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EPBD.wise

Bringing European Building Policy to Life

Elaboration of legal studies on EPBD provisions

Final Report

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List of abbreviations

ADEME	Agency for the Ecological Transition
ADENE	Portuguese Energy Agency
API	Application programming interface
BIM	Building information modelling
BMWSB	Federal Ministry for Housing Urban Development and Building
BNB	Assessment System for Sustainable Building
BPIE	Buildings Performance Institute Europe
CDC	*Caisse des Dépôts*
CF	Cohesion Fund
CI	Certifying Institution
CJEU	Court of Justice of the European Union
CNIL	National Commission for Information Technology and Civil Liberties
CPTRA	Consumer Protection and Technical Regulatory Authority
DEA	Danish Energy Agency
DPE	*Diagnostic de Performance Énergétique*
ECHR	European Convention of Human Rights
ECtHR	European Court of Human Rights
EDP	Excessive deficit procedure
EED	Energy Efficiency Directive
EHR	Estonia's National Register of Buildings
EIB	European Investment Bank
EnPC	Energy performance contracting
EPBD	Energy Performance of Buildings Directive
EPCs	Energy performance certificates
ERDF	European Regional Development Fund
ESCOs	Energy service companies
GBER	General Block Exemption Regulation
GBCE	General Data Protection Regulation
GDP	Gross domestic product
GEG	Building Energy Act (Germany)
GHG	Greenhouse gas
IEQ	Indoor environmental quality
IGBC	Irish Green Building Council
ILT	Human Environment and Transport Inspectorate
IoT	Internet of things
IP	Intellectual property
IPCC	Intergovernmental Panel on Climate Change
JTF	Just Transition Fund
KFW	German public development bank (*Kreditanstalt für Wiederaufbau*)
MEPS	Minimum energy performance standards
MFF	Multiannual financial framework

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MIVAU	Spain's Ministry of Housing and Urban Agenda
NBRPs	National building renovation plans
OIB	Austrian Institute of Construction Engineering
OPs	Operational programmes
PPP	Public-private partnership
PRTR	Spain's Recovery Transformation and Resilience Plan
QNG	Quality Seal for Sustainable Buildings
RED	Renewable Energy Directive
RP	Renovation passport
RRF	Recovery and Resilience Facility
RVO	Netherlands Enterprise Agency
SCE	National System for Energy and Indoor Air Quality Certification of Buildings
SCF	Social Climate Fund
SEAI	Sustainable Energy Authority of Ireland
SGGCCS	Construction Cluster of Slovenia
SGP	Stability and Growth Pact
SMEs	Small and medium-sized enterprises
SRI	Smart readiness indicator
TFEU	Treaty on the Functioning of the European Union
TPF	Third-party financing

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Executive summary

Study objectives

This report supports the implementation of the Energy Performance of Buildings Directive (EPBD) by examining three interlinked legal and governance conditions for delivering its renovation ambitions in practice. It looks at how national frameworks for building-related data can move from document-centric compliance to a reusable, interoperable data ecosystem; how mandatory renovation obligations and minimum energy performance standards can be framed in a manner that is compatible with fundamental rights and national constitutional traditions; and how financing architectures can be designed so that deep renovations are legally feasible and financially accessible across different territories and ownership structures.

Key findings

- The **first case study** shows the EPBD's requirement for national building databases to be both an opportunity and a legal challenge. Article 22 marks a shift towards a data-centric regime but realising its potential requires **clearer allocation of roles and responsibilities (controllers, joint controllers, processors), a practical right of access and reuse for owners, tenants and managers, and solutions to persistent uncertainty around data ownership, privacy and liability**. Without a solid legal basis for collection and reuse, a unified consent and authorisation mechanism, and minimum interoperability standards (machine-readable formats, unique building identifiers, open application programming interfaces (APIs)), Member States risk fragmented systems, vendor lock-in and professionals continuing to re-collect data rather than relying on central repositories.
- The **second case study** confirms that the move from voluntary incentives to mandatory renovation obligations can be defended under European Union (EU) fundamental rights law, provided certain conditions are met. Minimum energy performance standards (MEPS) for non-residential buildings and national trajectories for residential buildings might interfere with property rights, and must therefore be grounded in clear, specific statutory provisions and subjected to a structured proportionality assessment. **Renovation duties are most robust where they target the worst-performing stock first, use technology-neutral performance metrics, are phased in line with investment cycles, and are accompanied by hardship and unfeasibility valves, tailored tools for co-owned and rented buildings, and a credible enabling framework of finance and advisory support.** Where these elements are absent, the risk of successful legal challenges on proportionality and legal certainty grounds increases significantly.
- The **third case study** shows that the EPBD effectively transforms deep-renovation finance from a discretionary policy field into a legal compliance requirement, and that EU competition and fiscal rules operate as structuring parameters rather than hard obstacles. As large-scale renovation schemes supporting landlords, social housing providers, energy service companies (ESCOs) or financial intermediaries may constitute State aid, it is crucial to design them *ex ante* to fit within the General Block Exemption Regulation (GBER) or the Climate, Energy and Environmental State aid Guidelines, and to allocate risks in energy performance contracting (EnPC) so that off balance sheet treatment is possible where appropriate. In parallel, **EU funds need to be programmed in a complementary way along the project cycle to avoid fragmentation, overlaps and delays.** A distinctive finding concerns rural and low-value markets, where renovation costs

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can exceed property values: because the EPBD does not allow these segments to be exempted, high-intensity, place-based support packages, combining grants, guarantees, long-tenor loans and, where necessary, partial measures instead of full deep renovation, become a legal necessity to preserve proportionality and non-discrimination.

Conclusion

Overall, the study offers practical and legal guidance to aid EPBD implementation across the EU Member States. **By tackling three interconnected issues – data governance, property rights safeguards, and financing mechanisms – Member States can create an enabling framework for the EPBD's success**. Clear and coherent legal measures are essential to operationalise the EPBD's goals: from unlocking building data for innovation, to enforcing renovation standards in a fair and rights-compliant manner, to mobilising capital for renovations without legal bottlenecks. **Taken together, the three case studies provide practical recommendations to guide national authorities in transposing the EPBD in ways that respect EU law and national conditions.** By adopting these best practices and recommendations, Member States can significantly accelerate building renovations and move toward a highly energy-efficient, decarbonised building stock by 2050, in line with Europe's climate objectives. **The overarching implication is that effective EPBD implementation will require not only technical ambition but also careful legal craftsmanship, ensuring that ambitious renovation policies are underpinned by solid legal frameworks that protect citizens' rights and distribute benefits and burdens equitably**.

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Introduction

This report aims to support the effective implementation of Directive (EU) 2024/1275, the Energy Performance of Buildings Directive (EPBD)[1], by addressing three critical legal and policy challenges that are central to achieving a highly energy-efficient and decarbonised building stock by 2050. The three case studies are intended to provide policymakers, regulators, and other stakeholders with robust legal analyses and practical recommendations to guide national transposition and application of the EPBD's provisions.

Case Study 1 focuses on the reuse of building-related data, which is increasingly essential as buildings become 'smarter' and more data-rich through systems such as smart meters, energy performance certificates (EPCs) and digital building logbooks. The legal analysis explores how Member States can ensure third-party access to such data while complying with data protection obligations under the General Data Protection Regulation (GDPR) and other relevant data governance rules. Given the growing role of digitalisation in energy performance monitoring, it also identifies best practices for balancing data availability with privacy safeguards, including examples from Member States building data-sharing initiatives.

Case Study 2 examines the balance between public climate objectives and private property rights in the context of mandatory renovation obligations. The EPBD empowers Member States to establish MEPS and trajectories to renovate the worst-performing segments of the building stock. However, these obligations may affect fundamental property rights and raise concerns about proportionality, legal certainty, and fairness. This case study investigates how to justify these obligations under EU law and how they can be incorporated to mitigate negative social impacts, including for vulnerable households. The analysis includes examples from Member States that have already legislated renovation mandates.

Case Study 3 addresses the establishment of sound legal and regulatory frameworks for financing deep renovations. Given the enormous investment needs required to decarbonise the building stock, Member States must deploy a wide range of financial tools and incentives, from preferential loans and green bonds to energy performance contracting (EnPC) and revolving funds. This case study explores how such instruments can be designed in compliance with EU State aid rules, while ensuring transparency, accountability, and accessibility for vulnerable or low-income households.

The report applies a legal methodology that combines desk research with a comparative analysis of national frameworks and targeted stakeholder interviews. The comparative element draws lessons from the practical experience of Member States that have pioneered approaches to these issues. Stakeholder interviews provide insights into implementation barriers and enforcement risks, ensuring that recommendations are both operational and legally robust. The case studies draw on existing guidance, soft-law instruments and technical initiatives to identify workable solutions and best practices that can be scaled or adapted. The result is a set of cross-cutting findings and recommendations aimed at guiding national transposition choices.

[1] Directive (EU) 2024/1275 of the European Parliament and of the Council of 24 April 2024 on the energy performance of buildings, https://eur-lex.europa.eu/eli/dir/2024/1275/oj/eng.

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Background

The EPBD is central to achieving the EU's 2030 and 2050 climate and energy targets, as it aims to drastically improve the energy performance of Europe's building stock. Buildings are responsible for approximately 40% of the EU's total energy consumption, with around 75% of the building stock **considered energy inefficient**. Increasing renovation rates, which currently remain at a modest rate of 1% per year, remains a fundamental priority to advance the EU's climate and energy objectives. The revised EPBD introduces more ambitious measures to stimulate renovations, with a particular focus on the worst-performing buildings that waste the most energy and contribute heavily to greenhouse gas (GHG) emissions[2].

Article 9 of the EPBD introduces **MEPS** for non-residential buildings. These standards require Member States to progressively renovate the worst-performing parts of their non-residential building stock. For non-residential buildings, MEPS provide the legal basis for mandatory renovation obligations. For residential buildings, Article 9(2) requires a national trajectory to reduce average primary energy use by at least 16% by 2030 and by 20-22% by 2035, with at least 55% of the reduction delivered by renovations of the 43% worst-performing dwellings. While national authorities retain flexibility to adapt requirements for certain categories of buildings, the overarching aim is to accelerate the renovation rate across the Union towards climate neutrality by 2050.

The EPBD emphasises better use of **data and information tools** to drive efficiency improvements. It strengthens **EPCs**, requiring a common EU-wide template, more reliable ratings, and becoming fully digital, with each country establishing a national database for building energy performance data[3]. Building owners, tenants and managers are to have direct access to key building information (e.g. energy consumption and system performance data), enabling effective and lawful reuse of building-related data for energy management and renovation planning. New instruments such as the **renovation passport (RP)** are introduced to help property owners to plan staged renovations over time[4].

Finally, the EPBD addresses the need for **financing and support mechanisms** to enable deep renovations at scale. Member States are obliged to provide targeted financial incentives and funding programmes to support building upgrades, with a focus on assisting vulnerable households and reducing energy poverty. The EPBD calls for safeguards to balance public interest and private rights, such as protections for tenants (e.g. rent caps, support schemes) to ensure that mandatory renovation requirements do not lead to unjust rent increases or evictions. It also encourages the establishment of one-stop-shops offering technical assistance and advice to homeowners and businesses undertaking renovations, as well as measures to build the needed workforce skills. These elements are intended to create a

[2] European Commission, *Energy Performance of Buildings Directive*, n.d., https://energy.ec.europa.eu/topics/energy-efficiency/energy-performance-buildings/energy-performance-buildings-directive_en.
[3] Rescoop.EU, *Directive (EU) 2024/1275 (recast European Performance of Buildings Directive)*, 2024, https://www.rescoop.eu/uploads/rescoop/downloads/EPBD-Policy-Briefing-2nd-Generation-of-Energy-Communities-Legislation.pdf.
[4] Nicoletti, F., Carpino, C., Barbosa, G., Domenico, A., Arcuri, N. and Almeida, M., 'Building renovation passport: A new methodology for scheduling and addressing financial challenges for low-income households', *Energy and Buildings*, Vol. 331, 2025, 115353, https://doi.org/10.1016/j.enbuild.2025.115353.

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supportive framework enabling higher energy performance standards for buildings to be met in practice.

Case studies

Case Study 1: Legal framework for the reuse of building data

1.1 Introduction and context

Article 22 of the EPBD creates a binding obligation for Member States to establish and operate a national database for the energy performance of buildings. This case study focuses on the legal implications and potential implementation challenges of Article 22 for Member States, setting the frame for the detailed requirements that follow. Modern buildings are becoming progressively smarter, generating extensive datasets through internet-of-things (IoT)-connected devices such as smart meters, building management systems, and energy performance certification processes[5]. These data streams include not only real-time energy usage and performance data, but also documentation such as building permits, energy audits, and maintenance records. Effective reuse of such comprehensive building datasets is essential for informed decision-making, performance benchmarking, streamlined renovation processes, improved resource allocation, and accurate risk assessment. Crucially, effective data management contributes directly to achieving Europe's ambitious goals for energy efficiency, decarbonisation, and sustainability.

The European building sector remains relatively underdeveloped in respect of digitalisation and integrated data management compared to other economic sectors[6]. Current practices often involve repetitive data collection by multiple professionals throughout the building's life, resulting in significant inefficiencies, increased costs, and heightened risk of data inconsistencies or errors. This repeated collection contributes not only to project delays and higher transaction costs but also negatively impacts the affordability and efficiency of crucial building instruments such as RPs and the smart readiness indicator (SRI)[7]. The absence of clear data ownership frameworks and explicit third-party access rights frequently leads to legal ambiguity and hampers effective reuse[8].

One of the most pressing goals is to enable progressive enrichment and updating of a building's dataset over time. Rather than requiring data to be collected from scratch every time a new report or certificate is needed, the legal and technical infrastructure should allow for a continuous, centralised gathering of information. Such a model presupposes the ability for

[5] Bakar, A. A., Yussof, S., Ghapar, A. A., Sameon, S. S. and Jørgensen, B. N., ' A review of privacy concerns in energy-efficient smart buildings: risks, rights, and regulations', *Energies*, Vol. 17, Issue 5, 2024, p. 977.
[6] European Commission: Executive Agency for Small and Medium-sized Enterprises, Volt, J., Toth, Z., Glicker, J., De Groote, M. et al., *Definition of the digital building logbook – Report 1 of the study on the development of a European Union framework for buildings' digital logbook*, Publications Office of the European Union, Luxembourg, 2020, https://data.europa.eu/doi/10.2826/480977.
[7] Ibid.
[8] Ibid.

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authorised experts to access a shared dataset that is quality-assured, legally coherent, and secure. At the same time, it raises essential legal questions about who owns the data, particularly where data results from expert calculations or assessments, and who bears responsibility if errors or omissions in those data lead to consequences for subsequent users.

A centralised and quality-assured data environment has multiple advantages: it would reduce unnecessary duplication of effort, support the interoperability of different digital tools and reporting obligations, and minimise costs for professionals and public administrations alike. In addition to technical infrastructure, realising this model requires a clear and coherent legal framework.

This case study explores the legal steps to enable such a system. It examines how data relevant to a building's lifecycle can be stored centrally and updated progressively, ensuring that they remain usable by multiple professionals for distinct but interrelated purposes. It also addresses how to ensure that the data are consistently quality-assured, how ownership and access rights should be structured, and how experts can rely on the data with confidence, free from disproportionate liability risks. The case study aims to support the development of clear, actionable guidance for Member States by identifying the legal conditions and governance structures necessary to operationalise a shared building data environment that is legally robust, cost-efficient, and conducive to the successful implementation of RPs, the SRI, and future digital innovations in the built environment.

The case study begins by outlining the current legal landscape governing building-related data. This includes an overview of the relevant provisions in the EPBD, particularly those addressing national databases and digital building logbooks, and examines their interaction with broader EU legislation such as the GDPR and the Data Act. It then assesses the key legal challenges and unresolved questions that may hinder the establishment of a shared building data environment, including ambiguities around data ownership, authorisation requirements, and liability frameworks. Drawing on a comparative review of existing practices in selected Member States, it identifies promising models and practical approaches. The case study concludes with recommendations for EU and national policymakers on building a legally sound, interoperable, and quality-assured building data infrastructure that supports innovation while safeguarding the rights and responsibilities of all stakeholders.

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1.2 Legal landscape

The EPBD was adopted in the context of the EU's broader digital and green transition strategies. Accordingly, a key theme is leveraging building-related data to drive energy efficiency improvements, smart building services, and informed decision-making by market actors. The European Strategy for Data underscores data as an essential resource for innovation and economic growth, calling for frameworks that make more data available and appropriately controlled[9]. The EPBD introduces new provisions to ensure that data on buildings – from EPCs to real-time systems information – can be **accessed, shared and reused** by relevant stakeholders under clear conditions. These legal provisions aim to unlock the value of building data while safeguarding privacy and maintaining data quality. Crucially, the framework is designed to be consistent with horizontal EU data legislation, notably the Data Act, to ensure fairness and interoperability across sectors. The following sections examine the main elements of this legal landscape: the establishment of national building data repositories, the introduction of digital building logbooks, the rules on accessing and sharing building data, provisions for data quality control, and requirements for interoperability.

National databases for energy performance of buildings

Article 22 of the EPBD requires each Member State to set up a national database for the energy performance of buildings. The database must collect data on the energy performance of individual buildings, as well as aggregated data on the national building stock.

Member States are allowed some flexibility in implementation as the database can be a composite system made up of interconnected databases rather than a single silo. The overarching goal is to ensure a comprehensive digital record of building performance information at national level, which can be used to monitor progress, inform policy and support renovations[10].

The EPBD specifies that the database should be able to gather data from all relevant sources related to building energy performance. At a minimum, this includes data from: EPCs, inspection reports for heating and air-conditioning systems, RPs, SRIs (where available), and the measured or calculated energy consumption of buildings. The database may also incorporate information on building typologies and data on operational GHG emissions and life-cycle global warming potential for buildings, where such data are available. In other words, the national database is envisaged as a holistic repository encompassing both the static characteristics of buildings and their operational performance[11].

Article 20(8) of the EPBD introduced a new obligation linked to the database: all newly issued EPCs must be uploaded to the national database, including 'the full energy performance certificate, including all necessary data required for the calculation of the energy performance of the building'. This means that each EPC's underlying input data (not just the summary rating

[9] European Commission, European Data Strategy, n.d., https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/europe-fit-digital-age/european-data-strategy_en.
[10] European Commission, Annex to the Communication to the Commission: Approval of the content of the draft Commission Notice providing guidance on new or substantially modified provisions of the recast Energy Performance of Buildings Directive (EU) 2024/1275: Databases for the energy performance of buildings (Article 22), 2025, https://energy.ec.europa.eu/document/download/74388e1e-ca33-4ae0-9e4a-900953873cf2_en?filename=Databases%20for%20the%20energy%20performance%20of%20buildings%20%28Article%2022%29%20-%20annex%205.pdf.
[11] Ibid.

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or label) and the recommended improvements must be stored, ensuring that the database holds the detailed information needed for any subsequent reuse or analysis. The Commission's guidance emphasises that a 'full EPC' in this context means the entire certificate, with all outputs and inputs mandated by Article 19 and Annex V to the EPBD, as well as any additional indicators a Member State might include[9]. This comprehensive approach enables the database to serve not only as an archive but as a practical tool, enabling building owners or authorised third parties to download the complete EPC document from the system on demand, facilitating data portability[10].

Data accessibility and use

The EPBD lays down detailed provisions on who should have access to the data in these national databases, and under what conditions. First and foremost, **building owners, tenants and managers** must have easy and free-of-charge access to the full EPC data for their buildings. The data should be accessible via an appropriate **digital interface** in a machine-readable format, meaning each Member State's database will likely feature an online portal or platform through which users can retrieve information (e.g. by logging into a property-specific account). In addition, **financial institutions** are explicitly granted access to the full EPCs of buildings in their lending or investment portfolios[12].

Access is also to be provided, with the owner's permission, to **independent experts** and **prospective buyers or tenants** of a building so that they can view the EPC when a property is marketed for sale or rent. These measures ensure that building performance data follows the building through transactions and can be reused by various legitimate actors to make informed decisions[13].

The EPBD mandates **public transparency of aggregated data.** Anonymised statistics about the building stock's energy performance (distribution of EPC classes, average consumption, share of buildings with certain ratings, etc., including data on energy use and, where available, lifecycle carbon emissions) must be made publicly available and updated at least twice per year[14].

Interconnection and integration

The EPBD requires that buildings databases be **interoperable and integrated with other relevant data systems**. Article 22(7) provides that the EPC database must be integrated with 'other administrative databases containing information on buildings, such as the national building cadastre or land registry'. This integration seeks to ensure coherence. For example, a building's unique identifier or address should match across the energy performance database and the land registry, allowing cross-referencing of data. It also opens the door for streamlined processes: if a cadastre already contains basic data like a building's age, size, or location, linking it with the EPC database can avoid duplicate data entry and even enable

[12] European Commission, Annex to the Communication to the Commission: Approval of the content of the draft Commission Notice providing guidance on new or substantially modified provisions of the recast Energy Performance of Buildings Directive (EU) 2024/1275: Data exchange (Article 16), 2025.
[13] Ibid.
[14] European Commission, Annex to the Communication to the Commission: Approval of the content of the draft Commission Notice providing guidance on new or substantially modified provisions of the recast Energy Performance of Buildings Directive (EU) 2024/1275: Databases for the energy performance of buildings (Article 22), 2025, https://energy.ec.europa.eu/document/download/74388e1e-ca33-4ae0-9e4a-900953873cf2_en?filename=Databases%20for%20the%20energy%20performance%20of%20buildings%20%28Article%2022%29%20-%20annex%205.pdf.

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automated checks. The Commission 'strongly recommends' that Member States use unique building identifiers (e.g. cadastre ID, national building code) across all databases, so that records in the energy performance database can be unambiguously linked to the corresponding building in property registers[15].

Digital building logbooks are another named system that should be interoperable with EPC databases. This implies that any data stored in a building's digital logbook should be exchangeable or accessible through the national database, creating a seamless flow of information about the building. Finally, Article 22(5)–(6) of the EPBD integrates national databases into the EU's own data ecosystem: Member States must transfer data from their database to the **EU Building Stock Observatory** at least annually (and potentially more frequently)[16].

Digital building logbooks

The EPBD formally introduces the concept of the digital building logbook as part of the Union's push for more comprehensive and user-friendly building documentation. Article 2(41) defines a digital building logbook as 'a common repository for all relevant building data, including data related to energy performance such as energy performance certificates, renovation passports and smart readiness indicators, as well as data related to the life cycle GWP, which facilitates informed decision making and information sharing…'. It is envisioned as a **digital dossier for a building**, compiling information over its lifetime from various sources in one accessible place. This can range from technical specifications and insulation levels to installed equipment details, maintenance records, past energy renovation measures, and the building's energy performance trajectory. By aggregating such data, the logbook would enable building owners and professionals to have a one-stop reference for planning upgrades and tracking compliance with standards. It would also aid prospective buyers or tenants by providing transparency about a building's history and characteristics.

While the EPBD stops short of mandating that every building must have a digital logbook, it creates incentives and references that encourage their development and use. Its provisions ensure that **where digital logbooks exist, they are linked to the broader data framework**. For example, Article 16(1) specifies that building systems' data should be linked to the digital building logbook 'where available'[21], i.e. where an owner has created or is required to maintain a logbook for a building, the data produced under the EPBD should be accessible through or stored in that logbook. The Commission reinforces this integration, listing the digital building logbook as one of the types of information that constitute 'building systems data' under Article 16(1) of the EPBD, to which owners and others should have access[17].

[15] European Commission, Annex to the Communication to the Commission: Approval of the content of the draft Commission Notice providing guidance on new or substantially modified provisions of the recast Energy Performance of Buildings Directive (EU) 2024/1275: Databases for the energy performance of buildings (Article 22), 2025, https://energy.ec.europa.eu/document/download/74388e1e-ca33-4ae0-9e4a-900953873cf2_en?filename=Databases%20for%20the%20energy%20performance%20of%20buildings%20%28Article%2022%29%20-%20annex%205.pdf.
[16] Linklaters, *EU "Fit for 55": The revamped Energy Performance of Buildings Directive – lion's teeth or paper tiger?,* 2024, https://sustainablefutures.linklaters.com/post/102j498/eu-fit-for-55-the-revamped-energy-performance-of-buildings-directive-lions.
[17] European Commission, Annex to the Communication to the Commission: Approval of the content of the draft Commission Notice providing guidance on new or substantially modified provisions of the recast Energy Performance of Buildings Directive (EU) 2024/1275: Data exchange (Article 16), 2025.

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In legal terms, the digital building logbook remains a **voluntary or complementary instrument** in the EPBD framework, as the EPBD does not yet require their creation for each building.

Access to building data and data exchange

One of the most significant new features of the EPBD is the creation of a legal framework for **accessing and sharing building systems data**, aimed at enabling data reuse by building owners and third-party service providers. Article 16 establishes that **building owners, tenants and managers** have a right to direct access to the data from their building's technical systems. This covers data related to the energy performance of building elements and services (heating, cooling, ventilation, etc.), the output of any building automation and control systems, meter readings, the status of charging points for electric vehicles, and even the 'projected lifespan of the heating systems' where such information is available. All such data is collectively termed 'building systems' data' in the EPBD, and Article 16(1) makes clear that at least all 'readily available' data in those categories must be accessible. Inclusion of the phrase 'readily available data' (from the definition in the Data Act) means that if the data can be obtained without disproportionate effort beyond standard operations, they should fall under this access regime[18].

The European Commission interprets the notion of **direct access** in Article 16 of the EPBD to mean that the entitled party (owner, tenant, manager) can obtain their building's data 'proactively, without needing to submit individual requests to whoever holds the data'[27]. In practice, this could be implemented by providing building owners and others with credentials to a platform, such as the national building performance database, where they can view and download their building's information. By requiring Member States to ensure this direct access, the EPBD places the building's data effectively under the control of the building's user[19].

Article 16(3) stipulates that **no additional cost** can be charged for this access – owners, tenants and managers must be able to retrieve or receive their data free of charge. This echoes principles in the Data Act that data holders should make data available to users without imposing fees, apart from perhaps minimal costs for requests that exceed normal use[20].

Article 16 addresses the scenario where **third parties** seek to use building data. The EPBD facilitates this by stating that if the owner (or tenant/manager) gives their consent, the data 'shall be made available to a third party' under the applicable rules. In other words, owners can delegate access to service providers of their choice. The legal framework ensures that such sharing is voluntary (consent-based) and subject to any existing agreements (for instance, if a third party is already contractually managing a building's systems, the data sharing would occur as per that contract). To prevent Member States or data holders from undermining this by procedural obstacles, Article 16(2) requires that the rules for data management and exchange do not create **barriers or discrimination** against third-party access. This encompasses both regulatory conditions (e.g. overly restrictive licensing) and economic conditions. For categories of third parties not covered by the free access rule, Article

[18] Ibid.
[19] Ibid.
[20] Ibid.

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16(3) empowers Member States to set charges, but these must be 'reasonable and duly justified' and must not have the effect of pricing data access prohibitively[21].

The EPBD gives examples of 'other eligible parties' that might access data: **financial institutions, aggregators, energy suppliers, energy service providers, and national statistical authorities**. In listing these, the law acknowledges legitimate interests in building data beyond the owner. The EPBD also goes further, and **encourages data sharing**[22].

EPBD compliance with data protection rules

All provisions for data access and exchange in Article 16 of the EPBD are explicitly subject to compliance with applicable EU law, especially on data protection. Article 16(4) mandates that 'the processing of personal data within the framework of this Directive shall be carried out in accordance with Regulation (EU) 2016/679' (GDPR). This serves as a strong safeguard; many types of building data can be linked to individuals (owners or tenants) and thus constitute personal data. The national rules transposing Article 16 will likely clarify details such as how consent for data sharing should be obtained and documented (aligning with the GDPR's definition of consent). Overall, **data reuse is promoted on the condition that privacy is respected**, and the framework seeks to balance openness of data with the fundamental rights of individuals.

Alignment with the Data Act

The EPBD's data exchange provisions were developed in synergy with the 2023 Data Act, a cross-sectoral regulation governing access to data generated by connected products and related services. Chapters II–IV of the Data Act, in particular, create a legal right for users of connected devices to access the data those devices generate and share those data with third parties of their choosing[23]. Heating systems, heating, ventilation and air conditioning (HVAC) controls, smart appliances, and other IoT devices in buildings clearly fall under the category of connected products. As such, many scenarios of building data reuse are covered in principle by the Data Act's horizontal rules. Article 16 of the EPBD can be seen as a **sector-specific refinement** that builds on those principles for the building domain. An important concept carried from the Data Act into Article 16 is the idea of '**readily available data'**, which is defined by the Data Act to ensure that data holders cannot refuse access on grounds of inconvenience if the data can be retrieved with reasonable effort. Another carry-over is the emphasis on **interoperability** (the Data Act mandates interoperability for data sharing, and Article 16 requires it specifically within the buildings context). The Data Act also delineates the kinds of data that need not be shared, such as highly processed or derived data to which a manufacturer has added significant value. The EPBD's focus on raw building systems data aligns with this, leaving more complex analytics out of scope unless voluntarily provided[24].

Interoperability and future implementing measures

[21] European Commission, Annex to the Communication to the Commission: Approval of the content of the draft Commission Notice providing guidance on new or substantially modified provisions of the recast Energy Performance of Buildings Directive (EU) 2024/1275: Data exchange (Article 16), 2025.
[22] Ibid.
[23] European Commission, *Data Act explained*, n.d., https://digital-strategy.ec.europa.eu/en/factpages/data-act-explained.
[24] European Commission, Annex to the Communication to the Commission: Approval of the content of the draft Commission Notice providing guidance on new or substantially modified provisions of the recast Energy Performance of Buildings Directive (EU) 2024/1275: Data exchange (Article 16), 2025.

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The success of the EPBD's data-related provisions hinges on interoperability, i.e. the ability of different systems, devices, and platforms to communicate and exchange data seamlessly. Recognising this, the EPBD embeds interoperability requirements and tasks the European Commission with developing detailed standards. At national level, Article 22(7) of the EPBD obliges Member States to ensure that their building performance databases can interface with other key data systems (cadastres, logbooks, etc.). In practical terms, this might involve adopting common data formats for EPCs and building data so that a certificate from one country can be understood by another's software[25].

To ensure coherence across the EU, Article 16(5) of the EPBD mandates the European Commission to adopt implementing acts by 31 December 2025 that will detail interoperability requirements and procedures for non-discriminatory access to building systems data. Article 22(6) provides for a specific implementing act to harmonise how data is sent to the EU Building Stock Observatory. That act (due by mid-2025) will likely set out a template so that each country exports its data in the same structure (covering indicators such as distribution of EPC ratings, average consumption per building type, etc.)

The legal landscape crafted by the EPBD establishes a comprehensive framework to support the **reuse of building-related data**. Measures are firmly grounded in the EPBD's text and related legislation such as the GDPR and the Data Act, promoting data-driven innovation while protecting individual rights. As Member States transpose and implement these provisions, the legal landscape will translate into concrete tools (databases, digital logbooks, web portals, and application programming interfaces (APIs)) that transform raw data from buildings into accessible, useful information for a wide range of users.

1.3 Legal issues and barriers

Data ownership

The unclear legal status of building-generated data is a foundational challenge in establishing a centralised building data environment, specifically who 'owns' such data and who is accountable. The EPBD acknowledges a **principle of occupant ownership** of data, alongside requirements for data protection and privacy. However, this principle is broadly stated and is not defined in enforceable terms. In practice, building-related data involve multiple stakeholders, each of whom may claim rights or have obligations. In the context of multi-occupant smart buildings, ownership of the data collected from the sensors is unclear, as is the extent to which it is legitimate to capture data in a built environment[26]. This ambiguity can lead to disputes or hesitation in data sharing and complicate assigning responsibility for data quality and management. If erroneous data in the central database leads to a faulty energy performance assessment, it is uncertain whether liability rests with the data provider (e.g. building owner) or the data controller operating the platform. Without clearer delineation,

[25] European Association for Storage of Energy (EASE), *EASE briefing on Energy Performance of Buildings Directive*, 2024, https://ease-storage.eu/wp-content/uploads/2024/05/2024.05.27-EASE-Analysis-on-Energy-Performance-of-Buildings-Directive.pdf.
[26] Bakar, A. A., Yussof, S., Ghapar, A. A., Sameon, S. S. and Jørgensen, B. N., 'A review of privacy concerns in energy-efficient smart buildings: risks, rights, and regulations', *Energies*, Vol. 17, Issue 5, 2024, p. 977.

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stakeholders may adopt a cautious stance, limiting data access or refusing to rely on data unless absolutely necessary.

Recommendations

Regulators and policymakers should issue clarifications on data ownership and roles in the building context. One approach is to treat building data as a shared resource under the control of the data subjects by default, while granting owners defined usage rights for operational purposes.

Clear designation of the data controller for each dataset is necessary. In many cases, the national building database operator will be a data controller with legal responsibility under GDPR, but building owners or professionals uploading data might act as joint controllers or processors, which should be formalised. Member States could require any party contributing data to the central platform to sign a data-sharing agreement outlining responsibilities (accuracy, updates, etc.). The Data Act will strengthen users' rights over device-generated data, ensuring that those who use a product (e.g. smart HVAC system) can access those data. This complements ownership clarifications by preventing manufacturers from exclusively 'owning' usage data.

Data privacy barriers to third-party access (GDPR compliance)

Data protection laws impose barriers to third-party access to building data. Much of the data relevant to building performance, such as energy consumption patterns, occupancy schedules, or indoor environmental measurements, can be considered personal data under GDPR if they relate to identified or identifiable individuals[27]. The EPBD explicitly requires that all processing of personal data under its framework is in accordance with GDPR, meaning that any central database or data exchange mechanism must implement strict privacy protections. In practice, this creates a high bar for third parties who wish to lawfully access granular building data. They must have a valid legal basis under the GDPR, typically the data subject's consent or a clear statutory mandate[28].

Another complication is determining what counts as personal data in a complex building dataset. The GDPR definition is broad and seemingly innocuous technical data can become personal when combined with other information. Applying GDPR to energy data in smart buildings is not straightforward because it is difficult to identify whether a particular type of data can be linked to an individual. For example, data that initially may not be linked could, when combined with other datasets, reveal personal patterns[29]. For instance, hourly electricity consumption data might not include a name or address, but if tied to a specific apartment and timestamp, could indirectly expose the occupant's lifestyle, thus falling under GDPR. This ambiguity forces data handlers to err on the side of caution and treat most building data as personal, which in turn means more stringent rules for processing and sharing those data.

Recommendations

[27] TeraBee, *People counters : Powering data-driven decisions in GDPR-compliant smart buildings*, 2024, https://www.terabee.com/people-counters-powering-data-driven-decisions-in-gdpr-compliant-smart-buildings/.
[28] European Commission, Annex to the Communication to the Commission: Approval of the content of the draft Commission Notice providing guidance on new or substantially modified provisions of the recast Energy Performance of Buildings Directive (EU) 2024/1275: Data exchange (Article 16), 2025.
[29] Ibid.

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To reconcile data sharing with privacy, a multi-pronged strategy is needed:

Clarify and standardise the legal basis for data sharing. Where feasible, Member States could create an explicit statutory basis for certain data flows (e.g. allowing certified energy auditors to access necessary building data as a legal obligation under national law, rather than relying on consent each time). This would be similar to how EPC databases already allow data to be accessed by authorised professionals under defined conditions. Even when consent is required, the process should be streamlined.

Develop standard consent and data-sharing agreements for building data. A template consent form (digitally implemented) can ensure that occupants are properly informed and that their permission covers the necessary scope (which data, which third party, for what duration, etc.). Clear, user-friendly consent interfaces will reduce confusion. As studies highlight, currently 'occupants are unsure about the level of disclosure that should be applied to their occupancy data'[30]. Providing them with clear options (e.g. share only aggregated data, share for a limited time) can empower informed decisions.

Member States should engage with their national data protection authority to **develop sector-specific guidance or codes of conduct** for building data. A code of conduct under Article 40 of the GDPR, tailored to energy/building management services, could spell out how third parties should handle data, security measures to implement, and how to obtain and record consent. Adhering to an approved code of conduct might give third parties some presumption of compliance, reducing their legal uncertainty.

Leverage the Data Governance Act for public sector-held data. Many building databases will be operated by public authorities, and Regulation (EU) 2022/868 (Data Governance Act) provides a framework for allowing reuse of protected data held by public bodies under strict conditions (including requiring anonymisation or the consent of data subjects). Member States should set up the requisite mechanisms so that requests to reuse building data can be handled transparently and lawfully.

Challenges in informed consent and authorisation logistics

Even when consent is one of the main legal bases for data sharing, practical logistics can become a challenge if not managed correctly. The model suggested by EPBD is that building owners, tenants and managers have control over who accesses their building's data. Article 16 of the EPBD establishes that 'Member States shall ensure that building owners, tenants and managers can have direct access to their building systems' data' and that with **their consent** the data shall be made available to a third party. In other words, the system relies on **user authorisation** – no third party can obtain data unless permitted by an authorised person. One issue is the lack of a standard mechanism for granting and managing these permissions. Currently, there is 'a lack of a well-defined method to gain agreement from residents for accessing their data' in smart buildings. Without a uniform solution, building occupants may be confronted with ad hoc consent requests via email, paper forms, or proprietary apps, which is confusing and burdensome. Likewise, from the third-party's perspective, obtaining consent from each individual building owner or tenant can be slow and laborious.

[30] Bakar, A. A., Yussof, S., Ghapar, A. A., Sameon, S. S. and Jørgensen, B. N., 'A review of privacy concerns in energy-efficient smart buildings: risks, rights, and regulations', *Energies*, Vol. 17, Issue 5, 2024, p. 977.

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Another challenge is **verifying authorisations** and handling the multi-actor nature of buildings. In a multi-unit building, a tenant might consent to share their apartment's data, but the landlord might also have a say if those data include building-wide systems. Conversely, an owner might wish to authorise a contractor to see data, but if those data include a tenant's personal usage, the tenant's consent is also needed. The European Commission recognises that each party (owner, tenant, manager) is individually entitled to access data relevant to their building or unit and 'may grant access to this data to a third party'[31]. This implies that systems must accommodate multi-party consent for the same dataset.

Coordinating these permissions and preventing conflicts requires a robust identity and access management solution.

Recommendations

The Commission is tasked with developing **implementing acts by the end of 2025 detailing procedures for data access and interoperability**. As a preliminary solution, it suggests a simple approach whereby an owner/tenant **sends a request to the data holder** (e.g. national database administrator) to grant access to a named third party. While straightforward, this still demands an interface for users to make requests and for data holders to verify and act on those requests. A **unified digital consent and authorisation platform** for building data would allow owners and tenants to easily manage who can see their building's information. Inspired by the success of 'consent dashboards' in open banking and data portability initiatives, it should list all third parties that have requested or been granted access, along with the ability to grant, deny, or withdraw consent with a click.

Risk of interoperability deficits

Fragmentation and lack of standardisation can exacerbate barriers. EU Member States each have their own systems for EPCs and building data. The European Commission lists a variety of national practices and urges harmonisation of methodologies to avoid 'misalignments that may limit data usage possibilities'[32]. In practice, without a harmonised core data model or an agreed crosswalk between models, a 'central' data environment might remain a collection of isolated national silos. Even within a country, if different regions or agencies use different software that are not interoperable, valuable data can get stuck in silos.

The EPBD narrows divergence at the presentation layer by requiring a common EPC template with mandatory information to be displayed, thereby harmonising what the public sees. However, considerable diversity remains: Member States continue to apply different methodologies and datasets for calculations, store different input fields, and version their national factors and code lists differently. This fragmentation continues to impair reuse across

[31] European Commission, Annex to the Communication to the Commission: Approval of the content of the draft Commission Notice providing guidance on new or substantially modified provisions of the recast Energy Performance of Buildings Directive (EU) 2024/1275: Data exchange (Article 16), 2025.

[32] European Commission, Annex to the Communication to the Commission: Approval of the content of the draft Commission Notice providing guidance on new or substantially modified provisions of the recast Energy Performance of Buildings Directive (EU) 2024/1275: Data exchange (Article 16), 2025.

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borders and even within a country where regional platforms or sectoral registers have evolved separately.

Recommendations

Open standards and enforced interoperability represent an effective solution. At EU level, the upcoming implementing acts under Article 16(5) of the EPBD should specify technical standards for data formats and exchange protocols for building systems data. In transposing the EPBD, Member States can mandate that data submitted to or retrieved from the national building database be in a machine-readable, structured format (as per Article 22).

Unique identifiers (e.g. national building ID, cadastral number) should be used across systems to link data unambiguously to the correct building. This way, data from an energy supplier, a building permit database and an EPC archive can all be merged for the same property. The European Commission explicitly recommends using unique IDs and geo-referencing to facilitate cross-database data exchange, and implementing this recommendation will reduce fragmentation.

The Data Act introduces **crucial provisions against vendor lock-in for IoT data**. In accordance with Article 3(1) and Article 50 of the Data Act, from 12 September 2026, manufacturers of connected products must design them so that 'product data…are by default easily, securely, free of charge, in a commonly used, machine-readable format, and, where relevant and technically feasible, directly accessible to the user…'. This means that a building owner or manager, as the 'user' of a device, has a right to obtain device data without hindrance. It also requires that, at the user's request, data holders must share data with third parties designated by the user (under fair and non-discriminatory conditions).

Liability and data reliability concerns for professionals

Concerns about **data accuracy and the liability implications** for those who rely on the data are crucial barriers. Authorised professionals are expected to use the central data repository as a resource when evaluating buildings. However, if those data are erroneous or incomplete, the professional's work could be compromised, raising questions about accountability. Under current rules, the burden tends to fall on the professional to ensure the outputs (e.g. EPC) are correct, regardless of the data source[33].

The EPBD places strong emphasis on the **quality and reliability of EPCs**, requiring Member States to have control systems to verify a sample of certificates and ensure they are issued correctly. The European Commission reiterates that whether an EPC assessment is done on-site or via virtual means, 'in either case, the quality and reliability of EPCs must be ensured', and the independent expert is ultimately **responsible for the validity of the certificate**[34]. In practice, this means that if an auditor uses data from a database and those data turn out to be wrong, the auditor cannot simply blame the database, but can be held liable for the

[33] European Commission, Annex to the Communication to the Commission: Approval of the content of the draft Commission Notice providing guidance on new or substantially modified provisions of the recast Energy Performance of Buildings Directive (EU) 2024/1275: Energy performance certificates (Articles 19-21, Annex V) and independent control systems (Annex VI), 2025, https://energy.ec.europa.eu/document/download/ccef4a7a-6985-484d-aaef-a7d3a830fb0e_en?filename=Energy%20performance%20certificates%20%28Articles%2019-21%2C%20Annex%20V%29%20and%20independent%20control%20systems%20%28Article%2027%2C%20Annex%20VI%29%20-%20annex%203.pdf.
[34] Ibid.

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inaccurate EPC unless they took steps to verify the information. This potential liability creates a disincentive, with professionals perhaps preferring to collect data themselves rather than trusting existing data. That undermines a reusable data environment and increases costs due to duplicated efforts.

Concerns about data reliability are justified. A central database will aggregate inputs from various sources over time – some data might be self-reported by building owners, some input by certified experts, some automatically uploaded from devices. There will inevitably be variability in quality. Without rigorous data governance, errors such as outdated information, typos, or other errors could propagate. The absence of a clear liability framework for data errors can thus be a barrier: professionals and companies will be reluctant to rely on external data if it is uncertain who bears the risk for their accuracy.

Recommendations

Establish clear data quality assurance processes and liability guidelines as part of the data environment's governance. Ensuring data reliability means implementing validation and verification mechanisms in the database. Member States should task the independent control systems (Article 27 of the EPBD) with checking certificates post-issuance and periodically auditing the data stored in the central repository. A practical audit programme under Article 27 can be built around a risk-based sampling plan, automated data checks embedded in the national database, and a clear corrective action loop back to the original submitter. An effective process would mirror the X-tendo four-step quality assurance method for EPC databases, which begins immediately after an EPC is lodged. First, the database runs automatic 'gross' threshold checks on key fields to catch obvious errors (e.g. empty mandatory fields, physically impossible values). Secondly, it applies 'narrow' threshold checks calibrated to national typologies (e.g. archetype-specific ranges for U-values, wall build-ups or HVAC efficiencies) to detect outliers vs what is typical for that building type and epoch. Thirdly, records that fail either screen are automatically flagged for further inspection, with inconsistencies clearly indicated at EPC level. Fourthly, the system generates structured feedback to the issuing assessor and the profession (including fault categories and severity levels) so that recurring mistakes are addressed through training and guidance, reducing error rates before certificates are submitted[35].

On the liability side, responsibility should attach in the first instance to the party that generates and submits each data element, with the national repository guaranteeing full provenance and the reliant professional protected where they act in good faith. The originator of a value is accountable for its factual accuracy at the time of submission, and the platform preserves the source, timestamp, method and evidence so that the chain of custody is transparent. If an authorised professional relies in good faith on data from the official database, they should not be penalised for any inaccuracy in those underlying data (provided it was not obviously wrong or outdated).

[35] Maia, I., Kranzl, L., Zuhaib, S. and Broer, R., *Introductory reports, EPC databases*, 2021, https://x-tendo.eu/wp-content/uploads/2021/03/X-TENDO_MINI_6_EPC-Databases_04.pdf.

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Robust version control and metadata in the database will support this liability allocation. Each data point should record when it was submitted and by whom, enabling later mistakes to be traced and corrected at its origin.

Ownership of expert-generated building data

Another core issue in the reuse of building-related data is the question of who owns technical data produced by experts (e.g. measured U-values, insulation thickness, HVAC efficiency, typically compiled in energy audit reports or certificates). These data are factual, technical descriptors of the building and generally do not identify individuals (typically non-personal data)[36]. They often result from an expert's manual measurements or calculations rather than from an IoT device continuously collecting data.

In legal terms, data ownership is quite a vague concept. Rights over data are defined by contracts, intellectual property (IP) in compilations, and access/control permissions. For example, a company or expert who invests in creating a dataset (by collecting and curating building information) may obtain copyright or database rights in that compiled dataset[37]. This can complicate reuse: the entity that gathered the data (e.g. energy auditor, software provider) might legally restrict others from copying or using the full dataset without permission, even if it pertains to a building owned by someone else.

In practice, it is widely assumed that building data 'belongs' to the building owner, yet the reality often differs. Expert-generated data tends to flow into the hands of whoever manages the measurement tools or software. Data from building management systems and audits has a practical tendency to find its way to service providers (energy consultants, equipment vendors, platform operators) and can end up inaccessible to the actual building owner[38]. In other words, if an expert uses specialised software to determine specific building values, the detailed inputs and results might remain on the expert's system or a third-party database. Unless contracts or regulations ensure the owner's access, the owner may receive only a summary (e.g. EPC) but not the underlying data needed for other uses. This misalignment is highlighted as a barrier in data-sharing frameworks: without clear legal arrangements, building owners can be locked out of data about their own buildings, undermining efforts to reuse that data for energy efficiency improvements.

Recommendations

Member States should explicitly clarify that factual building data collected by auditors or experts belongs to the building and its owner/occupants by default, rather than being exclusively owned by the collector. In line with the EPBD's principle of occupant ownership of data, any technical data measured on-site should be treated as part of the building's data

[36] International Energy Agency, *A Data Sharing Guidelines for Buildings and HVAC Systems; Energy in Buildings and Communities Technology Collaboration Programme*, 2023, https://www.iea-ebc.org/Data/publications/IEA%20Annex%2081%20Activity%20A1%20-%20A%20Data%20Sharing%20Guideline%20for%20Buildings%20and%20HVAC%20Systems%20(final).pdf.
[37] Ibid.
[38] Ibid.

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commons, with the owner (and other rightful stakeholders like tenants) having full access and usage rights[39].

Member States could mandate data-sharing agreements or contractual clauses in energy audit services. For instance, when a building owner hires an expert, the contract should stipulate that all data gathered (not just the final certificate) will be made available to the owner.

IP rights in building design data

Another legal barrier arises from IP rights in building designs. An EPC or a digital building logbook contain a description of the building's design, with architectural drawings, floor layouts, or construction details referenced to document the building's geometry and components. These design elements are not just data, they are creative works protected under IP law (specifically, copyright in architectural works)[40].

Typically, the building owner owns the physical structure, but the architect or designer retains the IP rights to the design itself[41]. Architectural plans and building models are considered 'artistic works' in legal terms, and the default rule (absent any special contract) is that the architect or their firm holds the copyright, not the building owner[42]. This means that reproducing or sharing detailed design documentation can potentially infringe on the architect's rights if done without permission. In the context of a centralised building data, this raises the question of whether including a building's design details in the database violates the designer's copyright, e.g. whether uploading an architect's floor plan to a public or widely accessible platform is effectively reproducing and distributing a copyrighted work. Unless there is a legal provision or licence allowing this, architects might object, or data controllers might err on the side of caution and refuse to include such data. Beyond formal drawings, the EPC data might indirectly reveal aspects of a design that the architect considers proprietary (e.g. insulation techniques).

Two additional layers are relevant. Firstly, database rights (e.g. detailed plan repository) can attract copyright in the selection/arrangement and/or the *sui generis* database right where there has been a substantial investment in obtaining, verifying or presenting content (but not in merely creating the content). Public authorities that make EPC databases may hold such rights, but their exercise is constrained by Directive (EU) 2019/1024 (Open Data Directive), which promotes reuse of public sector information but excludes documents where third parties hold IP rights unless permissions are obtained[43]. Secondly, design files and proprietary building information modelling (BIM) objects (e.g. Revit, Archicad, Tekla) may constitute confidential business information before disclosure. Once filed on open portals without safeguards, secrecy may be lost. Directive (EU) 2016/943 (Trade Secrets Directive) co-exists

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[39] European Commission: Executive Agency for Small and Medium-sized Enterprises, Volt, J., Toth, Z., Glicker, J., De Groote, M. et al., *Definition of the digital building logbook – Report 1 of the study on the development of a European Union framework for buildings' digital logbook*, Publications Office of the European Union, Luxembourg, 2020, https://data.europa.eu/doi/10.2826/480977.

[40] Jiménez de Alvear, B., 'Architecture and Intellectual Property: Is it possible to protect a building?', *Garrigues,* Intellectual property blog, 3 September 2023, https://blogip.garrigues.com/en/intellectual-property/architecture-and-intellectual-property-is-it-possible-to-protect-a-building.

[41] Ibid.

[42] Ricketson, S, and Suthersanen, U., 'The design/copyright overlap: is there a resolution?', in: Wilkof, N., Basheer, S. and Calboli, I. (Eds), *Overlapping Intellectual Property Rights* (2nd edn), Oxford, 2023, Pro, https://doi.org/10.1093/oso/9780192844477.003.0008.

[43] Directive (EU) 2019/1024 of the European Parliament and of the Council of 20 June 2019 on open data and the re-use of public sector information, https://eur-lex.europa.eu/eli/dir/2019/1024/oj/eng.

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with newer data-sharing laws, as lawful disclosure can be required by law, but confidentiality must be protected through proportionate technical and organisational measures[44].

Recommendations

Member States need a balanced approach that safeguards IP while still enabling the use of design data for energy performance purposes.

Member States should **adopt a layered approach** that makes EPC-relevant parameters broadly reusable while treating design expression under proportionate legal and technical controls. As a first step, authorities should issue guidance clarifying that supplying necessary design information for EPC issuance, building RPs, and related regulatory purposes constitutes a permitted use of architectural works.

Permitting and energy performance procedures should be updated so that, upon digital submission of plans, models and specification files, the submitter grants a non-exclusive, royalty-free licence to the competent authority for defined regulatory purposes, including controlled disclosure to accredited third-party professionals engaged in supervisory work.

National building databases should **separate the openly published factual layer from the protected expressive layer**. EPC inputs and outputs, system attributes, dates, identifiers and other non-expressive parameters should be made available in machine-readable form with stable schemas and an API, licensed for broad reuse. By contrast, protected information should be kept behind authenticated, role-based access with proportionate safeguards (e.g. on-screen viewing, watermarking, click-through terms, rate-limited access, logging and export controls). Where third-party rights or confidentiality concerns persist, access should be provided through a secure processing environment that allows consultation and extraction of neutral parameters but prevents bulk copying of protected intellectual expression.

It is advisable to **limit the level of detail of design data shared openly**. The central platform might store detailed plans in a secure manner, while exposing only high-level data (e.g. numerical attributes, simplified schematics) to third-party users. This would mean that the creative expression (the architect's authorship) is not freely downloadable, reducing the infringement risk. When detailed models or plans are needed, the system could implement access controls, for example requiring the third party to be a licensed professional and to agree to use the data only for the intended purpose and not to replicate the design elsewhere.

[44] Directive (EU) 2016/943 of the European Parliament and of the Council of 8 June 2016 on the protection of undisclosed know-how and business information (trade secrets) against their unlawful acquisition, use and disclosure, https://eur-lex.europa.eu/eli/dir/2016/943/oj/eng.

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1.4 Comparative practice in selected Member States

Denmark: Central EPC database and access rules

Denmark has one of the oldest and most open EPC data systems in Europe. EPCs have been issued since 1997 and a central **EPC database** has been operating since then. Following the adoption of the EPBD in 2002, Denmark swiftly established a national EPC scheme. By 2006, it had consolidated its previously separate certification databases for small and large buildings into a single central database covering all buildings. This unified system marks Denmark as one of the first countries in Europe to implement a central EPC database[45].

From the outset, Denmark's approach was innovative. It opted for a calculated energy performance rating for all buildings (both small dwellings and larger buildings), using a single standardised calculation engine and data format for EPCs. By unifying tools and data storage early, Denmark created a robust foundation for centralised building data management well ahead of other Member States.

Denmark's EPC database is administered by the Danish Energy Agency (DEA), which serves as the central authority responsible for storing all EPC records. The DEA oversees the platform's operation, implements quality assurance routines, and manages interoperability with other registries[46]. The database itself contains the full input data and results of each energy assessment, essentially storing the complete EPC for every building alongside relevant contextual information. All energy assessors (qualified experts) are required to use the national calculation software, ensuring that data enter the system in a standardised format. Uploading the EPC data to the central registry is an automated process: when an assessor finalises an EPC, a standardised data file (e.g. XML) is automatically transmitted to the database. This eliminates the need for manual re-entry of data and reduces errors[47].

A hallmark of Denmark's EPC data management is its integration with other data sources and tools. The central EPC database is not an isolated silo; rather, the DEA has linked it with various public databases to enrich the information available. For instance, each EPC entry is supplemented with property data from national registers, such as basic cadastral information, property valuation, and land ownership details. When viewing an energy certificate, users can also see public information such as the building's location, size, and even its tax valuation, providing context to the energy rating. A more extensive 'property data report' can be generated, which includes other aspects drawn from environmental and utility databases. Access to this detailed report is restricted and interested parties must request permission from the DEA. Similarly, certain data are available only to the property owner or registered users. This tiered access structure balances openness with privacy, focusing on building-related data reuse while protecting personal information[48].

Denmark's model places strong emphasis on data quality and reliability. The DEA conducts systematic quality assurance on the EPC entries both routinely and in response to specific complaints. Automated validation checks are applied to incoming data to flag inconsistencies or outlier values. In addition to these digital checks, the DEA regularly performs random sampling of EPCs for detailed audit. If an EPC is found to be non-

[45] European Climate Initiative EUKI, *Energy Performance Certificate Database in Denmark*, 2018, https://www.euki.de/wp-content/uploads/2018/09/fact-sheet-energy-performance-certificate-database-dk.pdf.
[46] Maia, I., Kranzl, L., Zuhaib, S. and Broer, R., *Introductory reports, EPC databases*, 2021, https://x-tendo.eu/wp-content/uploads/2021/03/X-TENDO_MINI_6_EPC-Databases_04.pdf.
[47] European Climate Initiative EUKI, *Energy Performance Certificate Database in Denmark*, 2018, https://www.euki.de/wp-content/uploads/2018/09/fact-sheet-energy-performance-certificate-database-dk.pdf.
[48] Ibid.

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compliant or erroneous, the responsible energy auditor can be notified and retrained if necessary. This feedback loop has become a key feature and Denmark uses the findings from database quality assurance to inform the education and upskilling of energy performance consultants.

Perhaps the most distinguishing feature of the Danish system is the high degree of public accessibility. All EPC records are openly available online through a user-friendly portal on the DEA's Sparenergi.dk website. Anyone, from homeowners to third parties, can search for a building's energy label by address or building ID and view the full certificate details. The published information includes the building's energy efficiency rating, energy consumption estimates, recommended improvements, and even the calculated input data used to derive the rating. What enables this level of transparency, despite the GDPR, is Denmark's clear delineation between building-level information and personal data: GDPR obligations are applied to information that identifies a natural person, whereas EPC data published at the level of the building (without personal identifiers) is treated as non-personal and therefore publishable. By contrast, many Member States cite the GDPR as a barrier and default to partial or highly restricted access. Denmark addresses residual privacy risks via tiered access (owner-specific or sensitive records remain restricted), while still providing rich public views and aggregated statistics. The result is a practical demonstration that wide EPC data reuse and GDPR compliance are compatible when publication scopes and safeguards are properly defined[49].

Denmark's experience with a centralised EPC database illustrates how a well-designed system can significantly enhance the value of energy performance data. As the EU moves to implement the EPBD, Denmark's case offers a compelling example of how centralised building data management and EPC data reuse can support both compliance and ambition. It ensures trust in the EPC scheme, facilitates cross-sector collaboration (from finance to renovation programmes), and ultimately contributes to achieving energy efficiency targets and carbon reductions in buildings. The Danish model's success lies in leveraging the EPC beyond a mere certificate, instead treating it as a dynamic data resource that underpins policy, market decisions, and public awareness in the transition to a more energy-efficient building stock.

France: Open data infrastructure and EPC regime dataset

France's EPC regime, *Diagnostic de performance énergétique* (DPE), is in place since 2006 and is anchored by a mandatory, central registry and a mature digital workflow for assessors. Every EPC is issued by a qualified expert following an on-site inspection of building, then automatically transmitted to the national EPC database (a legal requirement since 2013), with a standard validity of 10 years. Depending on building type and context, performance may be assessed by calculation or measured using energy bills[50]. The Ministry for the Ecological Transition Regional Planning Transport City and Housing and the Agency for the Ecological Transition (ADEME) have defined an end-to-end digital intake for assessors and strengthened quality assurance through continuous oversight by certification bodies, which may suspend or withdraw a professional's certification where mandatory fields or rules are not respected[51].

[49] Taranu, V. and Zuhaib, S., *eXTENDing the energy performance assessment and certification schemes via a modular approach,* 2022, https://x-tendo.eu/wp-content/uploads/2020/01/x-tendo-F6.pdf.
[50] Deslot, Q., Pache, Y., Cartier Da Costa, I., Thiebaut, A., Jeannet, B. et al., *Implementation of the EPBD France, status in 2020*, 2020, https://cdn1.gopublic.dk/epbd/Media/638373600341507794/Implementation-of-the-EPBD-in-France--Status-in-2020.pdf.
[51] ADEME, n.d., https://observatoire-dpe-audit.ademe.fr/accueil.

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The French approach couples centralisation with a clear legal perimeter for lawful reuse. Decree 2011-807 of July 2011 provides that the platform allows any user to verify a DPE's regularity and validity 'excluding any access to individual data', while authorising ADEME to furnish anonymised data to national and local authorities and prohibiting commercial reuse of those data. This frames a third-party access model designed for verification and public interest analysis without publishing personal data[52].

The Observatoire DPE-AUDIT functions as the central register for EPCs and regulated audits. Certified diagnosticians transmit certificates directly from approved software using Observatoire credentials. Before any submission is accepted, the system checks that the professional's identity, certification number and email match the *Annuaire des diagnostiqueurs*, an open dataset updated once per day. Where the directory and Observatoire entries do not align, the certificate remains invalid until corrected, enforcing provenance and reducing the risk of misattribution[53].

Access for third parties is organised in two complementary tiers. First, the Observatoire provides a public look-up by certificate number. Anyone in possession of the identifier, typically available through display and advertising rules, may open the record's detail page and, where the certificate is active, download the data. The scope of the public interface is deliberately narrow: it enables verification and reuse of building-level information, while avoiding broad, address-based trawling of microdata that could increase the risk of linking to natural persons. Second, ADEME publishes anonymised, statistical EPC outputs via the national open-data platform, with documentation that recalls the legal bases for collection (2011 Decree; Article 4 of Arrêté of 31 March 2021)[54].

The French set-up embodies privacy-by-design. The Observatoire's public endpoint publishes certificate content at building level without disclosing the identities of owners or occupiers, while broader record management features are restricted to authenticated professionals and their own portfolio of certificates. The Observatoire website also provides an GDPR privacy policy that explains purposes, roles and data subject rights. Where policymakers contemplate linking EPCs with measured consumption streams from smart meters (e.g. to monitor the impact of renovation), the French National Commission for Information Technology and Civil Liberties (CNIL) has clarified that such granular readings constitute personal data when linked to a subscriber[55].

France offers a coherent model for reuse of building-related data that is consistent with GDPR and the EPBD's objectives. The architecture couples a central, quality assured registry, narrowly scoped public verification, and anonymised open data with strong provenance controls and administratively validated lifecycle changes. It demonstrates that meaningful third-party access to support market transparency, research and programme evaluation can be achieved without publishing personal data.

Estonia: National Register of Buildings

Estonia's National Register of Buildings (*Ehitisregister*, EHR) is a centralised, highly integrated digital repository of data on all buildings and constructions in the country. It

[52] Décret no 2011-807 du 5 juillet 2011 relatif à la transmission des diagnostics de performance énergétique à l'Agence de l'environnement et de la maîtrise de l'énergie, https://www.legifrance.gouv.fr/jorf/id/JORFTEXT000024317077/#:~:text=Le%20d%C3%A9cret%20pr%C3%A9voit%20en%20cons%C3%A9quence,territoriales%20d'y%20avoir%20acc%C3%A8s.
[53] ADEME, *Guide des Diagnostiqueurs*, Observatoire DPE-AUDIT, 2025, https://www.qualixpert.com/wp-content/uploads/2024/07/Guide-Diagnostiqueurs.pdf.
[54] République Francaise, DPE logements existants (depuis juillet 2021), 2021, https://www.data.gouv.fr/datasets/dpe-logements-avant-juillet-2021/.
[55] ADEME, *Politique de protection des données personnelles*, n.d., https://observatoire-dpe-audit.ademe.fr/donnees-personnelles.

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serves as a comprehensive digital building logbook, containing detailed information throughout each building's lifecycle, from construction permits and technical characteristics to performance indicators and usage status. Since the implementation of the EPBD, the EHR also functions as the national register for EPCs[56].

Certified energy experts issue EPCs through the EHR and all certificates issued (along with their input data and calculations) are stored in the database, i.e. every EPC and related data for Estonian buildings is centrally compiled and publicly accessible via the EHR. By unifying general building information and energy performance data in one place, the EHR works as a single platform for citizens, professionals and authorities to obtain trusted information about any building's characteristics and energy efficiency status[57].

A distinguishing feature of the EHR is its commitment to open data, which makes it possible for anyone (researchers, businesses, policymakers, the public) to analyse and leverage building information for various purposes, from urban planning and real estate studies to energy analysis and policy evaluation[58].

Estonia's handling of EPCs through the EHR is a model of integration and quality assurance. Since 2013, as per the EPBD, it has been compulsory to have an EPC when selling or renting buildings in Estonia, and to publicly display the EPC in larger public buildings. Estonia uses the EHR as a single management platform, with EPCs issued and stored centrally in the EHR, rather than scattered in paper form or disparate systems. When an energy expert conducts an assessment for a building, they upload the EPC data and calculations to the EHR. All certificates issued, along with their supporting data (input values, calculation assumptions, etc.), are contained in this database.

Quality assurance of EPCs is overseen by the Consumer Protection and Technical Regulatory Authority (CPTRA). The CPTRA performs random checks on EPCs and investigates complaints related to certificate accuracy. For existing buildings' EPCs (based on measured consumption), CPTRA audits have mostly found minor issues such as using an outdated weighting factor for energy sources. These smaller errors are expected to be automatically resolved as Estonia moves toward a more automated, dynamic EPC system. In 2021, Estonia began to develop an innovative system where a building's energy performance rating would be continuously updated[59].

Enforcement mechanisms for EPC compliance exist, although Estonia emphasises improvement over punishment. To date, no financial penalties have been imposed on experts or building owners for EPC shortcomings. However, the legal framework allows for fines (up to €64 000 for a company or €6 400 for an individual expert) if serious shortcomings in an EPC are identified and not corrected. The existence of these potential penalties underscores the importance Estonia places on accuracy in energy certification, but the fact that none have been issued suggests that most issues are resolved cooperatively, or that compliance is generally good[60].

The EHR exemplifies a holistic, digital-first approach to managing building information. It integrates regulatory compliance, public transparency, open data, and advanced analytics in a single system. Daily activities of applying for permits or retrieving an energy certificate, as well as strategic planning for climate policy and smart-city development are all

[56] IMO, Estonian *National Register of Buildings' Open Data*, n.d., https://imo.ut.ee/en/infrastructure/estonian-open-government-data/estonian-national-register-of-buildings-open-data/#:~:text=The%20open%20data%20contains%20information,labels%2C%20and%20related%20cadastral%20units.
[57] Seinre, E., Kurnitski, J., Kuusk, K. and Tamm, R., *Implementation of the EPBD Estonia, status in 2020*, 2020, https://cdn1.gopublic.dk/epbd/Media/638373600922977170/Implementation-of-the-EPBD-in-Estonia.pdf.
[58] E-ehitus, Avaandmete info ja juhendid, n.d., https://livekluster.ehr.ee/ui/ehr/v1/infoportal/info.
[59] Seinre, E., Kurnitski, J., Kuusk, K. and Tamm, R., *Implementation of the EPBD Estonia, status in 2020*, 2020, https://cdn1.gopublic.dk/epbd/Media/638373600922977170/Implementation-of-the-EPBD-in-Estonia.pdf.
[60] Ibid.

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underpinned by reliable data in the EHR.

The Netherlands: Use of public energy label databases for market actors

The Netherlands maintains a central register for energy performance certificates (often referred to as energy labels for buildings) through the Netherlands Enterprise Agency (RVO). The core system is commonly known as EP-Online, a national database containing all EPCs issued for residential and non-residential buildings. EP-Online confers legal status on EPCs: only labels registered in this database are valid in the Dutch market[61]. This central system is coupled with a distinctly open position towards data reuse, with address-level look-up for citizens, and machine-readable bulk files and APIs for analysts and integrators. The result is a system that simultaneously assures compliance, supports market transparency and policy monitoring, and enables third-party reuse under clear access, identity and privacy safeguards[62].

Professional users (recognised energy advisers) can only act within organisations that are certified and authorised by a certifying institution (CI). The CI creates the first user for each certified organisation; thereafter, that organisation can manage adviser accounts and assign user management rights internally. On first login, an adviser links their *eHerkenningsmiddel* token to the EP-Online account and subsequently uses e-recognition for all authenticated operations. This identity and authorisation model gives the registry a strong assurance chain, from the legal entity to named, qualified advisors[63].

Quality and compliance are enforced through two complementary layers. Since 2015, the Human Environment and Transport Inspectorate (ILT) carries out sampling-based checks and can fine in cases of non-compliance (e.g. missing label at transfer). The RVO controls the integrity of the registration process. Only certified organisations and recognised, authenticated advisers can register labels, and the RVO can block accounts where a recognised expert is found to be non-compliant[64].

EP-Online's own privacy statement makes plain that personal data processing within the EPBD context is subject to GDPR and the privacy policy of The Ministry of the Interior and Kingdom Relations (BZK). In practice, the public, non-logged-in views, and open data deliberately publish only building-level fields needed for transparency, while owner-specific details sit behind authentication. Smart meter consumption data, which are increasingly relevant for smart buildings and dynamic EPC concepts, fall under specific Dutch and EU privacy rules. The Dutch Data Protection Authority (*Autoriteit Persoonsgegevens)* explains that suppliers may read smart meters more frequently only with the consumer's consent – higher-frequency or more granular readings require an explicit opt-in[65].

The Dutch model stands out for its legal certainty and operational clarity. Legal validity hinges on registration, which rests on strong identity and certification, creating a clean chain of trust. The system maximises the value of that trusted data: citizens get per-address transparency; public authorities and researchers get high-quality, schema-documented open data with predictable delivery; and professionals work in a secure, well-documented environment with clear correction and re-labelling routes.

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[61] Van Cruchten, G., Netherlands Enterprise Agency (RVO), *Implementation of the EPBD. The Netherlands, status in 2020*, 2020, https://cdn1.gopublic.dk/epbd/Media/638373597704805777/Implementation-of-the-EPBD-in-The-Netherlands-2020.pdf.
[62] Rijksoverheid, n.d., https://www.ep-online.nl/.
[63] Rijksdienst voor Ondernemend, *Handleiding EP-online.nl voor EP-adviseurs versie 9.0 2024*, 2024, https://www.rvo.nl/sites/default/files/2025-02/handleiding-ep-online-voor-energieadviseurs-2024-versie-9.pdf.
[64] Milieu central. Veelgestelde vragen energielabel woningen, n.d., https://www.energielabel.nl/woningen/veelgestelde-vragen-energielabel-woningen/.
[65] Rijksoverheid, Privacy, n.d., https://www.rijksoverheid.nl/privacy.

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Portugal: EPC Central Register

Portugal operates one of Europe's earliest fully digital EPC regimes. The National System for Energy and Indoor Air Quality Certification of Buildings (SCE) entered into force on 2007 as part of Portugal's transposition of the EPBD. Issuance and legal validity were immediately tied to a single, web-based national registry managed by the Portuguese Energy Agency (ADENE) under the supervision of the Directorate-General for Energy and Geology and the Portuguese Environment Agency[66].

The Portuguese approach combines legal centralisation with structured data capture. Qualified experts carry out a mandatory on-site visit, compile evidence, and register the EPC online; only certificates lodged through this environment are valid. By 2018, the SCE had accumulated close to 1.5 million EPCs, yielding hundreds of millions of structured data points. This granularity makes the repository directly usable for analytics, benchmarking and policy design, rather than serving solely as a document vault[67].

Interoperability is addressed pragmatically. A Portuguese EPC can carry multiple identifiers so that the same physical asset can be joined reliably to external registries. The logbook analysis anticipates and the SCE facilitates flows from other authoritative sources such as the National Statistics Institute, allowing automatic population of selected fields. These design choices reduce ambiguity at the 'identification layer' and make lawful exchange with adjacent public datasets technically straightforward[68].

Portugal couples its central repository with a one-stop-shop digital interface that operationalises reuse for owners, the casA+ portal. Conceived by ADENE to raise the perceived value of the EPC and bridge homeowners to the renovation market, casA+ aggregates the EPC record (construction details, systems, recommended measures), draws authoritative registration data from the National Statistics Institute, and enables the owner to interact directly with the qualified expert who issued the certificate. The portal hosts dashboards for energy and water consumption and presents the EPC's recommended measures as actionable opportunities, turning static certification into ongoing decision support. The concept and roadmap were co-designed with consumer organisations and market stakeholders through workshops and surveys, signalling an 'open by design' stance on both data and service integration[69].

Third-party access is enabled within a GDPR-compliant architecture. The logbook technical documentation underpinning the SCE context distinguishes clearly between non-personal building data, which can be shared or published, and personal data, which are handled under strict purpose limitation, storage minimisation, and security duties. Portuguese practice addresses retention specifically, 'in the Portuguese SCE database a period of 30 days is established to store personal data as property registration'. These elements show how broad reuse is reconciled with privacy. Building-level technical parameters and EPC outputs are visible and reusable, while personal data are constrained by default[70].

Portugal's SCE exemplifies an open-minded access model that sits within EU data protection law. Legally, it ties validity to a single national repository; technically, it captures rich, machine-readable variables and supports multiple identifiers to ease lawful linkage. It implements short retention for certain personal fields, role-based access, and privacy-by-

[66] ADENE, *Agência para a Energia. Certificação Energética dos Edifícios*, n.d., https://www.sce.pt/.
[67] Libório, P. et al., *The logbook data quest: Setting up indicators and other requirements for a renovation passport*, 2018, https://www.oneplanetnetwork.org/sites/default/files/ibroad-the-logbook-data-quest.pdf.
[68] Ibid.
[69] ADENE, *Guia de apoio ao utilizador particular*, 2023, https://portalcasamais.pt/app/uploads/2023/05/Guia-de-apoio-ao-utilizador-particular.pdf.
[70] Libório, P. et al., *The logbook data quest: Setting up indicators and other requirements for a renovation passport*, 2018, https://www.oneplanetnetwork.org/sites/default/files/ibroad-the-logbook-data-quest.pdf.

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design governance, while keeping non-personal building data broadly visible. The result is a balanced system in which openness and safeguards are mutually reinforcing[71].

1.5 Conclusions

The EPBD creates the opportunity and the obligation to move from document-centric compliance to a data-centric ecosystem in which building information is collected once, quality assured, and reutilisation is guaranteed. Realising that opportunity requires a clear allocation of roles, interoperable technical foundations, and practical mechanisms for access, consent, and redress. The measures described here distinguish what must be fixed in national law and governance, what is best addressed at EU level, and what should be standardised in private contracts between the principal actors, notably EPC issuers, database operators and third-party service providers.

Member States should anchor the national legal basis for collection, storage and reuse of the datasets listed in the EPBD, at a minimum EPC inputs and outputs, inspection reports, RPs, SRIs, and measured or calculated consumption, where available. In implementing the EPBD, they should clearly designate the role of the database operator as controller for the national repository and specify when other actors act as joint controllers or processors, ensuring that responsibility for accuracy, security and data subject rights are explicit rather than implied. The same instrument should mandate a practical right of direct, free-of-charge access for building owners, tenants and managers to their building systems' data, and a consent-based pathway for authorising third-party access. To make that pathway workable at scale, Member States should establish or procure a unified digital consent and authorisation service through which entitled parties can view who has access to their data, grant or withdraw permissions, and receive an auditable record of disclosures.

A second pillar is provenance, auditability and liability. National rules should adopt a primary source accountability principle: the actor who first submits building data is responsible for their factual accuracy at the time of submission. The repository must in turn guarantee full provenance, verified identity and role of the submitter, timestamp, method or software version, linked evidence, and maintain an immutable change log. Professionals who rely in good faith on repository values that have complete provenance and are not flagged by validation should benefit from a narrow safe harbour. Likewise, responsibility for underlying inaccuracy remains with the originator, while reliance becomes unreasonable only where warning signals were ignored. Independent control systems required by the EPBD should extend beyond post-issuance certificate checks to include a risk-based audit of the underlying repository data, combining automated threshold and plausibility tests with targeted manual reviews, and a structured corrective-action loop back to the originator.

Interoperability should be clearly defined and regulated, rather than left to discretion. National legislation and technical guidelines should: highlight the use of a stable, machine-readable core data model for EPC-relevant parameters; mandate open, documented APIs for retrieval by entitled parties and authorised third parties; and oblige the use of unique, persistent identifiers to link records to the same physical asset across public registers and utilities.

[71] Ibid.

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Charges, where permitted, must be reasonable, cost-related and non-discriminatory. Fee schedules and service levels for API access should be published *ex ante*.

Finally, two domain-specific clarifications are needed to prevent uncertainty from stifling reuse. Firstly, expert-generated factual parameters about a building should be treated as part of the building's factual record, accessible to the owner and other entitled parties, without prejudice to moral rights or IP in the expert's proprietary methods. Secondly, design expression embedded in plans or BIM models should be separated from the factual layer: numerical attributes and non-expressive descriptors should be broadly reusable, whereas protected drawings and models should be accessible only under proportionate, role-based conditions and for defined regulatory purposes.

At European level, the Commission's implementing measures under the EPBD are intended to reduce cross-border friction and facilitate efficient national implementation. Under Article 16(5), the Commission will adopt implementing acts by 31 December 2025 that detail interoperability requirements and non-discriminatory, transparent procedures for access to building systems' data, following a published consultation strategy. Under Article 21(6), the Commission will adopt implementing acts establishing common templates for Member States' transfers of information to the EU Building Stock Observatory, with the first act due by 30 June 2025. Within these legal mandates, the implementing acts may specify the technical and procedural conditions necessary to ensure interoperability and orderly access, while leaving national calculation methods unaffected.

Standard private instruments will do much of the day-to-day work of making these recommendations operational. Contracts between the database operator and EPC issuers should include a data contribution licence under which the issuer grants the operator a non-exclusive, royalty-free right to store, validate, process and disclose EPC data and associated factual parameters for defined regulatory and public interest purposes. The same agreement should capture the primary source warranty (the issuer warrants that values submitted are accurate to the best of their professional knowledge on the date of submission), duties to correct without undue delay when errors are discovered, cooperation with audits, and proportionate liability caps that reflect professional indemnity norms. API terms should bind third parties to purpose limitation, forbid onward disclosure without authorisation, require privacy-preserving use, and mandate deletion or refresh when data are corrected upstream. To support traceability, all contributors and reusers should be required to use strong, verifiable identities, and signatures or integrity checks on payloads should be built into technical terms of use.

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Case Study 2: Public and private interests in renovation

2.1 Introduction and context

The EPBD is a key element of the EU's legislative toolbox to decarbonise its building stock by 2050. At its core, the EPBD empowers Member States to implement national building renovation plans (NBRPs) and impose mandatory renovation obligations on the worst-performing parts of residential and non-residential buildings. This marks a strategic shift: while Europe's annual renovation rate hovers around only 1% of buildings[72], meeting the Union's 2030 and 2050 climate targets will require a far higher rate of deep, systematic energy upgrades. Article 9 of the EPBD introduces MEPS and progressive renovation trajectories, requiring Member States to (i) renovate the bottom 16% and 26% of non-residential buildings by 2030 and 2033, respectively, and (ii) establish a national pathway to reduce average primary energy use in the residential building stock by at least 16% by 2030, 20-22% by 2035, and continuing every five years, thereby directly targeting the worst-performing segment of the building stock. The policy rationale is clear: voluntary measures alone (e.g. advisory services, subsidies, incentives) have proven insufficient to deliver the scale of renovation needed, and mandatory retrofit requirements for inefficient buildings are necessary to achieve emissions reduction and energy savings commitments.

Article 9 of the EPBD draws a structural distinction between two instruments. First, under Article 9(1), **MEPS for non-residential buildings** are owner-facing and building-specific. Member States must define national thresholds (e.g. maximum energy use per square metre under the Annex I metric) and ensure that buildings above those thresholds are upgraded within set timelines. MEPS impose a direct legal obligation on identified owners of inefficient non-residential buildings, to be enforced either at pre-defined trigger points or by fixed compliance dates, with penalties or corrective measures where required.

Second, **the residential trajectory is a stock-average obligation**. Article 9(2) of the EPBD requires each Member State to reduce the average primary energy use of its housing stock along a progressive path and to ensure that a substantial share of those reductions comes from the worst-performing dwellings. The legal duty here is with the State to achieve the aggregate outcome, and does not, by itself, impose a uniform per-dwelling mandate. Member States retain discretion over the policy mix, as long as the nationally determined trajectory is met and the worst-performing segment is effectively addressed.

Mandatory renovation obligations for non-residential buildings directly engage fundamental rights guaranteed under EU and national legal orders, notably the right to peaceful enjoyment of property (Article 17 of the Charter of Fundamental Rights of the European Union (the Charter); Article 1, Protocol No 1 European Convention of Human Rights (ECHR)). Any legislative limitation of those rights must satisfy the twin pillars of EU law – an overriding public interest objective (action against climate change and energy insecurity) and compliance with the principles of legality, proportionality, and legal certainty. In other words, the limitation must be clearly provided by law, genuinely meet a legitimate general interest aim, and strike a fair balance between the public benefit and interference with individual property rights.

The proportionality test serves as the analytical framework for this case study, involving suitability to meet the public objective, necessity against less intrusive alternatives, and a fair balance (proportionality *stricto sensu*) between societal benefits and private burdens. In the context of renovation mandates, this means verifying that such obligations are apt to drive climate mitigation in the building sector, that voluntary or less coercive alternatives would not deliver the required energy savings, and that the measures do not impose an excessive or

[72] Keliauskaite, U., McWilliams, B., Sgaravatti, G. and Tagliapietra, S., *How to finance the European Union's building decarbonisation plan*, Bruegel, 2024.

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undue burden on owners or tenants (respecting the essence of the property right).

To date, most Member States have relied primarily on voluntary approaches, such as advisory services, financial incentives, and subsidy schemes, rather than on binding obligations[73]. While these measures can kick-start renovations, they are often insufficient to drive the deep, systematic upgrades that the EPBD demands. Transitioning to mandatory renovation mandates hinges on clarifying the legal thresholds and safeguards required under EU law. This includes defining the segments of the building stock that qualify as worst performing, delineating appropriate exemptions (e.g. micro owners, historic properties, structurally constrained buildings), and ensuring that social protections (e.g. tailored financial support, one-stop-shop advisory services) are in place to mitigate disproportionate impacts on vulnerable households. By examining these dimensions through the lens of the proportionality test, this case study pinpoints the concrete legal conditions that Member States must satisfy to impose building renovation obligations without overstepping fundamental property rights.

This case study offers a structured legal analysis of the compatibility of mandatory renovation obligations with EU fundamental rights. It sets out the legal rationale underpinning such obligations by drawing on core principles of EU law, including the Charter and the concept of overriding public interest, as developed in both case-law and sectoral environmental legislation. This provides the analytical foundation for understanding how renovation mandates can be framed as a proportionate and legitimate response to the climate crisis. It then identifies and examines the key legal and practical barriers that may arise in the implementation of renovation obligations. It pays particular attention to issues such as legal certainty, proportionality, ownership structures, enforcement feasibility, and the implications for low-income and vulnerable households. The analysis aims to clarify the conditions under which renovation obligations can be designed and enforced in a manner that is both effective and rights-compliant, ensuring the long-term success of the EPBD's objectives.

This is followed by a comparison of practices in selected Member States (Austria, Croatia, France, Germany), providing practical lessons on drafting techniques, proportionality safeguards, funding modalities, and enforcement models that have either withstood judicial review or sparked significant policy debate.

2.2 Legal landscape

Renovation obligations in the EU climate-energy acquis

Renovation mandates in the EPBD must be read together with the European Climate Law and the Renovation Wave strategy, as these instruments jointly establish the targets and reasons of general interest against which any owner-facing obligation will be assessed under EU law (including the Charter). The EPBD entered into force in May 2024 and codifies a shift from purely information tools to binding renovation pathways for Member States, while keeping implementation levers nationally determined within a common framework for calculation, certification and control (Articles 7–27 and Annex I)[74]. The European Climate Law fixes a legally binding Union objective of climate neutrality by 2050 and a domestic net reduction of at least 55% by 2030 compared to 1990 levels, which supplies the climate necessity context

[73] Whittington, E., 'Buildings Renovation: Low-Hanging Fruit for Emissions Savings', Corporate Leaders Group: Business Leadership for a Climate Neutral Economy, University of Cambridge, 2018, https://www.corporateleadersgroup.com/reports-evidence-and-insights/news-items/blog-buildings-renovation-low-hanging-fruit-for-emissions-savings#:~:text=But%20this%20will%20only%20happen,investment%20by%20business%20and%20homeowners.
[74] Directive (EU) 2024/1275 (recast EPBD), Articles 7–27 and Annex I.

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for sectoral measures in buildings (Article 4[75]).The Commission's Renovation Wave Communication had already framed the doubling of annual renovation rates and the renovation of 35 million building units by 2030 as a cornerstone of the European Green Deal, thereby identifying buildings as the Union's largest single energy consumer and a priority locus for demand-side measures in pursuit of climate and energy security goals[76]. Commission materials consistently note that buildings account for around 40% of final energy consumption and roughly 36% of GHG emissions in the EU, creating a salient premise for both the necessity and the proportionality of targeted obligations (including minimum standards) that address the worst energy performers first[77].

Article 9 of the EPBD: structure, metrics and their legal significance

Article 9 creates two linked duties that must be transposed into national law – a minimum standards scheme for non-residential buildings and a binding trajectory for the progressive renovation of the residential stock. The European Commission Notice on Article 9 explains how Member States should build these schemes (data, indicators, thresholds, governance, compliance, enabling measures, monitoring), while recalling that the notice is interpretive and that the Court of Justice of the European union (CJEU) alone gives authoritative interpretations of Union law[78].

- *Non-residential MEPS (thresholds, baselines, indicators)*

For non-residential buildings, Member States must set national maximum use thresholds that ensure that the worst-performing 16% of the stock is upgraded by 2030 and the worst-performing 26% by 2033 (with additional lower thresholds for 2040 and 2050 that are coherent with a zero-emission stock)[79]. The notion of 'worst performing' is based on the national distribution on 1 January 2020. It is computed by counting either buildings or floor area (the threshold is the kWh/(m²·y) value of the first building or marginal square metre above the counted 16% or 26%), which converts stock distributions into enforceable limits for owners[80]. The notice recommends using primary energy as the main indicator (aligned with Annex I and EPC practice), while allowing complementary indicators (non-renewable or renewable primary energy; operational GHG) as additional rather than substitute requirements[81]. For communication and enforcement, Member States may express the threshold by EPC class (e.g. mapping class G to the 16% cohort and class F to the 26% cohort), provided the legal coverage condition in Article 9(1) is satisfied[82]. To avoid unfairness across intrinsically different uses, the notice encourages category-specific thresholds (by use, size, typology or climate zone), rather than a single threshold for the whole service sector

[75] Regulation (EU) 2021/1119 (European Climate Law), Article 4.
[76] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: A Renovation Wave for Europe - greening our buildings, creating jobs, improving lives, COM(2020) 662 final, https://energy.ec.europa.eu/system/files/2020-10/eu_renovation_wave_strategy_0.pdf.
[77] European Commission, *In focus: Energy efficiency in buildings*, 2020, https://commission.europa.eu/news-and-media/news/focus-energy-efficiency-buildings-2020-02-17_en.
[78] The guidance referenced here refers to the various annexes to the Communication approving the content of the Notice providing guidance on the recast EPBD/Guidance on the recast EPBD of 30 June 2025, https://energy.ec.europa.eu/publications/communication-approving-content-notice-providing-guidance-recast-epbd-guidance-recast-epbd_en; European Commission, Annex 1: Minimum energy performance standards for non-residential buildings and trajectories for progressive renovation of residential buildings (Article 9).
[79] Ibid., Sections 2.2.2 and 2.3.2.3 (16% by 2030; 26% by 2033; pp. 19-21).
[80] Ibid., Sections 2.3.2.2 and 2.3.2.3.
[81] Ibid., Section 2.3.2.1.
[82] Ibid., Section 2.3.2.3.3.

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stock (e.g. hospitals should not face the same numeric limit as offices because of ventilation and process loads)[83]. Thresholds for 2040 and 2050 should be published early (the 2040 level can be conceived as a mid-point that minimises double interventions by encouraging 2033 cohort renovations to reach the later limit in one step)[84]. The notice allows a temporary adjustment where a portion of the stock is seriously damaged by a natural disaster, provided that adjustment is proportionate to the damaged share and is time limited[85].

- *Data, stock characterisation and representativeness*

The notice sets out that Member States should assemble a 2020 baseline that can rank the non-residential stock by energy use using either existing sources (EPC repositories, audits, cadastre, building permits, logbooks, 3D urban models, satellite imagery) or targeted sampling and ad hoc collection (approaches can be combined to fill representativeness gaps and cross-check bottom-up estimates against top-down energy statistics). It underlines the need to assess EPC representativeness (coverage by use, size, climate zone, construction period, recency bias) to document imputation or modelling choices and to explain any interpolation where more recent data are used to reconstruct 2020 conditions[86].

- *Governance, compliance models and identification*

The guidance recommends a clear institutional architecture (central or decentralised) with defined responsibilities for owner notification, evidence validation, monitoring and enforcement (where allowed by national rules, revenues from penalties may finance administration)[87]. Authorities should identify in-scope owners via EPC databases (with automatic notifications), landlord or business registers, or links to licensing events (e.g. hotel operating permits, rent licences), while addressing data obsolescence where EPCs pre-date renovation[88]. The notice sets out two evidence models for compliance: (i) an EPC-based route, i.e. a valid EPC calculated under Annex I showing the building below the applicable threshold; and (ii) a list-of-measures route, where owners prove that a predefined package of works or the measures recommended in their EPC or RP has been implemented to a standard that yields a result below the threshold, in both cases with third-party issuance and ex-post quality control by the authority[89]. The notice recommends announcing compliance timing early (with reminders ahead of 2030 and 2033) and foresees checks for owners who assert present compliance and for those renovating after notification[90].

- *Exclusions and exemptions (and their accounting)*

Category exclusions under Article 9(6) of the EPBD (e.g. certain heritage assets, places of worship, small stand-alone buildings, specified defence assets) are optional and, where used, should be removed from the baseline, with the excluded share quantified in the national plan and publicly explained. The notice cautions that exclusion may also exclude those owners from tailored financial and advisory support foreseen under Article 9(4) of the EPBD[91]. Individual exemptions under Article 9(1) (expected future use, serious hardship, unfavourable

[83] Ibid., Section 2.3.2.2.2.
[84] Ibid., Section 2.3.2.4.
[85] Ibid., Section 2.3.2.5.
[86] Ibid., Sections 2.3.1.1 and 2.3.1.2.
[87] Ibid., Section 2.3.3.1.
[88] Ibid., Section 2.3.3.2.
[89] Ibid., Section 2.3.3.3.
[90] Ibid., Section 2.3.3.3.1.
[91] Ibid., Section 2.3.2.2.1.

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cost–benefit) are different in law, as exempted buildings remain in the baseline and their unrealised improvement must be compensated elsewhere in the non-residential stock. The notice provides a formula to quantify the unrealised improvement: difference between the building's current kWh/(m²·y) and the threshold, multiplied by floor area. It allows for compensation either by renovating outside the cohort or by bringing forward improvements in the next cohort[92]. Where cost-benefit is unfavourable, Member States should require owners to implement those measures with a favourable balance as defined in the national framework; Member States should publish ex ante criteria and evidence standards, set time limits for future use claims (e.g. conversion, demolition), and report ex ante estimates of likely exemptions in the national plan (with ex post verification)[93].

- *Enabling measures, monitoring and penalties*

Article 9(4) of the EPBD obliges Member States to ensure that an enabling framework is in place before enforcement, such as finance packages that escalate with depth, instruments for split incentives, RPs, one-stop shops, and skills measures, as support conditions feed into proportionality analysis and practical enforceability[94]. The notice recommends that monitoring include a registry of buildings above the threshold linked to the Article 22 database, annual reminders before reference dates, and a post-deadline grace period followed by enforcement. Penalty schemes must be effective, proportionate and dissuasive (e.g. fixed fines, per-m² or per-kWh-above-threshold amounts, time escalators, public disclosure), as per the EPBD. It recommends calibrating penalties in light of the owner's financial situation and access to support and advises that penalties must consider the owner's financial situation and access to support, and must never extinguish the underlying duty to renovate[95].

- *Residential stock trajectory (milestones, 55% rule, counting rules)*

For residential stock, Member States must decrease average primary energy use by at least 16% by 2030 and 20-22% by 2035 compared with 2020, and ensure that at least 55% of the reductions come through renovation of dwellings in the worst-performing segment of the stock (bottom ~43% under the new A–G scale)[96]. The notice details how to compute the 2020 reference average, how to set milestones for 2030, 2035, 2040, 2045 and 2050 (with method consistency and transparent data sources), and how to identify the 43% cohort by ranking the stock by primary energy, counting either buildings or floor area[97]. Demolitions after 2020 and new construction may affect the stock average trajectory, but demolition cannot be counted toward the 55% renovation sub-target because the law requires renovation works to deliver those counted savings[98]. Member States may add complementary indicators (non-renewable and renewable primary energy, operational GHG) and, where the average fossil share in residential buildings is below 15%, may adjust the 2030 and 2035 milestones if the path follows a linear decrease to 2050[99]. The national plan should explain data, methodology and assumptions, including the estimated number or floor area of buildings to renovate each year

[92] Ibid., Sections 2.3.3.4.1 to 2.3.3.4.3, pp. 34-37.
[93] Ibid., Section 2.3.3.4.2.
[94] Ibid., Sections 2.3.4.1 and 2.3.4.2.
[95] Ibid., Sections 2.3.5.1 and 2.3.5.2.
[96] Ibid., Sections 3.2 to 3.3.2.
[97] Ibid., Sections 3.3.1 to 3.3.3.
[98] Ibid., Sections 3.3.2.3 and 3.3.2.5.
[99] Ibid., Section 3.3.2, final paragraph of Article 9(2).

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and the breakdown of the 55% contribution, and should remain consistent with assumptions used in national energy and climate planning (including primary energy factors)[100].

Fundamental rights baseline: property (Article 17) and limitations (Article 52(1) of the Charter)

The Charter guarantees the right to property while allowing limitations provided by law that respect the essence of the right and meet objectives of general interest recognised by the Union or the need to protect the rights of others, subject to proportionality (Article 52(1)). In *Nold*, the CJEU held that property and economic freedoms must be viewed 'in the light of [their] social function', which allows restrictions justified by objectives of general interest and provided the substance of the right is respected[101]. In *Hauer*, a temporary prohibition on new vine plantings was compatible with property protection because it pursued common market objectives and did not impose an intolerable burden on owners within the policy's limited temporal scope and safeguards[102]. In *Križan*, the CJEU confirmed that environmental protection is a legitimate objective of general interest capable of justifying restrictions on the use of property, and that the annulment of a permit issued in breach of EU environmental law could not be equated with a disproportionate deprivation of property when assessed within the EU law framework that emphasises legality and environmental objectives[103]. The Aarhus and the Intergovernmental Panel on Climate Change (IPPC) context reading of *Križan* underscores that where environmental law requires permit compliance and sets out procedural guarantees, ensuing interferences with property will tend to be characterised as justified control of use measures rather than deprivations, provided proportionality is maintained[104]. In practice, a national MEPS regime or residential trajectory established by statute or regulation, predicated on Annex I calculation rules and accompanied by reasonable compliance timeframes and support schemes, will satisfy the criteria of legality, pursuit of a general interest and proportionality under Articles 17 and 52(1) of the Charter.

Strasbourg jurisprudence on owner-facing environmental and planning controls

The European Court of Human Rights (ECtHR) treats many environmental or planning measures as 'control of the use of property' under the second paragraph of Article 1 of Protocol No 1 (A1P1) (rather than as deprivations), which can be justified where they pursue the general interest, have a clear legal basis and are proportionate[105]. In *Fredin,* the ECtHR found no violation of A1P1, noting the existence of a clear legal basis, the foreseeability of withdrawal, and the public interest aim linked to environmental protection[106]. In *Hamer*, the ECtHR accepted the legitimacy of restoring unlawfully altered land and found that proportionality was satisfied in light of the policy aim and the applicant's unlawful conduct[107]. Earlier, in *Sporrong and Lönnroth*, the ECtHR developed the fair balance test that weighs individual burdens against the demands of the general interest, insisting that measures not

[100] Ibid., Sections 3.3.2.4 and 3.3.2.5.
[101] Case 4/73, *Nold v Commission*, EU:C:1974:51.
[102] Case 44/79, *Hauer*, EU:C:1979:290.
[103] Case C-416/10, *Križan*, EU:C:2013:8.
[104] United Nations Economic Commission for Europe, *UNECE summary of Križan (property and permit annulment),* 2013, https://unece.org/fileadmin/DAM/env/pp/a.to.j/Jurisprudence_prj/EUROPEAN_UNION/CJEU_C416-10_Krizan/EU_2013_C416_10_Krizan.pdf.
[105] The ECtHR case-law guide synthesises this line, including the flexible margin of appreciation enjoyed by States in socioeconomic and environmental regulation (ECtHR, Guide on Article 1 of Protocol No. 1 (A1P1), https://ks.echr.coe.int/documents/d/echr-ks/guide_art_1_protocol_1_eng).
[106] ECtHR, *Fredin v Sweden*, no. 12033/86, 18 Feb 1991.
[107] ECtHR, *Hamer v Belgium*, no. 21861/03, 27 Nov 2007.

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impose an individual and excessive burden (this remains the essential inquiry even where measures are classed as control of use rather than deprivation)[108]. In *James*, the ECtHR accepted far-reaching property transfers in a socioeconomic setting, provided compensation and a broad margin of appreciation were present to achieve the legitimate aim, again illustrating that regulatory intensity can pass A1P1 muster if fair balance is maintained[109]. Transposed to renovation obligations, this line of cases supports the view that appropriately tailored MEPS and stock trajectories are controls of use enacted for a legitimate environmental and energy security aim, and that proportionality can be evidenced by clear statutory bases, objective and predictable thresholds, staged timelines, flexibility in compliance routes, and targeted supports for vulnerable owners.

Overriding public interest analogies and their implications

Although the EPBD does not itself use the term 'overriding public interest', analogies can be drawn from instruments where EU law expressly recognises that certain projects or policy actions may derogate from environmental protections when imperative reasons of overriding public interest are present, subject to strict conditions and compensatory measures[110]. Article 6(4) of Directive 92/43/EEC (Habitats Directive) permits projects adversely affecting Natura 2000 sites to proceed if there are no alternatives and they are justified by imperative reasons of overriding public interest, coupled with compensatory measures[111]. In *Sweetman*, the CJEU underlined the strictness of the Article 6(3)-(4) sequence and the depth of the assessment of site integrity, which gives a sense of the demanding balance before derogation is allowed[112]. Article 4(7) of Directive 2000/60/EC (Water Framework Directive) allows projects that cause deterioration or prevent status improvements to proceed where specific public interest, lack of alternatives, and mitigation conditions are met, with the CJEU, in *Weser,* confirming the binding nature of the deterioration rule and the structured derogation test[113]. More recently, both the temporary emergency Regulation (EU) 2022/2577 and amendments under Directive 2023/2413/EU (Renewable Energy Directive, RED III) articulate a presumption that renewable energy projects are of overriding public interest (for specified purposes, including Habitats Directive and Water Framework Directive derogations), operationalising an interest hierarchy for permitting when climate and energy security are at stake.

These analogies do not convert EPBD obligations into a derogation regime, but illuminate how EU law treats climate and energy security as weighty public interests and how it structures balancing tests, lack of alternatives inquiries, and safeguards. For national MEPS and stock trajectories, a legislator can justify targeted obligations by documenting the absence of less intrusive means capable of delivering the required stock level energy savings in time by focusing on worst performers and including remedial and support measures that keep individual burdens within acceptable bounds.

Proportionality in the design of MEPS and residential trajectories

[108] ECtHR, *Sporrong and Lönnroth* v Sweden, 23 Sept 1982.
[109] ECtHR, *James and Others v United Kingdom*, 21 Feb 1986.
[110] Article 9 of the recast EPBD is not a derogation clause; the balancing between private rights and public interests takes place under Articles 17 and 52(1) of the Charter, not under the derogation tests in Article 6(4) of the Habitats Directive or Article 4(7) of the Water Framework Directive.
[111] Habitats Directive, Article 6(4).
[112] Case C-258/11, *Sweetman*, EU:C:2013:220.
[113] Water Framework Directive, Article 4(7); Case C-461/13, *Weser*, 1 July 2015.

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Under the Charter, proportionality requires that renovation obligations be suitable to achieve climate and energy objectives, necessary in not going beyond what is required where less restrictive but equally effective measures are available, and proportionate *stricto sensu* in maintaining a fair balance. Three design features of Article 9 of the EPBD, supported by the Guidance Notice, reflect these criteria directly. First, targeting rests on objective distributions of energy performance within the national stock, as expressed through EPC classes constructed on a numeric primary energy indicator calculated under Annex I. This approach minimises arbitrariness and enables ex ante predictability for owners and financiers by linking thresholds to a transparent calculation framework and to stock distributions publicly explained in EPC schemes[114]. Second, timing is phased and stock wide rather than atomised, which allows Member States to sequence compliance according to capacity, market readiness and administrative resources, including the use of trigger points at moments of sale, change of tenant or major renovation, without depriving owners of all economic use of their property[115]. Third, flexibility is embedded through performance-based compliance (meeting a threshold or delivering a specified improvement) rather than prescriptive methods, and through the acceptance of a menu of measures at building or unit level, including envelope improvements, technical building systems upgrades and onsite renewables, preserving owner choice within a rules-based envelope[116].

Proportionality is supported by the EPBD's focus on technical accuracy and quality control. Annex I requires a harmonised structure for energy performance calculation that accounts for building envelope, technical systems and use patterns, and allows for metered energy use to be incorporated under specified conditions, improving the accuracy of classifications and reducing the risk of error burdens on owners[117]. EPC systems must be subject to independent inspection schemes that check input data, validate calculations and monitor the deviation between calculated and measured performance. These schemes are important legally, as well as ensuring avoidance of arbitrary burdens when applying MEPS or trajectories to particular buildings[118]. Inspections of technical building systems (Article 23 of the EPBD) have been expanded. For example, the 70 kW threshold is now assessed on the combined rated output of heating and cooling generators within a system, better capturing actual energy use patterns and reducing avoidance incentives, while remaining objectively verifiable and transparent to owners and installers[119]. The same inspection framework includes basic assessments of feasibility to reduce onsite fossil fuel use and enable low temperature operation of hydronic systems, which ties compliance pathways to technically coherent decarbonisation choices without prescribing a single technology solution[120]. These features matter because proportionality can only be satisfied by the careful arrangement of verifiable criteria, reasonable timelines and an architecture that allows owners to meet objectives through cost-effective and technically appropriate routes.

[114] Commission Notice, Annex 12: Common general framework for the calculation of the energy performance of buildings; Commission Notice, Annex 1: Minimum energy performance standards for non-residential buildings and trajectories for progressive renovation of residential buildings (Article 9).
[115] Ibid; Commission Notice, Annex 3: EPC classes and independent control systems.
[116] Ibid.
[117] Commission Notice, Annex 12, Sections 4.1-4.3 (metered energy; PEFs; storage).
[118] Commission Notice, Annex 3, Section 8 (independent control; validity checks; on-site verification).
[119] Commission Notice, Annex 10: Technical building systems, indoor environmental quality and inspections (Articles 13, 23 and 24), Section 4.1 (combined 70 kW threshold and scope).
[120] Ibid., Section 2.4 (low-temperature requirements); Commission Notice, Annex 3: Section 4.4 (low temperature hydronic heating guidance).

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Legal certainty and legitimate expectations

Renovation obligations interfere with the use of property and can require capital expenditure, necessitating strong legal certainty. The EPBD framework contributes certainty in three ways. First, it provides a common calculation 'grammar' and obliges Member States to express energy performance by a numeric indicator of primary energy per square metre per year, stabilising how obligations are triggered and assessed across time and administrative actors[121]. Second, it couples classification with a closed A-G EPC scale in which class A is a zero-emission building and class G corresponds to the lowest-performing segment of the national stock, embedding the distributional logic of worst performers first in the legal scale used for both certification and compliance[122]. Third, it requires independent inspection systems for EPCs, including onsite checks of input data, validity checks, and publication of quality levels, allowing owners, lenders and courts to track the reliability of administrative decisions that flow from EPC data[123]. The Guidance Notice emphasises a new inspection scheme after construction and renovation works, aimed at verifying that delivered performance meets design levels. This helps to align obligations, funding and outcomes while limiting disputes about compliance and expected savings[124]. Clear deadlines and notice periods are built into the timelines in Article 9 of the EPBD and into national schemes, which the notice explains Member States should develop through governance, compliance identification, enabling frameworks and penalty schemes subject to principles of transparency and proportionality[125]. This architecture supports the requirement that interferences be lawful, accessible and foreseeable, and that they avoid imposing an individual and excessive burden by ensuring that owners can anticipate obligations, plan works and access redress where classifications or calculations are contested[126].

Evidence, measurement and verification: EPCs and inspections

As proportionality and fair balance depend on both aims and evidence, the legal landscape attaches weight to measurement and verification. Annex I to the EPBD governs the energy performance calculation. Annex 12 to the Guidance Notice explains the use of metered data, primary energy and other weighting factors, and the treatment of on-site renewables and storage[127]. The EPC regime requires that the energy performance class be derived from the Annex I numeric indicator, which ensures that MEPS thresholds and stock trajectories are anchored to the same metric. The independent control system then imposes validity checks on input data and allows for on-site verification to correct misclassification before obligations or penalties can accrue[128]. The expanded inspection regime addresses technical building systems, indoor environmental quality and the feasibility of energy efficient operation, including requirements and exemptions linked to building automation and control and to indoor

[121] Commission Notice, Annex 12, point 1 fourth subparagraph (numeric indicator for EPC and requirements).
[122] Commission Notice, Annex 3, Sections 2.1-2.5 (EPC classes A-G; definition of A and G; distribution).
[123] Ibid., Section 8.
[124] Commission Notice, Annex 10, Section 4.6 (new inspection scheme after construction and renovation).
[125] Commission Notice, Annex 1, Sections 2.3 (MEPS governance, compliance, enabling framework, penalties).
[126] ECtHR, *Sporrong and Lönnroth* v Sweden, 23 September 1982; ECtHR, *James and Others v United Kingdom*, 21 February 1986.
[127] Commission Notice, Annex 12, Section 4.1.8 (use of metered energy) and Sections 4.3.1-4.3.4 (primary energy factors and weighting).
[128] Commission Notice, Annex 3, Sections 2.1-2.5 (EPC classes A-G; definition of A and G; distribution) and Section 8.6 (public disclosure of EPC quality levels and deviations).

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environmental quality (IEQ) monitoring. It can reduce the need for intrusive inspections while maintaining assurance levels, provided certain functionalities are in place[129].

Enabling frameworks, vulnerable owners and market barriers

EU law does not equate proportionality with costlessness, but requires public authorities to organise obligations such that individual excessive burdens are avoided and support mechanisms reflect policy intensity. Articles 17 and 18 of the EPBD focus on financial incentives, skills, one-stop-shops and barrier removal. The Guidance Notice details how Member States can link supports to targeted energy savings, provide greater support for deep renovations and for owners with low financial capacity, address split-incentive problems, simplify procedures and ensure geographical coverage of advisory services[130]. Regulation (EU) 2023/955 (Social Climate Fund (SCF) Regulation) establishes a financing vehicle for measures and investments that mitigate distributional impacts of decarbonisation in buildings and transport, which provides an EU law context for national support packages that accompany MEPS and trajectories. The Renovation Wave analysis[131] for the 2020 Communication highlighted that voluntary approaches had failed to deliver scale, reinforcing the need to combine binding renovation pathways with financing, advisory and skills infrastructures if Member States are to achieve the 2030 and 2035 targets without triggering excessive individual burdens. For legal design purposes, this means that exemptions, phase-ins and alternative compliance routes should be considered alongside grant schemes, subsidised loans and technical assistance. These supports should be visible in the legislative record and in implementing decrees, enabling courts to account for them in proportionality reviews.

Interfaces with housing and property law, procedural guarantees and redress

Mandatory renovation interacts with landlord–tenant relations, condominium rules, and co-ownership governance. The guidance on financial incentives and one-stop-shops addresses split incentives and co-ownership complexities, encouraging instruments that align costs and benefits between owners and tenants and facilitate decision-making in multi-unit buildings, which are crucial to the enforceability of MEPS in practice[132]. EPC quality controls and inspection report requirements support transparency and due process by generating documentation trails that can be challenged before national courts or administrative bodies where classifications, thresholds or compliance determinations are disputed[133]. The guidance emphasises IEQ as a substantive parameter to be addressed during renovations and, for certain non-residential buildings, monitored during operations. This connects renovation obligations with occupier health and safety in a way that reinforces the public interest rationale while using objective standards and recognised indicators (including EN 16798-1 and the Level(s) framework)[134]. RPs, which Member States must introduce by 29 May 2026, constitute an owner-facing planning tool that sequences measures toward deep renovation, can be coupled with EPCs and databases, and create a path dependency that supports gradual

[129] Commission Notice, Annex 10, Section 4.6 (new inspection scheme after construction and renovation).
[130] Commission Notice, Annex 2, Sections 2 to 5 (financial incentives; split incentives; one-stop-shops; social fairness).
[131] Buildings Performance Institute Europe (BPIE), *The Renovation Wave Strategy & Action Plan: analysis*, 2021, https://www.bpie.eu/wp-content/uploads/2021/04/BPIE_Renovation-Wave-Analysis_052021_Final.pdf.
[132] Commission Notice, Annex 2, Sections 2-5.
[133] Commission Notice, Annex 3, Sections 2.1-2.5 and Section 8.
[134] Commission Notice, Annex 10, Section 3.1 (IEQ references; EN 16798-1; Level(s)).

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compliance while respecting owner choice and budget constraints[135]. Finally, the guidance on MEPS governance states that monitoring and penalty schemes should be proportionate and calibrated to compliance risks, with explicit criteria for exemptions and for temporary adjustments in cases such as natural disasters. These are relevant to fair balance analysis and the avoidance of disproportionate sanctions in the event of hardship[136].

Case-law and the design and enforcement of renovation mandates

Luxembourg and Strasbourg jurisprudence show how renovation obligations such as MEPS and residential trajectories should be crafted and applied. First, measures must be provided by law and foreseeable: the national legislator should lay down the thresholds, timelines and indicators in a form that is accessible, make use of the Annex I numeric metric and the EPC scale, and define triggers and exemptions precisely so that owners can anticipate when and how obligations will apply to them[137]. Second, measures must serve an objective of general interest. The statutory recitals and impact assessments should link the national scheme to European Climate Law targets and to the building sector's share of energy and emissions, as well as to energy security considerations, demonstrating the general interest case at the time of adoption[138]. Third, proportionality requires careful balancing: legislators should target the worst performers first, embed phase-ins, provide performance-based compliance options, and document why less restrictive alternatives would not achieve the necessary stock-level reductions in time. A similar lack-of-alternatives reasoning was applied to the Habitats Directive and Water Framework Directive derogation regimes, even if no formal derogation test applies here[139]. Fourth, procedural and technical safeguards must be credible. Independent EPC controls, inspection schemes calibrated by output thresholds, and alternative measures (e.g. building automation, control systems, integrated IEQ parameters for certain non-residential buildings) support legality and reduce arbitrariness, which is relevant to fair balance and the CJEU insistence that environmental protection can justify restrictions where the substance of the right is preserved and burdens are not unreasonable[140]. Fifth, targeted support is part of the proportionality calculus. One-stop-shops, income-targeted grants and SCF-supported measures should be integrated with enforcement to prevent individual excessive burdens, especially for low-income owner-occupiers and small landlords, and to preserve continued economic use of property during transition[141]. When these elements are in place, a renovation mandate reflects control-of-use interference justified by climate and energy security imperatives, governed by clear technical criteria, tempered by flexibility and support, and compatible with Articles 17 and 52(1) of the Charter and with A1P1 as interpreted by the ECtHR[142].

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[135] Commission Notice, Annex 4: Renovation passports (coupling with EPC; sequencing).
[136] Commission Notice, Annex 1, Sections 2.3.3 and 2.3.5.
[137] Charter of Fundamental Rights of the European Union, Articles 17 and 52(1); Commission Notice, Annex 12, point 1 fourth subparagraph (numeric indicator for EPC and requirements); Commission Notice, Annex 3, Sections 2.1-2.5 (EPC classes A to G; definition of A and G; distribution).
[138] Regulation (EU) 2021/1119, Article 4; Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: A Renovation Wave for Europe - greening our buildings, creating jobs, improving lives, COM(2020) 662 final, https://energy.ec.europa.eu/system/files/2020-10/eu_renovation_wave_strategy_0.pdf.
[139] Case C-461/13, *Weser*, 1 July 2015.
[140] Case 44/79, *Hauer*, EU:C:1979:290; Case C-416/10, *Križan*, EU:C:2013:8; Commission Notice, Annex 10, Sections 3.1, 4.1 and 4.6.
[141] Regulation (EU) 2023/955; Commission Notice, Annex 2, Sections 2-5.
[142] Case 4/73, *Nold v Commission*, EU:C:1974:51; ECtHR, *Fredin v Sweden*, no. 12033/86, 18 Feb 1991; ECtHR, *Hamer v Belgium*, no. 21861/03, 27 Nov 2007; ECtHR, *Sporrong and Lönnroth v Sweden*, 23 Sept 1982; ECtHR, *James and Others v United Kingdom*, 21 Feb 1986.

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2.3 Legal issues and barriers

Proportionality and fair balance of interests

Any interference with property rights, such as forcing owners to invest in renovations, must respect the principle of **proportionality**. Under EU law (Article 5 of the Treaty on European Union (TEU); Article 52(1) of the Charter), measures must be suitable to achieve the climate objective, necessary in that no equally effective and less intrusive alternative is available, and proportionate *stricto sensu*, i.e. they must not impose an individual and excessive burden on owners when weighed against the general interest in decarbonising buildings. This three-step structure is now the focal point of legality and acceptability for owner-facing renovation mandates across the EU[143].

Suitability asks whether upgrading inefficient buildings is actually capable of delivering the required reduction in energy demand and operational emissions. Record and policy experience point in one direction: renovating the worst-performing parts of building stock is a direct and efficacious way to lower consumption and emissions from buildings. The literature emphasises that information tools and voluntary incentives alone have not produced the required scale of energy savings in the existing stock. By contrast, binding standards and obligations ensure that improvements are realised, particularly when they are framed in technology-neutral terms that allow owners to choose the lowest cost route to a defined performance outcome[144].

Necessity asks whether equally effective but less intrusive alternatives exist. Comparative surveys report that over the past decade incentives and information have often proved insufficient to lift renovation rates to a trajectory compatible with climate objectives. In the Netherlands, courts and administrators increasingly reason that where widespread refusal to connect would undermine the viability of low-carbon district heating, incentives are not an equally effective alternative to obligations to connect. Rather, a legally binding duty produces higher and more certain emissions reductions, subject to carve-outs for buildings that can demonstrate an equivalent decarbonised solution (e.g. a recently installed heat pump)[145].

Strict proportionality (fair balance) requires that the burden on owners remain reasonable. Key levers are generous phase-ins and trigger points. First, time operates as a proportionality instrument: generous lead-ins, sequenced milestones and objective trigger points (e.g. major renovation, end-of-life system replacement, change of ownership) align legal duties with normal investment cycles and reduce hardship. Second, money structures the balance, and technology-neutral performance targets should be paired with a visible, legally anchored support architecture (grants, soft loans, tax relief) so that typical cases are not forced into inevitable losses. Where payback is implausible within reasonable horizons, the law should adjust timing or intensity or provide additional support. Third, feasibility and foreseeability are indispensable to legal certainty. Obligations must have clear statutory bases, use objective indicators, and incorporate narrowly drawn hardship or infeasibility valves for atypical

[143] Hoops, B., Akkermans, B. and Von Samsonow, W., 'Obligations for owners to climate-proof buildings: A theoretical and comparative analysis', *European Property Law Journal,* Vol. 13, Issue 1, 2024, https://doi.org/10.1515/eplj-2024-0002.
[144] Ibid.
[145] Ibid.

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buildings, with offsetting rules that preserve aggregate savings. As owners often depend on third parties (tenants, co-owners, utilities, network operators) to execute works, the legal regime should supply procedural facilitation (decision-making rules, tolerance duties, alternative compliance routes) rather than penalise owners. Finally, strict proportionality guards against retroactive effects, favours protection for very recent compliant investments, and requires that any sanctions be graduated, reviewable and calibrated to means, never extinguishing the underlying duty where compliance remains achievable[146].

Recommendations

Member States should frame transposition and implementation choices with the proportionality trilogy – suitability, necessity, proportionality – in mind. Legislators should: (i) anchor duties in clear, specific statutory provisions that define scope, indicators and financial conditions up-front[147]; (ii) prefer technology-neutral performance metrics and use objective trigger points to align obligations with investment cycles; (iii) build ample transition periods and graduated milestones that mirror the EPBD's phased architecture; and (iv) legislate hardship clauses and tailored exemptions for atypical cases, coupled with a duty on authorities to secure equivalent savings elsewhere.

Constitutional heterogeneity

A central legal barrier to implementing mandatory renovation obligations under the EPBD is the uneven constitutional footing for such duties across the Member States and in conjunction with A1P1. In several jurisdictions, environmental protection, or the right to a healthy environment, has constitutional rank. That constitutional weight can reinforce the public interest side of the proportionality balance when owners are required to undertake works on existing buildings, making it easier for legislators and courts to characterise renovation mandates as a justified control of use rather than a deprivation of property. In other jurisdictions, environmental protection does not enjoy the same constitutional entrenchment. There, identical obligations are likely to attract narrower margins of appreciation and closer judicial scrutiny, even though the overarching A1P1 test of lawfulness, legitimate aim, and a fair balance applies equally in all Member States[148].

A second axis of divergence is how property interference is classified and reviewed. Some systems work primarily through A1P1 rather than domestic constitutional clauses, for example distinguishing between expropriation, individually excessive restrictions, generally excessive restrictions, and proportionate restrictions. Other systems start from domestic constitutional protections but still accept that regulations may amount to interference requiring constitutional

[146] Ibid.
[147] In *Décision n° 2015-718 DC du 13 août 2015* on *Loi relative à la transition énergétique pour la croissance verte*, the French Constitutional Council declared Article 6 unconstitutional. That provision introduced, in very general terms, an obligation to renovate private residential buildings 'on the occasion of a transfer' between 2030 and 2050, with the detailed calendar to be fixed by decree. While the Council accepted that reducing energy consumption in residential buildings is a legitimate objective of general interest that can justify limitations on property rights, it held that the legislature had not sufficiently defined either the scope of the obligation (categories of buildings and owners concerned) or the financial conditions for its implementation. As these elements were left open, the measure was found to impose a disproportionate interference with the right to property.
[148] Hoops, B., Akkermans, B. and Von Samsonow, W., 'Obligations for owners to climate-proof buildings: A theoretical and comparative analysis', *European Property Law Journal,* Vol. 13, Issue 1, 2024, https://doi.org/10.1515/eplj-2024-0002.

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scrutiny even where no physical taking occurs. These differences matter because characterisation drives legal consequences: control of use measures will turn on a rigorous proportionality assessment, whereas expropriation measures attract compensation as a matter of principle. For EPBD purposes, that distinction shapes legislative design (how precise scope, metric, timing and safeguards are framed ex ante) and litigation risk (burden of justification the State must meet to demonstrate suitability, necessity, and a strict balance between the climate objective and private burdens)[149].

This constitutional heterogeneity is directly relevant to the case study question, as the same Article 9 of the EPBD scheme can face materially different review intensities and remedial outcomes across the EU. Where constitutional environmental clauses exist (e.g. State goals to protect the environment, right to a healthy environment), they can supply additional weight at the proportionality *stricto sensu* stage. Where they do not exist, the proportionality showing must do more work: legislators will be expected to demonstrate why non-coercive instruments have proved insufficient, to calibrate obligations carefully to the worst-performing stock, and to describe criteria for relief that prevent 'individual and excessive burdens', especially for vulnerable owners. In all systems, the common constitutional task is to strike a fair balance, but the route to that balance, and the evidential demands placed on the legislator, varies with the underlying constitutional architecture and the A1P1 classification applied.

Recommendations

Member States should draft renovation mandates to withstand both domestic constitutional review and scrutiny under A1P1. Where constitutional environmental clauses exist, statutes should explicitly link the measure to those provisions and set out the public interest basis in climate mitigation and energy efficiency. Where no such clauses exist, legislators should accompany the statute with a reasoned necessity statement showing why non-coercive instruments have proved insufficient, and should calibrate obligations to the worst-performing stock with clear, criteria-based relief to prevent individually excessive burdens. In all systems, the statute should pre-empt classification risks by fixing the assessment metric, scope, timing and safeguards with sufficient precision to support a rigorous proportionality assessment.

Multi-owner governance

The ownership structure of buildings is a major challenge and can impede or complicate the implementation of renovation duties in those Member States that decide to implement MEPs in their residential building stock. Many of the worst-performing buildings are multi-unit residential blocks or other shared-ownership properties, where decision-making is collective and the split incentive problem is considerable. In condominiums and apartment blocks, retrofit measures often require a qualified majority of co-owners. Public law duties imposed on a single unitholder do not bind the association, and authorities cannot fairly fine a non-complying addressee who lacks the private law power to execute the works. Comparative analysis notes reforms that lower decision thresholds for certain collective measures, but no jurisdiction compels the association to vote 'yes' simply because a public law obligation exists. The enforcement consequence is clear: if the addressee cannot perform for reasons of private

[149] Ibid.

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governance beyond their control, punitive fines are unlawful because they cannot achieve the desired effect[150].

In rented housing, two additional questions dominate. First, whether tenants must tolerate works. All systems surveyed require tolerance of energy efficiency works subject to reasonable conditions (timing, duration, habitability). Second, whether landlords can recover some of the cost in rent. Here, the divergence is stark. German law allows a capped, structured uplift (subject to tenant protection checks)[151], the Dutch rely on reasonableness to ensure that tenants are not worse off overall[152], and Spanish law permits uplifts only at infrequent intervals (five or seven years), potentially undermining the investment case, especially where subsidies must be netted out of the capital base[153]. These private law frictions feed directly into public law proportionality: if the landlord cannot reasonably recover costs *and* receives no compensating support, the fair balance weakens. France's tenancy protections add a different constraint, whereby tenants must facilitate non-disruptive works, but termination windows are infrequent and tightly policed[154].

Recommendations

MEPS should be accompanied by tailored condominium and tenancy enablers. In co-ownership, lower the voting thresholds for energy works that follow from public obligations, provide statutory last resort mechanisms for court authorisation where a qualified minority blocks legally required measures, and allow cost-sharing formulae that reflect use/benefit. For rentals, combine a right-to-renovate (with defined notice, duration and habitability safeguards) with calibrated rent adjustment rules that prevent tenant hardship, yet make the landlord's business case plausible.

Enforcement feasibility and compliance mechanisms

Even a well-crafted obligation will fail if there is no credible and workable **enforcement mechanism**. A key challenge for Member States is how to ensure compliance, given the sheer number of buildings and the private nature of property use. Unlike a one-time product regulation, building renovation standards need continuous monitoring and enforcement. **Enforcement feasibility** involves both the capacity of authorities to check compliance and the design of penalties or incentives to motivate owners. Institutional powers and practices vary. For instance, beyond low fines and public disclosure for large tertiary buildings, France has no specific coercive mechanism to force owners to carry out retrofitting measures. The

[150] Hoops, B., Akkermans, B. and Von Samsonow, W., 'Obligations for owners to climate-proof buildings: A theoretical and comparative analysis', *European Property Law Journal,* Vol. 13, Issue 1, 2024, https://doi.org/10.1515/eplj-2024-0002.
[151] Godt, C. and Meyerholt, U., 'Obligations for owners to climate-proof buildings in Germany', *European Property Law Journal,* Vol. 13, Issue 1, 2024, pp. 77-103, https://doi.org/10.1515/eplj-2024-0005.
[152] Karens, J. and Hoops, B., 'Obligations for owners to climate-proof buildings in the Netherlands', *European Property Law Journal,* Vol. 13, Issue 1, 2024, pp. 161-189, https://doi.org/10.1515/eplj-2024-0009.
[153] Simón Moreno, H. and Garcia Teruel, R., 'Obligations for owners to climate-proof buildings in Spain', *European Property Law Journal*, Vol. 13, Issue 1, 2024, pp. 127-149, https://doi.org/10.1515/eplj-2024-0007.
[154] Joye, J., Vern, F. and Morin Guerry, A., 'Obligations for owners to climate-proof buildings in France', Vol. 13, Issue 1, 2024, https://doi.org/10.1515/eplj-2024-0004.

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constitutional culture does not favour hard coercion. The only theoretical tool is a daily *astreinte*, which has not yet been implemented by statute to climate-proof existing housing[155].

Capacity and market constraints affect proportionality. Where a lack of certified installers or materials makes timely compliance impossible, compelling owners to meet deadlines can itself be disproportionate. Dutch administrative practice allows authorities to prioritise enforcement and extend compliance windows in such circumstances, a responsive governance that keeps sanctioning within the bounds of Article 52(1) of the EPBD and A1P1[156].

A delicate enforcement issue is how to handle non-compliance by owners who genuinely cannot afford or manage the renovation. Simply issuing fines to a low-income homeowner or a small landlord may be counterproductive if they lack access to capital or contractors to do the work. Accordingly, enforcement regimes should be coupled with compliance support, for instance offering default renovation programmes where the government or utilities help to carry out the required improvements, with costs recouped later (e.g. at the time of property sale). In designing penalties, legislators might consider means-based approaches (lower fines or extended deadlines for certain hardship cases), although this must be balanced against treating all owners equally under the law. Enforcement will be effective if it combines credible penalties to deter intentional evasion (e.g. loss of rental income, fines that accumulate, public disclosure of non-compliance) with robust support systems to help willing but struggling owners to meet their obligations[157].

Recommendations

Member States should design credible but workable enforcement models that pair sanctions with compliance support. Enforcement provisions should prioritise progressive steps such as warnings, improvement notices, and time-bound plans before monetary penalties, with explicit powers to defer deadlines where installer capacity or supply constraints make timely compliance impossible. Compliance support should be institutionalised, for example through default renovation programmes or one-stop-shops able to organise works for willing but constrained owners, with costs recouped later on transparent terms. Authorities should be empowered to sequence and prioritise enforcement to remain within proportionality limits, and sanctions should be reviewable, means-sensitive and linked to remedial action rather than purely punitive outcomes. In short, enforcement must not crystallise a manifestly unfair balance.

Financial barriers

[155] Hoops, B., Akkermans, B. and Von Samsonow, W., 'Obligations for owners to climate-proof buildings: A theoretical and comparative analysis', *European Property Law Journal,* Vol. 13, Issue 1, 2024, https://doi.org/10.1515/eplj-2024-0002.
[156] Karens, J. and Hoops, B., 'Obligations for owners to climate-proof buildings in the Netherlands', *European Property Law Journal,* Vol. 13, Issue 1, 2024, pp. 161-189, https://doi.org/10.1515/eplj-2024-0009.
[157] Hoops, B., Akkermans, B. and Von Samsonow, W., 'Obligations for owners to climate-proof buildings: A theoretical and comparative analysis', *European Property Law Journal,* Vol. 13, Issue 1, 2024, https://doi.org/10.1515/eplj-2024-0002.

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Mandatory renovation duties inevitably entail upfront expenditure and ongoing financing decisions. The legal issue is not simply the headline cost but the way the law allocates, sequences and cushions that cost across different ownership situations. Where support instruments are undefined, discretionary or purely theoretical, owners face opaque financial exposure, inviting objections grounded in legal certainty and equality before the law. A general measure can, in practice, produce an individually excessive burden on a particular owner, often analysed as a 'special sacrifice'. Several systems limit compensation where the required package is reasonably expected to pay for itself over its useful life, or where public support is reliably available to close the gap. Conversely, if irrecoverable losses are left with the owner, compensation or other corrective relief may become an issue. This places the financing design at the centre of legal defensibility, without relying on proportionality labels[158].

A further difficulty is the absence in many frameworks of clear statutory distinctions between **recoverable costs** (those offset by predictable energy bill savings over the measure's lifetime) and **inevitable losses** (expenditure that cannot be earned back within any practicable timeframe). Non-residential buildings with high and stable demand typically exhibit stronger savings profiles, while owner-occupied housing and small landlords often do not, because credit capacity is thinner and savings less certain. In rented housing, split incentive frictions are structural: tenants benefit from lower bills, while landlords bear the capital costs, and tenancy rules both limit intrusive works and restrict landlords' ability to recover renovation costs through rent. Without harmonised pathways, mandates are legally harder to execute and easier to contest. Collective ownership adds another layer, as condominium statutes frequently require qualified majorities for improvement works. If voting thresholds and timelines are not aligned with renovation duties, even willing owners may be legally unable to comply, undermining enforceability[159].

Finally, although the EPBD requires enabling frameworks (finance, split incentive tools, one-stop-shops, quality control), the adequacy and predictability of national funding remain crucial. If support is late, insufficient, or rationed in ways owners cannot anticipate, renovation duties become vulnerable on legal certainty and equality grounds, even where their environmental aim is uncontested[160].

Recommendations

Member States should anchor enforcement to finance that is real, specific and timed. The transposing statute should make a funding decision part of the compliance decision so that each owner receives, together with the notice to renovate, a binding offer setting out the eligible measures, expected savings, net cost after public support and available repayment channels. It should also define in law how recoverable costs are identified and how any

[158] Hoops, B., Akkermans, B. and Von Samsonow, W., 'Obligations for owners to climate-proof buildings: A theoretical and comparative analysis', *European Property Law Journal,* Vol. 13, Issue 1, 2024, https://doi.org/10.1515/eplj-2024-0002.
[159] Bundes Architekten Kammer, *Position Paper of the Federal Chamber of German Architects (BAK) on the Proposal for a Directive of the European Parliament and of the Council on the Energy Performance of Buildings (RECAST),* 2022, https://bak.de/wp-content/uploads/2022/03/Energy-Performance-of-Buildings-Directive-EPBD_Position-Paper-BAK.pdf.
[160] European Commission, *Energy Performance of Buildings Directive*, n.d., https://energy.ec.europa.eu/topics/energy-efficiency/energy-performance-buildings/energy-performance-buildings-directive_en.

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residual inevitable loss is covered through grants or zero-interest long-tenor loans issued before the compliance date, provide standardised rent-and-savings formulae and deferred payment options to resolve split incentive frictions, align condominium decision-making rules with mandated works, and sequence any technology-specific duties with the completion of local heat-planning. By turning finance, cost-sharing and timing into clear statutory entitlements rather than discretionary promises, schemes can improve legal certainty for owners, narrow compensation exposure, and make day-to-day enforcement practicable.

Legal certainty

A robust statutory basis is indispensable. While Member States can rely on general frameworks for new-build standards, obligations compelling owners to engage in works on existing buildings typically require specific, clear statutory authorisation. Vague 'open norms' in building, housing or planning law are viewed as inadequate for positive duties of this intensity.

French constitutional doctrine underscores how legislative specificity functions as a proportionality prerequisite in its own right. When the legislature creates a transfer-triggered retrofit duty for private dwellings, it must also define the scope, financial parameters and compensation logic so that proportionality can be meaningfully assessed. The Constitutional Council's annulment of Article 6 of the 2015 Energy Transition Law on precisely these grounds is often cited as a cautionary example: climate is a legitimate aim, but the law failed because the framework left too much undefined[161].

This connects directly to legal certainty under EU law. Owners must foresee what is required, when, and on which metric. The EPBD's closed energy efficiency scale supports foreseeability and stabilises triggers, but Member States still need to translate Article 9 into accessible thresholds, milestones, exemptions and evidence models within their own laws. Where the authorising statute is thin or delegates too much without criteria, review bodies can, and do, interrupt the chain from legitimate aim to enforceable duty[162].

Recommendations

Member States should provide a robust statutory basis in primary law expressly authorising renovation duties for existing buildings. They should adopt a clear Article 9 of the EPBD clause in primary transposing legislation that authorises renovation duties for existing buildings and fixes the few anchors that legal certainty requires, i.e. the assessment metric by reference to Annex I and the national EPC scale, who is covered and when through publicly announced calendars, and how compliance is shown through defined, objective evidence. Any further

[161] Joye, J., Vern, F. and Morin Guerry, A., 'Obligations for owners to climate-proof buildings in France', *European Property Law Review,* Vol. 13, Issue 1, 2024, https://doi.org/10.1515/eplj-2024-0004
[162] European Commission, Minimum energy performance standards for non-residential buildings and trajectories for the progressive renovation of residential buildings (Article 9), 2025, https://energy.ec.europa.eu/document/download/205d9030-1a81-4c0e-aa65-af87b7a0b57d_en?filename=Minimum%20energy%20performance%20standards%20for%20non-residential%20buildings%20and%20trajectories%20for%20the%20progressive%20renovation%20of%20residential%20buildings%20%28Article%209%29%20-%20annex%201.pdf.

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detail should be made by secondary rules tightly bound to published criteria and accompanied by a short proportionality statement explaining scope, timing, expected cost exposure, and the support available.

Mixed-use buildings (residential & non-residential)

One complex scenario under the EPBD is how to handle mixed-use buildings, i.e. those containing both residential and non-residential units. The EPBD provisions split along building use (non-residential vs residential), creating a legal grey area for buildings of mixed purpose. Recital 34 of the EPBD explicitly acknowledges this issue: Member States may decide whether to treat a mixed-use building as residential or non-residential (or a combination) for the purposes of MEPS[163]. While useful, this flexibility can lead to inconsistencies and uncertainty if not clearly defined in national law. Owners and regulators might be unsure which standards apply to a building with shops or offices on the ground floor and apartments above, for example. There is also a risk of regulatory arbitrage, where an owner could claim the building under whichever category has less stringent requirements unless clear criteria are set.

Another challenge is accounting for renovations and energy improvements in mixed-use properties. As the EPBD sets different targets for each segment (specific performance thresholds for non-residential, vs average consumption reduction for residential), any upgrades in a mixed building must be carefully attributed. The European Commission advises that to avoid double-counting, improvements should be clearly assigned to either the residential portion or the non-residential portion of the building stock[164]. In practice, this means if a mixed-use building undergoes an energy renovation, the resulting energy savings should count either toward the country's worst-performing non-residential improvements or toward the residential stock's average reduction, but not both. Without clear rules, there is potential for confusion in reporting progress or, conversely, for missed opportunities if neither segment takes credit for the improvement.

Recommendations

Member States should incorporate clear guidance and enforcement measures in their national legislation when implementing Article 9 of the EPBD on MEPS for mixed-use buildings. Competent authorities should define clear rules for classifying mixed-use buildings as residential, non-residential, or split for MEPS purposes. The EPBD allows flexibility, but a uniform national approach is crucial for consistency. One strategy is to use a floor-area threshold. For instance, if a building's non-residential portion is below a certain percentage (e.g. 10% of total floor area), the whole building is treated as residential, and if it is above that

[163] European Commission, Minimum energy performance standards for non-residential buildings and trajectories for the progressive renovation of residential buildings (Article 9), 2025, https://energy.ec.europa.eu/document/download/205d9030-1a81-4c0e-aa65-af87b7a0b57d_en?filename=Minimum%20energy%20performance%20standards%20for%20non-residential%20buildings%20and%20trajectories%20for%20the%20progressive%20renovation%20of%20residential%20buildings%20%28Article%209%29%20-%20annex%201.pdf.
[164] Ibid.

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percentage, it is treated as non-residential[165]. This avoids case-by-case ambiguity. Alternatively, Member States can differentiate by building unit, i.e. commercial unit(s) within a mixed building follow non-residential MEPS rules, while the dwelling units follow residential trajectory rules. Whichever method is chosen, it should be explicitly codified so that building owners know their obligations from the outset[166].

Energy performance improvements in mixed-use buildings should be counted only once in national monitoring and reporting. Any savings or upgrades should be allocated to either the residential or the non-residential category based on the part of the building renovated, in line with EU guidance. For example, efficiency upgrades in the residential flats of a mixed building would contribute to the residential sector's targets, whereas upgrades in the commercial portion (e.g. ground-floor shop) would count toward non-residential compliance. Clear accounting rules in legislation will prevent overlaps and provide a true picture of progress in each segment.

MEPS obligations should be supported with robust enforcement mechanisms so that they become a real driver for renovation. Member States' laws should designate a competent authority (or authorities) to verify compliance and impose penalties for non-compliance.

2.4 Comparative practice in selected Member States

France: using housing decency rules to enforce MEPS

France provides a leading EU example of mandatory energy performance standards for existing buildings, particularly in the rental housing sector. Under the Climate and Resilience Law[167] and its implementing measures, France set enforceable energy efficiency thresholds that progressively restrict the leasing of poorly insulated homes (*passoires énergétiques*).[168] Since January 2023, in mainland France, a dwelling whose final energy consumption exceeds 450 kWh/m²/year is not considered 'decent' for renting, with the rule applying to new, renewed or tacitly renewed leases[169]. From 1 January 2025, all residences rated G on the EPC are deemed indecent and cannot be newly let or re-let; by 2028, rentals must meet at least class F standards, and by 2034 the legal minimum will rise to D[170]. For leases signed before each milestone, the new criterion applies at the moment of renewal

[165] Sibileau, H., BPIE, *Delivering the EPBD: a guide towards better, affordable and more resilient buildings for all in Europe*, 2025, https://www.bpie.eu/wp-content/uploads/2025/05/BPIEs-Guide-to-EPBD-Implementation-final-version.pdf.
[166] Ibid.
[167] Law No. 2021-1104 of 22 August 2021 on combating climate change and strengthening resilience to its effects (*Loi n° 2021-1104 du 22 août 2021 portant lutte contre le dérèglement climatique et renforcement de la résilience face à ses effets*) (Climate and Resilience Law), https://www.legifrance.gouv.fr/loda/id/JORFTEXT000043956924.
[168] Perrotin, F., 'Strengthening the reliability and supervision of the DPE' (*Renforcer la fiabilité et l'encadrement du DPE*), *Actu-Juridique*, 2025, https://www.actu-juridique.fr/fiscalite/fiscal-finances/renforcer-la-fiabilite-et-lencadrement-du-dpe/#:~:text=propri%C3%A9taires%20%C3%A0%20r%C3%A9habiliter%20leur%20bien,propri%C3%A9taires%20concern%C3%A9s%20ont%20peu%20entrepris.
[169] Decree No. 2021-19 of 11 January on energy performance criteria in the definition of decent housing in mainland France (*Décret n° 2021-19 du 11 janvier 2021 relatif au critère de performance énergétique dans la définition du logement décent en France métropolitaine*), https://www.legifrance.gouv.fr/jorf/id/JORFTEXT000042953125.
[170] French Directorate for Legal and Administrative Information (Prime Minister), 'The less well insulated heat strainers can no longer be rented', 2025, https://www.service-public.fr/particuliers/actualites/A17975?lang=en#:~:text=Since%201,from%20the%20beginning%20of%202025.

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or tacit renewal[171]. In practice, landlords of inefficient properties face a legal obligation to renovate if they are to continue renting, or else remove such units from the market over the coming decade. These decency-based prohibitions do not apply to seasonal rentals (*meublés touristiques*), which are governed by short-term letting rules, but, rather, target dwellings rented as a principal residence. For seasonal rentals newly subject to a change-of-use authorisation, a separate rule requires at least class E until 31 December 2033 and at least class D from 1 January 2034[172].

These measures are enforced through France's housing decency regulations. Energy performance is now a decency criterion, giving tenants legal rights to ensure that their accommodation meets minimum efficiency norms[173]. If a rental property fails to satisfy the new EPC requirements, tenants can initiate action prompting authorities or courts to intervene. Government guidance makes it clear that a tenant may ultimately ask a court to order the landlord to perform renovation works, with the judge empowered to set deadlines and even impose penalties[174]. During this process, rent payments can be reduced or suspended by judicial decision until the upgrades are completed. Certain legal safeguards and exemptions are built in to ensure proportionality: for instance, if a landlord in a multi-unit building has attempted in good faith to get necessary building-wide improvements (but was blocked by co-owners), or if structural/heritage constraints make the required energy level unachievable, a judge may refrain from ordering impracticable works.

France's Constitutional Council reviewed these provisions and in August 2021 declared them partially conforming[175]. No provision central to the rental decency mechanism was struck down, reinforcing its legitimacy[176]. The Council's decision, while not centered on an individual landlord's challenge, confirmed that the legislature's environmental objectives (e.g. reducing building emissions) qualify as an overriding public interest that can justify regulating property use. In essence, the French legislature was found to be within its authority to condition the use of private property (e.g. renting out a home) on meeting energy performance standards, provided the measures are proportionate and clearly defined.

France has coupled its mandatory standards with extensive support measures and phased timing to ensure fairness and practicality. Substantial public financial incentives are in place to help property owners to fund renovations. For example, the nationwide MaPrimeRénov' grant programme offers generous subsidies for insulation, heating upgrades and energy audits, available to all homeowners (including landlords), with increased aid for modest-income households. Recent updates show that the programme will be limited to worst-performing buildings and vulnerable households. Zero-interest eco-loans (Eco-PTZ) of up

[171] Ministry for Ecological Transition, 'Renting and rent freeze for energy-inefficient properties, updated 07/01/2025', https://www.ecologie.gouv.fr/politiques-publiques/location-gel-loyers-passoires-energetiques.
[172] Law No. 2024-1039 of 19 November 2024 aimed at strengthening the tools for regulating tourist accommodation at the local level (*Loi n° 2024-1039 du 19 novembre 2024 visant à renforcer les outils de régulation des meublés de tourisme à l'échelle locale*), https://www.legifrance.gouv.fr/jorf/id/JORFTEXT000050612711; Decree No. 2002-120 of 30 January 2002 on the characteristics of decent housing (*Décret n° 2002-120 du 30 janvier 2002 relatif aux caractéristiques du logement décent*), https://www.legifrance.gouv.fr/loda/id/JORFTEXT000000217471/.
[173] Article 6 of the 1989 Tenancy Law (as amended by the Climate and Resilience Law) requires that a rented dwelling be 'répondant à un niveau de performance minimal au sens de l'article L. 173-1-1' and sets the phased EPC thresholds (F from 1 January 2025; E from 1 January 2028; D from 1 January 2034). Dwellings that do not meet these criteria are 'non décents'.
[174] ParisRental, 'What to do if my apartment classed at G on DPE is prohibited for rental in 2025?', Blog, 2023, https://en.parisrental.com/blog/landlords-guide/what-to-do-if-my-apartment-classed-at-g-on-dpe-is-prohibited-for-rental-in-2023#:~:text=energy%20renovation,conformity%20of%20the%20dwelling.
[175] Decision No. 2021-825 DC of 13 August 2021 (*Décision n° 2021-825 DC du 13 août 2021*), https://www.legifrance.gouv.fr/jorf/id/JORFTEXT000043957268.
[176] JurisHebdo, 'The Constitutional Council approves the climate and resilience bill' (*Le Conseil constitutionnel valide le projet de loi climat et résilience*), 2021, https://jurishebdo.fr/le-conseil-constitutionnel-valide-le-projet-de-loi-climat-et-resilience/#:~:text=L%20e%20Conseil%20constitutionnel%20a,d%C3%A9cision%20du%2013%20ao%C3%BBt%202021.

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to €50 000 are also offered to spread retrofit costs[177]. The government has adjusted the EPC (DPE) methodology several times to improve its accuracy and reliability, after initial rollout issues, giving owners confidence in the energy ratings driving these obligations[178]. Phased compliance deadlines (2025, 2028, 2034) give owners several years to plan and execute renovations, with interim measures introduced to ease the transition. Notably, since 24 August 2022, rents for F-rated or G-rated dwellings in the private rented sector may not be increased on new, renewed or tacitly renewed leases[179], serving as a warning and incentive to renovate ahead of outright rental bans[180]. Authorities have also developed tools such as RPs (roadmap for staged upgrades) and one-stop advisory services (e.g. France Rénov') to assist homeowners in meeting the new standards[181]. These measures aim to ensure that the public interest goal of decarbonising buildings is achieved in a socially balanced way, minimising negative impacts on low-income households and small landlords.

The French case shows that with careful design – clear legal bases, phased implementation, support for compliance, and judicial oversight to ensure proportionality – mandatory renovation obligations can withstand legal scrutiny and deliver ambitious climate policy goals. This balance of stringency and support offers valuable lessons for other Member States seeking to upgrade buildings to high energy standards by 2050.

Austria: phasing out fossil heating systems as an indirect renovation mandate

Since February 2024, Austria's Renewable Heat Act (*Erneuerbare-Wärme-Gesetz*, EWG 2024) has prohibited the installation of fossil fuel space-heating and water-heating systems in new buildings, embedding a legally binding pathway to phase out oil, coal and gas in the building sector[182]. The earlier Oil Boiler Installation Prohibition Act (ÖKEVG, 2020) already barred central heating systems using liquid or solid fossil fuels in new builds[183], and the EWG broadens that prohibition. The law ensures that any connected district heating system meets strict sustainability criteria. To qualify as quality assured, district heating must be

[177] This ceiling only applies when coupled with MaPrimeRénov' (Order of 27 March 2025 on the conditions for applying provisions concerning interest-free repayable advances intended to finance energy renovation work on old housing in mainland France and overseas territories, *Arrêté du 27 mars 2025 relatif aux conditions d'application de dispositions concernant les avances remboursables sans intérêt destinées au financement de travaux de rénovation énergétique des logements anciens en France métropolitaine et en outre-mer*), https://www.legifrance.gouv.fr/jorf/id/JORFTEXT000051391559.

[178] Decree of 8 October 2021 amending the method of calculation and the procedures for establishing the energy performance diagnosis (*Arrêté du 8 octobre 2021 modifiant la méthode de calcul et les modalités d'établissement du diagnostic de performance énergétique*), https://www.legifrance.gouv.fr/jorf/id/JORFTEXT000044202205; Order of 25 March 2024 recalibrating energy performance certificates for small homes (*Arrêté du 25 mars 2024 recalibrating DPE labels for small homes*), https://www.legifrance.gouv.fr/jorf/id/JORFTEXT000049446315; Decree of 13 August 2025 amending the conversion factor from final energy to primary energy for electricity relating to energy performance diagnostics (*Arrêté du 13 août 2025 modifiant le facteur de conversion de l'énergie finale en énergie primaire de l'électricité relatif au diagnostic de performance énergétique*), which will become applicable on 1 January 2026, https://www.legifrance.gouv.fr/jorf/id/JORFTEXT000052134589.

[179] Climate and Resilience Law, Article 159.

[180] DPEs issued between 1 January 2018 and 30 June 2021 ceased to be valid on 1 January 2025; owners must ensure that the DPE is valid when relying on it for decency or transaction purposes, https://rt-re-batiment.developpement-durable.gouv.fr/IMG/pdf/consolide_annexe_1_arrete_du_31_03_2021_relatif_aux_methodes_et_procedures_applicables.pdf.

[181] Perrotin, P., 'Strengthening the reliability and supervision of the DPE ('Renforcer la fiabilité et l'encadrement du DPE')', *Actu-Juridique*, 2025, https://www.actu-juridique.fr/fiscalite/fiscal-finances/renforcer-la-fiabilite-et-lencadrement-du-dpe/#:~:text=propri%C3%A9taires%20%C3%A0%20r%C3%A9habiliter%20leur%20bien,propri%C3%A9taires%20concern%C3%A9s%20ont%20peu%20entrepris.

[182] Erneuerbare-Wärme-Gesetz (EWG), BGBl. I Nr. 8/2024, https://www.ris.bka.gv.at/NormDokument.wxe?Abfrage=Bundesnormen&Gesetzesnummer=20012541&FassungVom=2024-11-01&Paragraf=2&utm.

[183] Oil Boiler Installation Ban Act – International Energy Agency Policies Database, https://www.iea.org/policies/18136-oil-boiler-installation-ban-act.

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generated from at least 80% renewable sources, high-efficiency combined heat and power, recovered waste heat, or a combination, as defined in Article 2(13)(c) of the EWG 2024.

To accelerate replacement and conversion of existing fossil-capable systems, Austria pairs regulation with targeted public finance. The federal 'Get out of Oil and Gas' scheme ran until December 2024, covering up to 75% of eligible costs (including removal) for replacing old oil/gas boilers. Fiscal constraints saw the federal pot closed from January 2025. The Länder continue to offer co-funded grants, and from early January 2025 the 'Clean Heating for All' programme provides non-repayable investment grants for low-income households (lower third of the income distribution), with technology-specific caps (e.g. €25 383 for air-to-water heat pump, €35 893 for pellet or woodchip boiler, €37 252 for water-to-water or brine-to-water heat pump). Owners of single-family, two-family and terraced houses are eligible where the home was declared as the principal residence by 31 December 2022 and remains so. Income thresholds apply[184].

Austria introduced technical standards at renovation trigger points. Through the Austrian Institute of Construction Engineering (OIB), the Länder have harmonised energy efficiency standards (OIB Guideline 6). When owners undertake major renovations, minimum performance specifications must be met, ensuring that refurbishments materially improve efficiency. These are obligations triggered by the act of renovating (or heating system replacement), not a blanket duty to initiate renovation of the existing stock. In other words, Austria's model raises the baseline when works occur, but does not impose a general retrofit mandate on private owners[185].

The Renewable Heat Act is structured to be proportionate: it pursues a legitimate aim (decarbonising heat) and uses targeted, least-intrusive means by regulating heating systems rather than imposing a blanket duty to retrofit. Its graduated timeline (no fossil systems in new builds, end-of-life replacement rather than immediate removal, with staged phase-outs to 2035 for oil/coal and 2040 for gas) and technology choice (heat pumps, biomass, or quality assured district heating) limit interference and enhance feasibility. Legal certainty is high (clear prohibitions and dates), while burden mitigation is built in through finance. Although the broad 'Get out of Oil and Gas' fund has closed, means-tested, non-repayable grants under Clean Heating for All and Länder co-funding remain to cushion low-income households, alongside cost caps per technology. On balance, the interference appears necessary and proportionate, provided funding access remains effective and administrative pathways are clear.

Austria is in a development phase to transpose the EPBD by 2026. Both federal and regional instruments are expected to introduce binding MEPS for the worst-performing non-residential buildings (2030/2033 timeline) and to set a legally backed trajectory for progressively upgrading residential buildings on clear legal bases and financing channels[186].

Germany: trigger-based renovation obligations under the Building Energy Act

The Federal Ministry for Housing, Urban Development and Building (BMWSB) leads sustainable building policy and ensures that national rules align with EU standards such as the EPBD. It maintains voluntary frameworks such as the Assessment System for

[184] Sigl, L., Erneuerbare-Wärme-Gesetz: What You Need to Know (*Was Sie jetzt wissen müssen*), Infina Guide, https://www.infina.at/ratgeber/erneuerbare-waerme-gesetz/#c35297.
[185] Austrian Institute of Construction Engineering, *OIB Guideline 6: Energy Saving and Thermal Insulation* (April 2007 edition), OIB-300.6-038/07, https://www.technik.steiermark.at/cms/dokumente/12039006_58813874/acfcf53a/Richtlinie%206%20Ausgabe%20April%202007.pdf.
[186] Reported during interview with stakeholders.

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Sustainable Building (BNB) and the Quality Seal for Sustainable Buildings (QNG) to promote best practices, while underpining these with binding legal obligations. Germany's Building Energy Act (*Gebäudeenergiegesetz*, GEG) is the primary law imposing energy renovation duties on property owners[187]. Owners of existing buildings must upgrade insulation and heating systems when certain triggers occur. An uninsulated top-floor ceiling above a heated space must be insulated to meet prescribed efficiency values (U-value ≤0.24 W/m²K), and any fossil-fuel heating boiler over 30 years old generally must be replaced[188]. The GEG's 10% rule ensures that if an owner renovates more than 10% of a building (e.g. re-plastering an entire façade or retiling a roof), they must bring that component up to current energy standards[189]. Since 2024, another GEG amendment requires that when old heating systems are replaced, the new system must source at least 65% of its heat from renewable energy. Non-compliance with these obligations can lead to fines of up to €50 000, although enforcement so far relies on spot-checks and compliance at trigger points (e.g. during property sale or heating inspections). Crucially, Germany has built in safeguards to balance these mandates with property rights and social fairness. The German legal principle *eigentum verpflichtet* (property entails obligations) is explicitly invoked to justify energy retrofit duties, reflecting Article 14 of the German Basic Law, which allows regulation of property use for the common good. At the same time, the GEG provides exemptions for certain owners and buildings to ensure proportionality. Notably, an owner-occupier who has lived in a one- or two-family house since before 1 February 2002 is exempt from the retrofit requirements, preventing undue hardship for long-time owners. There are also carve-outs for technical cases (e.g. modern low-temperature boilers are excluded from the 30-year replacement rule) and allowances for historic buildings where strict efficiency upgrades are impractical. Germany pairs its obligations with substantial financial support to mitigate the cost burden, especially for vulnerable groups. The federal Building Efficiency Promotion (BEG) programmes administered by *Kreditanstalt für Wiederaufbau* (KfW) and *Bundesamt für Wirtschaft und Ausfuhrkontrolle* (BAFA) provide grants and cheap loans for energy renovations, and homeowners can claim tax credits for a portion of renovation expenses. To protect tenants from excessive costs when landlords renovate rental housing, German tenancy law caps how much of the renovation cost can be passed onto rent (generally 8% of costs per year, not exceeding €3 per m² monthly within six years)[190]. In cases of financial or personal hardship (e.g. older or low-income owners facing mandatory heating upgrades), the law allows extensions or exceptions so that climate goals are pursued with a social buffer. Germany is preparing to implement the new EU-wide MEPS in line with the EPBD. By May 2026, the GEG and related regulations will be amended to introduce staged targets for worst-performing buildings, as required by EU law. This will likely include defining a national efficiency class threshold so that the bottom 16% of non-residential floor space is improved by 2030 (and 26% by 2033) and achieving an average 16% reduction in residential primary energy use by 2030. German officials have signalled that they will implement these EU obligations in a way that preserves flexibility and affordability. For example, the government plans to harmonise building energy classes with the common EU scale and to pursue a technology-neutral approach to upgrades.

[187] Building Energy Act (Gebäudeenergiegesetz, GEG), https://www.gesetze-im-internet.de/geg/.
[188] Müller, A., 'Renovation obligation 2025: expert tips for homeowners' (*Sanierungspflicht 2025: Expertentipps für Hausbesitzer*), Blog, 2025, https://www.enter.de/blog/sanierungspflicht.
[189] Ervig, I., 'Renovation obligation: what you need to do now' (*Sanierungspflicht: Was du jetzt tun musst*), 2025, https://www.immobilienscout24.de/wissen/modernisieren/sanierungspflicht.html#:~:text=Unabh%C3%A4ngig%20von%20einem%20Eigent%C3%BCmerwechsel%20oder,konkret%3F%20Hierzu%20zwei%20typische%20Beispiele.
[190] Beate Schön, B., 'Rent increase after modernisation and heating replacement: your rights when the flat is modernised' *(Mieterhöhung nach Modernisierung und Heizungsaustausch – Deine Rechte, wenn die Wohnung modernisiert wird)*, 2024, https://www.finanztip.de/mietwohnung-modernisierung/.

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Croatia: enabling collective renovation through co-ownership

Croatia has not yet imposed direct retrofit mandates on private owners, but, rather, relies on long-term strategies and public programmes to drive upgrades. The government adopted a National Building Renovation Strategy 2020–2050 and a 2021–2030 renovation programme targeting multi-unit residential buildings[191]. These plans set voluntary renovation targets and offer generous financial incentives, covering 60-80% of retrofit costs for most projects, and up to 100% for low-income households at risk of energy poverty. Information tools such as EPCs are mandatory: virtually all buildings must obtain an EPC before sale or rental (or risk fines). While not improving efficiency directly, this raises awareness and helps to reflect energy performance in property values. These obligations represent regulatory restrictions on land use. Article 50 of the Croatian Constitution permits limitations on property if prescribed by law 'in the interest of the Republic of Croatia', which expressly encompasses protecting nature, the human environment and human health. Such restrictions must respect the principle of proportionality. The Croatian Constitutional Court (in line with ECtHR jurisprudence) requires that any interference with the peaceful enjoyment of property pursue a legitimate aim and strike a fair balance between community benefit and individual burden[192].

To facilitate deeper renovations in apartment buildings, Croatia has adjusted property and housing laws. Recognising that the requirement for unanimous consent among co-owners can block necessary works, the Energy Efficiency Act permits energy renovation decisions in multi-apartment buildings to be approved by a majority of co-owners (calculated by ownership shares) instead of unanimously[193]. This reform enables proactive majorities to implement efficiency improvements even if some apartment owners' object. An initial version of the law demanded a double majority (by both shares and number of owners), but the Croatian Constitutional Court struck down that provision in 2021 for lacking clarity. The Court held that laws affecting property rights must be sufficiently clear and precise so that citizens can foresee their obligations, calling the dual-criteria rule incompatible with legal certainty and the rule of law[194]. The legislation was promptly revised to require only an absolute majority by share, aligning with ordinary property management rules and providing the necessary clarity. This episode underscores the importance of designing renovation obligations in a legally certain and proportionate manner[195].

2.5 Conclusions

The EPBD confirms that renovation is no longer purely a matter of incentives and voluntary uptake. It creates an explicit legal pathway for Member States to make renovation mandatory for the worst-performing non-residential buildings through MEPS and obliges Member States to deliver measurable, time-bound reductions in average energy consumption in the housing stock. This shift from encouragement to obligation is legally defensible under EU law where three enabling conditions are met: first, that the obligations are clearly provided for in legislation, using objective and foreseeable metrics; second, that they pursue a legitimate and urgent public interest such as climate mitigation, energy security and protection of occupants'

[191] Josipović, T. and Ernst, H., 'Constitutional protections of property and energy-efficient housing in Croatia', *Journal of Agricultural and Environmental Law*, Vol. 18, Issue 35, 2023, pp. 178-198, https://real.mtak.hu/183677/1/12%20Tatjana%20JOSIPOVI%C4%86%20%E2%80%93%20Hano%20ERNST.pdf.
[192] Constitutional Court of the Republic of Croatia [CCRC], U-IIIB-1373/2000, July 7, 2009.
[193] Ibid.
[194] Ibid.
[195] Ibid.

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health; and third, that they respect proportionality and the fair balance required by the Charter and by A1P1, including protection against individual and excessive burdens.

This case study shows that four elements are essential to make renovation obligations compatible with fundamental rights and enforceable in practice. Each corresponds to the tests that EU law and the ECHR apply to interference with property: clear legal basis; pursuit of a legitimate public interest; proportionality that avoids individual excessive burdens; and enforceability through predictable procedures and reviewable decisions.

First, obligations on building owners must rest on a specific statutory or regulatory basis that fixes the trigger, the timeline, the performance metric, and the addressee. Open-ended clauses in housing or planning law are generally not sufficient. The law should state in plain terms which buildings are in scope, how compliance will be demonstrated, and by when.

Second, interference with owners' property rights must be suitable to meet the stated climate and energy objective, necessary in that less intrusive alternatives would not deliver the required stock-wide savings in time, and proportionate *stricto sensu*, meaning it does not impose an excessive individual burden. In concrete terms this requires (i) targeting the worst-performing part of the stock first, rather than imposing blanket obligations on already efficient buildings; (ii) sequencing obligations across realistic milestones (2030, 2033, 2040); and (iii) calibrating penalties so they are dissuasive but adjustable in cases of verified hardship, without ever removing the underlying duty to renovate.

Third, the case study makes it clear that proportionality must be assessed in light of the support measures that accompany the renovation obligation. Article 9(4) of the EPBD requires Member States to have an enabling framework in place before enforcement. Articles 17 and 18 of the EPBD develop the financial, advisory and capacity-building architecture, such as targeted grants, subsidised finance, and one-stop-shops. These measures are not optional policy add-ons, but form part of the legal defence of the obligation. If a landlord or small owner can point to a predictable financing offer, technical assistance, staged works (via an RP), and protection against arbitrary rent price rises or eviction, the same duty looks proportionate. If, by contrast, the State imposes a duty to renovate but provides no credible access to finance, no procedural facilitation in co-owned buildings, and no tenant/landlord burden-sharing rules, the risk of a successful proportionality challenge rises sharply. In other words, support mechanisms should be legislated and operational before penalties start to impact owners, especially for vulnerable households and small landlords.

Fourth, enforceability in practice. A renovation obligation that cannot be identified, monitored and enforced is vulnerable on legality grounds and risks selective enforcement that undermines equal treatment. Member States should designate a competent authority responsible for identifying in-scope buildings, notifying owners, validating evidence of compliance, and applying penalties. Enforcement should proceed in stages: notice, opportunity to remedy or agree a compliance plan, and only then sanctions.

If the political or constitutional space still does not allow a generalised owner-facing renovation obligation, Member States have alternatives that remain legally meaningful and can be deployed. One is to tighten use conditions instead of imposing a direct works duty, for example declaring that units below a certain energy performance may no longer be lawfully rented out after a given date unless renovated, or that certain categories of commercial premises cannot obtain or renew an operating licence unless they meet a stated efficiency threshold (e.g. France). This technique regulates economic exploitation of the property rather than mandating

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immediate physical works; courts have traditionally treated it as a control of use that is easier to justify under the fair balance test, provided the deadlines are phased, the standard is clear, and support is available. Another alternative is to escalate financial and procedural incentives in a way that makes non-renovation economically unattractive, for example progressive surcharges or local levies on very inefficient buildings, preferential access to subsidised loans and tax relief for worst performers, and accelerated permitting for deep renovation and fossil-free heating systems. While these do not replace MEPS, they can impact the worst-performing stock and build political acceptance of firmer obligations.

Finally, Member States should recognise that renovation mandates are most resilient, legally and politically, when they are seen not as confiscatory impositions but as structured transitions – a sequence of foreseeable duties, aligned with investment cycles, supported by finance and technical advice. The EPBD gives governments the legal space, and in the non-residential sector the obligation, to act in that direction. The task is to legislate with sufficient clarity, proportionality, and practical support so that these obligations are enforceable in court, workable in co-owned and rented buildings, and socially acceptable to the households and small businesses that will ultimately carry them out.

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Case Study 3: Legal and regulatory framework for financing deep renovations

3.1 Introduction and context

Europe's goal of a zero-emission building stock by 2050 poses a formidable **financing challenge for financing deep renovations** in Member States. Deep renovations of existing buildings that are essential to cut energy use and emissions must scale up dramatically in the coming decades. The EPBD underlines this urgency by setting ambitious targets towards climate neutrality. However, current levels of investment fall far short of what is required. The European Commission estimates that over €300 billion per year is needed to meet the 2030 energy efficiency and renovation objectives, with an annual investment gap of at least €165 billion[196]. Likewise, analysts note that achieving the EPBD targets, which would effectively triple the current rate of decarbonisation in the buildings sector, would demand an extra €149 billion (approx.) in building renovation investment each year[197]. Closing this gap is daunting but essential to deliver the EPBD's vision of climate-neutral buildings by 2050.

Adequate, accessible, and legally sound financing mechanisms are crucial. Article 17 of the EPBD expressly requires Member States to mobilise appropriate funding, support measures and tools to drive the necessary renovations and overcome market barriers, so that all buildings can transition to zero-emission status by 2050. In practice, this means developing a comprehensive framework of financing options, from public grants and loans to innovative private sector solutions, to support deep renovation projects at scale.

Traditional public subsidies alone cannot close the gap and must be blended effectively with private sector financing. The **EPBD encourages use of different instruments** such as preferential 'green' loans and mortgages, EnPC, on-bill and on-tax financing schemes, tax incentives, guarantee funds and dedicated renovation funds targeting deep retrofits. Crucially, these funding streams should be deployed consistently and strategically aligned with the zero-emissions goal, ensuring that there are no gaps in support that could slow down renovation efforts[198].

Member States are also expected to tap into EU-level resources, making **the best use of available Union funding mechanisms** such as the RRF, the SCF, Cohesion Policy funds, InvestEU and revenue from emissions trading to bolster their national renovation programmes[199]. Using financing or guarantees from EU-level sources could help to mobilise funding at lower cost and scale up lending for renovations across all Member States, alleviating pressure on national budgets. Accessible financing, underpinned by a robust legal framework, is the linchpin for meeting the EPBD's renovation ambitions fairly and efficiently.

This case study provides an overview of the legal landscape that shapes financing tools for deep renovations, with a focus on EU and national landscapes, financing instruments and challenges that arise during implementation. It also presents a selection of national best practices across the EU. These illustrate how different Member States have structured public and blended financing instruments to support deep renovations, from Germany's grant and loan schemes to France's use of public investment banks, to Slovenia's deployment of EU

[196] European Commission, Financing for building renovations, n.d., https://energy.ec.europa.eu/topics/energy-efficiency/financing/financing-building-renovations_en.
[197] Keliauskaite, U., McWilliams, B., Sgaravatti, G. and Tagliapietra, S., *How to finance the European Union's building decarbonisation plan*, Bruegel, 2024, https://www.bruegel.org/policy-brief/how-finance-european-unions-building-decarbonisation-plan.
[198] Rescoop.EU, *Directive (EU) 2024/1275 (recast European Performance of Buildings Directive)*, 2024, https://www.rescoop.eu/uploads/rescoop/downloads/EPBD-Policy-Briefing-2nd-Generation-of-Energy-Communities-Legislation.pdf.
[199] European Commission, Financing for building renovations, n.d., https://energy.ec.europa.eu/topics/energy-efficiency/financing/financing-building-renovations_en.

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funds through public-private partnerships (PPPs). EnPC frameworks are highlighted as a promising tool to attract private capital and improve building efficiency, particularly in complex or large-scale projects. Drawing on these insights, the case study concludes with a set of practical recommendations to inform national transposition processes and support EU-level reflections on the potential design of a refinancing facility or a complementary structural instrument to close the renovation investment gap.

3.2 Legal landscape

Financing framework

The EPBD places strong emphasis on facilitating deep renovations of building stock as part of the EU's climate goals. It requires Member States to **establish a supportive financing framework** that addresses market barriers and mobilises the necessary investment in building renovations. Article 17 of the EPBD sets out detailed obligations for national frameworks on financing, incentives and support measures for energy performance improvements, while Article 18 requires the creation of one-stop-shops to provide technical assistance to the public, including advice on financial instruments. This section analyses the legal landscape governing financing for deep renovations under these provisions, and examines the requirements placed on Member States.

Article 17 of the EPBD establishes that Member States 'shall provide appropriate financing support measures and other instruments' to overcome market barriers to building renovation, deliver the investments identified in their NBRPs and meet the 2050 decarbonisation target. This obligation ties financing directly to the quantified investment needs and trajectories set out in NBRPs, integrating Article 17 with the planning and reporting framework under Article 3 and Annex II to the EPBD. Article 17 thus functions as a **results-oriented enabling framework**: it does not prescribe a single instrument or financing model, but requires Member States to assemble an evidence-based, socially balanced and administratively accessible toolkit that unlocks private and public capital at scale, while ensuring value for money and legal certainty[200].

This broad mandate ties the financing framework to the **NBRP** process. Member States must use that planning process to identify economic and non-economic barriers to renovation and determine how best to tackle them with financing instruments or other measures. The national plans must outline estimated investment needs and the mix of policy measures, public investments and budgetary sources to meet those needs. Article 17 requires a strategic blending of national and EU resources and policy tools to ensure that the building sector can undertake deep renovations at the scale required. The financing framework is also expected to deliver social objectives, notably alleviating energy poverty, empowering vulnerable groups, and ensuring housing affordability. Article 17 weaves together climate and social priorities,

[200] European Commission, Annex to the Communication to the Commission: Approval of the content of the draft Commission Notice providing guidance on new or substantially modified provisions of the recast Energy Performance of Buildings Directive (EU) 2024/1275: Financial incentives, skills and market barriers (Article 17) and one-stop-shops (Article 18), 2025, https://energy.ec.europa.eu/document/download/40f29e74-65a6-4a5d-ad1f-c20d9ff75f04_en?filename=Financial%20incentives%2C%20skills%20and%20market%20barriers%20%28Article%2017%29%20and%20one-stop%20shops%20%28Article%2018%29%20-%20annex%202.pdf.

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mandating that public support for renovations be designed for bith cost-effective decarbonisation and social fairness[201].

Article 17 places great emphasis on **user access** to public support. Article 17(2) requires that 'applications and procedures for public financing are simple and streamlined […] especially for households'. This is a legally operative quality standard: schemes must be designed with proportionate evidentiary burdens, clear timelines and limited administrative friction. Article 17(8) complements this with a transparency obligation, 'information about available funding and financial tools is made available to the public in an easily accessible and transparent manner, including by digital means'. Effective compliance typically involves a central digital portal presenting eligibility, budgets, selection or allocation procedures and processing times. Article 17(13) recognises the capacity constraints of smaller actors by requiring Member States to ensure that programmes are accessible to organisations with lower administrative, financial and organisational capacities. It also provides for Commission assistance upon request. Taken together, these provisions make accessibility and transparency justiciable aspects of the financing framework, rather than solely good practice recommendations[202].

Article 17(3) requires Member States to assess and, where appropriate, address barriers related to upfront costs of renovations. Three typical constraints are solvency, liquidity, and prioritisation, each requiring a tailored solution. Where **solvency** is the binding constraint, instruments such as guarantee funds and long-tenor income-tested loans can shift risk without excessive grant dependency. Where **liquidity** is decisive, staged payment mechanisms, on-bill/on-tax finance and pay-as-you-save models can align cash-flows with realised savings. Where **prioritisation** is the issue, targeted grants and fiscal nudges can raise the importance of renovation in household decision-making[203].

Article 17(5) addresses **non-economic barriers**, requiring 'appropriate regulatory measures to remove non-economic barriers to building renovation'. In multi-apartment buildings, the EPBD explicitly points to removing unanimity requirements in co-ownership structures or allowing such structures to be **direct recipients of financial support**. This responds to recurrent governance frictions, difficulty convening owners, and uncertainty about legal capacity to apply for funds, contract, or bear responsibility that can stall otherwise viable projects. The legal effect is to require Member States to **audit and adjust** co-ownership and condominium rules where they unduly impede energy renovations. The policy rationale is strong – updated governance can reduce transaction costs, enable bulk procurement and comprehensive works on common elements, improving cost-effectiveness at building level[204].

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[201] Voïta, T. and Coupechoux, S., *Building decarbonization and affordable housing: Promoting local skills and accelerating the green deal,* Policy paper, Jacques Delors Institute, 2025, https://institutdelors.eu/content/uploads/2025/06/PP312_Building_decarbonization_affordable_housing_Voita_EN_3.pdf.

[202] European Commission, Annex to the Communication to the Commission: Approval of the content of the draft Commission Notice providing guidance on new or substantially modified provisions of the recast Energy Performance of Buildings Directive (EU) 2024/1275: Financial incentives, skills and market barriers (Article 17) and one-stop-shops (Article 18), 2025, https://energy.ec.europa.eu/document/download/40f29e74-65a6-4a5d-ad1f-c20d9ff75f04_en?filename=Financial%20incentives%2C%20skills%20and%20market%20barriers%20%28Article%2017%29%20and%20one-stop%20shops%20%28Article%2018%29%20-%20annex%202.pdf.

[203] Ibid.

[204] Ibid.

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Enabling instruments and innovation in retail lending

Article 17 centres on a **non-exhaustive list of enabling instruments** that Member States shall promote to mobilise investment. Article 17(7) requires the 'effective development and use of enabling funding and financial tools, such as energy efficiency loans and mortgages for building renovation, energy performance contracting, pay-as-you-save financial schemes, fiscal incentives, for example reduced tax rates on renovation works and materials, on-tax schemes, on-bill schemes, guarantee funds, funds targeting deep renovations, funds targeting renovations with a significant minimum threshold of targeted energy savings and mortgage portfolio standards'.

Article 17(7) also calls for guidance of investments into an energy-efficient public building stock 'in line with Eurostat guidance on the recording of energy performance contracts in government accounts', and allows the promotion and simplification of **PPPs**[205]. Article 17(9) confirms that enabling tools 'may include renovation loans or guarantee funds […] including in combination with relevant Union programmes', expressly endorsing blending with EU facilities.

Crucially, Article 17(11) moves beyond public instruments to the market infrastructure for retail lending. Member States must 'facilitate the aggregation of projects to enable investor access as well as packaged solutions for potential clients' and 'adopt measures that promote energy efficiency lending products for building renovations, such as green mortgages and green loans […] and ensure that they are offered widely and in a non-discriminatory manner … [and] are visible and accessible to consumers'. They must also ensure that **banks, other financial institutions and investors** receive information about participation opportunities. The legislative intent is to standardise and scale bankable products, support securitisation/aggregation channels, and thereby connect household-level projects to institutional capital[206].

Strategic use of national and EU financing

A cornerstone of Article 17 is the instruction that 'Member States shall make best cost-effective use of national financing and financing available established at Union level'. This requirement underscores that **national budgets should be leveraged alongside EU funds** to fill the investment gap. The share of national financing against EU financing should correspond to each country's needs and decarbonisation potential, ensuring that available EU financing instruments (many established post-2020 for green recovery) are fully tapped. In practice, this means that countries with tighter fiscal space are encouraged to maximise grants and loans from EU instruments (e.g. RRF, SCF) to support renovations, rather than relying solely on domestic budgets[207]. Article 17(6) links this optimisation to the national planning architecture – Article 3 and Annex II require an outline of investment needs, financing sources and

[205] World Wide Fund for Nature (WWF) EU, *Bridging the Renovation Gap; A comprehensive financing strategy for EU residential buildings*, 2025, https://wwfeu.awsassets.panda.org/downloads/bridging-the-renovation-gap.pdf.
[206] European Commission, Annex to the Communication to the Commission: Approval of the content of the draft Commission Notice providing guidance on new or substantially modified provisions of the recast Energy Performance of Buildings Directive (EU) 2024/1275: Financial incentives, skills and market barriers (Article 17) and one-stop-shops (Article 18), 2025, https://energy.ec.europa.eu/document/download/40f29e74-65a6-4a5d-ad1f-c20d9ff75f04_en?filename=Financial%20incentives%2C%20skills%20and%20market%20barriers%20%28Article%2017%29%20and%20one-stop%20shops%20%28Article%2018%29%20-%20annex%202.pdf.
[207] Keliauskaitė, U., McWilliams, B., Sgaravatti, G. and Tagliapietra, S., *How to finance the European Union's building decarbonisation plan*, Policy brief, Bruegel, 2024.

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administrative resources, which in practice become the benchmark against which the sufficiency and coherence of the Article 17 framework can be assessed[208].

Article 17(6) implies that the composition of financing matters. Member States should calibrate how much is covered by national public expenditure versus EU or private sources to achieve climate targets cost-effectively. Any public investments or schemes developed under this article must comply with EU State aid rules where applicable, a caveat directly linking national financing measures to the broader European competition law framework.

Social safeguards and split incentive corrections

Article 17 integrates **social protection** within the financing framework. Article 17(17) requires Member States 'without prejudice to their national economic and social policies and to their systems of property law' to address the eviction of vulnerable households caused by disproportionate rent increases following energy renovation. The EPBD leaves the legal technique to national systems (e.g. caps, staged pass-through, rent support), but the obligation to act is unequivocal. Article 17(18) adds a targeting rule that financial incentives shall prioritise vulnerable households, people affected by energy poverty, and people living in social housing, in accordance with Article 24 of Directive (EU) 2023/1791 (Energy Efficiency Directive, EED)[209].

Article 17(19) tackles the **split incentive** in rented properties by instructing that when owners of rented buildings receive public incentives, Member States 'shall aim at financial incentives benefiting both the owners and the tenants' and 'shall introduce effective safeguards, to protect in particular vulnerable households, including by providing rent support or by imposing caps on rent increases', and may incentivise schemes that tackle upfront costs, such as on-bill, pay-as-you-save and energy performance contracting (also referenced in the EED)[210].

Article 18 and the role of one-stop-shops in accessing financial resources

Article 18 of the EPBD introduces the obligation for Member States to establish one-stop-shops as technical assistance facilities accessible across their territories by May 2026. While the EPBD does not provide a formal legal definition of a one-stop-shop, the provisions of Article 18(2) and (3) clarify that they must provide streamlined technical and financial information, offer independent advice, support households, particularly those in energy poverty or living in worst-performing buildings, and accompany renovation projects through all stages, from conception to delivery. Commission Recommendation (EU) 2024/2481 describes one-stop-shops as physical or virtual places where stakeholders are supported throughout the renovation process, including with respect to the financial tools necessary to implement ambitious energy efficiency/renovation projects[211].

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[208] European Commission, Annex to the Communication to the Commission: Approval of the content of the draft Commission Notice providing guidance on new or substantially modified provisions of the recast Energy Performance of Buildings Directive (EU) 2024/1275: Financial incentives, skills and market barriers (Article 17) and one-stop-shops (Article 18), 2025, https://energy.ec.europa.eu/document/download/40f29e74-65a6-4a5d-ad1f-c20d9ff75f04_en?filename=Financial%20incentives%2C%20skills%20and%20market%20barriers%20%28Article%2017%29%20and%20one-stop%20shops%20%28Article%2018%29%20-%20annex%202.pdf.

[209] Ibid.; Directive (EU) 2023/1791 of the European Parliament and of the Council of 13 September 2023 on energy efficiency and amending Regulation (EU) 2023/955 (recast), https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=OJ%3AJOL_2023_231_R_0001&qid=1695186598766.

[210] Ibid.

[211] Commission Recommendation (EU) 2024/2481 of 13 September 2024 setting out guidelines for the interpretation of Articles 21, 22 and 24 of Directive (EU) 2023/1791 of the European Parliament and of the Council as regards the consumer related provisions, https://eur-lex.europa.eu/eli/reco/2024/2481/oj/eng.

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From a financing perspective, one-stop-shops are conceived as **integral nodes within the enabling framework** of Article 17 of the EPBD. They are designed not only to deliver information, but to rationalise access to financing and ensure that financial measures reach their intended beneficiaries. In practice, this means that one-stop-shops must act as intermediaries between households, financial institutions, and public authorities, thereby helping to overcome one of the key barriers identified in Article 17, i.e. the difficulty faced by households and small organisations in navigating fragmented and complex support schemes. By centralising financial information and providing assistance with applications, one-stop-shops are legally mandated instruments to ensure that public financing becomes genuinely accessible[212].

The EPBD sets out minimum criteria to guarantee effective coverage**, requiring at least one one-stop-shop per 80 000 inhabitants**, per region, in areas with above-average building age, in areas designated for integrated district renovation, **or within a 90-minute travel time** from households. These criteria, while flexible, aim to ensure that no segment of the population is excluded from access to both technical and financial support. The Commission encourages Member States to design territorial coverage to maximise the potential of one-stop-shops, including leveraging existing local energy agencies[213].

One-stop-shops are expected to **enhance transparency and trust in financial schemes**. One of the obstacles to renovation investment is a lack of credible independent advice, often compounded by households' uncertainty about eligibility conditions and liabilities. By acting as neutral intermediaries, one-stop-shops contribute to clarifying rights and obligations, providing standardised information about financing opportunities, and reducing transaction costs for households and lenders. This role in clarifying liabilities is particularly important where public subsidies are combined with private lending, ensuring that beneficiaries understand repayment obligations, conditions for grants, and safeguards available to vulnerable households[214].

Article 18 places one-stop-shops at the intersection of technical assistance and financing facilitation. They are not substitutes for financial instruments under Article 17, but, rather, the **institutional vehicles that make those instruments operational and accessible**. By simplifying procedures, aggregating demand, and bridging the gap between households and finance providers, one-stop-shops become essential to the legal and financial architecture of the EPBD. Their effective implementation will determine whether the substantial financing obligations under Article 17 translate into actual investment on the ground.

EU support

Apart from the legal framework set up by the EPBD, various EU financing instruments and advisory services support EU policy objectives, such as the European Green Deal and

[212] Keliauskaitė, U., McWilliams, B., Sgaravatti, G. and Tagliapietra, S., *How to finance the European Union's building decarbonisation plan*, Policy brief, Bruegel, 2024.
[213] European Commission, Annex to the Communication to the Commission: Approval of the content of the draft Commission Notice providing guidance on new or substantially modified provisions of the recast Energy Performance of Buildings Directive (EU) 2024/1275: Financial incentives, skills and market barriers (Article 17) and one-stop-shops (Article 18), 2025, https://energy.ec.europa.eu/document/download/40f29e74-65a6-4a5d-ad1f-c20d9ff75f04_en?filename=Financial%20incentives%2C%20skills%20and%20market%20barriers%20%28Article%2017%29%20and%20one-stop%20shops%20%28Article%2018%29%20-%20annex%202.pdf.
[214] Keliauskaitė, U., McWilliams, B., Sgaravatti, G. and Tagliapietra, S., *How to finance the European Union's building decarbonisation plan*, Policy brief, Bruegel, 2024.

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decarbonisation policies, including deep renovation[215]. Member States can **access different EU sources providing grants, loans, guarantees or financial instruments, as well as technical assistance or support for developing projects**. EU support can be used for various measures (depending on the scope of each fund), including energy efficiency improvements and renovations of public and private buildings, development and improvement of district heating networks, and co-generation. Most instruments are available to different types of beneficiaries, including municipalities, local or regional authorities, associations and homeowners (see Annex 2 for a list of relevant funds and advisory services at EU level).

3.3 Legal issues and barriers

State aid compliance as a practical barrier to financing deep renovations

State aid control is not hostile to renovation – the Treaties and the Commission's framework are expressly designed to accommodate public support that fosters energy and environmental performance, provided it is well targeted and proportionate. The barrier arises because large-scale renovation programmes typically blend grants with public guarantees, interest subsidies, refinancing windows or fund-of-funds structures, triggering the Article 107(1) of the Treaty on Functioning of the European Union (TFEU) test for aid and the Article 108(3) standstill discipline[216].

First, the **threshold question** on whether a measure grants a selective advantage to an 'undertaking' through State resources is genuinely complex in this context. Purely owner-occupied dwellings of natural persons are not economic activity, so support to such households normally lies outside Article 107(1) of the TFEU. By contrast, landlords (including social landlords), housing companies, homeowner associations engaged in lettings, ESCOs, aggregators and financial intermediaries are undertakings. If public resources confer a selective advantage on any of these, the measure is considered State aid.

Second, Article 108 of the TFEU sets out the procedural architecture. Article 108(3) imposes the **standstill obligation**, where Member States must notify plans to grant or alter aid and may not implement the measure until the Commission has taken a final decision. Article 108(2) governs formal investigation and the recovery of unlawful aid from the beneficiary (recovery decision)[217]. Article 108(4) empowers the Commission to adopt block exemption measures that declare categories of aid compatible and exempt them from notification.

Once State aid is present, two compatibility routes are available: (i) notification and assessment under the Climate, Energy and Environmental State aid Guidelines compatibility

[215] European Commission, Renovate Europe, n.d., https://www.renovate-europe.eu/funding-for-energy-renovation/; European Commission, Financing for building renovations, n.d., https://energy.ec.europa.eu/topics/energy-efficiency/financing/financing-building-renovations_en.
[216] Communication from the Commission, Code of Best Practices for the conduct of State aid control procedures, C/2025/2810, https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:C_202502810.
[217] European Commission, Recovery of unlawful aid, n.d., https://competition-policy.ec.europa.eu/state-aid/procedures/recovery-unlawful-aid_en.

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test; or (ii) direct exemption under Regulation (EU) No 651/2014 (General Block Exemption Regulation, GBER)[218] (no notification) if all conditions are met.

The European Commission's 2022 **Climate, Energy and Environmental State aid Guidelines** explicitly recognise that market failures (e.g. split incentives) justify aid for building energy upgrades[219]. The guidelines permit aid for improving the energy performance of buildings, but only under detailed conditions that Member States must carefully fulfil. The aid must facilitate an economic activity (positive condition) and must not unduly distort competition and trade (negative condition). The Commission operationalises this through incentive effect, necessity/appropriateness among instruments, proportionality (including funding-gap logic or competitive allocation), and safeguards (transparency, cumulation control). The guidelines expressly recognise split incentive and information failures as justifying aid for energy and environmental performance improvements, anchoring compatibility in measurable savings and in instruments that minimise over-compensation. For instance, for existing buildings, renovation aid must induce at least a 20% reduction in primary energy demand (30% in staged renovations) and aid intensities are capped (generally 30% of eligible costs for comprehensive measures). These criteria require robust measurement and verification of energy savings and impose strict limits on support levels, which can constrain national schemes aimed at deep renovation (which often needs higher support, especially for low-income households). Designing programmes to fit these thresholds is administratively burdensome, while exceeding the thresholds risks the aid being deemed incompatible[220].

Member States may, where appropriate, proceed under the GBER and implement eligible renovation support measures without prior notification to the Commission. To do so, the measure must comply with both the horizontal requirements in Chapter I of the GBER and with the specific conditions of the applicable provisions. Article 38a, introduced in the 2023 revision of the GBER, enables investment aid for undertakings to improve the energy efficiency of buildings, which is exempt from notification when its cumulative conditions are met. The eligible costs are the total investment costs directly linked to the higher level of energy efficiency where investments are combined with on-site renewables, storage, smart-readiness upgrades, recharging infrastructure, green roofs or rainwater measures. The entire cost of those installations and equipment may also qualify where directly linked to improved energy or environmental performance. The measure must achieve at least a 20% improvement in primary energy in existing buildings, 10% for single element works (subject to an overall significant effect at scheme level), and 10% beyond the nearly zero-energy threshold for new buildings. Aid intensities are capped, with a 30% basic intensity for renovations (25% for single element works), subject to bonuses for smaller undertakings, assisted areas and, in certain cases, higher savings. Reduced ceilings apply where aid supports compliance with a Union MEPS less than 18 months before entry into force. Critically, Article 38a excludes aid for equipment fired by fossil fuels, including natural gas, and prohibits aid for compliance with EU standards already in force. It permits pre-compliance support

[218] Commission Regulation (EU) No 651/2014 of 17 June 2014 declaring certain categories of aid compatible with the internal market in application of Articles 107 and 108 of the Treaty, https://eur-lex.europa.eu/eli/reg/2014/651/oj/eng.
[219] Communication from the Commission – Guidelines on State aid for climate, environmental protection and energy 2022, C/2022/481, *OJ C 80, 18.2.2022, pp. 1–89,* . https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A52022XC0218%2803%29
[220] Ibid.

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where standards are adopted but not yet in force, under tight temporal conditions and, in some cases, reduced intensities[221].

Article 39 of the GBER deals with the same objective via financial instruments. Instead of a direct grant, the Member State endows an energy efficiency fund or other intermediary (equity, loan, guarantee or endowment). The advantage must be passed on 'to the largest extent possible' to building owners or tenants, for example as lower interest rates, reduced collateral, or cheaper guarantee premia. The eligible costs are the total costs of the energy efficiency project (plus, for combined projects, the cost of the combined components). At beneficiary level, the nominal value of loans/guarantees is capped at €25 million per project (€30 million for combined investments), and guarantees may not exceed 80% of the underlying loan. Article 39 imposes structural safeguards: the intermediary/manager must be selected through an open, transparent and non-discriminatory call; the instrument must operate on a commercial basis with performance-linked remuneration; private capital must be mobilised to at least 30% at fund or project level; first-loss public tranches must be capped (and asymmetric upside rather than pure downside protection is preferred); and pass-through of advantage to final beneficiaries must be maximised (cheaper rates, lower collateral, lower premia, larger volumes). Article 39 thus provides a fixed grammar for renovation loan and guarantee facilities. It is generous, but also rigid: attempts to deviate will break the exemption and push the scheme into notification[222].

Recommendations

To reduce legal uncertainty and delay, Member States should make full use of existing flexibilities in State aid rules and engage proactively with the Commission. First, governments can **design renovation schemes to fall under GBER or *de minimis* aid** where possible, minimising the need for notifications. This starts with a beneficiary map that distinguishes non-aid support for owner-occupied dwellings from measures conferring advantage on undertakings, then channels any aid to undertakings into the correct legal base as a default: Article 38a for direct investment aid to improve a building's energy performance, Article 38b for liquidity to EPC providers that are small and medium-sized enterprises **(**SMEs) or small mid-caps, and Article 39 for delivery via funds or other financial intermediaries

Where notification is unavoidable (for large or innovative schemes), early **pre-notification consultations with the Commission are essential**. The Commission's 2025 Code of Best Practice encourages early dialogue and aims to improve the predictability and efficiency of State aid procedures. Member States should follow this guidance, supplying robust evidence to expedite approval[223].

Finally, **clear national guidelines should be issued** to help local authorities and to comply with State aid law. For instance, Member States should publish guidance on financing building

[221] European Commission, Recovery and resilience facility (RRF) guiding template: Energy efficiency in buildings, 2023, https://competition-policy.ec.europa.eu/document/download/f38dcd94-689e-4de9-9747-765126f49438_en?filename=template_RRF_energy_efficiency_in_buildings_04042023.pdf.

[222] Ibid.
[223] Communication from the Commission. (2025). Code of Best Practices for the conduct of State aid control procedures. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:C_202502810

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efficiency under State aid rules, explaining concepts like 'no selective advantage' and Altmark criteria for public housing[224].

Barriers to establishing functional ESCO markets

ESCOs, firms that implement energy efficiency renovations and recover costs from the resulting energy savings, are a key vehicle to finance deep renovations. Through EnPC, an ESCO undertakes a building renovation (often with its own or third-party financing) and is repaid over time by a share of the energy cost savings, usually under a guarantee of performance. In theory, this model overcomes upfront cost barriers for building owners (the ESCO covers initial costs) and aligns incentives to ensure energy savings[225]. In practice, however, Member States have struggled to establish functional ESCO markets for deep renovation, with a range of legal and administrative barriers hindering growth of the EnPC model[226].

One fundamental challenge is **lack of awareness and trust** in the ESCO model. Many building owners and public authorities are simply not familiar with EnPC, or remain sceptical about its benefits. Public officials may be unsure how to procure and manage an EnPC, while private owners might mistrust an arrangement that outsources building improvements to a third party with long contract durations. This is compounded by the absence of accreditation or quality standards for ESCOs in some countries. Without a certification system, less-scrupulous actors can enter the market, leading to sub-par projects that hurt the reputation of the concept[227].

Another set of barriers is **insufficient policy support and regulatory clarity**. Until recently, a limited number of governments had dedicated policies to promote ESCOs or remove obstacles to their operation. Article 29(6)(b) of the EED requires Member States to remove legal and regulatory provisions and administrative practices that hinder the uptake of EnPCs. However, implementation of this obligation has been uneven, with some Member States taking concrete steps only recently. For instance, Poland has issued comprehensive national guidelines and ready-to-use EnPC contract templates for public sector projects to standardise processes and reassure contracting authorities[228]

Prohibitive public procurement rules are a critical barrier in the public sector, which is often the market for ESCOs. Traditional procurement procedures are not always well-suited to performance-based, long-term contracts. Local authorities may find it challenging to award

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[224] European Commission, *Guidance Paper on EU regulation & public support for housing*, 2017, https://ec.europa.eu/futurium/en/system/files/ged/3._briefing_note_2016_social_housing_and_state_aid_for_services_of_general_economic.pdf.
[225] Dentons, *The Energy Performance Contract: a sustainable investment to fast track energy efficiency?,* 2019, https://www.dentons.com/en/insights/articles/2019/august/26/the-energy-performance-contract-a-sustainable-investment-to-fast-track-energy-efficiency.
[226] Andersen, *Energy Performance Contracts, a pathway to sustainable energy solution*, 2025, https://de.andersen.com/fileadmin/user_upload/Andersen_insight_-_European_Energy_Industry_Group_-_EPC_Contracts_-_07.2025.pdf.
[227] Ibid.
[228] Ministry of Climate and Environment, *Guidelines for Energy Performance Contracts*, 2023, https://www.gov.pl/web/klimat/wytyczne-do-umow-o-poprawe-efektywnosci-energetycznej.

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contracts based on lifecycle savings rather than lowest upfront cost unless/until procurement law is adapted to allow award criteria for energy performance[229].

Finally, **market structure and demand issues** play a role. Many EU countries have a high share of residential buildings where split incentives and collective decision-making complicate ESCO solutions. Deep renovations in multi-apartment buildings require approval of many owners and coordination, which is outside the typical scope of an ESCO contract (often more straightforward in single-owner facilities or public buildings). This limits the potential market for ESCOs unless supportive facilitators (e.g. housing associations, municipal programmes) help to bundle and mediate such projects[230].

Recommendations

Member States should begin by **institutionalising a national EnPC enablement package** that makes the model intelligible and bankable for buyers and lenders. This means publishing a standard suite of EnPC documents for public clients, a model contract, performance and risk matrix, and a measurement-and-verification plan, together with a plain language buyer's guide that explains procurement routes, evaluation on life-cycle cost, and the mechanics of savings-based repayment. Access to publicly supported calls can then be conditioned on use of the model documentation and adherence to the performance guarantee and verification disciplines. Accreditation or registration of ESCOs should be introduced so that contracting authorities and private owners can identify credible counterparties[231].

To remove procurement and budgeting frictions, finance and central purchasing authorities should **issue EPC-specific instructions** that translate existing rules into a workable process. These should confirm that contracting authorities may evaluate tenders on the basis of lifecycle cost and guaranteed savings quality rather than lowest upfront price, authorise 'building bundling' using criteria of physical proximity and similarity of consumption, and identify the procedures most suited to performance-based solutions where technical dialogue is needed before award. On the budgeting side, treasuries should provide statements clarifying how multi-year repayment commitments funded from verified savings are to be authorised and recorded and pre-approve a standard set of contractual clauses on performance risk, verification, and termination so that municipalities are not deterred by fears of breaching balanced-budget disciplines[232].

Finally, to expand potential demand in the residential segment and other multi-occupancy settings, governments should **put in place facilitation and aggregation mechanisms** that solve the coordination problems flagged in the market structure barrier. This function could be assigned to one-stop-shops, alongside municipal or regional programmes. These actors should be mandated to assemble portfolios of similar buildings, prepare common technical baselines and decision packs, and act as neutral convenors for homeowner associations so

[229] Andersen, *Energy Performance Contracts, a pathway to sustainable energy solution*, 2025, https://de.andersen.com/fileadmin/user_upload/Andersen_insight_-_European_Energy_Industry_Group_-_EPC_Contracts_-_07.2025.pdf.
[230] Ibid.
[231] Global ESCO Network, United Nations Environment Programme (UNEP), *Regulatory barriers for energy service companies. Perspectives based on feedback from national ESCO associations*, 2022, https://unepccc.org/wp-content/uploads/2022/11/perspectives-2022-regulatory-barriers-for-energy-service-companies-perspectives-based-on-feedback-from-national-esco-associations.pdf.
[232] Ibid.

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that collective approvals are secured once, on standard terms, rather than building by building. Giving one-stop-shops an explicit aggregation and EnPC-facilitation mandate would help to address ESCO market barriers and strengthen the case for their establishment and long-term resourcing[233].

Financing deep renovations in rural areas and small municipalities

A distinct – and structurally acute – barrier to implementing the EPBD arises in rural and depopulating areas where the cost of a deep renovation is equal to or higher than the market value of the building itself.

The difficulties of financing deep renovations in rural areas are not simply a function of income constraints or information deficits, but are structurally embedded in the interplay between the characteristics of the rural housing stock, local property markets and the prevailing design of renovation finance instruments. Rural households spend on average 7.1% of their total expenditure on electricity, gas and other fuels, compared with 6.2% in towns and suburbs and 5% in cities[234]. Rural dwellings are predominantly detached and semi-detached houses (around 79% of rural stock), with larger volumes per inhabitant, less compact shapes and more heating degree days, all of which structurally increase energy demand and make cost-effective performance upgrades more capital-intensive[235]. These buildings are larger, less compact and more exposed, with higher surface-to-volume ratios. They also tend to be older, with predominantly rural regions showing a marginally higher share of pre-1980 dwellings, which are typically less efficient under today's standards. The combined effect is that deep renovation packages in rural settings must often tackle extensive upgrades and heating system replacements in buildings that are structurally more energy-intensive[236]. Those same properties are often located in low-liquidity housing markets where transaction values are depressed and long-term price expectations are flat or negative. In many regions, particularly in depopulating or economically lagging rural areas, the market value of a dwelling can be lower than, or only marginally higher than, the cost of a comprehensive renovation. This negative equity renovation problem has direct legal and financial consequences[237].

From a strictly financial perspective, non-renovation can appear rational, even where the dwelling is not energy efficient. However, the EPBD, the Renovation Wave Strategy and related instruments expect a progressive upgrade of the entire building stock, including worst-performing buildings and the homes of vulnerable households. The tension between these expectations and local market realities is particularly pronounced in Eastern, South-Eastern and Southern Europe, but is present in pockets of rural territory across the EU[238].

From a legal perspective, the EPBD does not permit Member States to treat large segments of the building stock as *de facto* exempt simply because renovation is uneconomic in local market terms. For non-residential buildings, Article 9 of the EPBD requires Member States to set MEPS based on national maximum energy performance thresholds that initially capture

[233] Ibid.
[234] Hormigos Feliu, C., Florio, P., Dijkstra, I., Auteri, D. and Bertozzi, C., *Exploring rural energy poverty and needs - Rural households spend more on energy but lead in renovations*, Publications Office of the European Union, Luxembourg, 2025, https://data.europa.eu/doi/10.2760/9160880, JRC142243.
[235] Ibid.
[236] Ibid.
[237] Ibid.
[238] Institute for European Energy and Climate Policy, Renoverty, n.d., https://ieecp.org/projects/renoverty/.

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the 16% and 26% worst-performing segments of the stock and to ensure that all non-residential buildings are brought below those thresholds by 2030 and 2033, respectively. Narrowly circumscribed exemptions are subject to strict, transparent criteria, equal treatment, *ex ante* quantification of the exempted share, with an obligation to secure equivalent performance improvements elsewhere in the non-residential stock. Where an individual building's overall deep renovation shows an unfavourable cost-benefit assessment, Member States must still require implementation of all measures that are cost-effective, rather than excuse the building entirely. For residential buildings, there is even less room: the EPBD does not foresee a broad territorial carve-out for rural dwellings. Rather, minimum performance trajectories and renovation planning obligations apply across the territory, with specific attention to worst-performing buildings and energy-poor households.

The rural challenge thus crystallises as a core compliance issue. Member States are under a positive obligation to design financing, support and phasing mechanisms that make it realistically possible for rural households and non-residential building owners to follow the mandated renovation trajectory.

Recommendations

Member States should clearly specify which buildings, locations, and works qualify for support. Given the rural focus, **rural areas might be defined by population density or administrative units** (e.g. municipalities below a certain population, or classified as rural in national spatial plans). Both **residential and non-residential buildings** can be covered, but criteria may differ. For residential buildings, eligibility may target single-family homes or multi-apartment buildings of certain ages or energy ratings, while for non-residential buildings, it may include farms, rural SMEs, municipal and community buildings, etc. It is advisable to tie eligibility to **energy performance status**, for instance limiting aid to buildings with poor energy ratings, or those that fall in the worst-performing percentile locally. This aligns with the EPBD's emphasis on tackling the worst-performing stock first and provides objective justification for state support by focusing on the biggest energy savers.

Another aspect to consider is **conditionality**. Funding schemes could stipulate that if an owner accepts public money, they commit to not dropping below the achieved energy performance in future (no backsliding) and to fulfil any remaining obligations under EPBD (e.g. obtaining a new EPC after renovation, or complying with fossil boiler phase-out). The EPBD's requirement to **end fossil fuel boiler incentives from 2025** is directly relevant, and the scheme's legal documents must make clear that funded renovations cannot include installing new standalone fossil boilers and should ideally require replacing any existing fossil heating with compliant alternatives.

A mix of innovative financing structures can be used to deliver co-financing in rural areas. Key models include:

- **Revolving renovation funds:** Publicly-backed revolving funds extend loans for renovations and reuse repayments for new projects, creating a sustainable cycle of finance. Such funds can be capitalised by national budgets or EU Cohesion Policy funds and co-invested by private banks, ensuring continuous capital for rural projects beyond one-off grants.

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- **Public loan guarantees:** Governments can provide guarantees covering a large share of renovation loans (e.g. 70–80% of principal) to de-risk lending in high-risk rural markets.
- **Blended grant–loan packages:** Combining upfront grants with low-interest loans can bridge the investment gap in rural renovations. Grants reduce the principal and improve project economics, while loans (potentially interest-subsidised by the state) bring in private capital.
- **Standardised EnPC finance:** Member States can facilitate ESCO-led renovations via standardised EnPC frameworks. Under an EnPC, an ESCO finances and implements efficiency upgrades and is repaid from the guaranteed energy cost savings over time. This model shifts upfront costs off the building owner and leverages private performance-based financing.
- **Investment platforms and aggregation:** Given the small size of typical rural projects, a legal delivery structure can aggregate multiple renovations into a single financing vehicle (an investment platform or fund). Such platforms, possibly under the InvestEU framework or national promotional banks, pool public and private funds to finance a portfolio of rural renovations, diversifying risk and achieving economies of scale.

Public debt treatment of renovation contracts

The treatment of energy renovation contracts under public sector debt and deficit rules is a significant legal barrier, particularly for municipalities and other public bodies trying to use innovative financing. The EU's **Maastricht criteria** and **Stability and Growth Pact** (SGP) set strict limits on government debt and deficits, which means public authorities must be careful in taking on obligations that could be recorded as public liabilities. The Maastricht framework establishes reference values of 3% of GDP for the general government deficit and 60% of GDP for public debt, embedded in Protocol No 12 and operationalised through SGP surveillance procedures[239]. The reformed SGP retains these references but steers compliance via country-specific medium-term fiscal structural plans and a binding net expenditure path agreed by the Council of the EU (default four years, extendable to seven for reforms and investments). The corrective arm (excessive deficit procedure) remains applicable where breaches occur. In short, even where a renovation pipeline is economically sensible, its budgetary footprint is assessed against these Treaty reference values and the Member State's agreed expenditure trajectory[240].

The 2024 economic governance framework reform preserves **escape clauses** for exceptional circumstances beyond a Member State's control[241]. On 8 July 2025, the Council of the EU activated the national escape clause for 15 Member States to accommodate a temporary deviation, capped at 1.5% of GDP over four years, from their agreed net expenditure paths

[239] European Parliament, *The EU framework for fiscal policies*, n.d., https://www.europarl.europa.eu/factsheets/en/sheet/89/the-eu-framework-for-fiscal-policies.
[240] European Commission, 'Commission welcomes political agreement on a new economic governance framework fit for the future', Press release, 10 February 2024, https://ec.europa.eu/commission/presscorner/detail/en/ip_24_711.
[241] Kołodziejczyk, K., *The 2024 reform of the European Union's economic governance framework as a response to contemporary challenges*, 2024, doi: 10.33067/SE.4.2024.3.

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where the excess is due to defence outlays[242]. This avoids the Commission and the Council opening a new excessive deficit procedure (EDP) when an overrun stems from qualifying defence expenditure, with all other spending remaining subject to the rules. This was framed as targeted, time-limited flexibility to address an acute security shock while safeguarding debt sustainability.

Traditional public investment in renovations clearly increases public debt. EnPCs with ESCOs offered a potential solution by shifting upfront costs to the private sector. However, until recently, it was unclear whether these arrangements would truly stay 'off balance sheet' for government accounting purposes. **Eurostat's accounting rules** determine when a long-term contract is considered government expenditure/debt. If a renovation EnPC was judged, in substance, to be government financing, the investment would count against public debt, nullifying the budgetary advantage[243].

Historically, this **ambiguity dissuaded many public authorities from engaging in EnPCs**. The fear was that engaging an ESCO to finance and implement a renovation might be reclassified as public debt by auditors, especially if the authority provided any guarantees or minimum payments. In countries with tight fiscal space, or those under EU fiscal surveillance, officials were reluctant to risk a retrospective reclassification that could push them over deficit limits. This created a legal uncertainty barrier: even though EnPCs could deliver savings and outsource risk, they appeared financially risky from an accounting perspective. In practice, ensuring that an EnPC qualifies as off-balance-sheet under Eurostat's rules has proven challenging. Eurostat's 2017 guidance note (and the subsequent Eurostat–European Investment Bank (EIB) Guide) clarified that 'in certain circumstances, energy performance contracts (EnPCs) can be recorded off-balance-sheet for government'[244]. The key criterion is which party is deemed the 'economic owner' of the assets installed under the EnPC. For an EnPC to stay off the government balance sheet, the private contractor must be the economic owner, meaning it carries most of the risks and rewards of the investment[245]. In other words, the ESCO needs to bear the construction risk and either availability or demand risk associated with the project. If those risks remain with the public authority (or if the authority guarantees the ESCO's revenue), then the assets are viewed as government-owned and the EPC must be recorded on-budget.

Although the 2017 Eurostat guidance softened the stance by providing a pathway to off-balance-sheet EnPCs, the complexity of the rules and fear of misclassification still deter many public authorities. This tension creates a legal uncertainty: public finance officers must decide whether to proceed with a renovation via EnPC not just on its merits, but also on an interpretation of accounting criteria. Eurostat's statistical rules, while aimed at fiscal transparency, have unintentionally created a barrier to innovative financing of deep renovations. Keeping EnPCs off the books is possible on paper, but in reality requires overcoming contractual and risk allocation hurdles that many authorities find difficult. The need

[242] Council of the European Union, 'Council activates flexibility in EU fiscal rules for 15 member states to increase defence spending', Press release, 8 July 2025, https://www.consilium.europa.eu/en/press/press-releases/2025/07/08/council-activates-flexibility-in-eu-fiscal-rules-for-15-member-states-to-increase-defence-spending/.
[243] European Commission, Eurostat and EIB, *A guide to the statistical treatment of energy performance contracts: May 2018*, 2018, European Investment Bank, https://data.europa.eu/doi/10.2867/677198.
[244] Ibid.
[245] Ibid.

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to ensure full risk transfer to the private side often clashes with public authorities' desire to minimise risk or provide guarantees[246].

Publicly sponsored renovation, whether direct capital expenditure (capex) (the authority procures and pays for the works and equipment itself through its budget or borrowing) or via EnPCs, guarantees or revolving funds, feeds into general government accounts if the structure fails off-balance-sheet tests. Where investments fit with budgets, they absorb fiscal space under the national net expenditure path and may weigh on deficit/debt indicators. Conversely, structures that (i) transfer construction and performance risk to the private counterparty and (ii) avoid significant government financing can remain off the government balance sheet, easing pressure on fiscal metrics.

Recommendations

To overcome these legal issues, the **financing architecture for deep renovations** should be engineered to **align with the fiscal framework *ex ante***, rather than negotiated against it *ex post.* At contractual level, public authorities should deploy EnPC and EnPC-like structures in which the private counterparty is demonstrably the economic owner of the installed assets and bears construction risk together with availability or demand risk for the duration of the contract. Payment mechanisms should be tightly linked to verified savings, with under-performance remedies that operate automatically and without public guarantees, minimum revenue undertakings or other forms of credit support that would reallocate risk back to the authority. Where public support is indispensable, it should be channelled so as not to substitute for private financing of the EnPC assets: affordability grants to households can sit outside the EnPC perimeter; advisory and development stage support can be provided through technical assistance windows; and credit risk should be absorbed primarily through EU-level or market-based instruments rather than through the general government balance sheet.

Where the fiscal impact of climate and energy security measures becomes both material and time-bound, Member States should consider the same legal path recently used for defence outlays. The national escape clause in the SGP permits **a temporary, targeted deviation from the agreed net expenditure path in exceptional circumstances**, subject to debt-sustainability safeguards and Council of the EU approval. However, it is politically and legally easier to frame a sudden security shock as such an 'exceptional circumstance' than a renovation wave whose urgency is real but less immediately perceptible. Any climate-related use of the clause would have to be tightly framed: a clearly defined category of eligible renovation spending linked to energy security and resilience, strict temporal limits, quantitative caps, and enhanced monitoring tied to verified energy savings. This does not amend the Maastricht reference values, but, rather, operationalises existing secondary law flexibility to accommodate a discrete, necessary renovation shock while maintaining fiscal prudence. Used alongside structural measures, it would close the residual gap between legal obligation under the EPBD and budgetary feasibility under the fiscal rules, allowing deep renovation programmes to proceed at the required scale without compromising the integrity of EU fiscal surveillance.

[246] European Parliament: Directorate-General for Parliamentary Research Services, *Introduction to the fiscal framework of the EU: the Maastricht Treaty, the Treaty on stability, coordination and governance in the economic and monetary Union, and the stability and growth pact*, Publications Office of the European Union, Luxembourg, 2021, https://data.europa.eu/doi/10.2861/072030.

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Challenges in the use of EU support instruments

A variety of EU instruments can finance deep renovations, but their scope and implementation vary, offering different relative advantages and disadvantages. Ensuring that these funds are used in a complementary way in line with EU rules and navigating the different application procedures may present significant barriers for public authorities.

One of the most important considerations is the management mode[247] of different funds:

- **Shared management**: EU funds managed jointly by the European Commission and national authorities. This includes funds such as the European Regional Development Fund (ERDF) and the Cohesion Fund (CF), which are spent according to regional or national operational programmes (OPs) or the Just Transition Fund (JTF), which is spent according to Territorial Just Transition Plans. These planning documents should be aligned with the global objectives set in the EU legislation establishing the funds.
- **Direct management**: EU funds managed directly by the European Commission and/or its agencies. This includes funds such as Horizon Europe and LIFE, which are managed by EU agencies. The calls for proposals under these funds are more competitive as they cover the entire EU and other participating countries. They might also have specific requirements about partnering and types of projects supported. The RRF and SCF are also under direct management, but their spending is tied to national plans.
- **Indirect management**: EU funds managed by intermediaries such as the EIB or other financial institutions. Non-grant instruments of EU funds are usually managed by financial intermediaries. This includes InvestEU and financial instruments under the ERDF/CF. Financing under the Modernisation Fund is decided by the European Commission and the EIB.

The management mode of EU funds means that competition and application procedures may vary in different regions or countries. **Application procedures**, especially for non-grant instruments, or calls for proposals at EU level may be complex. For funds such as Horizon Europe, proposals may require partners from different countries, which may be difficult to organise. In addition, preparing financial proposals requires expertise and resources that may not always be available in-house for beneficiaries. The technical assistance provided by advisory services at EU level could be very useful to aid the preparation of proposals and/or the use of EU funds. While accessing support from ELENA, JASPERS or the EU Investment Hub (see Annex 2) may require some awareness, language capacity and preparation, it can help to strengthen project proposals and unlock large EU financing for deep renovation.

Another potential barrier to accessing EU funds is the need to prove the **financial viability and/or large scale** of projects. This is especially relevant for financing disbursed in the form of loans or other financial instruments managed through intermediaries. Consideration of proposals by the EIB or other financial institutions usually means that the financial viability of projects needs to be assured. In some cases, this may require a sufficiently large scale of investment to justify participation of the EIB, national development banks or other large financial institutions. In practice, these considerations may create difficulties in funding small projects or projects not generating financial profits. Renovation projects would need to show

[247] European Commission, Funding by management mode, n.d., https://commission.europa.eu/funding-tenders/find-funding/funding-management-mode_en.

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proof of the various non-financial benefits they can generate and explore bundling similar or close proximity renovations to increase their changes of receiving funding.

Eligible projects must fit the **scope of the funds**. Deep renovation can theoretically be financed by multiple EU funds, but there might be specific conditions to consider. For example, as Horizon Europe supports innovation projects and LIFE supports demonstration projects, they might not be suitable for large-scale renovations, but could suit testing innovative approaches or awareness-raising. ERDF/CF, RRF, InvestEU or the Modernisation Fund might be better suited to fund deep renovations in buildings at a larger scale. They might also be able to provide a combination of grants and financial instruments (e.g. loans, guarantees) to leverage the necessary investments.

Another consideration is the existence of national or regional planning documents for fund implementation. Where such documents exist, this leaves some discretion to Member States to identify relevant priorities and renovation objectives tailored to the local context, legal and financial frameworks or needs. This means that funds such as the ERDF/CF, JTF, SCF and RRF can be tailored to support building renovations according to the specific needs of the country or region.

Finally, an issue can arise when EU funding stops. EU funding is often disbursed according to predefined timelines with different funds usually operating over the seven-year period of the multiannual financial framework (MFF). While most instruments remain over time and are only adjusted across MFFs to reflect shifting or new priorities (e.g. CF, ERDF, LIFE, research programmes), some funds are introduced, merged or replaced. This can create risks for projects with timelines longer that the typical seven years of the MFF, endangering the **sustainability and continuity of EU funding**. Without alternative financial sources to complement or replace EU funding, some energy efficiency or renovation projects might not take place. This highlights **the need to leverage private resources** in addition to public funding, not only to increase the pool of the available investment but to ensure a buffer if any of the sources is withdrawn. Funds like InvestEU explicitly target the leveraging of private resources for eligible projects.

Recommendations

To overcome these barriers and make efficient use of the various EU funds available for energy efficiency and renovation, Member States should:

- **Design tailored national documents for EU funds** (e.g. OPs for CF/ERDF, territorial just transition plans, recovery and resilience plans, social climate plans) that identify specific priorities and needs for renovation. These priorities should reflect local needs and specific conditions while respecting the general requirements of the EU fund. Depending on scope, local or regional authorities and other actors managing public and private buildings should be consulted to support the identification and prioritisation of (deep) renovation needs. Where relevant, these documents should identify synergies between different EU funds and provide clear guidelines on avoiding double funding, for example by identifying which EU fund can be used for which project phase (see Figure 1). Complementary guidance and information on EU mechanisms that can support potential applicants in preparing proposals should also be provided.

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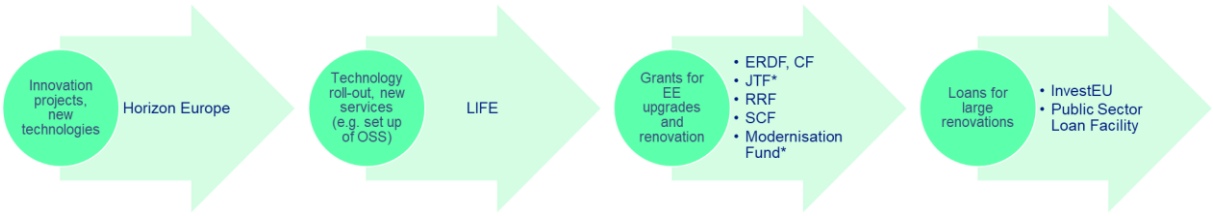
Figure 1: Possible use of different EU funds in different renovation project phases



Source: Authors' elaboration.

*Note: *Funding may be limited in its geographical scope (see Annex 2).*

- **Provide national funding** that can complement EU sources and continue to provide funding beyond the cycles of the MFF and EU fund implementation. This will ensure that longer term investments can be realised and potential beneficiaries have access to predictable financing over time. Public financing may also be used to leverage private investment where it provides some initial capital, guarantees or technical support. Recommendations on the treatment of public debt can also be considered to ensure that any public funding for renovation is not unexpectedly reduced as a result of austerity or shifting priority considerations.
- **Establish a legal framework that facilitates the use of different financing sources and mechanisms** to ensure renovation investments can tap into both public and private resources. Clear legal provisions and certainty is needed for project promoters and public or private investors to combine different financing instruments, including not only national and EU public funds, but also options such as PPPs, EPC, green bonds, preferential loans, equity, revolving funds, tax credits, financing from energy cooperatives, etc. The financing needs for renovation exceed the public funding available and successful investment strategies need to make smart use of the different financing options available at local, national and EU level.
- **Provide non-financial support** to different stakeholders in the form of guidelines, information, opportunities for peer exchanges, one-stop-shops, and sharing lessons across borders. The need to renovate the building stock is EU-wide and different places and strategies can offer different lessons. Member States should encourage information sharing within and across countries. Member States should facilitate and support one-stop-shops as knowledge hubs for different information about renovations, from information about financing and guidance on how to access funding, to examples of best practices and tips from other EU, national or local projects. This support can significantly complement financial support and ensure that the best financial strategies for renovation are developed.

Potential fund beneficiaries and investors in renovation projects should:

- **Consult the information available at local one-stop-shops or similar hubs, such as energy cooperatives**.
- **Look for multiple sources of financing** and ways to combine EU funding, national public funding and private financing.
- **Consult the national documents of EU funds** to understand the specific priorities for each fund in their territory.

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- **Make use of the multiple support mechanisms for project development** available to support potential beneficiaries of EU funding or financial instruments (see Annex 2).

3.4 Comparative practice in selected Member States

France: Combining financing sources for renovation of residential buildings

France leverages a combination of public and private bank financing, zero-interest loans, and income-based subsidies to promote energy efficiency renovations.

One of the financial aids available is *MaPrimeRénov'*, a **government grant** for major energy renovations available to all owners of homes with an energy rating of E, F, or G. The grant covers up to 80% of renovation work that provides a minimum improvement of two energy efficiency classes. The conditions are differentiated between homeowners and landlords, as well as income level. The grant can be combined with some additional support, including aid from local authorities, pension fund assistance, zero-interest eco loans, and a reduced VAT rate of 5.5%. Until the end of 2025, this grant is reserved for low-income households[248].

Another grant is available specifically for co-owners of multi-apartment buildings, *MaPrimeRénov' Copropriété*. It finances renovation in common areas (e.g. roof and wall insulation, change of heating system, installation of ventilation) and private areas declared to be of collective interest (e.g. windows), of up to €25 000 per dwelling. Additional grants are available to low-income co-owners, and the grant can be combined with MaPrimeRénov' if renovation is also undertaken in the individual dwelling[249].

Mon Accompagnateur Rénov', a network of state-approved and accredited professionals, can provide personalised technical, administrative, social, and financial support based on the specific needs of applicants. This includes energy audits, help with accessing available subsidies, and selecting companies to carry out the work. The costs of these services can be covered by a subsidy of up to €2 000[250].

A **zero-interest eco loan** (eco-PTZ) is available to all homeowners for energy efficiency improvements, regardless of income and depending on their borrowing capacity. Eco-PTZ can be combined with MaPrimeRénov' and MaPrimeRénov' Copropriété grants to cover the part of the renovation work that remains at the homeowner's expense. The loan can reach up to €50 000, with a repayment period of up to 20 years. Applications are made directly with a bank/credit institution that has an agreement with the state[251]. Fifteen banks participate in the initiative in exchange for tax credits commensurate with the normal interest rate they would have charged borrowers in the same period. Eco-PTZ was launched in 2009 and by 2022 had facilitated €7.46 billion of loans, while by 2023 it had supported more than 105 000 projects[252].

An **eco loan for social housing** (eco-PLS) is available to social landlords, with a goal of

[248] French Republic, MaPrimeRénov' pour une rénovation d'ampleur, n.d., https://france-renov.gouv.fr/aides/maprimerenov-renovation-ampleur.
[249] French Republic, MaPrimeRénov' Copropriété, n.d., https://france-renov.gouv.fr/aides/maprimerenov-copropriete.
[250] French Republic, Mon Accompagnateur Rénov' simplifie et sécurise votre rénovation énergétique, n.d., https://france-renov.gouv.fr/preparer-projet/faire-accompagner/mon-accompagnateur-renov.
[251] French Republic, L'éco-prêt à taux zero, n.d., https://france-renov.gouv.fr/aides/eco-pret-taux-zero.
[252] Green Finance Institute, Unsecured Green Home Loans: Consumer Protection and Scale in International Markets, 2024, https://www.greenfinanceinstitute.com/wp-content/uploads/2024/11/International-Consumer-Protections-and-Green-Loans.pdf.

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renovating the 800 000 most energy inefficient social housing units. The loan can be up to €33 000, with €10 000 of possible complementary bonuses, per dwelling, to fund renovation work that can improve the energy classification of social rental housing rated D, E, F or G. The loan was established in 2009 and is managed by the **public bank *Caisse des Dépôts* (CDC)**. The loan is repayable in 5-30 years and the interest rate is lower than the savings account A rate (adjusted for duration of the loan) to provide preferential terms[253].

The CDC provides additional financing options with preferential rates to social housing providers, local authorities or local public enterprises for energy renovation projects[254]. In 2021, the CDC received a €1 billion loan from the EIB for its programme 'CDC *Renovation Energetique Logement Social*'. This loan aimed to help the CDC to develop energy efficiency in residential buildings, specifically the thermal rehabilitation of 75 000 social housing units. The CDC lends financing to social housing providers to implement deep renovation work expected to achieve at least a 40% reduction in energy consumption[255]. The EIB Improvement Loan (EIB PAM) is a fixed-rate loan that complements the eco loan for social housing and is available to providers/managers of social housing. The loan has a fixed rate indexed to that of the savings account A rate, a flexible repayment period of 15-30 years depending on the nature of the work and no limit on the amount borrowed[256]. The CDC also offers the Moderate Assistance Loan (*Prêt d'Accompagnement à la Mode)* to finance up to 100% of project costs for continuous improvement of social housing stock. The repayment period varies from 25-35 years according to the ambition of the work, and the interest rate is lower than the savings account A rate, or is a monthly rate indexed for inflation[257].

Five **third-party financing (TPF) companies** provide technical and financial solutions to homeowners interested in deep renovation, regardless of their income. The TPF companies are established by local governments, i.e. metropolitan or regional councils. Their offers include direct and indirect financing: no upfront investment (the TPF company pays upfront for renovation works); pre-financing of public subsidies; direct low-interest loans repayable after work completion over a period of up to 25 years (10 years for consumer loans offered by banks) and integrating expected energy savings; indirect interest-free loan (*eco-prêt à taux zéro*). TPF companies also provide technical advice and guarantee the quality of the work and energy savings. The combination of comprehensive and trustworthy services provided in a single place, physically close to homeowners, boosts the model's success. In the areas in which TFP companies operate, their works account for 30% of the deep energy renovation market. In 2023, they covered 6 160 renovation projects for €173 million[258].

The French model for deep renovation support highlights the importance of combining different financing sources. The combination of grants and preferential loans ensures that renovation does not rely solely on subsidies, while the specific conditions available for social housing managers and low-income households ensures that energy poverty can be tackled hand-in-hand with decarbonisation. While some measures might not be directly applicable in countries without public banks similar to the CDC, the use of EIB resources to fund financial intermediaries is replicable. The provision of advice through one-stop-shops is an

[253] Ministry of Ecological Transition, Spatial Planning, Transport, Urban Development and Housing, Éco-prêt logement social, n.d., https://www.ecologie.gouv.fr/politiques-publiques/eco-pret-logement-social; CDC, Eco-Prêt : financer vos projets de rénovation énergétique, n.d., https://www.banquedesterritoires.fr/produits-services/prets-long-terme/pret-eco-pret.
[254] CDC Banque des Territoires, Rénovation logement social: accélérer vos projets de renovation, n.d., https://www.banquedesterritoires.fr/offres/renovation-logement-social#expand-collapse-1.
[255] EIB, CDC, Renovation Energetique Logement Social, n.d., https://www.eib.org/en/projects/all/20200933.
[256] CDC, Prêt PAM BEI pour financer la réhabilitation thermique des logements sociaux, n.d., https://www.banquedesterritoires.fr/produits-services/prets-long-terme/pret-pam-bei-taux-fixe-complementaire-eco-pret.
[257] CDC, Prêt PAM (Prêt à l'Amélioration): financer vos travaux de rehabilitation, n.d., https://www.banquedesterritoires.fr/produits-services/prets-long-terme/pret-pam.
[258] Energy Cities, 'In France, a specific one-stop-shop model shakes up the deep energy renovation market,' 2024, https://energy-cities.eu/in-france-a-specific-one-stop-shop-model-shakes-up-the-deep-energy-renovation-market/.

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important enabling factor.

Lithuania: Financial instruments using the ERDF for residential buildings

Since the 2007-2013 programming period, Lithuania has used EU funding from the ERDF and support from the EIB to set up non-grant, financial instruments for investments in energy efficiency in multi-owner apartment blocks[259,260].

In 2010, the managing authority (Ministry of Finance) used **EIB** support through the Joint European Support for Sustainable Investment in City Areas (**JESSICA**) initiative to set up financial instruments, committing nearly €138 million of **ERDF** funding and nearly €36 million of national funding. The EIB acted as the holding fund manager, appointing four intermediary financial instruments to mobilise loans for energy efficiency improvements. The demand for these loans exceeded supply and all available funding was used. As such the **modernisation loan** became the centrepiece of the Lithuanian government's programme for energy efficiency improvements in residential properties.

In 2014, at the start of the next programming period, the JESSICA II fund of funds was established to meet the demand created in the previous period and continue the loan programme. To ensure continuous funding, the managing authority created a transitional financial instrument. That second fund followed the same principle, with the EIB acting as the manager and a local financial institution, *AB Šiaulių bankas*, as the financial intermediary. As part of this set-up the EIB managed €250 million of EU and national funds under the ERDF OP to support investment in energy efficiency in privately owned multi-block housing apartments (primarily in common areas). The renovation work had to result in the building being upgraded to at least C energy performance and more than 80% of the project cost had to go to energy efficiency measures. The financing could be provided to residents or building administrators acting on behalf of individual apartment owners, and was distributed by the financial intermediary.

An important requirement for the selection of the intermediary was its ability to commit its own resources, at least matching the ERDF funding in each project. Following two selection rounds, a total of €138 million of ERDF funding was committed, together with €255 million by *AB Šiaulių bankas*.

To complement the modernisation loan, the **Lithuanian leveraged fund** was created in 2018. Backed by two ERDF financial instruments, it aimed to leverage more private resources by using guarantees and layered structures. The managing authority and the Ministry of the Environment committed a further €100 million to the EIB to implement the fund and its two financial instruments, a guarantee instrument and an investment platform.

The first-loss portfolio guarantee covered 80% of the losses incurred by participating banks in respect of each defaulted modernisation loan, and up to a maximum amount of 25% of cumulative losses across the portfolio of modernisation loans. Lending under the guarantee

[259] Fi Compass, Residential energy efficiency financial instruments in Lithuania, n.d., https://www.fi-compass.eu/sites/default/files/publications/Residential%20energy%20efficiency%20financial%20instruments%20in%20Lithuania_2.pdf.
[260] EIB, Fund of funds Lithuania, n.d., https://www.eib.org/en/products/mandates-partnerships/shared-management-funds/lithuania.

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started in 2019 to support the continued operation of the modernisation loan, with €40 million committed by 2020.

An investment platform was established to support the functioning of the guarantee. It has a layered structure to allow private investors to provide lower risk and thus more affordable senior debt to the platform, with the protection of a first loss piece through ERDF and financial intermediary resources. The layers of the investment platform include:

- first-loss piece with contributions from ERDF and the financial intermediary. This tranche has the highest risk level, as all defaults in the underlying modernisation loan portfolio would first result in losses for this layer of funding;
- junior debt (e.g. from international financial institutions) – lower risk layer;
- senior debt (e.g. from commercial banks) – lowest risk layer, as any losses would only be incurred in the relatively unlikely event that the defaults in the Modernisation loan portfolio exceeded the other two layers.

In addition to the financial instruments, ERDF grants are used to complement the modernisation loan and provide: technical support (e.g. preparation of investment plan, preparation of energy audits); interest rate subsidies to help reduce the cost of borrowing for the final recipients; capital rebates of 30% of the project cost to enable early repayment; and an additional 10% capital rebate of the project cost where additional energy efficiency measures are achieved.

By 2020, this multi-pronged approached had helped to deliver:

- €390 million disbursed to final recipients;
- 1 456 of loans provided for renovation of apartment block buildings;
- 50 000 apartments and 2.4 million m^2 of apartment block area renovated.

This experience shows that the market for energy efficiency has matured in Lithuania, with financial intermediaries more willing to provide their own resources for such investments. This approach can be replicated in other Member States where the ERDF supports deep renovations. By combining grants with financial instruments, Member States can ensure that resources feed into a revolving fund, creating continuous resources for further loans, while more private resources are committed. In addition, grants can be used to support particularly vulnerable stakeholders.

Germany: Comprehensive framework for supporting residential and non-residential buildings

Germany's approach to energy efficient building renovation combines a strong legal framework with extensive financial support. The system ensures that energy savings and carbon dioxide (CO_2) reduction are integrated into both new construction and refurbishment projects. The scope includes single-family homes, multi-family apartments, some municipal/public buildings, and social housing (via intermediary banks).

The public development bank, KfW, manages federal funding for the energy-efficient buildings (BEG) programme through three sub-programmes on renovation (a fourth sub-

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programme is dedicated to new buildings)[261]:

- Low-interest loans with a repayment grant from federal funds (credit) for complete renovations under:
  - BEG WG focused on complete renovation of residential buildings;
  - BEG NWG focused on complete renovation of non-residential buildings;
- Non-repayable grants for individual measures under:
  - BEG EM focused on renovation with individual measures for both residential and non-residential measures.

KfW programmes are conducted on behalf of the Federal Ministry for Economics and Energy. They provide preferential loans with low interest rates and flexible repayment terms[262], with a maximum funding amount for energy efficient houses up to €120 000[263]. Projects must achieve at least a 30% reduction in energy demand, verified through the *Effizienzhaus* standard. Between 1990 and 2009, subsidies supported over 3.1 million homes, totalling €16.9 billion, with €10.6 billion for energy efficiency and €6.3 billion for renewable energy[264]. The funding invested by KfW reduces the strain on public resources by leading to increases in public revenue or reductions in public expenditure that exceed the costs of the programmes[265].

This direct financial support is complemented with **building standards**, **advisory services and tax incentives**. The Buildings Energy Act defines rules for retrofitting existing buildings and for the maintenance and inspection of technical building systems. Support services include on-site advisory services and an on-site visit by consumer centres, an online tool (renovation calculator) and a subsidised tailored modernisation roadmap. This roadmap is funded by a grant as part of the energy advisory services for residential buildings and creates eligibility for preferential conditions under BEG funding. The energy retrofitting of residential buildings can also result in tax breaks if funding is not used (i.e. some energy efficiency retrofits can be supported with the funding programmes, and others with a tax break)[266].

Germany's model demonstrates how financial instruments, advisory services, regulatory standards and technical benchmarks can drive large-scale renovations while reducing public budget pressure. Integrating loans and grants and setting clear energy reduction targets ensures efficient use of resources and meaningful impact of the renovations. These practices can be replicated in other Member States. One feature unique to this approach is the central role of KfW, a public development bank central to implementation of the financial mechanisms. This may not be directly replicable in countries lacking similar institutions.

[261] Bundesministerium fur Wirtschaft und Energie (BMWE), Efficient buildings, n.d., https://www.bundeswirtschaftsministerium.de/Redaktion/DE/Dossier/energiewende-im-gebaeudebereich.html.
[262] KfW, 'KfW's programmes for energy-efficient construction and refurbishment have positive impacts on the climate and public coffers', Press release, 4 June 2018, https://www.kfw.de/About-KfW/Newsroom/Latest-News/Pressemitteilungen-Details_472512.html.
[263] KfW, 'Climate resolutions of government implemented: promotion of energy-efficient construction & refurbishment even more attractive', Press release, 24 January 2020, https://www.kfw.de/About-KfW/Newsroom/Latest-News/Pressemitteilungen-Details_563264.html.
[264] BPIE, Europe's buildings under the microscope, 2015, https://www.bpie.eu/wp-content/uploads/2015/10/HR_EU_B_under_microscope_study.pdf.
[265] KfW, 'KfW's programmes for energy-efficient construction and refurbishment have positive impacts on the climate and public coffers', Press release, 4 June 2018, https://www.kfw.de/About-KfW/Newsroom/Latest-News/Pressemitteilungen-Details_472512.html.
[266] BMWE, Efficient buildings, n.d., https://www.bundeswirtschaftsministerium.de/Redaktion/EN/Dossier/enhancing-energy-efficiency-in-buildings.html.

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Sweden: Using green bonds for residential and non-residential buildings

Sweden has a well-structured, finance-driven renovation ecosystem in which green bonds play an increasing role. As a voluntary membership organisation bringing together municipalities and regions in Sweden, the Kommuninvest Cooperative Society is an important source of funding for communal projects[267].

The **green bonds** issued by Kommuninvest finance projects for climate change mitigation. They offer an interest rate product, explicitly guaranteed by the members of the Kommuninvest Cooperative Economic Association, with the highest possible rating (AAA/Aaa credit quality)[268].

Kommuninvest issued its first green bond in 2016 and has since become the largest Nordic issuer of green bonds, servicing a growing demand for such products. Investors in its Green Bonds Framework are usually fixed-income investors such as large pension funds and institutional investors[269]. The net proceeds from green bonds are used for a portfolio of green loans disbursed by Kommuninvest. A Green Register tracks the allocation of net proceeds from green bonds to green loans, ensuring that they are used only to finance or refinance carefully selected green projects. Kommuninvest's environmental department identifies and verifies projects against a set of eligibility criteria, the financial department selects and sends for appraisal the completed green loan application forms, and the Committee for Green Financing gives the final approval. Ongoing green loan eligibility is evaluated annually over the lifetime of the loan, while the framework itself is subject to external review[270].

By the end of 2024, SEK 76.8 billion (around €7 billion) was outstanding in 11 green bonds. The Green Bonds Framework allows financing for eight project categories (reflecting the EU Taxonomy requirements) that may be undertaken by Kommuninvest's members. The categories include renewable energy, energy efficiency in energy systems and clean buildings. The latter category covers new or existing residential and non-residential buildings with an energy performance per m^2 that is at least 20% better than the Swedish building code, major renovations of buildings that reduce energy use by at least 30%, and energy efficiency measures in partial systems that reduce energy use by at least 30%[271]. The green buildings category is larger, more ambitious and links mainly to energy performance of public buildings such as public housing, schools, hospitals, and basic infrastructure. The energy efficiency category is smaller, includes more generalised projects and is heavily regulated[272]. In 2024, the green loans to buildings supported 428 projects for over SEK 55 billion (around €5 billion)[273].

Sweden's approach leverages municipal expertise and market actors to streamline renovation delivery, while the legal and institutional framework supports long-term municipal borrowing and performance-based financing (even if deep renovation uptake is

[267] Kommuninvest, About us, n.d., https://kommuninvest.se/eng/homepage/aboutus.4.35de2c7b1900fda7e6273e1.html.
[268] Kommuninvest, Green bonds, n.d., https://kommuninvest.se/eng/homepage/investors/funding/greenbonds.4.35de2c7b1900fda7e62576f.html.
[269] Lee, G., 'Green investors flock to Kommuninvest four year paper, Global Capital, 29 August 2023, https://www.globalcapital.com/article/2c4eonc4qhn8y242m5szl/ssa/supras-and-agencies/green-investors-flock-to-kommuninvest-four-year-paper.
[270] Kommuninvest, Green Bond Framework, June 2024, https://kommuninvest.se/download/18.35de2c7b1900fda7e62e7b0/1719409479334/Kommuninvest_Green%20Bond%20Framework-FINAL240626.pdf.
[271] Kommuninvest, *Green Bonds Impact Report,* 2024, https://kommuninvest.se/download/18.20ba4cb4195b26b1d03159a0/1744177136457/Green-Bonds-Impact-Report-2024.pdf.
[272] Interview with Kommuninvest on 7 August 2025.
[273] Kommuninvest, *Green Bonds Impact Report,* 2024, https://kommuninvest.se/download/18.20ba4cb4195b26b1d03159a0/1744177136457/Green-Bonds-Impact-Report-2024.pdf.

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dependent on municipal capacity and commitment). Kommuninvest continuously develops its sustainability financing and explores innovative financing solutions. It tries to promote social and green loans and strives to have 25% of all its loans from this category in the coming years. Many general loans are also used for green projects, as the criteria for approval are simpler. The green category has two subcategories: green buildings and energy efficiency[274].

The Kommuninvest model shows the added value of pooling resources and using a trusted organisation as an intermediary for raising and distributing green finance. This reduces risks for investors, as green bonds are not linked to the financing of individual projects but are issued only after green loan approvals. This reduces transaction and due diligence costs for investors. At the same time, the role of Kommuninvest as an aggregator enables funding to be raised and lent to small municipalities and projects. By using green bonds, the model attracts private sector resources, limiting the strain on public resources. The external accreditation of the green bonds ensures market trust and credibility. The replicability of this model depends on the legal framework in Member States and the extent to which is allows the issuance of green bonds and/or the creation of municipal cooperatives that can raise financing resources.

Spain: Integration of NextGenerationEU funds

Spain has a particularly challenging baseline, with around 82% of its building stock considered energy inefficient and roughly half of all homes constructed without any specific efficiency standard. While an annual renovation rate in the order of 2–3% is needed to align with the EU's energy efficiency and Renovation Wave objectives, Spain's effective rate has hovered around 0.1%, leaving a substantial gap between climate ambition and actual market delivery. Against this backdrop, the RRF and the broader NextGenerationEU framework have been used as a catalyst to reconfigure Spain's renovation ecosystem by injecting unprecedented volumes of public finance and building the institutional infrastructure needed to turn that finance into credible, standardised projects[275].

The core of Spain's strategy is the residential renovation programme under the Recovery, Transformation and Resilience Plan (PRTR), endowed with €3.42 billion of NextGenerationEU funds. The programme explicitly focuses on financing renovation works and proven improvements in the energy performance of residential buildings and dwellings. While national schemes and regional programmes already existed in the Autonomous Communities, the PRTR creates a unified, large-scale framework that channels EU funds into concrete building-level interventions. The Ministry of Housing and Urban Agenda (MIVAU) has developed a dedicated information portal, complemented by regional 'rehabilitation offices', technical professionals and 'rehabilitation agents' providing guidance to households and communities of owners. This combination of funding and advisory support is designed to overcome the financial and information barriers that have historically kept renovation rates low[276].

NextGenerationEU funds are used to provide grants covering 40-80% of eligible renovation costs for residential buildings and individual homes, depending on the level of certified energy savings attained. Eligible measures include improvements to façade and roof insulation, renewal of windows, replacement of heating and cooling systems, and broader works that enhance the state of conservation, habitability or accessibility of the building,

[274] Interview with Kommuninvest on 7 August 2025.
[275] Green Building Council, *GBCe Country Report: On the Status of Sustainable Building in Spain*, 2021, https://gbce.es/documentos/GBCe-Country-Report-2021.pdf.
[276] Recovery, Transformation and Resilience Plan (PRTR), n.d., https://planderecuperacion.gob.es/noticias/conoce-ayudas-europeas-rehabilitacion-viviendas-prtr.

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provided that a minimum 30% reduction in primary energy consumption is achieved. The scheme is deliberately structured around measured performance: the higher the energy savings, the higher the grant, with typical support ranging from €6,300 to €18,800 per dwelling. These subsidies are exempt from personal income tax and do not count as a taxable capital gain. The residual part of the investment can benefit from additional income tax deductions of up to 60%, which increases effective support levels without triggering State aid concerns in the case of non-economic, owner-occupied housing.

A notable innovation in the Spanish approach is the **treatment of vulnerable households**. Where a householder meets criteria for economic vulnerability, the base subsidy can be increased to 100% of eligible costs. This ensures that low-income households in multi-owner buildings are not excluded from comprehensive renovation projects because they cannot finance their co-payment. Vulnerable owners can request this additional support through the rehabilitation office.

The PRTR's residential renovation component is organised into five support programmes, as set out in Royal Decree 853/2021[277]:

- renovation at building level;
- improvement of energy efficiency at dwelling level;
- area-based (barrier) renovation programmes;
- support to rehabilitation offices;
- aid for the building logbook and drafting of renovation projects.

The **building-level renovation programme** finances works that produce certified improvements in energy efficiency in multi-apartment residential buildings and single-family homes (whether detached or grouped), with particular emphasis on the building envelope. For collective residential buildings, eligibility requires that at least 50% of above-ground built surface (excluding the ground floor) be used for housing and that the community of owners approve the works, except where the building has a single owner. To qualify, interventions must deliver at least a 30% reduction in non-renewable primary energy consumption as shown in the updated EPC, and a defined percentage reduction in annual heating and cooling demand (35% in climatic zones D and E, 25% in zone C)[278].

The **programme for energy efficiency improvements at dwelling level** targets individual homes that constitute the habitual and permanent residence of the owner, tenant, or those with a right of residence, whether single-family or part of a multi-apartment building. This programme finances works that deliver a reduction of at least 7% in heating and cooling demand, or a 30% reduction in non-renewable primary energy consumption, or the replacement of façade elements forming part of the thermal envelope, such as window upgrades. Focusing on the dwelling as the basic unit and applying lower savings thresholds for demand captures cases where a full building-level intervention is not feasible (e.g. where communities of owners have not agreed to comprehensive renovation), but meaningful efficiency improvements can still be delivered in individual homes. It thus acts as a complementary channel for triggering energy savings in situations where governance or coordination barriers at building level would otherwise delay action[279].

The programme supporting the building logbook and technical projects uses

[277] Royal Decree 853/2021, of 5 October, regulating aid programmes for residential renovation and social housing under the Recovery, Transformation and Resilience Plan, https://www.boe.es/buscar/doc.php?id=BOE-A-2021-16233.
[278] MIVAU, The building-level renovation programme, n.d., https://www.mivau.gob.es/ministerio/proyectos-singulares/prtr/vivienda-y-agenda-urbana/programa-de-ayuda-las-actuaciones-de-rehabilitacion-nivel-de-edificio.
[279] MIVAU, Programme for energy-efficiency improvements at dwelling level, n.d., https://www.mivau.gob.es/ministerio/proyectos-singulares/prtr/vivienda-y-agenda-urbana/programa-de-ayuda-las-actuaciones-de-mejora-de-la-eficiencia-energetica-en-viviendas.

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NextGenerationEU resources to subsidise the preparation and generalisation of the building logbook. It is also used to draft comprehensive renovation projects for residential buildings completed before 2000, where at least 50% of above-ground surface (excluding the ground floor) is residential. Eligible costs include professional fees for compiling the logbook and developing the technical design for deep renovation. The action plan attached to each logbook must identify measures capable of achieving at least a 30% reduction in non-renewable primary energy consumption. Aid amounts vary with building size: for the logbook, support ranges up to €3 500 per building, with per-dwelling caps and potential increases where there is no existing technical inspection report, while for technical projects, grants can reach up to €30 000 per building[280].

To complement outright grants and reduce residual financing barriers, Spain has created a state-backed loan facility, blending national resources with private bank finance. Under this scheme, owners and communities of owners who have already obtained regional renovation grants for eligible buildings can obtain additional loans of up to €30 000 per dwelling to cover remaining costs. The loans are originated by commercial banks at fixed or variable rates but are backed by a 50% guarantee from MIVAU. Loan maturities range from 1-15 years, with the possibility of up to two years of principal grace. Legally, this instrument is structured as a state guarantee scheme routed through the public development bank (ICO), designed to crowd in private lenders while maintaining acceptable risk levels in a segment where traditional collateral might otherwise be insufficient (particularly in low-value or rural areas)[281].

MIVAU has developed a distinctive digital simulator and information system[282]. This advanced tool allows households and communities of owners to estimate the current energy performance of their building (using existing data where available), explore different renovation options, and identify the corresponding level of NextGenerationEU support for each scenario. The simulator is restricted to residential buildings, but can identify specific dwellings, display their estimated energy characteristics, and indicate the grant intensity and eligible measures.

Slovenia: Integration of PPPs and EPC for non-residential buildings

Slovenia's strategy for renovating public buildings uses PPPs and EnPC, as demonstrated by a successful PPP model established in Ljubljana[283,284,285].

In 2017, the City of Ljubljana established a **PPP with two private companies**, the largest Slovenian Energy Company (Petrol) and a large ESCO (Resalta). The purpose of the PPP was to carry out deep renovations of 48 public buildings such as schools, libraries, sports centres, etc. The cost of the works was nearly €15 million, provided by the private consortium (51%) and EU Cohesion Policy funds, the Republic of Slovenia and the City of Ljubljana (49%).

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[280] MIVAU, Programme supporting the building logbook and technical projects, n.d., https://www.mivau.gob.es/ministerio/proyectos-singulares/prtr/vivienda-y-agenda-urbana/programa-de-ayuda-la-elaboracion-del-libro-del-edificio-existente-para-la-rehabilitacion-y-la-redaccion-de-proyectos-de-rehabilitacion.
[281] Ministry of Economy Commerce and Enterprise, 'CO MIVAU Rehabilitación de Edificios Residenciales', n.d., https://www.ico.es/web/guest/ico-mitma-rehabilitaci%C3%B3n-de-edificios-residenciales/tipos-de-interes.
[282] MIVAU, Renueva: Conoce y mejora tu Vivienda, n.d., https://renueva.five.es/.
[283] RENOVATE Europe, *PPP Renovation Financing Programme, Ljubljana*, n.d., https://www.renovate-europe.eu/national-initiatives/slovenia/.
[284] Balkan Green Energy News, 'Resalta completes largest public-private partnership for energy efficiency in South-East Europe', 2018, https://balkangreenenergynews.com/resalta-completes-largest-public-private-partnership-for-energy-efficiency-in-south-east-europe/.
[285] Covenant of Mayors, 'Public-private partnership for a large scale building retrofit programme', Energy Cities, 2020, https://energy-cities.eu/wp-content/uploads/2020/07/Ljubljana_PPP-retrofitting_CoM_2020_en.pdf.

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Measures included insulation of roofs and walls, replacement of windows and doors, installation of renewable energy sources covering 25% of energy needs, new lighting, new heating systems, connection of all buildings to a central building energy management system enabling remote monitoring, operation and data collection. Overall, 25 of the 48 buildings were deep energy renovated, with the rest renovated to a high standard (due to their protected status under national legislation). Expected results include energy savings of 8 245 MWh (savings range of 70-85% per building type), lower CO_2 emissions of 2 956 tonnes per year, and financial savings of €1 million per year from avoided energy expenditure.

The project was completed and handed over to the city in August 2018. The private companies provided expertise during implementation and will continue to provide management and maintenance of the equipment and systems installed for the duration of the contract. The main advantage of this PPP model is that city can benefit immediately from the savings and use them to repay the private partners over the 15-year duration of the contract.

The project has delivered additional benefits, strengthening its success. In the public sector, the city decided to use 10% of the additional income generated from energy savings to a programme teaching school pupils about energy-saving behaviour and renewable energy. In the private sector, the reputational gain from the PPP helped the ESCO to secure a €12 million loan from the EIB and another retrofit contract with the city. A second energy retrofit project was established in 2018 for primary schools, kindergartens, sport centres and municipal buildings. With a duration of 15 years, this €4.8 million project is expected to deliver 2 260 MWh of energy savings and 459 tonnes of CO_2 emissions savings per year.

This model demonstrates how a PPP/EnPC approach can be beneficial for both public sector actors and private companies. It also shows that improvements in energy efficiency with the accompanying quality of life gains for local communities and cost savings can be achieved without accumulating public debt. This model is replicable and can be implemented in other Member States, provided the set-up of PPPs and EnPC is well defined and supported through a clear legal framework. Other countries may also use EU funding to finance part of such contracts, emphasising the leverage effect of public resources.

Ireland: Energy cooperative funding renovations in rural areas

In Ireland, an energy community helps local homeowners, businesses and community organisations in their pursuit of energy efficiency and renovations.

EcoVision (trading name of the Energy Communities Tipperary Cooperative) is a not-for-profit energy upgrade and retrofitting organisation. Started as a pilot scheme in rural Tipperary to halt economic and social decline in 2011, the energy community was established in 2015. It represents 1 000-1 600 residents (300-500 households)[286].

EcoVision provides various services to private homeowners, businesses and community organisations, including acting as a one-stop-shop, leveraging public grants from the Sustainable Energy Authority Ireland (SEAI), sourcing contractors, and overseeing all aspects of a project while guaranteeing the work meets the highest standards[287]. As part of the service, a team from the cooperative performs a preliminary technical assessment of the home. Local projects are then bundled to bid for a SEAI grant. When the grant is obtained, the cooperative manages the renovation projects for individual residents. The

[286] REScoop.EU, *Best Practice Guide*, n.d., https://www.rescoop.eu/uploads/rescoop/downloads/D4.1.1_Best_Practice_Guide.pdf.
[287] Ecovision, https://ecovision.ie/.

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residents only pay the remainder not financed through the grant scheme[288].

The EcoVision process is based on several comprehensive steps[289]:

1) Initial consultation with project managers who conduct a basic assessment of the home/business, estimate costs, explore available SEAI grants or eligibility for voucher scheme for energy audits, and provide guidance for the next steps.
2) Energy audit: a comprehensive technical assessment of the home/business.
3) An energy report highlighting the most cost-efficient updates to achieve a minimum B2 energy rating, confirming the SEAI grant funding provided or estimation of costs.
4) Quotation: a technical report with the recommended upgrades, and cost of the works.
5) Grant letter: a contract is drafted with a detailed works programme and a percentage of costs to be repaid.
6) Project supervision: project managers conduct interim quality checks and final inspections of all energy upgrade works.
7) Completion: comprehensive pack at handover stage, along with a new building energy rating (BER) certificate. For businesses, this includes a grant claim.

This model exemplifies the benefits of combining comprehensive services, from advice and initial assessments to complete project management of renovation works, and providing them close to the communities served. This can be particularly relevant for rural areas where bundling multiple individual building renovations can reduce transaction costs and enhance the likelihood of obtaining funding. An important pre-condition for replicating this in other Member States is a legal framework that fosters the existence of cooperatives and/or energy communities.

3.5 Conclusions

The EPBD transforms the financing of deep renovations from a discretionary policy choice into a legal obligation. By binding Member States to ensure that all buildings move towards zero-emission status by 2050 and anchoring this trajectory in NBRPs, it requires a financing architecture that is not only adequate in aggregate but also legally coherent, socially fair and operationally accessible. Financing is no longer an exogenous background condition, but a core element of compliance. The central challenge identified in this case study is less the design and adoption of new instruments than the deliberate restructuring of existing legal, budgetary and market tools into a framework capable of delivering deep renovations at scale across very different territorial and socioeconomic contexts.

EU competition and fiscal rules emerge as structuring parameters rather than external obstacles. Large-scale renovation schemes that support landlords, social housing bodies, ESCOs or financial intermediaries will frequently fall within Article 107(1) of the TFEU and

[288] REScoop.EU, *Best Practice Guide*, n.d., https://www.rescoop.eu/uploads/rescoop/downloads/D4.1.1_Best_Practice_Guide.pdf.
[289] Ecovision, Home Energy Upgrades, Insulation, Solar & Retrofits, n.d., https://ecovision.ie/energy-upgrades-seai-grants-retrofits-ireland/home-energy-upgrades-insulation-solar-retrofits-ireland/; Ecovision, Business Energy Upgrades, SEAI Grants & Retrofits, n.d., https://ecovision.ie/energy-upgrades-seai-grants-retrofits-ireland/business-energy-upgrades-retrofits-seai-grants-ireland/.

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trigger the standstill obligation in Article 108(3) of the TFEU. Likewise, major public renovation programmes and EnPC pipelines interact with national net expenditure paths under the reformed SGP and with Eurostat's rules on whether assets are recorded on the government balance sheet. Member States' experiences indicate that legal uncertainty on these two fronts has often delayed or diluted renovation initiatives. The solution is not to retreat from ambition, but to embed State aid and fiscal compliance in the design of instruments *ex ante*. In practice, this means that State aid routing, GBER reliance, risk allocation under EnPCs, and the budgetary treatment of renovation pipelines have to be engineered *ex ante* into the legal and contractual design of financing instruments, rather than negotiated *ad hoc* once schemes are announced.

The analysis of EU-level funds points in the same direction. Since 2020, the EU budget has generated a dense landscape of grant and financial instruments, all of which are, in principle, available to support deep renovations. This proliferation risks fragmentation, overlap and administrative burden. Effective implementation of Article 17(6) of the EPBD requires Member States to use their OPs, territorial plans, social climate plans and recovery and resilience plans as the legal framework assigning clear, complementary roles to each EU source along the project cycle and across beneficiary segments. The case study suggests that a future EU-level refinancing or guarantee facility could be transformative if national schemes converge on a common grammar of eligibility criteria, performance metrics, risk-sharing rules, and data standards. Without such convergence, an EU-level facility risks becoming a further layer of complexity rather than a backbone that lowers funding costs and crowds in private capital across the Union.

A distinctive insight from this case study is the territorial dimension of the financing challenge, particularly in rural and depopulating areas where the cost of deep renovation can exceed the market value of the building. The EPBD does not allow Member States to treat these segments as *de facto* exempt: renovation obligations apply across the territory, and Article 9 of the EPBD permits only narrowly circumscribed exemptions for non-residential buildings, coupled with an obligation to achieve equivalent improvements elsewhere. For residential buildings, there is even less room to carve out low-value housing. This makes the design of high-intensity, place-based support a compliance issue rather than a purely distributive choice. The legal test of proportionality in relation to property rights and social fairness will hinge on whether rural households, small municipalities and owners of low-value non-residential buildings can access credible combinations of grants, guarantees and long tenor loans that make renovation a realistic option instead of a theoretical obligation. Where renovation is structurally uneconomic in local market terms, Member States must still deploy a mix of partial measures, tailored support and phasing, rather than simply invoking 'unfavourable cost-benefit' as a blanket justification for inaction.

The case study confirms that the mobilisation of private capital is not an optional add-on but a structural necessity. Even with full use of national and EU public resources, the investment gap identified for the building sector cannot be bridged without large-scale participation from banks, institutional investors, and, in some contexts, capital markets. Legal frameworks need to enable the design and deployment of standardised green mortgages and renovation loans, guarantee instruments, revolving funds, municipal green bonds and investment platforms that translate building-level projects into assets that fit the risk-return profile of private investors. At the same time, one-stop-shops, local energy agencies, and similar intermediaries must be treated as part of the financing framework itself: they support applications to national and EU schemes and provide independent advice on rights and obligations, particularly for vulnerable

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households and small public authorities. Without such intermediaries, Member States may multiply nominal support schemes but still fail to meet the EPBD's qualitative standards on accessibility, simplicity and territorial coverage.

Annex 1: List of literature and sources

ADEME, Guide des Diagnostiqueurs, Observatoire DPE-AUDIT, 2025, https://www.qualixpert.com/wp-content/uploads/2024/07/Guide-Diagnostiqueurs.pdf.

ADEME, n.d., https://observatoire-dpe-audit.ademe.fr/accueil.

ADEME, Politique de protection des données personnelles, n.d., https://observatoire-dpe-audit.ademe.fr/donnees-personnelles.

ADENE - Agência para a Energia. Certificação Energética dos Edifícios, n.d., https://www.sce.pt/.

ADENE, *Guia de apoio ao utilizador particular*, 2023, https://portalcasamais.pt/app/uploads/2023/05/Guia-de-apoio-ao-utilizador-particular.pdf.

Andersen, 'Energy Performance Contracts, a pathway to sustainable energy solution', 2025, https://de.andersen.com/fileadmin/user_upload/Andersen_insight_-_European_Energy_Industry_Group_-_EPC_Contracts_-_07.2025.pdf.

Austrian Institute of Construction Engineering, *OIB Guideline 6: Energy Saving and Thermal Insulation (April 2007 edition),* OIB-300.6-038/07, https://www.technik.steiermark.at/cms/dokumente/12039006_58813874/acfcf53a/Richtlinie%206%20Ausgabe%20April%202007.pdf.

Bakar, A. A., Yussof, S., Ghapar, A. A., Sameon, S. S. and Jørgensen, B. N., 'A review of privacy concerns in energy-efficient smart buildings: risks, rights, and regulations', *Energies*, Vol. 17, Issue 5, 2024, p. 977.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor CINEA can be held responsible for them.

Balkan Green Energy News, 'Resalta completes largest public-private partnership for energy efficiency in South-East Europe', 2018, https://balkangreenenergynews.com/resalta-completes-largest-public-private-partnership-for-energy-efficiency-in-south-east-europe/.

Beate Schön, B., 'Rent increase after modernisation and heating replacement: your rights when the flat is modernised' *(Mieterhöhung nach Modernisierung und Heizungsaustausch – Deine Rechte, wenn die Wohnung modernisiert wird)*, 2024, https://www.finanztip.de/mietwohnung-modernisierung/.

Bertoldi, P., Economidou, M., Palermo, V., Boza-Kiss, B. and Todeschi, V., 'How to finance energy renovation of residential buildings: review of current and emerging financing instruments in the EU', WIREs, Wiley Interdisciplinary Reviews, 21 June 2020, https://wires.onlinelibrary.wiley.com/doi/10.1002/wene.384.

Buildings Performance Institute Europe (BPIE), European Climate Initiative (EUKI) and BMU, *Long-term renovation strategies and the Renovation Wave*, 2021, https://www.bpie.eu/wp-content/uploads/2021/03/OurBuildings-Long-term-renovation-strategies-report_final.pdf

Buildings Performance Institute Europe (BPIE), *Europe's buildings under the microscope*, 2015, https://www.bpie.eu/wp-content/uploads/2015/10/HR_EU_B_under_microscope_study.pdf.

Buildings Performance Institute Europe (BPIE), *Status of energy performance contracting*, 2020, https://www.bpie.eu/wp-content/uploads/2020/10/BPIE-AmBIENCe-Factsheet-Spain-06201.pdf

Bundes Architekten Kammer, *Position Paper of the Federal Chamber of German Architects (BAK). Proposal for a Directive of the European Parliament and of the Council on the Energy Performance of Buildings (RECAST),* 2022, https://bak.de/wp-content/uploads/2022/03/Energy-Performance-of-Buildings-Directive-EPBD_Position-Paper-BAK.pdf.

Bundesministerium fur Wirtschaft und Energie (BMWE), Efficient buildings, n.d., https://www.bundeswirtschaftsministerium.de/Redaktion/EN/Dossier/enhancing-energy-efficiency-in-buildings.html.

CDP, *Iberdrola SA - Climate Change,* 2021, https://www.iberdrola.com/documents/20125/41506/CDP_Climate_Change21.pdf.

Commission Recommendation (EU) 2024/2481 of 13 September 2024 setting out guidelines for the interpretation of Articles 21, 22 and 24 of Directive (EU) 2023/1791 of the European Parliament and of the Council as regards the consumer related provisions, C/2024/6331, https://eur-lex.europa.eu/eli/reco/2024/2481/oj/eng.

Commission Regulation (EU) No 651/2014 of 17 June 2014 declaring certain categories of aid compatible with the internal market in application of Articles 107 and 108 of the Treaty, *OJ L 187, 26.6.2014, pp. 1–78,* https://eur-lex.europa.eu/eli/reg/2014/651/oj/eng.

Communication approving the content of the Notice providing guidance on the recast EPBD, Guidance on the recast EPBD of 30 June 2025, https://energy.ec.europa.eu/publications/communication-approving-content-notice-providing-guidance-recast-epbd-guidance-recast-epbd_en.

Communication from the Commission, Code of Best Practices for the conduct of State aid control procedures, C/2025/2810, https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:C_202502810.

Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: A Renovation Wave for Europe - greening our buildings, creating jobs, improving lives, COM(2020) 662 final, https://energy.ec.europa.eu/system/files/2020-

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor CINEA can be held responsible for them.

10/eu_renovation_wave_strategy_0.pdf.

Council of the European Union, 'Council activates flexibility in EU fiscal rules for 15 member states to increase defence spending', Press release, 8 July 2025, https://www.consilium.europa.eu/en/press/press-releases/2025/07/08/council-activates-flexibility-in-eu-fiscal-rules-for-15-member-states-to-increase-defence-spending/.

Court of Justice of the European Union (CJEU) Case 4/73, *Nold v Commission*, EU:C:1974:51.

Court of Justice of the European Union (CJEU) Case 44/79, *Hauer*, EU:C:1979:290.

Court of Justice of the European Union (CJEU) Case C-416/10, *Križan*, EU:C:2013:8.

Covenant of Mayors, 'Public-private partnership for a large scale building retrofit programme', Energy Cities, 2020, https://energy-cities.eu/wp-content/uploads/2020/07/Ljubljana_PPP-retrofitting_CoM_2020_en.pdf.

Decree No. 2002-120 of 30 January 2002 on the characteristics of decent housing (*Décret n° 2002-120 du 30 janvier 2002 relatif aux caractéristiques du logement décent*), https://www.legifrance.gouv.fr/loda/id/JORFTEXT000000217471/.

Decision No. 2021-825 DC of 13 August 2021 (Décision n° 2021-825 DC du 13 août 2021), https://www.legifrance.gouv.fr/jorf/id/JORFTEXT000043957268.

Decree No. 2021-19 of 11 January on energy performance criteria in the definition of decent housing in mainland France (*Décret n° 2021-19 du 11 janvier 2021 relatif au critère de performance énergétique dans la définition du logement décent en France métropolitaine*), https://www.legifrance.gouv.fr/jorf/id/JORFTEXT000042953125.

Décret n° 2011-807 du 5 juillet 2011 relatif à la transmission des diagnostics de performance énergétique à l'Agence de l'environnement et de la maîtrise de l'énergie, https://www.legifrance.gouv.fr/jorf/id/JORFTEXT000024317077/#:~:text=Le%20d%C3%A9cret%20pr%C3%A9voit%20en%20cons%C3%A9quence,territoriales%20d'y%20avoir%20acc%C3%A8s.

Dentons, 'The Energy Performance Contract: a sustainable investment to fast track energy efficiency?', 26 August 2019, https://www.dentons.com/en/insights/articles/2019/august/26/the-energy-performance-contract-a-sustainable-investment-to-fast-track-energy-efficiency.

Deslot, Q., Pache, Y., Cartier Da Costa, I., Thiebaut, A., Jeannet, B. et al., *Implementation of the EPBD France, status in 2020*, 2020, https://cdn1.gopublic.dk/epbd/Media/638373600341507794/Implementation-of-the-EPBD-in-France--Status-in-2020.pdf.

Directive (EU) 2016/943 of the European Parliament and of the Council of 8 June 2016 on the protection of undisclosed know-how and business information (trade secrets) against their unlawful acquisition, use and disclosure, https://eur-lex.europa.eu/eli/dir/2016/943/oj/eng.

Directive (EU) 2019/1024 of the European Parliament and of the Council of 20 June 2019 on open data and the re-use of public sector information, https://eur-lex.europa.eu/eli/dir/2019/1024/oj/eng.

Directive (EU) 2023/1791 of the European Parliament and of the Council of 13 September 2023 on energy efficiency and amending Regulation (EU) 2023/955 (recast), https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=OJ%3AJOL_2023_231_R_0001&qid=1695186598766.

Directive (EU) 2024/1275 of the European Parliament and of the Council of 24 April 2024 on the energy performance of buildings, https://eur-lex.europa.eu/eli/dir/2024/1275/oj/eng.

Eco Sklad, n.d., https://www.ekosklad.si/prebivalstvo/pridobite-spodbudo/seznam-spodbud.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor CINEA can be held responsible for them.

Ecovision, Home Energy Upgrades, Insulation, Solar & Retrofits, n.d., https://ecovision.ie/energy-upgrades-seai-grants-retrofits-ireland/home-energy-upgrades-insulation-solar-retrofits-ireland/.

Ecovision, Business Energy Upgrades, SEAI Grants & Retrofits, n.d., https://ecovision.ie/energy-upgrades-seai-grants-retrofits-ireland/business-energy-upgrades-retrofits-seai-grants-ireland/.

Ecovision, n.d., https://ecovision.ie/.

E-ehitus. Avaandmete info ja juhendid. https://livekluster.ehr.ee/ui/ehr/v1/infoportal/info

Erneuerbare-Wärme-Gesetz (EWG), BGBl. I Nr. 8/2024, available a, available at https://www.ris.bka.gv.at/NormDokument.wxe?Abfrage=Bundesnormen&Gesetzesnummer=20012541&FassungVom=2024-11-01&Paragraf=2&utm

Ervig, I., 'Renovation obligation: what you need to do now' (*Sanierungspflicht: Was du jetzt tun musst*), 2025, https://www.immobilienscout24.de/wissen/modernisieren/sanierungspflicht.html#:~:text=Unabh%C3%A4ngig%20von%20einem%20Eigent%C3%BCmerwechsel%20oder,konkret%3F%20Hierzu%20zwei%20typische%20Beispiele.

European Association for Storage of Energy (EASE), *EASE briefing on Energy Performance of Buildings Directive*, 2024, https://ease-storage.eu/wp-content/uploads/2024/05/2024.05.27-EASE-Analysis-on-Energy-Performance-of-Buildings-Directive.pdf.

European Climate Initiative EUKI, Energy Performance Certificate Database in Denmark, 2018, https://www.euki.de/wp-content/uploads/2018/09/fact-sheet-energy-performance-certificate-database-dk.pdf.

European Commission, *Guidance paper on EU regulation & public support for housing*, 2017, https://ec.europa.eu/futurium/en/system/files/ged/3._briefing_note_2016_social_housing_and_state_aid_for_services_of_general_economic.pdf.

European Commission, European Data Strategy, 2019, https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/europe-fit-digital-age/european-data-strategy_en.

European Commission, In focus: Energy efficiency in buildings, 2020, https://commission.europa.eu/news-and-media/news/focus-energy-efficiency-buildings-2020-02-17_en.

European Commission, Recovery and resilience facility (RRF) guiding template: Energy efficiency in buildings, 2023, https://competition-policy.ec.europa.eu/document/download/f38dcd94-689e-4de9-9747-765126f49438_en?filename=template_RRF_energy_efficiency_in_buildings_04042023.pdf.

European Commission, 'Commission welcomes political agreement on a new economic governance framework fit for the future', Press release, 10 February 2024, https://ec.europa.eu/commission/presscorner/detail/en/ip_24_711.

European Commission, Annex to the Communication to the Commission: Approval of the content of the draft Commission Notice providing guidance on new or substantially modified provisions of the recast Energy Performance of Buildings Directive (EU) 2024/1275: Databases for the energy performance of buildings (Article 22), 2025, https://energy.ec.europa.eu/document/download/74388e1e-ca33-4ae0-9e4a-900953873cf2_en?filename=Databases%20for%20the%20energy%20performance%20of%20buildings%20%28Article%2022%29%20-%20annex%205.pdf.

European Commission, Annex to the Communication to the Commission: Approval of the content of the draft Commission Notice providing guidance on new or substantially modified

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor CINEA can be held responsible for them.

provisions of the recast Energy Performance of Buildings Directive (EU) 2024/1275, 2025.

European Commission, Annex to the Communication to the Commission: Approval of the content of the draft Commission Notice providing guidance on new or substantially modified provisions of the recast Energy Performance of Buildings Directive (EU) 2024/1275: Energy performance certificates (Articles 19-21, Annex V) and independent control systems (Annex VI, 2025, https://energy.ec.europa.eu/document/download/ccef4a7a-6985-484d-aaef-a7d3a830fb0e_en?filename=Energy%20performance%20certificates%20%28Articles%2019-21%2C%20Annex%20V%29%20and%20independent%20control%20systems%20%28Article%2027%2C%20Annex%20VI%29%20-%20annex%203.pdf.

European Commission, Annex to the Communication to the Commission: Approval of the content of the draft Commission Notice providing guidance on new or substantially modified provisions of the recast Energy Performance of Buildings Directive (EU) 2024/1275: Financial incentives, skills and market barriers (Article 17) and one-stop-shops (Article 18), 2025, https://energy.ec.europa.eu/document/download/40f29e74-65a6-4a5d-ad1f-c20d9ff75f04_en?filename=Financial%20incentives%2C%20skills%20and%20market%20barriers%20%28Article%2017%29%20and%20one-stop%20shops%20%28Article%2018%29%20-%20annex%202.pdf.

European Commission, Minimum energy performance standards for non-residential buildings and trajectories for the progressive renovation of residential buildings (Article 9), 2025, https://energy.ec.europa.eu/document/download/205d9030-1a81-4c0e-aa65-af87b7a0b57d_en?filename=Minimum%20energy%20performance%20standards%20for%20non-residential%20buildings%20and%20trajectories%20for%20the%20progressive%20renovation%20of%20residential%20buildings%20%28Article%209%29%20-%20annex%201.pdf.

European Commission, Data Act explained, n.d., https://digital-strategy.ec.europa.eu/en/factpages/data-act-explained.

European Commission, Energy Performance of Buildings Directive, n.d., https://energy.ec.europa.eu/topics/energy-efficiency/energy-performance-buildings/energy-performance-buildings-directive_en.

European Commission, Financing for building renovations, n.d., https://energy.ec.europa.eu/topics/energy-efficiency/financing/financing-building-renovations_en.

European Commission, Renovate Europe, n.d., https://www.renovate-europe.eu/funding-for-energy-renovation/.

European Commission: Eurostat and European Investment Bank (EIB), *A guide to the statistical treatment of energy performance contracts: May 2018,* European Investment Bank, 2018, https://data.europa.eu/doi/10.2867/677198.

European Commission: Executive Agency for Small and Medium-sized Enterprises, Volt, J., Toth, Z., Glicker, J., De Groote, M. et al., *Definition of the digital building logbook – Report 1 of the study on the development of a European Union framework for buildings' digital logbook*, Publications Office of the European Union, Luxembourg, 2020, https://data.europa.eu/doi/10.2826/480977

European Court of Human Rights (ECtHR), *Fredin v Sweden*, no. 12033/86, 18 Feb 1991.

European Court of Human Rights (ECtHR), *Hamer v Belgium*, no. 21861/03, 27 Nov 2007.

European Court of Human Rights (ECtHR), *James and Others v United Kingdom*, 21 Feb 1986.

European Court of Human Rights (ECtHR), *Sporrong and Lönnroth* v Sweden, 23 Sept 1982.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor CINEA can be held responsible for them.

European Parliament, The EU framework for fiscal policies, n.d., https://www.europarl.europa.eu/factsheets/en/sheet/89/the-eu-framework-for-fiscal-policies.

European Parliament: Directorate-General for Parliamentary Research Services, *Introduction to the fiscal framework of the EU : the Maastricht treaty, the treaty on stability, coordination and governance in the economic and monetary Union, and the stability and growth pact*, Publications Office of the European Union, Luxembourg, 2021, https://data.europa.eu/doi/10.2861/072030.

FiCompass, *Residential energy efficiency financial instruments in Lithuania*, n.d., https://www.fi-compass.eu/sites/default/files/publications/Residential%20energy%20efficiency%20financial%20instruments%20in%20Lithuania_2.pdf.

French Directorate for Legal and Administrative Information (Prime Minister), 'The less well insulated heat strainers can no longer be rented', 2025, https://www.service-public.fr/particuliers/actualites/A17975?lang=en#:~:text=Since%201,from%20the%20beginning%20of%202025.

German Building Energy Act (*Gebäudeenergiegesetz*, GEG), https://www.gesetze-im-internet.de/geg/

Global ESCO Network, UN Environment Programme (UNEP), *Regulatory barriers for energy service companies: perspectives based on feedback from national ESCO associations*, 2022, https://unepccc.org/wp-content/uploads/2022/11/perspectives-2022-regulatory-barriers-for-energy-service-companies-perspectives-based-on-feedback-from-national-esco-associations.pdf.

Godt, C. and Meyerholt, U., 'Obligations for owners to climate-proof buildings in Germany', *European Property Law Journal,* Vol. 13, Issue 1, 2024, pp. 77-103, https://doi.org/10.1515/eplj-2024-0005.

GBCe, *Green building council España: GBCe country report,* 2021, https://gbce.es/documentos/GBCe-Country-Report-2021.pdf.

Green Finance Institute, *Unsecured green home loans: consumer protection and scale in international markets*, 2024, https://www.greenfinanceinstitute.com/wp-content/uploads/2024/11/International-Consumer-Protections-and-Green-Loans.pdf.

Hoops, B., Akkermans, B. and Von Samsonow, W., 'Obligations for owners to climate-proof buildings: A theoretical and comparative analysis', *European Property Law Journal,* Vol. 13, Issue 1, 2024, https://doi.org/10.1515/eplj-2024-0002.

Hormigos Feliu, C., Florio, P., Dijkstra, I., Auteri, D. and Bertozzi, C., *Exploring rural energy poverty and needs - Rural households spend more on energy but lead in renovations*, Publications Office of the European Union, Luxembourg, 2025, https://data.europa.eu/doi/10.2760/9160880, JRC142243.

Iberdrola, Energy rehabilitation, n.d., https://www.iberdrola.es/en/energy-efficiency/energy-rehabilitation.

IMO, Estonian National Register of Buildings', Open data, n.d., https://imo.ut.ee/en/infrastructure/estonian-open-government-data/estonian-national-register-of-buildings-open-data/#:~:text=The%20open%20data%20contains%20information,labels%2C%20and%20related%20cadastral%20units.

International Energy Agency, *Data sharing guidelines for buildings and HVAC systems*, Energy in Buildings and Communities Technology Collaboration Programme, 2023, https://www.iea-ebc.org/Data/publications/IEA%20Annex%2081%20Activity%20A1%20-%20A%20Data%20Sharing%20Guideline%20for%20Buildings%20and%20HVAC%20Systems%20(final).pdf.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor CINEA can be held responsible for them.

International Energy Agency (IEA), Oil Boiler Installation Ban Act, International Energy Agency Policies Database, n.d., https://www.iea.org/policies/18136-oil-boiler-installation-ban-act.

Jacques Delors Institute, *Promoting local skills and accelerating the Green Deal*, Policy paper, 2025, https://institutdelors.eu/content/uploads/2025/06/PP312_Building_decarbonization_affordable_housing_Voita_EN_3.pdf.

Jiménez de Alvear, B., 'Architecture and Intellectual Property: Is it possible to protect a building?', Blog, Garrigues, 2023, https://blogip.garrigues.com/en/intellectual-property/architecture-and-intellectual-property-is-it-possible-to-protect-a-building.

Josipović, T. and Ernst, H., 'Constitutional protections of property and energy-efficient housing in Croatia', *Journal of Agricultural and Environmental Law* , Vol. 18, Issue 35, 2023, pp. 178–198, https://real.mtak.hu/183677/1/12%20Tatjana%20JOSIPOVI%C4%86%20%E2%80%93%20Hano%20ERNST.pdf.

Joye, J., Vern, F. and Morin Guerry, A., 'Obligations for owners to climate-proof buildings in France', *European Property Law Journal,* Vol. 13, Issue 1, https://doi.org/10.1515/eplj-2024-0004.

Karens, J. and Hoops, B., 'Obligations for owners to climate-proof buildings in the Netherlands', *European Property Law Journal,* Vol. 13, Issue 1, 2024, pp. 161-189, https://doi.org/10.1515/eplj-2024-0009.

Keliauskaite, U., McWilliams, B., Sgaravatti, G. and Tagliapietra, S., 'How to finance the European Union's building decarbonisation plan', Bruegel, 2024, https://www.bruegel.org/policy-brief/how-finance-european-unions-building-decarbonisation-plan.

Kreditanstalt für Wiederaufbau (KfW), 'KfW's programmes for energy-efficient construction and refurbishment have positive impacts on the climate and public coffers', Press release, 4 June 2018, https://www.kfw.de/About-KfW/Newsroom/Latest-News/Pressemitteilungen-Details_472512.html.

Kołodziejczyk, K., *The 2024 reform of the European Union's economic governance framework as a response to contemporary challenges*, 2024, doi: 10.33067/SE.4.2024.3.

Kommuninvest, *Green bonds impact report*, 2023, https://kommuninvest.se/download/18.35de2c7b1900fda7e621c217/1720389859649/Green-Bonds-Impact-Report-2023.pdf.

Kommuninvest, Green Bond Framework, June 2024, https://kommuninvest.se/download/18.35de2c7b1900fda7e62e7b0/1719409479334/Kommuninvest_Green%20Bond%20Framework-FINAL240626.pdf.

Kommuninvest, About us, n.d., https://kommuninvest.se/eng/homepage/aboutus.4.35de2c7b1900fda7e6273e1.html.

Kommuninvest, Green bonds, n.d., https://kommuninvest.se/eng/homepage/investors/funding/greenbonds.4.35de2c7b1900fda7e62576f.html.

Law No. 2021-1104 of 22 August 2021 on combating climate change and strengthening resilience to its effects (*Loi n° 2021-1104 du 22 août 2021 portant lutte contre le dérèglement climatique et renforcement de la résilience face à ses effets*) (Climate and Resilience Law), https://www.legifrance.gouv.fr/loda/id/JORFTEXT000043956924.

Law No. 2024-1039 of 19 November 2024 aimed at strengthening the tools for regulating tourist accommodation at the local level (*Loi n° 2024-1039 du 19 novembre 2024 visant à renforcer les outils de régulation des meublés de tourisme à l'échelle locale*),

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor CINEA can be held responsible for them.

https://www.legifrance.gouv.fr/jorf/id/JORFTEXT000050612711.

Lee, G., 'Green investors flock to Kommuninvest four year paper, Global Capital, 29 August 2023, https://www.globalcapital.com/article/2c4eonc4qhn8y242m5szl/ssa/supras-and-agencies/green-investors-flock-to-kommuninvest-four-year-paper.

Libório, P. et al., *The logbook data quest: Setting up indicators and other requirements for a renovation passport,* 2018, https://www.oneplanetnetwork.org/sites/default/files/ibroad-the-logbook-data-quest.pdf.

Linklaters, 'EU "Fit for 55": The revamped Energy Performance of Buildings Directive – lion's teeth or paper tiger?', Linklaters Sustainable Futures, 2024, https://sustainablefutures.linklaters.com/post/102j498/eu-fit-for-55-the-revamped-energy-performance-of-buildings-directive-lions.

Maia, I., Kranzl, L., Zuhaib, S. and Broer, R., *Introductory Reports, EPC databases*, 2021, https://x-tendo.eu/wp-content/uploads/2021/03/X-TENDO_MINI_6_EPC-Databases_04.pdf.

Milieu central, Veelgestelde vragen energielabel woningen, n.d., https://www.energielabel.nl/woningen/veelgestelde-vragen-energielabel-woningen/.

Ministry for Ecological Transition, *Renting and rent freeze for energy-inefficient properties*, 7 January 2025, https://www.ecologie.gouv.fr/politiques-publiques/location-gel-loyers-passoires-energetiques.

Ministry of Climate and Environment, *Guidelines for Energy Performance Contracts*, 2023, https://www.gov.pl/web/klimat/wytyczne-do-umow-o-poprawe-efektywnosci-energetycznej.

Ministry of Economy, Commerce and Enterprise, ICO MIVAU Rehabilitación de Edificios Residenciales, n.d., https://www.ico.es/web/guest/ico-mitma-rehabilitaci%C3%B3n-de-edificios-residenciales/tipos-de-interes.

Ministry of Housing and Urban Agenda (MIVAU), Programme for energy-efficiency improvements at dwelling level, n.d., https://www.mivau.gob.es/ministerio/proyectos-singulares/prtr/vivienda-y-agenda-urbana/programa-de-ayuda-las-actuaciones-de-mejora-de-la-eficiencia-energetica-en-viviendas.

Ministry of Housing and Urban Agenda (MIVAU), Programme supporting the building logbook and technical projects, n.d., https://www.mivau.gob.es/ministerio/proyectos-singulares/prtr/vivienda-y-agenda-urbana/programa-de-ayuda-la-elaboracion-del-libro-del-edificio-existente-para-la-rehabilitacion-y-la-redaccion-de-proyectos-de-rehabilitacion.

Ministry of Housing and Urban Agenda (MIVAU), The building-level renovation programme, n.d., https://www.mivau.gob.es/ministerio/proyectos-singulares/prtr/vivienda-y-agenda-urbana/programa-de-ayuda-las-actuaciones-de-rehabilitacion-nivel-de-edificio.

Müller, A., 'Renovation obligation 2025: expert tips for homeowners' (*Sanierungspflicht 2025: Expertentipps für Hausbesitzer*), Blog, 2025, https://www.enter.de/blog/sanierungspflicht.

Nicoletti, F., Carpino, C., Barbosa, G., Domenico, A., Arcuri, N. and Almeida, M., 'Building renovation passport: A new methodology for scheduling and addressing financial challenges for low-income households', *Energy and Buildings*, Vol. 331, 2025, 115353, https://doi.org/10.1016/j.enbuild.2025.115353.

ParisRental, 'What to do if my apartment classed at G on DPE is prohibited for rental in 2025?', Blog, 2023, https://en.parisrental.com/blog/landlords-guide/what-to-do-if-my-apartment-classed-at-g-on-dpe-is-prohibited-for-rental-in-2023#:~:text=energy%20renovation,conformity%20of%20the%20dwelling.

Perrotin, F., 'Strengthening the reliability and supervision of the DPE' (*Renforcer la fiabilité et l'encadrement du DPE*), Actu-Juridique, 2025, https://www.actu-juridique.fr/fiscalite/fiscal-finances/renforcer-la-fiabilite-et-lencadrement-du-

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor CINEA can be held responsible for them.

dpe/#:~:text=propri%C3%A9taires%20%C3%A0%20r%C3%A9habiliter%20leur%20bien,propri%C3%A9taires%20concern%C3%A9s%20ont%20peu%20entrepris.

Recovery, Transformation and Resilience Plan (PRTR), https://planderecuperacion.gob.es/noticias/conoce-ayudas-europeas-rehabilitacion-viviendas-prtr.

Renov, MaPrimeRénov' for a major renovation, n.d., https://france-renov.gouv.fr/aides/maprimerenov-renovation-ampleur.

RENOVATE Europe, PPP Renovation Financing Programme, Ljubljana, n.d., https://www.renovate-europe.eu/national-initiatives/slovenia/.

République Francaise, DPE logements existants (depuis juillet 2021), https://www.data.gouv.fr/datasets/dpe-logements-avant-juillet-2021/.

ReScoop.EU, *Directive (EU) 2024/1275 (recast European Performance of Buildings Directive)*, 2024, https://www.rescoop.eu/uploads/rescoop/downloads/EPBD-Policy-Briefing-2nd-Generation-of-Energy-Communities-Legislation.pdf.

ReScoop.EU, *Best Practice Guide*, n.d., https://www.rescoop.eu/uploads/rescoop/downloads/D4.1.1_Best_Practice_Guide.pdf.

Ricketson, S, and Suthersanen, U., 'The design/copyright overlap: is there a resolution?', in: Wilkof, N., Basheer, S. and Calboli, I. (Eds.), *Overlapping Intellectual Property Rights* (2nd edition), Oxford, 2023, https://doi.org/10.1093/oso/9780192844477.003.0008.

Rijksdienst voor Ondernemend, Handleiding EP-online.nl voor EP-adviseurs, versie 9.0 2024, https://www.rvo.nl/sites/default/files/2025-02/handleiding-ep-online-voor-energieadviseurs-2024-versie-9.pdf.

Rijksoverheid, n.d., https://www.ep-online.nl/.

Rijksoverheid, Privacy, n.d., https://www.rijksoverheid.nl/privacy.

Royal Decree 853/2021, of 5 October, regulating aid programmes for residential renovation and social housing under the Recovery, Transformation and Resilience Plan, https://www.boe.es/buscar/doc.php?id=BOE-A-2021-16233.

Seinre, E., Kurnitski, J., Kuusk, K. and Tamm, R., *Implementation of the EPBD Estonia, status in 2020*, 2020, https://cdn1.gopublic.dk/epbd/Media/638373600922977170/Implementation-of-the-EPBD-in-Estonia.pdf.

SGG, construction cluster, n.d., https://www.sgg.si/en/.

Sibileau, H., Buildings Performance Institute Europe (BPIE), *Delivering the EPBD: a guide towards better, affordable and more resilient buildings for all in Europe*, 2025, https://www.bpie.eu/wp-content/uploads/2025/05/BPIEs-Guide-to-EPBD-Implementation-final-version.pdf.

Simón Moreno, H. and Garcia Teruel, R., 'Obligations for owners to climate-proof buildings in Spain', *European Property Law Journal,* Vol. 13, Issue 1, 2024, pp. 127-149, https://doi.org/10.1515/eplj-2024-0007.

Sustainable Energy Authority of Ireland (SEAI), Home grants, n.d., https://www.seai.ie/grants/home-energy-grants.

Sustainable Energy Authority of Ireland (SEAI), Sustainable energy communities: understanding their formation and progression to individual action, n.d., https://www.seai.ie/sites/default/files/publications/secs-focused-impact-analysis.pdf.

Taranu, V. and Zuhaib, S., *eXTENDing the energy performance assessment and certification schemes via a modular approach,* 2022, https://x-tendo.eu/wp-content/uploads/2020/01/x-tendo-F6.pdf

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor CINEA can be held responsible for them.

TeraBee, *People counters : Powering data-driven decisions in GDPR-compliant smart buildings*, 2024, https://www.terabee.com/people-counters-powering-data-driven-decisions-in-gdpr-compliant-smart-buildings/

JurisHebdo, 'The Constitutional Council approves the climate and resilience bill' (*Le Conseil constitutionnel valide le projet de loi climat et résilience*), *JurisHebdo*, 18 August 2021, https://jurishebdo.fr/le-conseil-constitutionnel-valide-le-projet-de-loi-climat-et-resilience/#:~:text=L%20e%20Conseil%20constitutionnel%20a,d%C3%A9cision%20du%2013%20ao%C3%BBt%202021.

UNECE, Summary of *Križan* (property and permit annulment), 2013, https://unece.org/fileadmin/DAM/env/pp/a.to.j/Jurisprudence_prj/EUROPEAN_UNION/CJEU_C416-10_Krizan/EU_2013_C416_10_Krizan.pdf.

Van Cruchten, G., Netherlands Enterprise Agency (RVO), *Implementation of the EPBD: The Netherlands, status in 2020*, 2020, https://cdn1.gopublic.dk/epbd/Media/638373597704805777/Implementation-of-the-EPBD-in-The-Netherlands-2020.pdf.

Voïta, T. and Coupechoux, S., *Building decarbonization and affordable housing: Promoting local skills and accelerating the green deal,* Policy paper, Jacques Delors Institute, 2025, https://institutdelors.eu/content/uploads/2025/06/PP312_Building_decarbonization_affordable_housing_Voita_EN_3.pdf.

Whittington, E., *Buildings renovation: low-hanging fruit for emissions savings*, Corporate Leaders Group: Business Leadership for a Climate Neutral Economy, University of Cambridge, 2018, https://www.corporateleadersgroup.com/reports-evidence-and-insights/news-items/blog-buildings-renovation-low-hanging-fruit-for-emissions-savings#:~:text=But%20this%20will%20only%20happen,investment%20by%20business%20and%20homeowners.

World Wide Fund for Nature (WWF) EU, *Bridging the renovation gap; A comprehensive financing strategy for EU residential buildings*, 2025, https://wwfeu.awsassets.panda.org/downloads/bridging-the-renovation-gap.pdf.

X-tendo, *Feature 6: EPC databases*, 2020, https://x-tendo.eu/wp-content/uploads/2020/01/x-tendo-F6.pdf

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor CINEA can be held responsible for them.

Annex 2: EU support for deep renovation

Table 1: EU funding sources for deep renovation

Funding source	Scope and potential to fund deep renovation	Type of support and potential to support a refinancing facility	Key considerations
European Regional Development Fund (ERDF) and Cohesion Fund (CF)	Investments in energy efficiency upgrades of public and private buildings, as well as improvements of district heating networks and co-generation. CF specifically in less-developed Member States[290], in addition to ERDF.	Grants and financial instruments (e.g. revolving funds, guarantee funds).	Funding should be aligned with national or regional Ops.
Just Transition Fund (JTF) under Just Transition Mechanism	Investments in energy efficiency and improvements in district heating networks.	Grants and financial instruments.	Funding should be aligned with approved just transition plans; scope for renovation measures may be limited (e.g. must be in just transition regions).
Recovery and Resilience Facility (RRF)	Investments in energy efficiency renovation of existing housing stock and public infrastructure (including large-scale renovation, energy upgrades, deep retrofits), construction of new energy efficient buildings, as	Grants and loans.	Support should be aligned with national recovery and resilience plans, less flexibility at local level.

[290] In the 2021-2027 programming period, this covers 15 Member States: Bulgaria, Croatia, Cyprus, Czechia, Estonia, Greece, Hungary, Latvia, Lithuania, Malta, Poland, Portugal, Romania, Slovakia, Slovenia.

Funding source	Scope and potential to fund deep renovation	Type of support and potential to support a refinancing facility	Key considerations
	well as in-district heating networks and co-generation.		
LIFE Clean Energy Transition	Support for: building policy frameworks supporting the clean energy transition; accelerating technology rollout, new services and business models and skills development; development of local and regional investment projects; involving and empowering citizens in the clean energy transition.	Pilot/demonstration projects and awareness-raising/knowledge sharing (e.g. platforms, one-stop-shops).	Applications centralised at EU level (more competition than funds at national level) and in line with multiannual fund programmes. Good for de-risking new technologies/methods but projects can be small/demonstration scale and might require cross-border partners.
Horizon Europe Cluster 'Climate, Energy and Mobility'	Support for research and innovation, under 'Climate, Energy and Mobility' cluster. 2023-2025 work programme[291] includes calls for proposals under 'highly energy efficient and climate neutral European building stock'.	Innovation projects and knowledge development.	Applications centralised at EU level (more competition than funds at national level) and in line with multiannual fund programmes. Good for de-risking new technologies/methods but might require cross-border partners.
Social Climate Fund (SCF)	Mitigating social impacts of green transition, addressing energy and mobility poverty, measures can include building renovations, access to	Grants or subsidies for interest rates/loan guarantees.	Support based on approved social climate plans.

[291] European Commission, Horizon Europe Work Programme 2023-2025, 8. Climate, Energy and Mobility, 2024, https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/wp-call/2023-2024/wp-8-climate-energy-and-mobility_horizon-2023-2024_en.pdf.

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Funding source	Scope and potential to fund deep renovation	Type of support and potential to support a refinancing facility	Key considerations
	affordable energy efficient housing, provision of affordable energy efficiency solutions and appropriate funding instruments, as well as awareness-raising.		
InvestEU Programme	Sustainable infrastructure, including energy efficiency/renovation of buildings, energy systems, building-grid interaction, smart buildings.	Guarantees, loans, equity investments, blending public and private capital, intermediated finance by the EIB and other implementing partners.	Significant private capital can be leveraged via the EU guarantee, good for riskier or innovative projects but loans/debt should be repaid, and financial viability of projects must be proved to the financial intermediaries.
Public sector loan facility under Just Transition Mechanism	Investments in energy efficiency and integration measures, including renovations and conversions of buildings.	Blending EIB loans and EU grants for projects implemented by public sector entities or entities acting on their behalf or with a public mission.	Good for projects that do not generate sufficient revenue but must be in just transition regions.
Modernisation Fund	Energy efficiency measures in buildings, investments in lower-income EU countries.[292]	Can fund grants, interest subsidies, first loss tranches, and technical assistance and can be blended with other EU funds (e.g. InvestEU, ERDF/CF, JTF).	Financing must be approved by EIB and European Commission. Requires State aid clearance and a strong pipeline of projects.

[292] Currently, the Modernisation Fund covers 13 Member States: Bulgaria, Croatia, Czechia, Estonia, Greece, Hungary, Latvia, Lithuania, Poland, Portugal, Romania, Slovakia, Slovenia.

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Table 2: EU advisory services relevant for deep renovation

Service	Support provided	Key considerations
European Investment Advisory Hub at the EIB	Advisory and capacity-building, project development support throughout all stages of project cycle (from pre-feasibility to financing), financial advice to structure investments and access InvestEU/other EU finance.	Accessible for public and private project promoters, intermediaries. Facilitates access to a wide range of advisory and technical assistance programmes and initiatives in the EU and provides a cooperation platform; Does not provide grants for works and outcomes depend on agreed mandate scope.
European Local ENergy Assistance (ELENA) at the EIB	Technical assistance for energy efficiency and renewable energy investments targeting buildings and innovative urban transport - grants (up to 90%) for project development (including audit, design, organisational set-up).	Accessible for cities, regions, public bodies, housing providers, sometimes private promoters via public intermediaries. Should ensure a bankable pipeline of projects and meet investment leverage and deadlines.
Joint Assistance to Support Projects in European Regions (JASPERS) at the EIB	Support through the entire project cycle, technical training and capacity-building to aid promoters to secure EU funding under Cohesion Policy.	Provides free assistance to national, regional and local authorities. Focus is on Cohesion Policy Ops.
Financing instruments advisory (fi-compass)	Advice on financial instruments under EU Cohesion Policy funds (including ERDF and CF).	Aimed at managing authorities, but offers information on the functioning and use of financial instruments under ERDF/CF.
European City Facility under Horizon 2020	Small and fast grants for developing investment concepts, feasibility studies and other preparatory work for sustainable energy projects and climate action planning.	Accessible specifically for municipalities/local authorities. Provides financial resources for the early stages of project development and access to further investment support and can be a good first step before using ELENA.

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Service	Support provided	Key considerations
ManagEnergy	Supports regional and local energy agencies to become leaders in energy transition and accelerate sustainable energy investments in regions and cities.	Provides information, know-how, visibility, and networking opportunities, masterclasses and expert missions for skill and capacity development in energy agencies.
Smart EPC	Horizon 2020-funded project for integration of energy efficiency services with other services, focusing on EnPC and the creation of new revenue streams for local authorities.	Provides know-how, capacity-building and documentation for replication among its services.
European PPP Expertise Centre	Exchange of good practices and guidance, assistance in policy development for legal and regulatory frameworks on PPPs, support for PPP project preparation.	Supports public sector entities to deliver PPPs.

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The EPBD.wise consortium