This report addresses how the Energy Performance Certificate (EPC) and the Smart Readiness Indicator (SRI) can be operationalised as pragmatic tools to de-risk green finance in the building sector. Building on the regulatory landscape and supervisory expectations, the report explains the transmission channels through which better energy performance improves borrower affordability and collateral resilience, and how standardised data and governance can support more robust credit and valuation practices. It then synthesises evidence and best practices, from green mortgages to portfolio monitoring and capital markets, and translates these insights into actionable recommendations for scaling.

The overarching message is that scale will not be achieved through isolated pilots alone. It requires:

- systematic data availability (starting from EPC at origination),
- an ecosystem that connects lenders, homeowners, public authorities and the renovation supply chain, and
- digital tools, including smart building technologies, capable of verifying performance and enabling continuous monitoring. In short, EPC and SRI are not only compliance instruments: when embedded into banking processes, they become enablers of a more resilient, measurable, and investable renovation market across Europe.

## 1.1. The need for a green finance ecosystem

The challenge is systemic. Scaling up green finance for energy efficiency requires a robust ecosystem that brings together homeowners, banks, insurers, construction companies, public authorities, and policy makers. Each actor plays a critical role, homeowners invest in upgrades, banks develop green financial products and integrate decarbonisation into their strategies, insurers adapt risk models, and governments provide incentives and regulatory clarity. The benefits are shared: reduced energy bills and improved comfort for households, lower credit and collateral risk for banks, new business opportunities for the construction sector, and progress towards climate and energy goals for society as a whole.

Addressing energy poverty is a central pillar of this approach. Millions of Europeans still struggle to afford adequate heating, cooling, and lighting in their homes. By targeting energy efficiency investments and supporting deep renovations, the EU's strategy aims to lift households out of energy poverty, reduce social inequalities, and promote a just transition.

## 1.2. Objectives and scope of the report

The objective of this report is to examine how Energy Performance Certificates (EPCs) and the Smart Readiness Indicator (SRI) can support the de-risking and scaling-up of green finance for energy efficiency and smartness upgrades in buildings. Addressed primarily to European policy makers, financial institutions and market stakeholders, the report explores how a coordinated ecosystem, combining reliable data, regulatory clarity, financial innovation and collaboration across the renovation value chain, can help mobilise private capital for building decarbonisation.

CRIF is a global company specialised in credit bureau services, business information, analytics, outsourcing and advanced digital solutions for financial institutions and enterprises. CRIF's experience, particularly in the Italian market, demonstrates that when this ecosystem is activated, supported by data, standards, and innovation, green finance can accelerate. Initiatives such as the Energy Efficient Mortgages Initiative (EEMI) and the DeliverEEM project have shown that integrating energy performance data (EPC/SRI) into credit risk models not only supports regulatory compliance (EU Taxonomy, EPBD, CSRD, EBA Guidelines) but also reduces default risk and enhances property value. Empirical evidence from Italy and other EU countries confirms that energy-efficient properties are associated with lower credit risk, providing a strong rationale for banks and investors to support the green transition.

This report, addressed to European policy makers, explores how the right ecosystem, regulatory framework, and market practices can de-risk and scale up green finance for energy efficiency. It draws on best practices and case studies from across the EU, with a focus on the Italian experience, and provides recommendations for building a resilient, inclusive, and effective green finance market, one that delivers on the EU's climate goals while tackling energy poverty and supporting social cohesion.

## 2. The role of EPC/SRI and the regulatory & market framework for de-risking green finance

### 2.1. The EU regulatory landscape (Taxonomy, EPBD, CSRD, EBA, national schemes)

In recent years, the European financial sector has faced a rapidly evolving regulatory landscape, with sustainability at the core of both national and EU policy priorities.

Policymakers, regulatory authorities, and supervisors are actively developing measures to foster long-term investments in environmentally sustainable activities, ensuring that banks address both direct and transition risks associated with climate change to safeguard financial stability. This has resulted in the introduction of binding regulations, voluntary standards, and guidance that have significantly altered the operating environment for banks, presenting both challenges and opportunities for institutions willing to adapt.

At the heart of this framework is the EU Taxonomy Regulation (EU 2020/852), which plays a central role by classifying environmentally sustainable economic activities and determining whether banks' operations are aligned with these criteria.

The Taxonomy Regulation (EU 2020/852) standardizes definitions of “green” activities, guides investments, and helps prevent greenwashing. Its scope extends to mortgage loans and their funding through covered bonds or securitization.

Furthermore, the Taxonomy underpins key EU disclosure legislation, including:

- the Corporate Sustainability Reporting Directive (CSRD), which requires companies to report detailed information on their environmental, social, and governance (ESG) practices;
- the Sustainable Finance Disclosure Regulation (SFDR);
- the Energy Performance of Buildings Directive (EPBD);
- and the Green Asset Ratio (GAR), which quantifies the proportion of a bank's assets financing environmentally sustainable activities.

#### 2.1.1. *The Energy Performance of Buildings Directive (EPBD)*

The EPBD sets minimum energy efficiency standards for buildings, promoting financial instruments such as green mortgages to support sustainable investments.

The directive mandates ambitious targets (see the SmarterEPC report [D3.2 Adapting Smarter EPC tool to the requirements of the EPBD](#) for a thorough analysis of the 2024 recast of the directive):

- residential buildings must achieve energy class E by 2030 and D by 2033;
- non-residential buildings must reach class E by 2027 and D by 2030;
- and new buildings must be zero-emission from 2028.

These requirements will drive property owners to undertake renovations to improve energy ratings and ensure compliance with sustainability objectives.

Building on this framework, the EPBD's regulatory structure not only establishes energy performance benchmarks but also positions financial institutions as key facilitators in achieving its goals.

Given the stringent renovation targets, banks play a crucial role in mobilizing capital and incentivizing energy-efficient upgrades through financial mechanisms such as Green Mortgages.

Properties with poor energy performance, classified as lower EPC ratings, face higher transition risk, as regulatory pressure and market demand favor sustainable assets. Additionally, the physical risks linked to climate change further reinforce the need for resilience-focused investments.

In this context, Green Mortgages serve as a strategic bridge between regulatory obligations and financial viability, enabling banks to:

- Offer preferential financing for properties that meet or exceed minimum EPC thresholds, incentivizing renovations.
- Integrate ESG risk assessment into lending models, ensuring property sustainability aligns with financial stability.
- Encourage large-scale market adaptation, supporting homeowners and investors in meeting EPBD renovation mandates.

Banks leveraging Green Mortgages enhance their portfolio resilience, mitigating exposure to inefficient assets while proactively aligning with EU Taxonomy and SFDR disclosure requirements.

Moreover, by funding energy efficiency improvements, financial institutions contribute directly to the decarbonization goals outlined in the EPBD, reinforcing their commitment to sustainable finance and climate risk mitigation.

### ***2.1.2. The Corporate Sustainability Reporting Directive (CSRD) and the Sustainable Finance Disclosure Regulation (SFDR)***

The Corporate Sustainability Reporting Directive (CSRD) and the Sustainable Finance Disclosure Regulation (SFDR) represent two pivotal pillars in the European regulatory framework, both designed to significantly enhance transparency and accountability in the realm of sustainability.

The CSRD requires companies to disclose comprehensive information regarding their environmental, social, and governance (ESG) practices, including how their activities align with the EU Taxonomy. This means that organizations must systematically report on their sustainability strategies, performance, and impacts, providing stakeholders with clear, comparable, and reliable data.

The SFDR, on the other hand, imposes sustainability transparency obligations on financial operators, compelling them to communicate how ESG risks are integrated into investment decisions and how these risks may affect financial returns.

Together, these regulations ensure that both corporations and financial institutions are held to high standards of disclosure, making it easier for investors, regulators, and the public to assess the true sustainability of business activities and financial products.

By mandating detailed reporting, the CSRD and the SFDR address the risk of greenwashing and foster a culture of accountability, where claims of sustainability must be substantiated by verifiable evidence. This regulatory approach not only supports informed decision-making but also drives market participants to improve their ESG performance, knowing that their disclosures are subject to scrutiny. Furthermore, these directives facilitate the harmonization of ESG data across sectors, enabling the development of standardized metrics and benchmarks that underpin sustainable finance and investment strategies.

As a result, the CSRD and the SFDR are instrumental in embedding sustainability into the core of corporate governance and financial market operations, ensuring that transparency and accountability are not just regulatory requirements but fundamental principles guiding the transition to a more sustainable economy.

### ***2.1.3. Prudential regulation***

The European Banking Authority (EBA), in its October 2023 report (EBA/REP/2023/34), assessed how the current prudential framework captures environmental and social risks and recommended targeted enhancements to accelerate their integration into Pillar 1 (the regulatory framework that determines minimum capital requirements for banks).

The EBA specifically advises institutions to account for environmental factors in the prudent valuation of immovable property collateral, considering transition and physical risks both at origination and during monitoring. In this context, collateral valuation refers to the process through which a lender determines the value of an asset pledged as security for a loan, in

order to assess the level of protection available in case the borrower defaults. The EBA will continue to monitor how ESG factors are reflected in collateral values, taking national specificities into account.

The EBA proposes a series of recommendations for short and medium to long-term actions across a number of relevant areas for the EU's mortgage and covered bond industries.

The EBA makes two specific recommendations/commitments relating to collateral valuation:

- 1. The EBA recommends that institutions account for relevant environmental factors in the prudent valuation of immovable property collateral. In particular, institutions should consider making necessary adjustments when the current market value of the collateral does not adequately address relevant risks associated with environmental factors that could affect the sustainability of the market value of the property over the life of the exposure. These considerations should include climate-related transition risk and physical risk, as well as other environmental risks, and should cover valuation at origination, revaluation and monitoring, whenever relevant for current market values and sustainable market values over the life of the exposure.*
- 2. The EBA will continue monitoring how environmental factors and broader ESG factors are reflected in the value of collateral, with due consideration of national specificities that may exacerbate environmental risks.*

As highlighted above, the EBA has furthermore underlined the importance of collateral valuation in capturing environmental and social in Pillar 1 of the prudential framework. Against this background, there is an urgent need to accelerate the development of a market where energy efficiency and ESG are firmly embedded and reflected in valuations.

This comprehensive regulatory landscape is shaping the future of sustainable finance and real estate valuation in Europe, driving the integration of ESG factors into risk management, investment strategies, and compliance frameworks.

## 2.2. Decarbonisation Strategies for Financial Institutions

Financial institutions across Europe are entering a decisive phase in their sustainability journey. The era of high-level commitments and aspirational targets is over; regulators, investors, and society now expect banks to operationalize robust, data-driven decarbonisation strategies that deliver measurable outcomes. This shift is not merely a compliance exercise, it is a strategic imperative that touches every dimension of banking, from credit risk management to product innovation and long-term profitability.

At the heart of this transformation lies the collection of accurate and sufficiently granular data, meaning reliable, updated and verifiable information available at the level of individual clients, loans and buildings. This includes, for example, EPC class, energy consumption, renovation plans, expected savings and exposure to climate-related risks. Without such data, banks cannot effectively measure portfolio emissions, set science-based targets, or comply with supervisory expectations under frameworks such as the EU Taxonomy and the Corporate Sustainability Reporting Directive (CSRD)<sup>1</sup>. Data is the foundation upon which transition plans are built. It enables institutions to assess climate-related risks, identify opportunities for sustainable lending, and design pricing models that reward energy efficiency while penalizing carbon-intensive activities.

The urgency of this data-driven approach is reinforced by regulatory developments such as the revised Energy Performance of Buildings Directive (EPBD)<sup>2</sup>, adopted in 2024 and transposed in 2026. With 75% of EU buildings classified as energy inefficient and responsible for 40% of total energy consumption, the directive aims to accelerate renovation rates and achieve a fully decarbonised building stock by 2050. For banks, this translates into a clear strategic mandate: integrate building performance data into credit assessments and leverage digital platforms to monitor compliance with zero-emission targets. Institutions that fail to act risk not only regulatory sanctions but also heightened credit risk exposure as carbon-intensive assets lose value over time.

Building on this data foundation, financial institutions are expected to define comprehensive decarbonisation strategies that embed ESG factors into governance, credit risk frameworks, and capital allocation. These strategies must go beyond disclosure and demonstrate operational capacity to manage climate risks. They should include clear transition pathways for high-emission sectors, mechanisms to monitor progress through metrics such as the Green Asset Ratio<sup>3</sup>, and governance structures that ensure accountability at every level. The integration of sustainability into credit granting is no longer optional; it is becoming a core criterion for assessing creditworthiness and long-term resilience.

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<sup>1</sup> Corporate Sustainability Reporting Directive (CSRD) – Directive (EU) 2022/2464, requiring detailed sustainability disclosures from large companies.

<sup>2</sup> Energy Performance of Buildings Directive (EPBD) – Directive (EU) 2024/XXX, revised to accelerate building renovations and achieve zero-emission targets by 2050.

<sup>3</sup> Green Asset Ratio – Key metric under the EU Banking Package to measure the proportion of taxonomy-aligned assets in a bank's portfolio.

A critical lever for implementing these strategies is the development and promotion of green financial products. Green mortgages, sustainability-linked loans, and targeted credit lines for retrofitting projects are powerful tools to incentivize households and SMEs to undertake energy-efficient renovations. These products not only accelerate emissions reductions but also strengthen customer engagement and loyalty. Yet, according to the European Banking Authority (EBA)<sup>4</sup>, green loans currently represent only 4.5% of total lending, with most directed toward new buildings rather than retrofits. To address this gap, the EBA advocates for a common EU definition and voluntary label for green loans, ensuring transparency and comparability across markets. Such measures would complement existing EU Taxonomy criteria while accommodating transitional activities that contribute to emissions reduction.

Beyond lending, banks can leverage capital markets to reinforce their climate commitments. The issuance of green covered bonds, backed by pools of energy-efficient assets, offers institutions favorable funding conditions, diversification of their investor base, and enhanced reputation in sustainable finance markets. These instruments serve as tangible evidence of climate alignment, reinforcing credibility with regulators and stakeholders. Moreover, they create a virtuous cycle: by securitizing green assets, banks unlock liquidity that can be reinvested in further sustainable lending initiatives.

Empirical evidence confirms that these strategies are gaining traction. Research by Banca d'Italia<sup>5</sup> shows that Italian credit institutions are actively embedding decarbonisation objectives into their strategic planning processes. A significant share of the banking market has already implemented medium- to long-term targets for credit portfolios and corporate operations, while others plan to follow in the coming years. Larger institutions lead this process, but smaller banks are also aligning with these objectives, often beyond the immediate scope of regulatory requirements. This proactive stance suggests that reputational benefits and competitive positioning are key drivers alongside compliance. Banks recognize that sustainability is not just a regulatory burden, it is a source of growth and differentiation in a market expected to expand significantly under the EPBD-driven renovation wave.

Ultimately, the convergence of accurate data collection, well-defined decarbonisation strategies, and innovative green products creates a powerful synergy. Banks reduce portfolio emissions, unlock new revenue streams, and strengthen resilience against regulatory and market shocks. Institutions that act decisively will not only fulfill their obligations but also gain competitive advantages in funding, reputation, and long-term profitability. In doing so, they position themselves as key enablers of Europe's sustainable economic transformation, a role that carries both responsibility and opportunity.

The message is clear: decarbonisation is not a peripheral issue; it is central to the future of banking. By financing energy efficiency interventions, institutions can mitigate credit risk, comply with evolving regulations, and capture emerging business opportunities.

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<sup>4</sup> European Banking Authority (EBA) Guidelines on loan origination and monitoring, including sustainability considerations.

<sup>5</sup> Questioni di Economia e Finanza (Occasional Papers) Greening the present to decarbonise the future: an analysis of Italian banks' decarbonisation strategies, N. 939

## 2.3. EPC/SRI as tools for de-risking finance and property evaluation assessment

This section sets out how Energy Performance Certificates (EPC) and the Smart Readiness Indicator (SRI) can be operationalised by lenders, investors, valuers and public authorities to reduce credit and collateral risk, accelerate the origination of green mortgages, and embed sustainability into property valuation practices. The approach builds on the market development work led by the Energy Efficient Mortgages Initiative (EEMI), of which CRIF is an expert partner, on evidence from public support schemes, and on empirical insights regarding borrower affordability and collateral resilience across different EU jurisdictions. In particular, EEMI's ecosystem perspective, combining consumer tools, financing options and supplier directories, shows that data-rich, standardised processes are a prerequisite for credible origination, transparent investor reporting and robust secondary-market demand for energy-efficient assets (see section 2.4). The SmarterEPC report [D2.2 EPC and SRI current coverage and uptake policies](#) also offers a comprehensive analysis of the current implementation and coverage of EPC and SRI across EU Member States, emphasising the importance of EPCs and SRI as key tools in achieving the EU's ambitious energy efficiency and decarbonisation goals under the EPBD.

### 2.3.1. *What EPC and SRI capture and why they matter for risk*

EPCs provide a standardised snapshot of building performance, expressing primary energy demand, CO<sub>2</sub> intensity and rating class. As a regulatory and market label, EPCs enable portfolio segmentation, EU Taxonomy alignment and comparability across geographies, which is essential both for origination and for harmonised disclosure to investors. European research under Horizon programmes repeatedly highlights that the availability and accessibility of EPC data is a precondition for scaling the green mortgage market and for credible impact reporting in capital markets.<sup>6</sup> By contrast, the SRI captures the operational intelligence and resilience of a building: the readiness to monitor, control and optimise energy use through automation, demand-response, storage and on-site generation. SRI therefore strengthens the persistence and verifiability of savings, which enhances the credibility of performance-linked lending and enables better monitoring of affordability under energy price shocks or supply disruptions.<sup>7</sup>

<sup>6</sup>

<https://energyefficientmortgages.eu/wp-content/uploads/2023/05/Exploring-Global-Best-Practices-in-Energy-Efficient-Mortgages.pdf>;  
<https://energyefficientmortgages.eu/wp-content/uploads/2022/10/Technical-Report-on-relevant-public-support-actions-in-relation-to-EEM.pdf>

<sup>7</sup>

<https://energyefficientmortgages.eu/wp-content/uploads/2023/10/Roadmap-to-EEM-Market-Development-The-EEMI-Ecosystem.pdf> &  
<https://energyefficientmortgages.eu/wp-content/uploads/2023/01/Research-into-market-appetite-for-Energy-Efficient-Mortgages.pdf>

Taken together, EPC tells us how efficient, while SRI tells us how adaptive and verifiable, a combination that improves visibility on cash-flow stability (Probability of Default or PD), collateral durability (Loss Given Default or LGD) and marketability, all of which are critical for credit and valuation decisions in a tightening prudential and sustainable-finance regime.<sup>8</sup>

The two instruments have been designed independently; however, according to Commission Delegated Regulation (EU) 2020/2155, Member States are allowed, if they wish, to connect or integrate the SRI with the national EPC scheme. This is explored in SmarterEPC's white paper, [Integrated Certification for Energy Performance and Smart Readiness: A Unified Approach to Building Assessment](#).

### **2.3.2. De-risking channels: translating EPC/SRI into PD, LGD and valuation**

From a credit perspective, the first transmission channel is **borrower affordability**, which is directly relevant to the **Probability of Default** (PD). PD measures the likelihood that a borrower will be unable to meet loan repayment obligations. EPC upgrades that lower and stabilise utility bills can improve household or business cash flow, while SRI-enabled controls, automation and monitoring can increase the persistence of these savings and reduce sensitivity to energy price volatility. As a result, energy-efficient and smart-ready buildings may contribute to stronger borrower affordability over the life of the loan. EEMI's work on consumer behaviour and market appetite shows that when expected savings are made visible and credible, through certificates, metered data and transparent advisory, customer uptake rises and lenders can better reflect improved affordability in underwriting and pricing.

The second transmission channel is **collateral resilience**, which is directly relevant to **Loss Given Default** (LGD). LGD measures the share of exposure that a lender may lose if the borrower defaults, after taking into account the recovery value of the collateral. Efficient and smart-ready assets are expected to be more resilient because they tend to be more liquid, more attractive to buyers and less exposed to regulatory obsolescence. In a context of stricter energy performance requirements and persistent uncertainty around energy costs, inefficient properties may face higher transition risk and potential "brown discounts". By contrast, buildings with better EPC ratings and relevant SRI features may exhibit shorter time-to-sale, stronger marketability and more stable collateral values, thereby reducing potential losses in default scenarios.

The third channel is **property valuation**. EPC and SRI can support more informed valuation practices by making energy performance and smart readiness more visible, comparable and evidence-based. EPC provides a measurable baseline for the building's energy efficiency, while SRI adds information on the building's capacity to monitor, control and optimise energy use. These indicators can inform comparable analysis, income-based valuation and forward-looking assessments of transition risk. Where market evidence supports it, valuers may reflect energy efficiency and smart-readiness through adjustments to market comparables, operating cost assumptions, capitalisation rates or obsolescence risk. In this

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<sup>8</sup> [How-to-comply-and-align-with-the-EU-policy-agenda.pdf](#)

way, EPC and SRI help translate technical building characteristics into financial parameters that are relevant for lending, collateral assessment and investment decisions.

Taken together, these three channels show how EPC and SRI can contribute to de-risking green finance: EPC upgrades and SRI-enabled functionalities can support lower PD through improved affordability, lower LGD through more resilient collateral, and more robust valuation through better evidence on energy performance, marketability and future-proofing.

### 2.3.3. *Embedding EPC/SRI in valuation practice*

Valuation needs to reflect both the efficiency baseline and the operational intelligence of buildings. In practice, comparable analysis should adjust for EPC class and relevant SRI features, informed by local transaction evidence and observed differences in marketing times and buyer appeal. Where smart monitoring reduces consumption variability and maintenance contingencies, the income approach can incorporate a more resilient net operating income, potentially supporting lower cap-rates for assets that demonstrably combine efficiency and smart-readiness. Valuers can incorporate EPC class and SRI features through:

- **Comparable adjustment.** Apply premiums/discounts reflecting efficiency and smart features, informed by local transaction evidence and time-to-sale analytics; reduce obsolescence risk for efficient, smart-ready assets.<sup>9</sup>
- **Income approach.** Adjust net operating income for lower utilities and maintenance contingencies due to smart monitoring; consider cap-rate reductions for resilience/marketability.<sup>10</sup>

#### *Practical sequencing: EPC at loan origination; SRI for client advisory and upgrade orchestration*

A clear division of roles improves outcomes. In this context, **loan origination** refers to the initial phase of the lending process, when the borrower applies for financing and the bank collects the information needed to assess creditworthiness, collateral value, eligibility criteria and pricing conditions:

- **EPCs** are the right instrument for origination: at application stage they provide the baseline used to segment risk, to screen for EU Taxonomy eligibility, to set efficiency-linked pricing grids, and to populate the EEM Label/harmonised disclosure templates for downstream investor reporting.
- **SRI** is the right instrument for advisory and upgrade proposals across the customer lifecycle: starting at offer stage, lenders and partners can use SRI to design tailored packages for households and SMEs, focusing on measures that stabilise bills and cash-flows, increase the resilience and verifiability of savings, and help the asset climb EPC classes over time. In retail contexts, SRI-guided “quick wins”, from smart zoning and advanced thermostatic control to DR-ready appliances, often have short

<sup>9</sup> [EeMAP-Technical-Report-on-Building-Performance-Indicators-that-Impact-Mortgage-Credit-Risk\\_0.pdf](#)

<sup>10</sup> [EeMAP-Technical-Report-on-Building-Performance-Indicators-that-Impact-Mortgage-Credit-Risk\\_0.pdf](#)

paybacks and can be bundled within green mortgage products at origination or offered as green top-ups post-origination. In SME and commercial contexts, SRI supports the prioritisation of upgrades with operational benefits (comfort, uptime, predictive maintenance), while generating data trails consistent with CSRD-grade reporting, easing access to sustainability-linked credit and improving valuation inputs.<sup>11</sup>

### *How SRI facilitates green finance in practice*

SRI can be used as a practical instrument to facilitate green finance by translating smart-readiness features into structured, finance-relevant upgrade pathways. Rather than functioning as a stand-alone indicator, SRI is most effective when embedded in a workflow that connects technical assessment, customer advisory, financing options, execution monitoring and impact reporting. In this workflow, SRI builds on the energy performance baseline provided by the EPC and helps identify smartness measures that can improve controllability, monitoring, flexibility and the persistence of energy savings.

Starting with data acquisition, the first step is to collect the EPC and estimate baseline energy bills and Primary Energy Demand (PED). This provides the reference point against which SRI-based improvements can be assessed. At offer stage, EEMI ecosystem tools, such as simulators, financing options and supplier directories, can support the presentation of an SRI-based improvement plan, including CAPEX, expected savings in kWh and monetary terms, and estimated tonnes of CO<sub>2</sub> avoided. Where available, bank finance can be combined with public support to improve affordability and increase customer uptake.

During execution, commissioning documentation and smart-meter readings can be used to update SRI sub-scores and verify whether expected performance improvements are being achieved. This evidence allows lenders to strengthen monitoring, potentially unlock dynamic pricing mechanisms or loyalty bonuses, and tag eligible loans for green pools. It also supports investor reporting through impact KPIs such as kWh saved, tonnes of CO<sub>2</sub> avoided and EPC class improvements.

The experience of leading public schemes in Germany (KfW), Estonia (KredEx), Italy (Superbonus 110%), Spain (PAREER II) and the UK (Green Deal) shows that stable incentive frameworks, robust quality assurance, consumer protection and integrated advice or assessment mechanisms can significantly reduce execution risk and crowd in private capital. Lenders can leverage these conditions by combining EPC-aligned origination with SRI-enabled advisory and monitoring, thereby making renovation pathways more transparent, verifiable and bankable.<sup>12</sup>

What this means by segment:

<sup>11</sup>

<https://energyefficientmortgages.eu/wp-content/uploads/2023/10/Roadmap-to-EEM-Market-Development-The-EEMI-Ecosystem.pdf> & <https://energyefficientmortgages.eu/wp-content/uploads/2023/01/Research-into-market-appetite-for-Energy-Efficient-Mortgages.pdf>

<sup>12</sup>

<https://energyefficientmortgages.eu/wp-content/uploads/2023/01/Best-Practice-in-European-Public-Support-Schemes-for-Energy-Efficiency.pdf>

- **Households:** SRI-guided cost-effective and low-complexity measures (controls, zoning, DR-ready appliances) often have short paybacks and can be bundled with green finance products at origination; this improves affordability and uptake, as evidenced in EEMI market appetite research.
- **SMEs and property owners:** SRI helps prioritize measures with operational benefits (comfort, uptime, maintenance savings) and supports CSRD-grade data trails, easing access to sustainability-linked credit and improving valuation inputs.

To make SRI-based recommendations more actionable for financial institutions, it is useful to translate smart-readiness improvements into simplified technical and financial indicators. This helps lenders, advisors and building owners compare alternative measures not only in terms of technical performance, but also in terms of investment cost, expected savings, payback profile and bankability. Illustration 1 shows how this type of approach can strengthen the finance-readiness of SRI-related upgrades by linking smart functionalities to measurable technical and economic outcomes.

***Illustration 1. The integration of simplified technical and financial indicators makes SRI-related measures more transparent, comparable, and easier to assess in financing decisions.***

A practical way to strengthen the finance-readiness of SRI-based upgrades is to complement the assessment of smart functionalities with simplified technical and financial indicators at measure level. In this perspective, each upgrade can be linked to a defined improvement in control functionality and, where relevant, to a corresponding change in Building Automation and Control Systems (BACS) efficiency class. BACS refers to the systems that monitor, control and optimise technical building functions, such as heating, cooling, ventilation, lighting and energy management. This link makes it possible to estimate expected energy savings through standardised factor-based approaches and to translate them into monetary terms over time. It also creates a more structured basis for comparing investment costs, operational expenditure and expected benefits.

Such an approach is particularly useful for lenders and advisors because it helps distinguish between measures that are economically viable on a stand-alone basis and those that may require bundling, public support or longer investment horizons. Evidence from smart-ready technology catalogues and life-cycle cost analyses shows that some control and automation solutions can generate positive economic returns within a medium-term horizon, while others deliver value mainly when combined with broader renovation packages or when their non-energy benefits are also considered. In this sense, the use of indicators such as Net Present Value (NPV) and Internal Rate of Return (IRR) does not merely support investment appraisal; it also improves the transparency, sequencing and bankability of renovation pathways aligned with EPC and SRI objectives.

Source: easySRI project, [D3.3 Technical and Financial indicators for SRTs.pdf](#)

## 2.4. Defining the ecosystem: actors, data, and collaboration

Financing energy-efficiency interventions requires the coordinated involvement of multiple actors, supported by reliable data and effective collaboration mechanisms. Banks, homeowners, insurers, construction companies, utilities, public authorities and data providers all contribute to reducing uncertainty and making renovation investments more attractive, measurable and financeable.

From a banking perspective, energy-efficiency improvements are not only relevant for climate objectives, but also for credit risk management. They can influence two key risk parameters used by banks: Probability of Default (PD), which refers to the likelihood that a borrower will be unable to repay a loan, and Loss Given Default (LGD), which refers to the potential loss for the lender if default occurs, after taking into account the value of the collateral. Energy-efficient buildings may support lower PD because reduced energy bills can improve household or business cash flow. At the same time, improved building performance can strengthen collateral value and marketability, thereby helping to reduce LGD.

These risk parameters are important in prudential banking regulation, including the Basel frameworks and its implementation in European rules such as the Capital Requirements Regulation (CRR). In simple terms, these frameworks determine how much capital banks must hold against different types of lending exposures. If energy-efficient properties are associated with more resilient borrowers and better collateral values, they may contribute to more robust risk assessment and, indirectly, to more efficient capital allocation over time. This creates a link between sustainability objectives and financial stability: green finance can support decarbonisation while also improving the quality and resilience of real-estate lending portfolios.

European regulation already incentivises this shift. The EU Taxonomy Regulation classifies certain energy-efficiency renovations as sustainable activities, while the Energy Performance of Buildings Directive (EPBD) promotes tools such as renovation passports and zero-emission building standards. These frameworks, together with ESG disclosure requirements, encourage banks to integrate climate-related risks into credit processes and to report financed emissions more transparently. As a result, mortgages for highly efficient homes can become more attractive for both lenders and borrowers, helping to offset higher upfront costs and improve access to finance for renovation.

A resilient ecosystem for green finance requires coordinated action across multiple actors, each contributing specific capabilities and sharing reliable data.

- **Homeowners** invest in performance upgrades and benefit from lower energy consumption, improved cash flow, higher property value and greater resilience to energy price shocks.
- **Banks** can benefit from better risk assessment, potentially lower PD and LGD, stronger collateral values and improved alignment with prudential and ESG expectations.

- **Insurers** can offer tailored green products and performance-related guarantees, helping to reduce uncertainty around renovation outcomes.
- **Construction firms and utilities and ESCOs** deliver the technical interventions and provide documentation, installation quality and performance evidence.
- **Public authorities** support the ecosystem through regulation, incentives, public guarantees, data infrastructure and policy continuity.
- **Data providers and valuers** help ensure that EPC, SRI, smart-meter, renovation and market data are reliable, interoperable and usable in credit and valuation processes.

This strategic logic is detailed in Table 1.

**Table 1. Commitment and benefits expected by each stakeholder of the ecosystem**

|                                                                          | Commitment                                                                                                                                                                                                      | Expected benefits                                                                                                                                                                                                                                                                                                           |
|--------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Homeowner</b>                                                         | <ul style="list-style-type: none"> <li>• <b>Investing</b> to improve the energy performance of the building</li> </ul>                                                                                          | <ul style="list-style-type: none"> <li>• <b>Reduction of energy consumption</b></li> <li>• <b>Improvement of cash flow / income</b></li> <li>• <b>Increase in property value / resaleability</b></li> <li>• <b>Reduction of energy shock risks</b></li> <li>• <b>Improvement of living comfort / healthiness</b></li> </ul> |
| <b>Bank</b>                                                              | <ul style="list-style-type: none"> <li>• <b>Customer awareness Support</b></li> <li>• <b>Green Finance / Spread Reduction / Green Policy</b></li> <li>• <b>Definition of decarbonisation pathway</b></li> </ul> | <ul style="list-style-type: none"> <li>• <b>Risk reduction (PD/LGD)</b></li> <li>• <b>Collateral value improvement (CRR)</b></li> <li>• <b>Reduction of capital absorption (indirect)</b></li> </ul>                                                                                                                        |
| <b>Insurance</b>                                                         | <ul style="list-style-type: none"> <li>• Dedicated offer <b>green insurance</b></li> <li>• <b>Reduction of the cost</b> of the policy</li> </ul>                                                                | <ul style="list-style-type: none"> <li>• <b>Lower risks</b></li> </ul>                                                                                                                                                                                                                                                      |
| <b>Company</b><br>(construction companies, contractors, utilities, etc.) | <ul style="list-style-type: none"> <li>• <b>Quality work / worker safety</b></li> <li>• <b>Performance guarantee / target of reducing consumption</b></li> </ul>                                                | <ul style="list-style-type: none"> <li>• <b>More business / also from the Bank channel</b></li> <li>• <b>Easier and cheaper access to (green) finance</b></li> </ul>                                                                                                                                                        |
| <b>State / Region/ European Commission / Guarantee Funds / other</b>     | <ul style="list-style-type: none"> <li>• <b>Support / contributions</b> to energy requalification</li> <li>• <b>Supply Chain Cost optimization</b></li> <li>• <b>Awareness</b></li> </ul>                       | <ul style="list-style-type: none"> <li>• <b>Reduction of GHG emissions</b></li> <li>• <b>Reduction of energy demand / shock risks</b></li> <li>• <b>More business (GDP) / employment</b></li> <li>• <b>Reduction of health risks</b></li> </ul>                                                                             |

The effective collaboration of these actors depends on the ability to translate building performance and smart-readiness features into information that is measurable, comparable and usable in decision-making processes. Beyond energy efficiency alone, smart-ready buildings can also provide flexibility to the energy system by adjusting consumption patterns, supporting demand response and improving the integration of renewable energy. This creates additional value for homeowners, property managers, utilities and financial institutions, because flexibility can contribute to lower operating costs, improved resilience and more future-proof building performance. Illustration 2 provides an example from France, where the GOFLEX approach quantifies the electricity flexibility potential of tertiary buildings and shows how smart building capabilities can be transformed into operational and market-relevant indicators.



### ***Illustration 2. Beyond the SRI: quantifying the electricity flexibility potential of buildings in France***

In France, the GOFLEX indicator has been developed for easily assessing sources of electricity flexibility in the tertiary sector. The initiative also provides a platform for matching supply and demand in demand response (DR) markets.

Electricity flexibility is one of the regulatory tools used to balance the electricity grid and facilitate the integration of renewable energy sources, which are by nature intermittent. Building flexibility offers the prospect of purchasing lower-carbon energy at a lower cost, with financial rewards to boot. Flexibility also contributes to efforts to manage energy consumption.

Reducing electricity demand for a few hours will allow owners and property managers to contribute to the day-to-day balancing of the national electricity grid, achieve energy savings, and benefit from tariff advantages under their energy provision contract.



The GOFLEX approach allows unlocking buildings' untapped potential, by providing:

- A letter (A to D) that indicates the building's control class. This indicates whether the site is capable of responding quickly to a demand for load shedding and of providing accurate measurements following load shedding;
- An estimate of the site's absolute load shedding capacity (kW);
- A relative estimate (%) reflecting the site's effort: load shedding capacity/contracted power.

Source: <https://goflex.fr/>

### 2.4.1. Homeowners and Property Owners

Homeowners are pivotal decision-makers. Their responsibilities include selecting interventions, granting consent for data sharing, and enabling measurement and verification (M&V). The benefits, lower bills, improved comfort, and higher property value, are clear, but trust in data governance is essential. Digital renovation passports and standardized EPCs under the EPBD recast empower owners with actionable insights and facilitate interoperability across the ecosystem. Public campaigns could encourage homeowners to update EPCs regularly, as accredited technicians can recommend cost-effective upgrades.

### 2.4.2. Banks and Financial Institutions

Banks are the cornerstone of this transformation. Their role extends beyond lending to designing products that reward energy performance, such as mortgages with interest rate reductions linked to verified savings. To comply with **EBA Guidelines on Loan Origination and Monitoring** and **European Central Banks (ECB) climate risk expectations**, banks must embed energy data into origination, pricing, and monitoring. This includes incorporating:

- **Energy Performance Certificates (EPCs)** at origination for baseline risk assessment.
- **Smart meter data** and consumption analytics to monitor real performance and detect stress signals related to energy costs.
- **Renovation passports** to plan staged upgrades and align with decarbonization pathways. These data streams not only inform credit decisions but also feed into **Pillar 3 ESG disclosures**, where banks must report financed emissions, taxonomy alignment, and exposure to transition risks. For corporate lending, real consumption data is critical to assess operational resilience and energy cost exposure, an increasingly material factor for creditworthiness.

These data streams not only inform credit decisions but also feed into sustainability disclosures (namely: Pillar 3 ESG): where banks must report financed emissions, taxonomy alignment, and exposure to transition risks. For corporate lending, real consumption data is critical to assess operational resilience and energy cost exposure, an increasingly material factor for creditworthiness. A practical example of how EPC information can support both renovation planning and loan eligibility is provided by the French “projected EPC” approach. As shown in Illustration 3, projected EPCs can help banks and property owners assess the expected energy performance of a building after renovation works, thereby linking technical improvement plans with financing conditions and eligibility criteria.



#### **Illustration 3. “Projected EPC” required by banks to finance energy renovations in France.**

In France, as in most EU countries, EPCs are mandatory to sell or rent a property to inform the buyer or the tenant of the current energy performance of the property. In addition, French banks require a “projected EPC” as part of a zero-interest loan to finance energy

renovations. Indeed, when purchasing an older property, the buyer is eligible for such a loan only if the annual energy consumption is at least class E after the works, which means that a simulated EPC has to be issued to take into account the impact of the works.

In addition, 15-year old, multi-owner residential buildings with more than 50 units mandatorily have to prepare a multi-year works plan to establish a schedule of works over a 10-year period, in particular to safeguard the building and ensure its proper maintenance. The plan must be based on the actual EPC of the building, and include the “projected EPC” following completion of the works under the plan.

In these two examples, the projected EPC is mandatory... even though it has no regulatory status yet

Source: <https://www.quotidiaq.fr/le-dpe-projete-nexiste-pas/>  
<https://www.cerema.fr/fr/actualites/renovation-energetique-logements-decryptage-dispositifs-aide>

### 2.4.3. Insurers

Insurance companies provide a critical safety net. By offering performance guarantees and tailored green insurance products, they mitigate underperformance risk and protect both lenders and borrowers. Insurers rely on commissioning data and verified savings to calibrate premiums, creating incentives for quality execution. Their involvement reduces uncertainty for banks, enabling more favorable capital treatment under prudential rules. This role becomes even more relevant when insurance mechanisms are connected not only to post-event compensation, but also to preventive investment, climate resilience and measurable improvements in building performance, as illustrated by recent developments in Italy.



#### ***Illustration 4: Insurers as Catalysts for Climate Resilience and Green Finance, evidence from Italy***

The role of insurers can be further strengthened when catastrophic risk coverage is connected to preventive investment and measurable building performance. Recent developments in Italy provide a relevant example. The introduction of mandatory insurance coverage for enterprises against natural catastrophes such as floods, landslides, earthquakes and extreme weather events signals a shift from an ex-post compensation model towards a more structured risk-sharing framework. However, insurance alone cannot reduce the underlying exposure of buildings and businesses to climate-related shocks. Its effectiveness depends on the capacity of the market to reward prevention, resilience and transparent measurement of environmental performance

In this perspective, insurers can become key partners in the green finance ecosystem by linking premiums, guarantees and underwriting conditions to verified mitigation measures. Energy efficiency upgrades, smart monitoring systems, climate adaptation works and robust assessment methodologies can all contribute to reducing expected losses and improving the insurability of assets. Standards such as whole-life carbon

assessment and comparable ESG valuation approaches may help reduce fragmentation in environmental metrics and provide a more consistent evidence base for insurers, banks and valuers. This creates a complementary mechanism: banks finance improvements that reduce transition and physical risks, while insurers support confidence in the persistence and resilience of those improvements.

*Source: Paolo Dalmagioni, Assicurazioni catastrofali: l'Italia accelera, ma la prevenzione è la chiave per contrastare il cambiamento climatico, Il Sole 24 ORE, 3 Settembre 2025*

#### 2.4.4. Construction Sector and ESCOs

Contractors, installers, and energy service companies deliver the physical improvements that underpin financial models. Their obligations include providing detailed documentation, product IDs, commissioning certificates, and compliance with safety and performance norms. These data points feed into banks' risk models and insurers' underwriting processes. Collaboration with financial actors ensures timely drawdowns and performance-linked disbursements, reducing execution risk and fostering trust.

#### 2.4.5. Public Authorities and Guarantee Funds

Governments and EU bodies set the regulatory framework and provide financial backstops. Through renovation subsidies, tax incentives, and guarantee schemes, they lower the cost of capital and absorb part of the risk. Public authorities also manage critical datasets, EPC registries, building logbooks, and renovation passports, under the **Data Act (EU 2023/2854)** and **Data Governance Act (EU 2022/868)**. These laws enable the creation of national data spaces, ensuring that EPC data becomes more accessible for banks to define decarbonization strategies and monitor portfolio alignment. Guarantee funds can further de-risk deep renovation loans, accelerating market uptake.

Given the novelty of the SRI scheme, no such datasets exist, but initiatives are launched at national or regional levels (see Illustration 5).



#### **Illustration 5. Creation of a regional cadaster of SRI audits in Lombardy**

Through its programme Fesr 2021-2027, Asse 1 – “Un’Europa Più Competitiva E Intelligente”, Bando “Collabora & Innova”, the Lombardy Region (Italy) has cofunded the D-SMART project to set up a regional cadaster of SRI audits as a digital hub to guide the transformation of buildings into intelligent and dynamic entities, in line with the EPBD objectives.

D-SMART addresses the strategic challenge consisting in equipping Lombardy with the necessary tools to assess building intelligence, improve living comfort, and optimize consumption, transforming real estate assets into connected and efficient ones.

Through the use of automatic and intelligent controls in buildings and integration with BIM and BMS systems, the project develops innovative methodological tools and a

regional database to measure and classify the smart readiness of public and private buildings. The results will converge into a Digital One-Stop-Shop, an access point that will allow stakeholders to benefit from advanced services for energy efficiency, anticipating the European regulatory obligations scheduled for 2027.

Amongst the key results expected from the project, an analysis of the increase in market value of properties thanks to the evaluation of the smart-readiness will be conducted.

Source: <https://www.r2msolution.com/en/eu-projects/dsmart/>

### 2.4.6. Data Providers and Valuation Experts

Data aggregators and valuation professionals ensure that information flows seamlessly and meets quality standards. They harmonize inputs from EPC databases, smart meters, and construction records, applying **openBIM** and **IFC schemas** for interoperability. Valuers incorporate energy performance into property assessments following **RICS Red Book** and **TEGoVA European Evaluation Standards (EVS)**, enabling banks to reflect sustainability in collateral values. Accurate data underpins every financial and policy decision, making these actors the backbone of trust in the ecosystem.

Looking at energy efficiency through the lens of the entire value chain is essential. The ecosystem we have outlined, banks, homeowners, insurers, construction companies, public authorities, and data providers, must operate as an integrated network where every actor benefits economically from renovation activities. Quantifiable advantages, such as reduced credit risk for banks, lower energy bills for households, and new business opportunities for contractors and insurers, create the foundation for a sustainable market.

To make this collaboration effective, **data must flow seamlessly**. Here, the Internet of Things and home automation technologies, promoted by the SRI, represent the first building block. Smart meters, connected devices, and digital renovation passports enable real-time visibility of consumption and performance, allowing stakeholders to exchange key information about properties and energy use. This transparency not only supports better credit decisions and ESG reporting but also accelerates the entire process, making green finance more accessible and attractive.

In short, energy efficiency is not just a technical upgrade, it is a systemic transformation. By treating the value chain as an ecosystem and leveraging digital tools for data sharing, we can align climate objectives with financial stability and unlock measurable benefits for all participants. The Finnish case provides a useful illustration of how policy design, advisory services, data infrastructure and smart-readiness measures can be combined to improve the scalability and bankability of renovation pathways.



#### ***Illustration 6. Finland integrated policy support for bankable energy efficiency and smart readiness investments***

Finland provides a relevant example of how a coherent national framework can improve

the finance-readiness of energy efficiency and smartness investments. In line with the “energy efficiency first” principle, the Finnish approach combines voluntary energy efficiency agreements, energy audits, public support for both audits and investments, and structured energy counselling services, creating a stable environment for decision-making by households and building owners.

This combination is particularly important from a financial perspective, because it reduces information asymmetries, strengthens the quality of project preparation, and lowers execution risk for lenders and investors.

The consolidation of regionally comprehensive energy advice and one-stop-shop service points further supports this process by providing independent and up-to-date guidance on energy savings, renewable solutions and consumption flexibility options.

At the same time, Finland’s efforts to promote demand response, develop a market model for independent aggregators, introduce load-control interfaces through second-generation smart meters, and enable decentralised energy communities show how building upgrades can be connected to broader energy market participation.

This strengthens the relevance of SRI-related functionalities, as smart-ready buildings are not only more efficient, but also better equipped to deliver measurable flexibility, operational resilience and additional value streams.

In this sense, the Finnish case illustrates how integrated policy design can support both the scalability and the bankability of renovation pathways aligned with EPC and SRI objectives.

Source:

[https://publications.vtt.fi/pdf/technology/2025/KEITO-keskipitkan\\_aikavalin\\_vaikutusarviot\\_VTT%20Technology\\_LUONNOS\\_010725.pdf](https://publications.vtt.fi/pdf/technology/2025/KEITO-keskipitkan_aikavalin_vaikutusarviot_VTT%20Technology_LUONNOS_010725.pdf)

## 2.5. Evidence and best practices

A growing body of empirical evidence and operational experience across Europe shows that improved building energy performance, measured through Energy Performance Certificates (EPCs) and, where applicable, complemented by Smart Readiness Indicators (SRI), is associated with lower financial risk for banks and investors. Real-world pilots, portfolio analyses and capital market transactions increasingly confirm that energy-efficient buildings tend to exhibit lower borrower default risk and more resilient collateral values, thereby supporting the de-risking of green finance. This section summarises key best practices from green mortgage lending, portfolio risk management, green bonds and EU-funded initiatives, with a focus on Italy and comparable EU markets.

Overall, the evidence from Italy and across the EU supports a clear conclusion: energy performance indicators can be operationalised as effective tools for financial risk mitigation. EPCs, complemented where relevant by SRI, already enable banks, investors and supervisors

to better assess creditworthiness, collateral resilience and transition risk. While these practices are still scaling from pilot to mainstream, they provide a strong empirical foundation for the policy and market recommendations presented in Section 2.6, which focuses on how to accelerate and standardise the adoption of these best practices across the European financial system.

### 2.5.1. *Green mortgages and credit risk reduction*

Over recent years, many European banks have introduced green mortgage products offering preferential conditions (e.g. interest rate discounts or extended LTV limits) for energy-efficient properties or for renovations improving energy performance. These products are increasingly underpinned by a data-driven risk rationale: lower household energy expenditures and better building quality contribute to improved borrower affordability and, in turn, lower probabilities of default (PD).

Strong empirical confirmation comes from the Energy Efficient Mortgages Initiative (EEMI) and related EU-funded projects. In Italy, an econometric analysis of more than 72,000 residential mortgages, conducted under the EeDaPP project<sup>13</sup>, identified a statistically significant negative correlation between EPC class and mortgage default risk. Mortgages securing energy-efficient dwellings consistently showed lower PDs compared to those backed by inefficient properties. Importantly, the analysis demonstrated that incremental improvements in energy efficiency, including upgrades from the lowest EPC classes, already yield material risk reductions. Similar findings have been reported in other EU markets, including the Netherlands<sup>14</sup> and the United Kingdom<sup>15</sup>, reinforcing the robustness of this relationship.

The Netherlands provides a practical example of the growing integration of EPCs into the green-finance ecosystem. Energy labels are often considered by mortgage providers when determining lending conditions, with several financial institutions offering interest-rate discounts for highly energy-efficient properties. For example, some lenders provide mortgage-rate reductions of around 0.05–0.10 percentage points for dwellings with superior energy labels. EPCs also influence borrowing capacity. Under current Dutch mortgage rules, homebuyers may obtain additional financing for energy-efficiency improvements through instruments such as the *Energiebespaarbudget*. Depending on the energy label, households can borrow an additional €10,000–20,000 for energy-saving measures. By contrast, the SRI has not yet achieved comparable market penetration and remains largely absent from mortgage underwriting and green-finance mechanisms.

In Italy, green mortgages represented around 6% of new mortgage originations by 2022 and typically featured modest interest rate discounts compared to conventional loans.<sup>16</sup> While the absolute pricing differences remain limited, they provide early evidence that banks are

<sup>13</sup> <https://cordis.europa.eu/project/id/784979>

<sup>14</sup> [Buildings' Energy Efficiency and the Probability of Mortgage Default: The Dutch Case](#)

<sup>15</sup> <https://energyefficientmortgages.eu/wp-content/uploads/2021/07/BE-IT-NL-UK-Correlation-Analysis.pdf>

<sup>16</sup> Banca d'Italia (2024) – *Is the Italian green mortgage market ready to take off?*

beginning to price energy performance as a credit risk factor, in line with prudential and supervisory expectations. Across Europe, major lenders have now embedded EPC-based criteria into green mortgage frameworks, often supported by public incentives or guarantees that further mitigate credit risk during the transition phase.

### ***2.5.2. EPC data in mortgage portfolio risk management***

Beyond individual loans, banks are increasingly integrating EPC data into portfolio risk management frameworks. Surveys conducted by national supervisors show that a large majority of banks now track the energy performance of properties securing their mortgage portfolios, reflecting both regulatory pressure and internal risk management needs. Mapping exposures by EPC class allows institutions to identify concentrations in energy-inefficient assets that may be more vulnerable to transition risk, regulatory tightening or energy price shocks.

Early portfolio analyses indicate that exposures secured by poorly rated properties are associated with higher default incidence, while portfolios with a higher share of energy-efficient assets tend to display more stable risk profiles. As a result, some leading banks have begun to analyse PD and loss metrics by EPC band and to incorporate energy performance into internal risk dashboards and climate stress-testing exercises. These practices are aligned with recent supervisory guidance encouraging the integration of environmental factors into credit risk and collateral valuation processes.

In parallel, improved data availability, including digitalised EPC registries and, where feasible, energy consumption data, supports more granular and forward-looking analysis. This enhances banks' ability to report under frameworks such as the EU Taxonomy and to define credible portfolio decarbonisation targets, while strengthening transparency towards supervisors and investors.

Overall, these practices are supported by growing supervisory and empirical evidence, notably from national central bank analyses and EU-funded initiatives, which document both the increasing use of EPC data in mortgage portfolio monitoring and the observed relationship between energy performance, default risk and pricing, as shown for the Italian market by Banca d'Italia and within the Energy Efficient Mortgages Initiative.

### ***2.5.3. Portfolio-level risk analysis, monitoring and capital market implications***

At portfolio level, banks are increasingly integrating EPC data into credit risk monitoring and asset allocation frameworks, driven by both supervisory expectations and emerging empirical evidence. Recent analyses show that a growing share of European lenders, particularly in Italy, now systematically track the energy performance of properties securing mortgage portfolios, as part of broader efforts to assess transition risk, collateral resilience and long-term credit quality. For the Italian market, supervisory research by Banca d'Italia documents that exposures backed by lower-rated properties are disproportionately

associated with default events, while portfolios with a higher share of energy-efficient collateral tend to display more stable risk profiles. This evidence is encouraging banks to segment portfolios by EPC class and to progressively incorporate energy performance into internal risk dashboards and climate stress-testing exercises, alongside traditional indicators such as LTV and debt-to-income ratios.

The same portfolio-level logic is increasingly reflected in funding and capital market strategies, most notably through the issuance of green bonds and green covered bonds backed by energy-efficient mortgage pools. In Italy and across Europe, banks issuing green covered bonds have relied on EPC-based eligibility criteria to identify low-risk, future-proof collateral, strengthening transparency for investors and aligning funding strategies with EU Taxonomy requirements. Empirical and market experience indicates that these transactions benefit from strong investor demand and competitive pricing, reinforcing the perception that energy-efficient mortgage portfolios represent lower-risk and more resilient asset pools. The systematic identification and reporting of EPC metrics at portfolio level has therefore become a prerequisite not only for risk management, but also for accessing diversified and potentially cheaper sources of long-term funding through green capital markets.

These developments are closely linked to the work of EU-funded initiatives, in particular the Energy Efficient Mortgages Initiative (EEMI) and its EeDaPP data framework, which demonstrated the technical feasibility of linking public EPC registries with private credit and portfolio data at scale. EEMI outputs provide the methodological foundation for analysing mortgage performance by EPC band, supporting both portfolio monitoring and the structuring of green covered bonds and securitisations based on standardised energy efficiency criteria. Together, supervisory evidence and EU project results confirm that the integration of EPC data at portfolio level serves a dual purpose: it enhances credit and collateral risk assessment, while simultaneously enabling the mobilisation of capital markets through credible, data-driven green funding instruments.

## 2.6. How to scale up

Having established in Section 2.5 that energy efficiency and robust EPC data can reduce credit risk and unlock new financing, this section focuses on how to scale up these practices from pilots and niche products to mainstream financial processes across the EU. The objective is to mainstream EPC/SRI-based assessment in origination, monitoring and funding; remove operational frictions; strengthen data infrastructure; and align incentives and standards so that scale can be achieved without undermining consumer protection or financial stability. This approach is consistent with the policy direction reflected in supervisory guidance and in market-led initiatives (e.g., EEM Label and related transparency templates).

## 2.6.1. Recommendations and Policy Priorities

### *Mainstream energy performance in finance and risk management*

Banks should treat EPCs (and, where available, SRI-related indicators) as core inputs for credit risk assessment, pricing and portfolio steering, rather than as optional ESG add-ons. This direction is coherent with the EBA's work on:

- encouraging consistent green retail lending practices and
- strengthening ESG risk management expectations for institutions, including the use of better data processes and risk identification/monitoring arrangements. In parallel, the case for embedding energy performance into bank strategy is reinforced by market evidence that green mortgages are already priced differently (albeit modestly) in Italy, suggesting that energy performance is beginning to be treated as a risk-relevant factor in practice.

### *Embed energy performance in valuation practices and credit collateral governance*

A key scaling priority is to ensure that valuation frameworks, both human valuation and AVM-based valuation, can consistently reflect energy performance, transition risk and resilience improvements, because valuation is the bridge between energy performance and collateral risk. This is aligned with the EMF-ECBC's position that environmental factors (including transition and physical risks) should be considered in collateral valuation at origination, revaluation and monitoring, consistent with EBA recommendations.

## 2.6.2. Removing barriers and ensuring continuity

### *Reduce operational friction for banks and borrowers*

A repeated bottleneck is the operational cost of identifying, verifying and monitoring "green" exposures, including the collection of EPC/SRI data and the documentation of renovation outcomes. The EBA's analysis of green loans and mortgages explicitly discusses industry practices, the costs and benefits of originating and monitoring green loans, and the need for measures that encourage uptake while supporting workable origination and monitoring processes. This matters particularly in markets where energy performance data are incomplete, fragmented or difficult to operationalise at portfolio level. In Italy, public market studies prepared by CTI and CRIF under the Energy Efficient Mortgages Initiative highlight the methodological challenges associated with using EPC and primary energy demand data to identify the top-performing share of the national building stock for EU Taxonomy purposes. CRIF technical reports prepared for Italian banks' green building

frameworks further illustrate how EPC data, proxy methodologies and eligibility criteria are increasingly used to support green mortgage classification, portfolio analysis and sustainable finance reporting<sup>17</sup>.

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*Ensure continuity in policy support and market infrastructure*

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Scaling is undermined by stop-go policies and fragmented implementation. The joint industry position on the EPBD stresses that, to unlock private finance at scale, regulatory measures should avoid unintended consequences and should be designed in a way that mortgage lenders can support through customer-facing products subject to creditworthiness requirements. In practice, continuity also means institutionalising the tools created under EU-funded initiatives (e.g., transparency templates and ecosystem components), rather than treating them as one-off pilots.

### **2.6.3. Enhancing data quality and standardization**

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*Make EPC data accessible, interoperable and comparable*

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Data quality and standardisation are prerequisites for mainstreaming energy performance into risk models, portfolio monitoring and investor reporting. The EPBD joint industry position highlights the importance of building energy performance databases and supports the retention of provisions facilitating access to, and usability of, EPC information, reflecting the broader need for reliable data pipelines to support the Renovation Wave. This is particularly critical in markets where energy performance data remain incomplete, fragmented or difficult to operationalise at portfolio level. In Italy, the CTI and CRIF study prepared under the Energy Efficient Mortgages Initiative highlights the methodological challenges associated with using EPC and primary energy demand data to identify the top-performing share of the national building stock for EU Taxonomy purposes. At the same time, ENEA-CTI evidence based on SIAPE data shows that a significant share of certified buildings remains concentrated in the lowest energy classes, confirming that scaling green finance requires structural improvements in EPC data capture, accessibility, comparability and integration into banking processes<sup>18</sup>.

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<sup>17</sup> EBA, Report on green loans and mortgages, EBA/REP/2023/38, December 2023;

CTI & CRIF, Percentage distribution of primary energy (Ep) values in the Italian national building stock, prepared under the Energy Efficient Mortgages Initiative / EeMMIP, final version, 1 August 2022;  
CRIF, CREDEM Green Building Framework – Technical Report, 2024/2026.

<sup>18</sup> EBF, EMF-ECBC and AFME, Joint position on the Energy Performance of Buildings Directive, April 2023;

CTI & CRIF, Percentage distribution of primary energy (Ep) values in the Italian national building stock, prepared under the Energy Efficient Mortgages Initiative / EeMMIP, final version, 1 August 2022;  
ENEA and CTI, Annual Report on the Energy Certification of Buildings, based on SIAPE data.

### 2.6.4. *Fostering public-private partnerships*

*Use guarantees and risk-sharing to crowd in private lending  
(especially for renovations)*

Public–private mechanisms are essential to scale renovation finance during the transition phase, particularly where execution risk and borrower affordability concerns remain barriers. A concrete example is the European Bank for Reconstruction and Development (EBRD)'s partnership with Zagrebačka banka under InvestEU, which uses an uncapped portfolio guarantee to unlock €100 million of new green financing and combines risk sharing with targeted technical assistance for the intermediary and borrowers. Such models are directly relevant for scaling because they reduce perceived credit risk and free balance sheet capacity for lenders while ensuring eligibility and technical standards for the financed projects. The same logic can be extended to SRI-related investments, where public incentives, technical assessment and private financing need to be combined into a single, understandable investment pathway for building owner

#### ***Illustration 7. Public Incentives as a Catalyst for SRI-Based Green Finance***

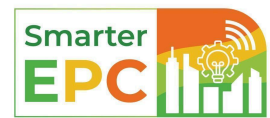
Public investment programmes can play a catalytic role in translating SRI-based recommendations into bankable renovation actions. Evidence from national and EU-supported schemes shows that smartness upgrades are more likely to be implemented when technical assessment, grant eligibility, tax incentives and private financing are presented to owners as part of a single investment pathway.

In this perspective, SRI can help identify measures that are not limited to energy savings, but also improve controllability, monitoring, flexibility and user responsiveness, such as building automation and control systems, smart thermostats, digital metering, demand-response ready equipment and predictive maintenance solutions.

When these measures are linked to public support, lenders can reduce the effective upfront cost for households and SMEs, improve affordability metrics and increase confidence in the expected performance of the financed intervention. Public schemes also contribute to market standardisation by defining eligible technologies, minimum performance requirements and verification procedures.

This creates a useful interface between policy objectives and banking processes: public authorities steer investment towards smart and efficient buildings, while banks can structure complementary loans, green top-ups or advisory services around a clearer set of technical and financial assumptions. As a result, SRI becomes not only an assessment tool, but also a practical bridge between public incentives, private capital and measurable building performance improvements.

*Source: SMART<sup>2</sup> Deliverable: D1.8 Smart Tools for Smart Buildings: Enhancing the intelligence of buildings in Europe*



In summary, scaling up green finance for energy efficiency requires coordinated progress on four fronts:

- mainstreaming EPC/SRI data in credit, valuation and portfolio risk processes;
- reducing operational frictions and ensuring policy continuity;
- strengthening data availability and standardisation to enable reliable risk modelling and investor reporting; and
- deploying public–private risk-sharing mechanisms that crowd in private capital and support execution capacity.

The direction of travel is consistent across supervisory guidance, industry positions on the EPBD, and EU-funded ecosystem initiatives that focus on policy consistency, transparency labels, supply-chain coordination and consumer enablement.

## 3. The Role of Energy Efficiency in Real Estate Evaluation

### 3.1 The impact on property valuation of Energy Efficiency

Banks care deeply about real estate because mortgages are core to banking: they anchor household finance, drive retail balance sheets, and are typically secured by property collateral. This makes buildings not only financially relevant, but also a powerful lever for decarbonisation at scale. When mortgages systematically recognise and reward energy performance, they channel capital toward upgrades that reduce consumption and emissions across millions of homes and business premises. In this sense, mortgage-backed properties become the most effective pathway to deliver widespread climate benefits, aligning household economics with supervisory expectations on climate and environmental risk.

Within this context, energy efficiency is a material input to property valuation throughout the mortgage process. Valuers and lenders need a forward-looking view of how efficiency affects marketability, liquidity and resilience under evolving regulation and energy prices. Properties with stronger energy performance, captured by robust Energy Performance Certificates (EPCs) and complemented by Smart Readiness Indicator (SRI) features, tend to command better buyer appeal, shorter time-to-sale and more stable operating costs. These attributes translate into lower obsolescence risk and more durable collateral values, which are directly relevant for credit risk parameters (PD/LGD) and for the prudential notion of “property value” as a sustainable estimate, distinct from short-term market swings.

Operationally, valuation should reflect energy efficiency in three ways. First, at origination, the EPC class and underlying primary energy demand provide the efficiency baseline used to benchmark comparables and to justify conservative adjustments where assets face transition headwinds (e.g., minimum performance standards, carbon pricing pass-through). Second, in income-based valuations, verified savings and SRI-enabled controls (automation, demand response, PV/storage) support a more resilient net operating income by reducing utilities volatility and maintenance contingencies; this may justify a lower capitalisation rate for assets that demonstrably sustain performance over time. Third, for monitoring and re-valuation, lenders and valuers should track performance evidence (commissioning data, smart-meter reads, M&V reports) and update property assumptions as upgrades are implemented, ensuring that collateral values remain aligned with the building’s efficiency trajectory.

This approach also strengthens market transparency. By segmenting price evidence and time-to-sale metrics by EPC class, and by documenting the contribution of SRI-type features, valuers can make adjustments that are traceable and reproducible, reducing model risk and supporting investor disclosures in green mortgage and covered-bond frameworks. For banks, the result is a valuation discipline that rewards efficiency and smart-readiness, accelerates portfolio decarbonisation through the mortgage channel, and reduces transition risk in line

with supervisory guidance. In short, because mortgages matter to banks, buildings matter, and because buildings can decarbonise quickly when finance is well-targeted, energy efficiency must be treated as a first-order driver of property value in every step of the mortgage process. The following illustration shows how this logic can be operationalised by embedding EPC and SRI-related information within a broader ESG evidence base for valuation.

**Illustration 8. Integrating ESG into Energy Performance-Based Valuation, evidence from RICS**

A practical way to embed energy performance into valuation is to treat EPC and SRI-related information as part of a broader ESG evidence base, rather than as isolated technical attributes. In line with emerging valuation practice, energy efficiency can influence value through three complementary channels: value drivers, risk drivers and cash-flow drivers. For example, a building with a stronger EPC class may benefit from lower expected operating costs, improved tenant or buyer demand and reduced exposure to future regulatory obsolescence. Conversely, an inefficient asset may face higher transition risk, additional retrofit costs and weaker marketability, which can translate into a brown discount where market evidence supports such an adjustment.

This does not imply that every ESG factor automatically changes market value. The valuer must assess whether the factor is already reflected in comparable transactions, whether it affects the specific asset or only the owner's corporate position, and whether the available evidence is sufficiently robust. In this perspective, EPC data provides a measurable baseline, while SRI-related features can support a more forward-looking assessment of operational resilience, monitoring capacity and adaptability. The integration of these indicators into valuation reports therefore improves transparency, supports prudent collateral assessment and helps financial institutions distinguish between assets that are merely compliant today and those that are more likely to remain liquid, financeable and resilient over time.

Source: *The future of real estate valuations: the impact of ESG Views from a European expert group, January 2024*, [WBEF-ESG-and-valuation-2024.pdf](#)

## 3.2 Transition risk and Property Value

Transition risk arises from the policy, technology, and market adjustments required to achieve climate neutrality. For mortgage and real-estate lending, this risk transmits primarily through two channels: borrower affordability (via energy price and retrofit obligations) and collateral value (via evolving regulation, buyer preferences, and obsolescence). European supervisors explicitly require banks to recognise that climate and environmental (C&E) risks are drivers of traditional risk credit, market, operational, rather than a new, separate risk class. The EBA's 2023 report on the role of environmental and social risks in the prudential framework sets out a risk-based approach and recommends targeted enhancements to Pillar 1 methods, including explicit consideration of environmental factors in due diligence and valuation of immovable property collateral. It also discourages simplistic "green supporting"

or “brown penalising” factors in favour of evidence-based, forward-looking tools (e.g., stress testing, scenario analysis).<sup>19</sup>

The ECB’s Guide on climate-related and environmental risks sets 13 expectations across business model, governance, risk appetite, risk management, and disclosures. It explicitly links C&E risks to PD/LGD and to collateral values, and (in Expectation 8.3) requires institutions to consider climate and environmental risks in collateral valuations with particular attention to location and energy efficiency for residential and commercial real estate. The ECB has monitored implementation through the 2022 thematic review and the 2022 climate stress test, and has warned that non-compliant banks could face supervisory measures; it also set staggered deadlines for alignment by the end of 2024.

In January 2025, the EBA issued its final Guidelines on the management of ESG risks (EBA/GL/2025/01). These guidelines make transition risk management mandatory and forward-looking requiring banks to:

- run materiality assessments;
- integrate ESG risk drivers into all risk types;
- adopt a time horizon of at least 10 years;
- develop transition plans under Article 76(2) CRD; and
- use a combination of exposure-, portfolio- and scenario-based methodologies, escalating to environmental scenario analysis (for which dedicated guidelines were published in November 2025).

In this supervisory context, Energy Performance Certificates (EPC) and the Smart Readiness Indicator (SRI) are practical levers to decarbonise portfolios and mitigate transition risk.

First, EPCs provide the efficiency baseline at origination and throughout the life of the exposure. EPC classes, and the underlying Primary Energy Demand (PED), allow banks to segment exposures, set efficiency-linked pricing and LTV limits, and identify assets at higher risk of policy-driven obsolescence. Second, SRI adds operational intelligence and verifiability. By scoring readiness for monitoring, automation, demand response, PV/storage, and EV-readiness, SRI supports tailored upgrade pathways for households and SMEs. These upgrades stabilise bills, enhance cash-flow resilience, and improve the persistence of savings, thereby lowering PD. They also reduce under-performance risk of renovation measures, an important concern in EBA’s forward-looking frameworks, and make savings measurable for scenario analysis, risk appetite metrics, and Pillar 3 disclosures.

Third, valuation and LGD benefit from both EPC and SRI. Markets increasingly price efficiency and smart-readiness; banks can therefore reduce LGD by favouring assets with stronger marketability, faster time-to-sale, and lower obsolescence risk under future standards. This

<sup>19</sup>[https://eba.europa.eu/sites/default/files/document\\_library/Publications/Reports/2023/1062711/Report%20on%20the%20role%20of%20environmental%20and%20social%20risks%20in%20the%20prudential%20framework.pdf](https://eba.europa.eu/sites/default/files/document_library/Publications/Reports/2023/1062711/Report%20on%20the%20role%20of%20environmental%20and%20social%20risks%20in%20the%20prudential%20framework.pdf),  
<https://www.moodys.com/web/en/us/insights/regulatory-news/eba-mulls-inclusion-of-environmental-social-risks-to-pillar-1-rules.html>

is consistent with the EBA 2023 recommendation to embed environmental factors in collateral valuation and with the ECB's collateral expectations.

Banks can operationalise EBA/ECB expectations and reduce transition risk by structuring a three-layer framework:

1. Origination and pricing. Require EPC at origination; use EPC class and PED to:
  - a. screen EU Taxonomy eligibility,
  - b. allocate pricing benefits to efficient assets or committed renovation plans, and
  - c. record a baseline for future monitoring under the EBA Guidelines on Loan Origination and Monitoring (LOM).

For riskier assets, apply transition overlays to PD/LGD and prudential valuation haircuts in line with supervisory expectations.

2. Advisory and upgrade orchestration. Leverage SRI to propose sequenced improvements with expected kWh/€ savings and tCO<sub>2</sub> avoided. This supports EBA transition plans and provides forward-looking inputs for the EBA environmental scenario analysis (e.g., shocks to energy prices, carbon costs, or minimum performance standards).
3. Monitoring, valuation, and capital markets. Connect smart-meter data and commissioning evidence to verify performance; adjust PD/LGD and pricing dynamically as savings persist; and tag loans with EPC/PED/SRI attributes for green pools and investor reporting.

By anchoring origination to EPC and steering upgrades via SRI, institutions lower borrower sensitivity to energy and policy shocks (supporting PD), raise collateral resilience under future standards (supporting LGD), and evidence alignment against supervisory expectations on risk management, valuation, and disclosures. The same data and processes feed transition plans under EBA/GL/2025/01 and the ECB Guide, and they are compatible with the Eurosystem's evolving collateral treatment of transition-exposed assets. This converts abstract transition risk into measurable, manageable parameters and accelerates portfolio decarbonisation without relying on blunt capital adjustment factors, exactly the direction indicated by European supervisors.

The revised Capital Requirements Regulation (CRR3) reinforces the prudential role of collateral valuation in real-estate lending. In the prudential framework, "property value" is distinct from short-term market price; it must reflect a prudent, sustainable estimate of the asset's value, excluding speculative elements and supported by regular monitoring and re-valuation. Supervisors expect banks to recognise that environmental risk drivers, especially transition risk, can affect property values over time, and to incorporate these effects into credit processes and collateral management. The ECB Guide on climate-related and environmental risks explicitly links climate drivers to PD/LGD and requires institutions to consider C&E risks in collateral valuations, with particular attention to location and energy efficiency, and to embed these considerations in the ongoing monitoring of property values (Article 208 CRR). CRR3's emphasis on property value, together with ECB/EBA expectations,

pushes banks to move from static, point-in-time market prices to documented, forward-looking valuation that accounts for efficiency and smart-readiness. Using EPC to originate and monitor, and SRI to advise, verify and upgrade, systematically reduces transition risk, strengthens prudential valuation, and enhances the resilience of real-estate portfolios under evolving climate policy and market preferences.

### 3.3 AI, EPC and AVM for evaluation of green finance

Artificial intelligence (AI) and Automated Valuation Models (AVMs) are increasingly relevant to scale EPC-aware valuation and collateral monitoring, but their role remains supportive rather than substitutive. In practice, AVMs help banks generate property valuations, revaluations and monitoring signals at portfolio scale, whereas responsibility for credit decisions and prudential assessments remains with the institution's governance and control functions. This framing is consistent with the current European discussion on AVM usage, which highlights both the growth of automated valuations and the fact that regulatory criteria for “advanced statistical models” were introduced through the EBA Guidelines on Loan Origination and Monitoring and later reflected in the revised CRR framework (Source: EMF–EAA Joint Paper on AVMs in Europe, 2025).

In this report, an Automated Valuation Model (AVM) is intended as an advanced statistical or other mathematical method used to estimate and monitor the value of immovable property collateral at scale, supporting valuation, revaluation and monitoring processes along the mortgage lifecycle. This definition is consistent with the prudential framework: CRR Article 208(3a) explicitly allows institutions to monitor the value of immovable property and identify properties in need of revaluation by means of “advanced statistical or other mathematical methods (‘models’)”, provided that these models are developed independently from the credit decision process and are governed through documented policies, performance track record, property-specific variables, minimum accurate information and uncertainty management.

From a valuation perspective, the Basel III transposition into the CRR introduces the process of turning global banking standards into legally binding European Union law and operationalises the concept of “property value” in CRR Article 229(1). The property value must be appraised independently and using prudently conservative valuation criteria, including the explicit exclusion of expectations on price increases and adjustments for the risk that current market values may not be sustainable over the life of the loan. Importantly for green finance and renovation lending, Article 229(1) also clarifies that, where a property is revalued, the property value may exceed the historical average value (or the value at origination) in the case of modifications that unequivocally increase its value, explicitly including “improvements of the energy performance” and improvements related to resilience, protection and adaptation to physical risks. This provides a clear prudential linkage between verified renovation outcomes (including EPC improvements) and collateral valuation processes, while maintaining conservative valuation discipline and data sufficiency requirements.

Properly governed AI and AVMs reduce operational frictions that otherwise slow down green lending and portfolio steering. First, they enable more systematic collateral monitoring by producing consistent valuation updates across large mortgage books, which supports earlier identification of concentrations and vulnerabilities (e.g., segments where low EPC classes combine with adverse market dynamics). This is aligned with the report’s broader logic that EPC-based segmentation supports portfolio monitoring and risk steering, and that richer, standardised processes are prerequisites for credible origination and investor reporting (see Sections 2.3–2.5). Second, AVM-enabled valuation processes allow banks to operationalise the link between energy performance and collateral value in a repeatable way, which is especially relevant where policy-driven transition dynamics may influence marketability and value over time (see Sections 3.1–3.2). Third, AVM-based processes facilitate transparency and consistency in reporting, because the same valuation logic and datasets can be applied across exposures when producing portfolio analytics that support internal monitoring and, where relevant, investor-facing disclosures (see Sections 2.5–2.6).

The scaling benefits of automation only materialise if institutions adopt strong governance and data controls. The EBA’s Guidelines on ESG risk management emphasise that banks should be able to identify and measure ESG risks through sound data processes and should integrate ESG drivers into their regular risk management framework using a combination of methodologies, including portfolio- and scenario-based approaches (Source: EBA/GL/2025/01 Final Guidelines on ESG risks, Executive Summary). In an AVM context, this implies:

- traceable and quality-assured data pipelines for core property attributes and EPC information;
- documented methodologies that allow internal audit and supervisors to understand how the model is used and where its limitations apply; and
- ongoing monitoring of model performance so that drift or bias can be detected and corrected within the model lifecycle.

AVM adoption is more credible when it is aligned with the regulatory scaffolding already recognised in Europe. The EMF–EAA 2025 joint paper explicitly notes that the EBA Guidelines on Loan Origination and Monitoring introduced EU-wide criteria for advanced statistical models and that the revised CRR framework adapted these criteria into level-1 legislation, reinforcing the need to distinguish between different AVM types and their compliance with regulatory criteria (Source: EMF–EAA Joint Paper on AVMs in Europe, 2025). Within this framework, the policy-relevant point for this deliverable is not “more automation per se”, but controlled and transparent automation that improves valuation consistency, enables more frequent monitoring, and supports the integration of EPC-related information into collateral assessment, while remaining embedded in strong governance arrangements and internal controls consistent with ESG risk management expectations<sup>20</sup>.

<sup>20</sup> Source: EBA/GL/2025/01 Final Guidelines on ESG risks

In practice, scaling AVM use in green finance requires a short set of safeguards that align with the principles above: (1) establish reliable and quality-controlled data processes for property attributes and EPC information. (2) ensure traceability of inputs and outputs so results can be audited and defended in supervisory contexts. (3) integrate AVM outputs into risk processes as decision support and monitoring tools, consistent with EU-wide criteria on advanced statistical models discussed in the European AVM context.

### 3.4 SRI and banks: what's next

SRI adds a complementary dimension to EPCs by capturing a building's operational intelligence: the readiness to monitor, control and optimise energy use through automation, demand response, storage and on-site generation. In the logic of this report, SRI therefore strengthens the persistence and verifiability of savings, which supports better monitoring of affordability under energy price shocks and improves visibility on cash-flow stability (PD) and collateral durability (LGD) (see Section 2.3). This is particularly relevant for banks because the key de-risking channel for retail lending is affordability: if savings are more reliable and persistent, the credit benefit of renovation finance is more credible over the life of the exposure (see Sections 2.3 and 3.2).

A pragmatic sequencing emerges from the report's own operational framing: use EPC at origination (baseline efficiency and eligibility screening) and use SRI as an advisory and orchestration tool across the customer lifecycle. The EPC is the appropriate baseline for segmentation, taxonomy screening and standardised disclosure at origination, while SRI supports tailored upgrade pathways by identifying measures that stabilise bills and cash flows and help the asset climb EPC classes over time. In practical terms, this allows banks to support renovation finance with more structured advisory packages and to connect upgrades to verifiable performance evidence, which is consistent with the report's emphasis on reducing execution risk and strengthening the credibility of expected savings (see Sections 2.3 and 2.4).

Beyond advisory, SRI can support stronger monitoring approaches by linking smart building capabilities with measurement and verification pathways. The present report explicitly notes that execution can connect commissioning documentation and smart-meter reads to update SRI sub-scores and verify performance, allowing lenders to improve the reliability of performance tracking and to support consistent investor reporting where relevant (see the section "How SRI facilitates green finance in practice", p.16). This framing is important because it avoids overclaiming: rather than asserting that SRI already changes capital requirements or risk parameters directly, it positions SRI as a data and process enabler that improves the quality of monitoring and the verifiability of savings, inputs that are increasingly relevant under forward-looking ESG risk management expectations<sup>21</sup>.

Recent evidence from Finland further shows why this advisory role matters: market-driven renovation proposals tend to prioritise measures with direct and easily measurable energy

<sup>21</sup> Source: EBA/GL/2025/01 Final Guidelines on ESG risks, Executive Summary

savings, while several SRI-relevant smartness features remain marginal despite their strategic value for future flexibility, adaptability and resilience.



**Illustration 9. Business ready SRI: underfinanced smartness features renovations, evidence from Finland**

In Finland, recent empirical evidence also suggests that the current market logic of energy efficiency renovation does not yet capture the full value proposition of smart readiness. An analysis of real energy-efficiency improvement proposals shows that most interventions concentrate on areas where direct energy and cost savings are easily measurable, especially heating, controlled ventilation, and monitoring and control, while dimensions such as grid interaction, on-site energy flexibility, electric vehicle charging, and occupant-oriented smart services remain marginal.

This finding is particularly relevant for banks. If SRI is to become a meaningful support tool for green finance, it should not be interpreted only as an additional technical score, but as a structured way to identify those smart features that are currently underfinanced despite their long-term strategic value. In practical terms, this means that lenders could use SRI to complement conventional energy retrofit financing by highlighting measures that improve the building's future adaptability, resilience to energy market volatility, and capacity to participate in more dynamic energy systems.

Such an approach would help move financing decisions beyond a narrow focus on immediate savings, enabling a broader assessment of building quality and future-proof performance. In this way, SRI can support banks not only in advisory and monitoring, but also in identifying investment gaps where market-driven renovation practices still fall short of the EU's smart transition objectives.

Source: *Smart Readiness Indicator: Ready for Business? Evidence from a Northern EU Country*  
<https://www.mdpi.com/3043694>

A further Finnish case confirms that the market adoption of SRI will depend not only on technical assessment, but also on the capacity to translate smartness results into actionable investment and financing decisions.



**Illustration 10. The potential adoption of the SRI in the Finnish residential rental property market**

Evidence from the Finnish residential rental property market suggests that the practical uptake of the SRI will depend less on the existence of the score itself than on the way its results are translated into decisions.

Interviews with professional owners, investors, BACS specialists and public actors show that direct awareness of the SRI may still be limited, even where the broader understanding of building smartness is already relatively mature. This does not imply weak adoption potential. On the contrary, stakeholders tend to recognise the relevance of smartness when it is linked to concrete outcomes such as lower energy costs, improved

indoor conditions, better demand-side management and clearer investment priorities.

From a banking perspective, this is an important signal. It suggests that the SRI is more likely to gain traction when positioned as a decision-support layer that helps structure upgrade roadmaps, benchmark assets and justify financing needs, rather than as an additional stand-alone certificate. In this sense, the strongest value proposition of the SRI lies in its capacity to convert technical smartness features into comparable, actionable and finance-relevant information.

Market uptake is therefore likely to depend on three conditions: simple interpretation, credible evidence of benefits, and operational alignment with familiar instruments such as EPCs, renovation plans and broader ESG reporting practices.

*Source: The adoption of the Smart readiness indicator in the Finnish residential rental property market*  
<https://aaltodoc.aalto.fi/server/api/core/bitstreams/8ce4b1b9-c337-45b9-9115-98e82369e14d/content>

Operational data further reinforces this role by connecting SRI-related smartness features with measured building performance, thereby improving the credibility of savings estimates and the bankability of renovation measures.

### ***Illustration 11. Operational Performance Data as a Bridge between Smart Readiness and Green Finance***

An operational assessment layer can further strengthen the role of SRI as a practical support tool for banks. Evidence from SmartLivingEPC shows that building performance can be evaluated not only through design-based indicators, but also through measured data collected during operation, including indoor temperature, relative humidity, CO<sub>2</sub> concentration, PM2.5, ventilation airflow and occupancy patterns. These data streams, typically collected through IoT devices at regular intervals, allow the comparison between expected and actual performance and make it possible to identify performance gaps that would otherwise remain invisible in static certification schemes.

From a financial perspective, this operational evidence is particularly relevant because it improves the reliability of savings estimates and supports more robust investment appraisal. By linking as-designed, as-operated and predicted performance with life-cycle costing indicators, banks can better assess whether renovation measures deliver persistent benefits over time. For example, smart controls or ventilation upgrades may be evaluated not only in terms of energy savings, but also in relation to comfort, indoor air quality, maintenance needs and long-term operating costs. This creates a stronger evidence base for performance-linked financing, supports customer advisory, and reduces uncertainty around renovation outcomes. In this sense, operational assessment complements EPC and SRI by transforming building smartness into measurable, verifiable and finance-relevant information.

*Source: SmartLivingEPC [D3.4 Operational assessment methodology at building level v2.pdf](#)*

From a scaling perspective, SRI's usefulness for banks depends on three enabling conditions:

- standardisation and interoperability so that SRI outputs can be consistently used across markets and integrated with EPC-based data flows;
- sufficient assessor capability and robust quality assurance to ensure trust in outputs; and
- conservative integration into risk processes while empirical evidence continues to mature.

The report already emphasises that SRI is newer and less widely deployed than EPC, and therefore its best near-term role is to complement EPC by improving monitoring and the persistence of savings (see Section 2.3). Consistent with the EBA's expectations on ESG risk management, banks should integrate new data-driven indicators through sound data processes and governance arrangements, using them to support risk identification and monitoring while maintaining controlled and auditable methodologies (Source: EBA/GL/2025/01 Final Guidelines on ESG risks).

In summary, SRI has a clear "next step" value proposition for banks when positioned correctly: it is a complementary tool that supports advisory, verification and monitoring of energy performance improvements, thereby strengthening the credibility of de-risking mechanisms described earlier in the report, without requiring premature claims about direct prudential effects.

## 4. Conclusion

This deliverable has shown that the case for embedding building energy performance into finance is no longer conceptual: it is increasingly supported by regulatory direction, supervisory expectations and market practice. EPCs and (where available) SRI-related indicators provide a practical bridge between climate objectives and traditional financial risk management, because they make energy efficiency observable, comparable, and usable in credit and valuation processes.

- 1) **EPC collection must become a standard banking practice.** A central conclusion is that banks should treat EPC information as a core dataset, not an optional ESG add-on. At origination, EPC provides the baseline needed to segment exposures, screen eligibility, and anchor portfolio monitoring over the life of the loan. The report's operational logic is clear: EPC is the right instrument to establish the starting point for risk assessment and to enable consistent downstream monitoring and reporting. Without systematic EPC collection, banks cannot reliably steer portfolios, credibly evidence progress in decarbonisation pathways, or scale green lending processes with appropriate governance.
- 2) **Scaling green finance requires financing “performance”, not only “labels”.** To move from pilots to volume, banks need mechanisms that reduce execution risk and strengthen confidence that expected savings will materialise. This is where the report positions SRI as a complementary tool: while EPC captures the efficiency baseline, SRI captures operational intelligence and verifiability, supporting more reliable persistence of savings and improved resilience to energy price volatility. In practice, this enables banks to design financing pathways that are not limited to funding static upgrades, but also support the operational capacity of buildings to manage energy over time.
- 3) **Banks should start financing SRI and IoT/smart-home solutions as part of the decarbonisation pathway.** A key “next step” implication is that banks should not focus only on traditional retrofit CAPEX (insulation, heating systems), but also begin to finance smart-home and IoT components, such as smart controls, monitoring devices, smart meters integration and digital renovation tools, because these are the enablers of measurement, verification, and continuous optimisation. The document explicitly frames IoT and home automation as foundational building blocks to make data flow seamless and to enable real-time visibility of consumption and performance across the ecosystem. This visibility supports better credit decisions and ESG reporting while reducing friction and accelerating market uptake.
- 4) **A pragmatic operational sequencing supports adoption and reduces risk.** The report supports a conservative, bankable sequencing: EPC at origination for baseline risk segmentation and eligibility; SRI post-origination for advisory, upgrade orchestration, and monitoring/verification of performance. This sequencing allows banks to start immediately with data collection and portfolio steering, while progressively expanding into performance-linked monitoring as SRI adoption

increases. It also supports a controlled approach to integrating new indicators into risk processes, consistent with the broader expectation that institutions strengthen data processes and governance arrangements to manage ESG risk drivers in a forward-looking way.

- 5) **Data infrastructure and interoperability are preconditions for scale.** The deliverable repeatedly highlights that scaling requires more than product design: it requires reliable data flows, standardisation and interoperability across actors. Building logbooks, digital renovation passports, smart meters and connected devices are not peripheral innovations; they are the infrastructure that makes performance measurable and financeable. In this sense, financing SRI and IoT should be seen as financing the “data layer” of decarbonisation, i.e., the capability to prove outcomes and reduce information asymmetries that currently inflate perceived risk.
- 6) **The SmarterEPC direction is aligned with the project’s original intent.** Finally, the report’s conclusions reinforce the project’s core ambition of aligning inputs and simplifying procedures across EPC and SRI assessments, an approach that is explicitly reflected in the project proposal. This alignment matters: it suggests that the pathway to scale is not adding complexity, but creating a more integrated and standardised certification and data ecosystem that financial institutions can use operationally. SmarterEPC’s [Roadmap for achieving the mandatory SRI target for buildings with heating capacity of over 290 kW](#) supports this approach.

To de-risk and decarbonise their portfolios, banks should:

- systematically collect EPCs for collateral at origination and portfolio monitoring, and
- start financing smartness, including SRI-aligned upgrades and IoT/smart-home technologies, because they enable verification, persistence of savings and resilient affordability.

This combination converts energy performance from a static label into a measurable risk-mitigation mechanism, improving the scalability, credibility and investability of green finance for buildings.

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