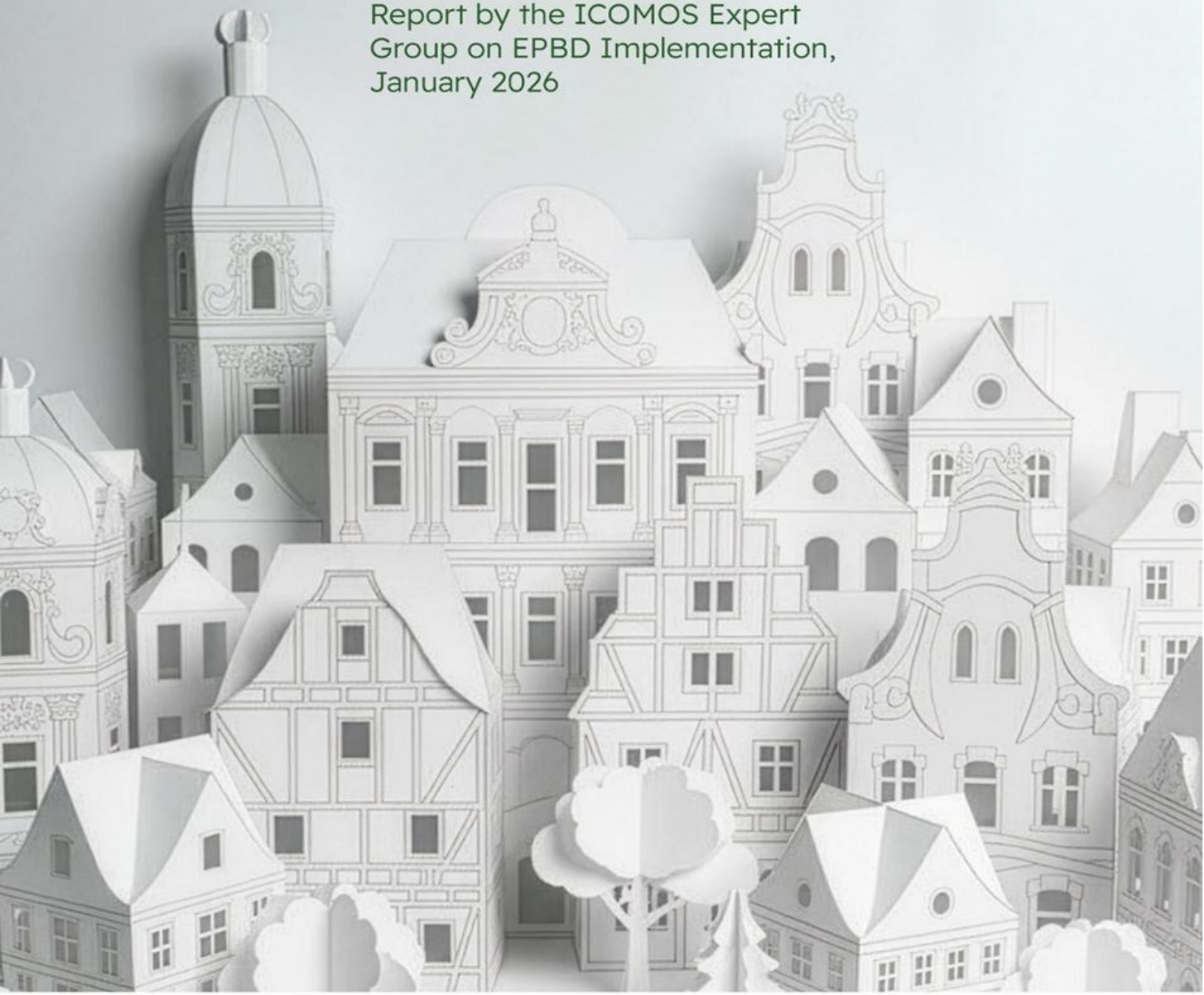
European Energy Performance of Buildings Directive and Cultural Heritage

Report by the ICOMOS Expert Group on EPBD Implementation, January 2026



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ICOMOS Expert Group on EPBD Implementation

Report

European Energy Performance of Buildings Directive and Cultural Heritage

January 2026

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Executive Summary

As Member States prepare for the 2026 transposition of the EPBD, heritage-sensitive discussion and clear guidance is urgently needed to avoid unintended impacts on Europe's historic built environment. This report provides evidence-based insights to support balanced and context-specific implementation.

Context and Objectives

This report summarises the work of the ICOMOS Expert Group on the Implementation of the Energy Performance of Buildings Directive (EPBD) in the Built Heritage Sector, established in 2023 to evaluate the impact of the EPBD recast on Europe's historic buildings.
Adopted under the European Green Deal, the recast Directive introduces Minimum Energy Performance Standards (MEPS), Zero-Emission Building (ZEB) targets, and life-cycle carbon assessment obligations. These measures represent a significant step towards climate neutrality, but they also present complex challenges for culturally and architecturally significant buildings.

The Expert Group gathered evidence from over nineteen EU and non-EU countries through national fact sheets, thematic analyses, and case studies. Executive summary distills the main findings, strategic recommendations, and future priorities emerging from this research.

Key Findings

1. **Fragmented and Inconsistent Implementation**
   National approaches to the EPBD vary widely. Exemptions for listed buildings exist in most countries but differ in scope and interpretation, creating inconsistencies between energy and heritage legislation. Regional disparities further fragment implementation.
2. **Defining (Heritage) Value**
   The removal of the "architectural merit" clause from the final text of EPBD (2023–2024) limited exemptions and mitigations to officially listed buildings. This change leaves vernacular and unlisted heritage exposed to unsympathetic

retrofits. Countries such as Belgium, Sweden, Germany, and Ireland show that flexible, context-based definitions can safeguard broader categories of cultural value.

3. **Data Deficit and Monitoring Gaps**
   There is no harmonised dataset for heritage buildings for Europe. The ESPON HERMES project (2025) and ICOMOS surveys reveal that maintenance and condition indicators—critical for understanding energy performance—are largely absent. The need for integrated cultural–energy data systems is urgent.
4. **Retrofit Strategies and Technical Challenges**
   Current retrofit approaches prioritise technology over traditional knowledge. Poorly conceived retrofits can increase waste and degrade building fabric. Initiatives such as FuturHist demonstrate the viability and effectiveness of passive, reversible interventions that respect authenticity while improving performance.
5. **Maintenance as a Strategy**
   Routine maintenance is one of the most effective, low-carbon interventions available. It can reduce energy consumption by up to 40%, prolong the building's lifespan, and reduce embodied carbon. Maintenance should be recognised as a core energy-efficiency strategy within the EPBD framework.
6. **Capacity and Knowledge Gaps**
   The lack of interdisciplinary expertise remains a major barrier. Standards like EN 16883:2017 (Conservation of cultural heritage - Guidelines for improving the energy performance of historic buildings) provide strong foundations but are rarely implemented. Expanding training for professionals in both conservation and energy disciplines is essential to bridge knowledge divides.

Strategic Implications and Recommendations

Europe’s green transition must build upon its cultural foundations. Europe’s path toward climate neutrality must be one that values its past as much as its future. Historic buildings are living witnesses of our shared heritage, identity, and craftsmanship – yet they are too often overlooked or treated as obstacles in the race towards energy efficiency. Historic buildings are living assets – repositories of craft, identity, and embodied energy. Their continued use and adaptation are critical for achieving climate neutrality. The implementation of the Energy Performance of Buildings Directive (EPBD) presents a crucial opportunity to change that narrative.

To ensure that the green transition strengthens rather than endangers our cultural heritage, stronger coordination and understanding between the cultural, energy, and environmental sectors are essential. Policies must reflect that heritage buildings require tailored, knowledge-based approaches that respect their materials, authenticity, and long-term sustainability.

The Expert Group recommends the following actions:

- Integrate heritage into climate policy: Recognise the significance of the embodied carbon of existing buildings to climate action and to avoid carbon across EU and national strategies.
- Clarify and harmonise exemptions: Issue EU-level interpretative guidance to balance flexibility and accountability.
- Encourage mitigations and flexible solutions: Support innovation to improve the energy efficiency of historic buildings
- Invest in data infrastructure and management: Support interoperable, open-access databases with heritage-specific indicators.
- Promote cross-sector coordination: Foster cooperation among ministries of culture, energy, construction and environment.
- Strengthen capacity building: Fund interdisciplinary training and demonstration projects linking energy performance with conservation practice.
- Strengthen technical guidance: Provide harmonised protocols for heritage-sensitive energy retrofitting, integrating reversibility and material compatibility.
- Encourage innovation and adaptive reuse: Support research and circular economy approaches that prioritise repair and reuse over demolition.
- Incentivise local innovation: Encourage demonstration projects, adaptive reuse strategies, and district-level interventions with strong heritage dimensions.
- Encourage the implementation of less energy-consuming heating/ ventilation systems.

- Introduce “building manuals”/instructions for owners and users on how to use and maintain their building in the most energy efficient way and maintain thermal comfort with passive strategies

Future Directions

The Expert Group proposes the creation of a European Observatory on Heritage and Climate Transition—a collaborative platform under ICOMOS and European institutions to coordinate data, exchange best practices, and align policies. The Observatory would connect initiatives such as ARCHE, FuturHist, and ICOMOS Climate Action programmes, positioning cultural heritage as a driver of Europe’s green transition.

Conclusion

Historic buildings are not barriers to decarbonisation—they are part of the solution. By valuing repair, reuse, and informed adaptation, Europe can advance its climate goals while preserving the architectural and cultural values that define its identity. The EPBD’s implementation represents a historic opportunity to make conservation a cornerstone of a sustainable, low-carbon future.

Key messages for policymakers:

- Historic buildings are not barriers to decarbonisation, but part of the solution through repair, reuse and informed adaptation.
- EPBD implementation requires flexible, knowledge-based approaches to avoid unintended damage to cultural heritage.
- Stronger coordination between energy, construction and heritage sectors is essential to achieve climate neutrality.

Introduction

Context of the EPBD recast (2023) leading to establishment of the ICOMOS EG EPBD working group

The European Building Performance Directive (EPBD) addresses the urgent need to lower carbon emissions and energy consumption from the built environment and will impact all buildings within the EU. However, the EPBD needs to recognise in addition to energy efficiency not only the cultural and social value of the totality of the historic built environment, but also the need for a different approach when dealing with historic buildings.

ICOMOS is an international non-governmental organisation that works for the conservation of monuments and sites worldwide and serves as a UNESCO advisory group on World Heritage. ICOMOS is not limited to World Heritage, but focuses on recognition and protection of cultural heritage, which includes not only protected historic buildings but also everyday homes, shops & city centres, etc., that form the collective fabric of our past.

ICOMOS is a global body of experts that initiates discussions, research and activities in diverse questions concerning heritage through its national committees, international scientific committees and working groups. ICOMOS approaches with its activities and doctrinal texts international and national heritage institutions and frameworks providing expertise for legislation, management, research, practices, etc.

Historic buildings hold immense value for our shared heritage. Their continued existence and use also showcases their durability and adaptability. As the need to cut carbon emissions and reduce energy use grows more urgent, these buildings face another challenge. To create a sustainable future, historic buildings need to be part of the equation, but the methods used to achieve a low-carbon future should differ from the standard solutions applied in modern architecture.

Heritage buildings must be valued for their already embodied energy and repair potential. Following the principle outlined in the Venice Charter, one of the signatory ICOMOS' charters, "as much as necessary and as little as possible", is key to building conservation and preservation, and we cannot have a sustainable future without first securing our past.

Therefore, the ICOMOS Expert Group on the Implementation of the Energy Performance of Buildings Directive (EPBD) in the Built Heritage Sector (EG EPBD WG), was established in 2023 to assess the impact of the EPBD recast on historic buildings across Europe.

As the implementation of the Energy Performance of Buildings Directive (EPBD) advances, it is crucial that the heritage sector is involved in shaping its application. Historic buildings represent a significant part of Europe's built environment and cultural identity, and their specific needs must be carefully integrated into energy performance measures and sustainability strategies. This is also recognised by BUILD UP, the European reference portal for energy efficiency and renewable energy in buildings.

Refurbishing historic buildings in line with contemporary energy standards can be more costly—both financially and environmentally and must be considered carefully. Poorly conceived or fitted retrofit installations may lead to unintended consequences, including poor indoor air quality, dampness, health issues, and structural problems. Evidence from the Concerted Action Energy Performance of Buildings (CA EPBD) report on the energy efficiency of heritage buildings confirms that retrofitting heritage assets generally involves higher costs and greater complexity than modern constructions. However, poor quality, and often inaccurate, assessments of the actual energy performance of these buildings can lead to over-specification and wasteful retrofitting solutions.

Furthermore, attention must be drawn to the fact that many EU-funded projects intended to promote sustainability have, in some cases, had negative impacts on cultural heritage and contributed to future waste—through inappropriate interventions such as wall insulation, PVC windows or the insensitive placement of solar panels.

To mitigate these risks, the adoption of the European Quality Principles for EU-funded Interventions with Potential Impact upon Cultural Heritage and the systematic use of Heritage Impact Assessments (HIA) should be strongly promoted. Integrating these tools and principles into the EPBD framework will ensure that energy efficiency and heritage conservation work hand in hand—supporting Europe's twin goals of sustainability and cultural preservation.

The Krakow Declaration "New European Bauhaus: Heritage & Transformation", jointly issued by ACE, Europa Nostra and ICOMOS, puts forward 7 key recommendations for the future of Europe's built environment, from favoring renovation and adaptive reuse, embracing innovation and traditional knowledge, upskilling and citizens' participation, to quality criteria, peer-learning and risk management and preparedness.

Methodology used by the ICOMOS EPBD WG

EG EPBD WG collected data from the EU and non-EU countries, especially as many of the latter follow the European principles in mitigating climate change. The comparative analysis highlights both the ambitions and the challenges faced by different Member States in implementing the EPBD, reflecting the diversity of administrative and cultural frameworks across Europe. These variations should not be seen as inconsistencies but

as evidence of context-specific approaches that offer opportunities for adaptable, interoperable models.

A fact sheet template was designed to gather comparable information across countries, covering legislation, implementation practices, technical solutions, exemptions, and strategic plans. The paper is supported by a country-based report.

Responses showed wide variation in national approaches, particularly in how exemptions are framed and what kind of buildings are targeted by renovation incentives.

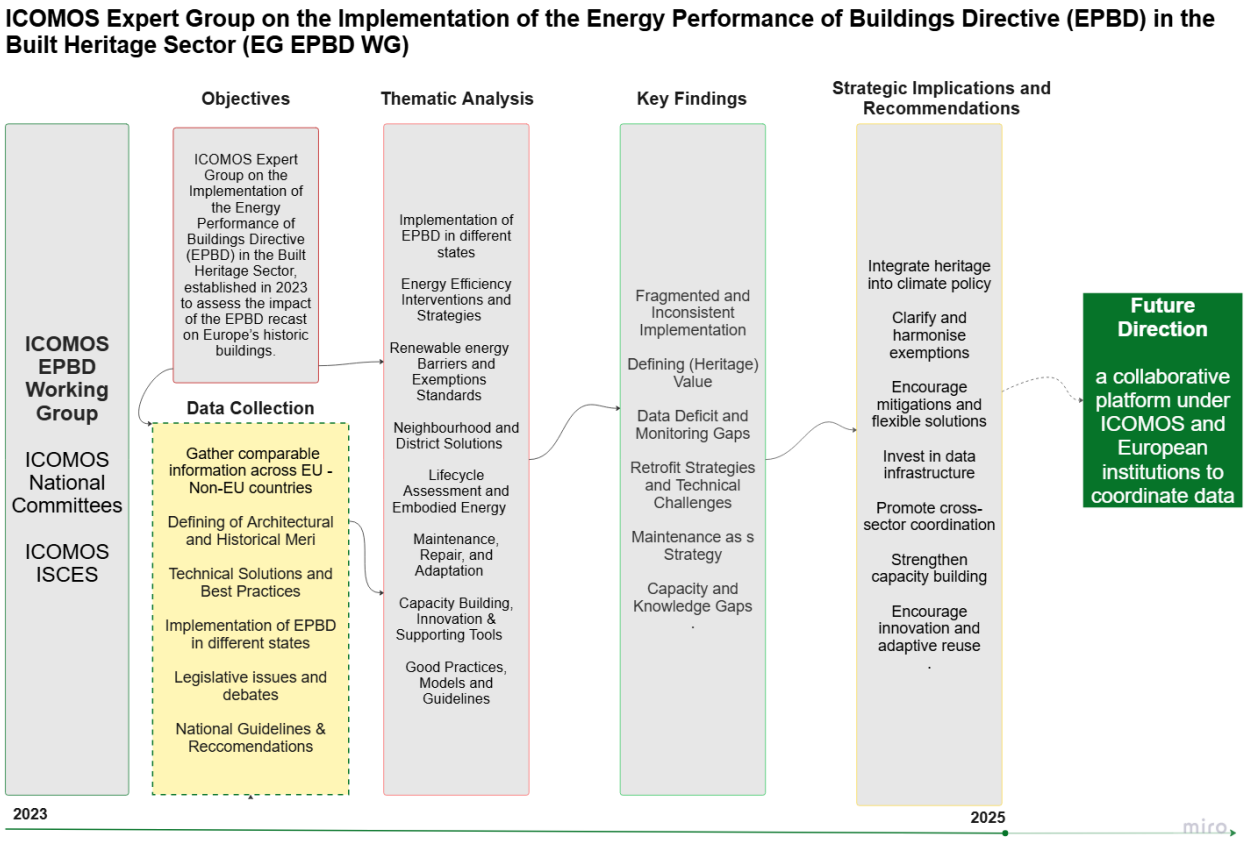

Figure 1. Methodology followed by ICOMOS EPBD Working Group

This methodology is based on expert input and national evidence. It is not intended as a statistical ranking, but as a qualitative, comparative analytical framework.

Findings:

- Most countries provide some form of exemption for protected buildings, though criteria and scope differ
- There is uneven alignment between energy goals and conservation objectives

Local implementation plays a key role: national laws are often interpreted differently across regions

Lessons learned:

- The fact sheet is a useful starting point but requires refinement to capture nuances (e.g., different heritage designations)
- Future surveys should incorporate both quantitative and qualitative fields
- Consideration should be given to user-friendly digital platforms for data entry and aggregation.

Thematic Analysis

1.1 Implementation of EPBD in different states

The EPBD asks member states to provide a policy instrument to achieve higher energy efficiency and lower greenhouse gas emissions in new buildings and equivalent renovations. European countries are implementing the EPBD with varying approaches to heritage buildings.

General Trends

- Protected buildings are in general exempt or subject to derogations from standard energy efficiency requirements to preserve architectural or cultural value.
- Few countries have special provisions for buildings with architectural merit.
- The national actions and funds are mostly focused on apartment buildings from the post-WWII era.
- Many countries highlight inaccuracies in energy performance assessments (EPCs) for older buildings and call for improved, tailored methodologies.
- Modern technologies encouraged by national policies, for example, installing photovoltaic panels, may lead to solutions that harm the architectural values
- In many countries the Building Acts are not yet adapted to the requirements of the EPBD.
- Several new or revised laws and guidelines are emerging to reflect the specific needs of historical and vernacular buildings.

National reports (see section 2.1) highlight diverging approaches: Ireland is piloting retrofitting schemes for traditional buildings; Sweden maintains a careful renewal principle in its Building Act; Slovenia links cultural heritage databases with EPC registries.

The debates in the EG EPBD WG emphasised the risk of 'numbers lying'—statistics may obscure nuances in heritage contexts. Studies within the ISCES framework indicate that the physical condition of a building — including the state of materials, moisture levels, and maintenance — can influence 30–40% of its actual energy performance. However, such condition-based parameters remain absent from most national EPC systems, leading to discrepancies between theoretical and real energy behaviour.

1.2 Defining Architectural and Historical Value

The Energy Performance of Buildings Directive states that Member States may adapt *the requirements to buildings officially protected /…/ in so far as compliance with certain requirements would unacceptably alter their character or appearance.*

The original EPBD from 2002 foresaw exceptions to protected buildings. In the consultations for the current i.e. fourth version of the document ISCES, on behalf of ICOMOS, promoted instead of full exemptions to go for minimum requirements for protected buildings as well as buildings with architectural merit. The aim of this amendment was to foster innovation, and to find suitable solutions to improve the energy efficiency of protected buildings. In addition, ICOMOS lobbied to prevent non-protected valuable historical buildings (for example vernacular buildings) from being altered and often unsuitably renovated as well as to promote traditional and sustainable solutions for improvement.

These proposals were taken into account and the text adopted by the European Parliament in March 2023 read:

> (5b) The renovation of monuments should always be carried out in compliance with the national rules on conservation, international conservation standards, including the 1964 Venice Charter for the Conservation and Restoration of Monuments and Sites, and the original architecture of the monuments concerned. (5c) For buildings that have historical or architectural merit, but are not officially protected, Member States should set criteria for the application of the highest energy performance class that is technically, functionally and economically feasible while maintaining the character of the building. (Amendments adopted by the European Parliament on 14 March 2023 on the proposal for a directive of the European Parliament and of the Council on the energy performance of buildings (recast) (COM(2021)0802 – C9-0469/2021 – 2021/0426(COD)).

However, the text was changed after and the final version reads:

> Member States may adapt the requirements referred to in paragraph 1 to buildings officially protected at national, regional or local level, as part of a designated environment or because of their special architectural or historical merit, in so far as compliance with certain requirements would unacceptably alter their character or appearance.

This later amendment illustrates the key challenge in implementing the EPBD – the officially protected buildings are only a minor part of traditional buildings where achieving the energy efficiency requires traditional measures and materials as well

careful solutions not to lose valuable architectural and historical assets. The sustainable use and reuse of built fabric in upgrading traditional buildings should be targeted as an energy efficiency measure per se.

For the provisions of EPBD the vernacular architecture is especially vulnerable. It is unnecessary and unproportional to protect all historical buildings. It is easier to work out suitable solutions for different types of historical constructions or specific solutions for buildings with decorative elements. The funding schemes should prioritize the reasonable upgrade of existing building stock without compromising its values.

The final correction to the definition cited above illustrates the challenge of defining architectural and historical value, how it is assessed and recognised within national frameworks. The national terminology used—such as “architectural merit,” “cultural significance,” or “protected status”—varies widely, and even more diverse are the national strategies of protection or recognition.

The absence of a shared EU-wide definition and significant diversity of protection strategies complicates the adoption of harmonised approaches to exemption and intervention. The report highlights the need for more nuanced assessments that consider not only architectural style or age, but also intangible value, historic use, and context.

The deletion of the 'architectural merit' category from the EPBD text (2023–24) poses risks to vernacular and historic urban fabrics. Germany’s municipal certification system, Sweden’s Planning & Building Act, and Ireland’s heritage inventories illustrate varied national solutions. EG EPBD WG participants stressed the need for dynamic, context-based definitions beyond statutory protection.

Examples:

The various approaches are indicated in the section of National reports (see section 2.1). Some examples:

- Italy applies a strict distinction between protected and unprotected buildings in MEPS.
- France includes “remarkable heritage sites” even if buildings are not individually listed.
- Belgium offers special status to the buildings noted in the established inventories while in Estonia similar inventories grant no legal recognition.

Emerging issues:

- Need for dynamic criteria adaptable to local contexts
- Tension between technical indicators and cultural values
- Risk of oversimplification in national EPBD transpositions.

1.3 Data Availability

Access to reliable data is critical for evidence-based policymaking under the EPBD. However, the availability and quality of data on heritage buildings vary significantly across Member States.

Valuable information on the EU's building stock can be found in the EU Building Stock Observatory, BSO, however it lacks data of protected buildings and the data on historic buildings is not always reliable because of different sources used. The most recent European study has been made as part of the ESPON HERMES project published in March 2025 "Material cultural heritage satellite account – methodological framework". This publication offers a potential methodology and addresses the growing recognition of cultural heritage as a component of Europe's economic landscape.

There are several useful links in the document, however the emphasis on building stock is only referring to the number of museums, World Heritage Sites and similar information that is easy to count and compare. At their workshop in June 2025 ESPON project members reinforced the need for integrated cultural and energy datasets. Condition and maintenance variables are essential yet absent from most systems.

ICOMOS recognizes the difficulties and challenges in collecting data even on protected buildings, the situation is even more challenging with buildings of historical or architectural merit. For example, in 2024 ICOMOS Slovakia collected information on protection from 54 national committees worldwide, including 29 from Europe. The received answers were very difficult to systematize and compare. The difficulties lie not only in the setup of a reliable questionnaire, but it was challenged to target the subject, categories and legal basis of protection, protection hierarchy (national, federal, regional, municipal, etc.).

It is even more complicated to count ensembles, cultural landscapes and territories protected using the spatial planning mechanisms. It became evident that many European countries do not have reliable data on historic building stock. For example, while some countries have integrated heritage attributes into national building registries (e.g., Ireland, the Netherlands), others rely on fragmented or regionally managed systems. In many cases, energy consumption data are not disaggregated for listed or historic buildings, making targeted analysis difficult.

Despite these challenges the ICOMOS working group collected relevant data (see National reports in Appendices) to orientate in the field and understand the scale of concerns for energy efficiency. The data provided illustrate the level of protection and the ratio of protection in comparison to the general building stock. There is certainly a

need for a more in-depth data collection. The data for this report is collected from national sources and there might be differences with the data of total building stock available in the EU Building Stock Observatory, BSO from 2020.

Monitoring frameworks also diverge: some rely on general building stock statistics, while others (e.g., France, Italy) have developed heritage-specific monitoring tools or pilot programs.

Challenges:

- Lack of harmonised indicators for heritage buildings
- Difficulties in accessing long-term energy performance data
- Incompatibility between conservation databases and energy registries

Good practices:

- Cross-referencing of cultural and energy databases (e.g., France's CSTB and DRAC systems)
- GIS-based mapping of protected areas with energy metrics (e.g., Netherlands).

1.4 Energy Efficiency Interventions and Strategies

On 30 June 2025, the European Commission published a comprehensive implementation package to guide Member States ahead of the 2026 transposition deadline for the recast Energy Performance of Buildings Directive (EPBD). A search in the EU Energy Policy website lacks recent research focusing on historic buildings. The technical solutions developed so far are mostly focused on retrofitting actions with an interest in developing new materials rather than ensuring that the traditional material and techniques are protected. There is more training focused on contemporary retrofitting measures than conservation.

The ongoing debate between retrofit and demolition demonstrates that rebuilding entails substantial embodied carbon costs, with life-cycle analyses showing that payback periods can extend over several decades—reinforcing the environmental and cultural rationale for prioritising adaptive reuse and sensitive retrofit. Bringing down the energy consumption is more efficient, cheaper and sustainable than new energy solutions. The grants should be based on the level of saved energy.

The ongoing Horizon-funded project "FuturHist. Conservation compatible passive retrofit solutions", in which ICOMOS is a partner, is testing specific retrofitting measures

such as window replacements and modern renders in selected buildings in Poland, Spain and Scotland. As part of the project, a report (FuturHist, 2025) was published, with a compilation of passive retrofit solutions that can be applied to historic buildings.

Renewable energy

One of the hottest topics in upgrading heritage buildings is the installation of solar panels as they create a visual impact that may influence the whole neighborhood. Extensive debates on modern interventions have taken place for example, in Italy on innovative use of the solar tiles at the archaeological site of Pompei. Historic England has published since 2010 advice on Energy Efficiency and Historic Buildings Solar Electric (Photovoltaics).

Many solar panels have been installed in historic buildings in the UK, most recently 184 solar panels are being installed on the roof of York Minster. There are more examples: Flanders permits PV integration under conditions on all protected buildings with only an exemption for world heritage buildings and sites; Flanders also published an assessment framework on carbon free heating and cooling of historic houses. Ireland promotes decarbonisation of heat sources over intrusive fabric changes; France develops typology-based retrofit solutions.

After almost 20 years of experience there are relevant examples proving that photovoltaics can be successfully incorporated in historic buildings. However, it is only possible with proper preliminary assessment, design and conservation skills which are not yet extended enough – there is more concern about education and training than technology.

ICOMOS WG highlights that in addition to visual aspects more attention must be paid to the efficiency, life cycle and resource streams of solar PV and any other renewable technology.

There is significant research going on in different countries on different levels. National Reports in the Appendix provides a selected overview.

EPBD offers methodology, for example renovation passport schemes, one-stop-shops, etc. The Member States are encouraged to elaborate their own schemes. However, little guidance is given to safeguard the authenticity and value of historic materials and buildings in these processes.

For example, the renovation passports are based on the principle of deep renovation rather than minimum intervention.

EG EPBD WG is concerned that blanket exemptions of protected buildings can condemn historic buildings to decline by excluding them from support. The exemptions discourage research to find innovative ways to improve the energy efficiency of historic buildings. It's important that EU taxonomies for green investment, etc. include historic building renovation.

Similar concern is the vulnerability of non-protected historic building stock as the historic buildings/neighborhoods are often scheduled for worst performing buildings based on calculations where the EPCs for historic buildings is calculated using the formulas for modern buildings.

Standards

The EN 16883:2017, Standard on conservation of cultural heritage - Guidelines for improving the energy performance of historic buildings is a complete document for building owners, authorities and professionals, focusing on the planning stage and promoting good practices. In the framework of the project TASK 59 Renovating Historic Buildings Towards Zero Energy (project funded by the International Energy Agency in 2017-2021) a handbook to implement the EN standard was developed. (DOI: 10.18777/ieashc-task59-2021-0003). As one of the outcomes of the project, a report was published by Leijonhufvud et al. (2021) about the usability of EN 16883:2017 that provided suggestions for enhancing the European guidelines.

The report found that lack of motivation and skills of users were the main challenges for the implementation of the guidelines. It recommended training and education for professionals in the field, as well as more easily accessible information and resources, literature and tools supplementing the standard, and that authorities and stakeholders demand to provide users with examples of:

- How steps in the standard can be carried out;
- How the standard can be integrated with existing standards and procedures;
- Energy retrofits and energy efficiency measures;
- The benefit of following the standard.

This report led to an ongoing revision of the standard. For example, Ireland's guidance IEETB and OPW follow the steps of EN16883 which has been adopted as an Irish Standard.

However, ICOMOS considers it necessary to highlight that standards are less followed in the heritage sector than in others. The standards are not often referred to in heritage

legislation, they are seldom promoted by heritage authorities and the practitioners are not interested to pay for them.

1.5 Maintenance, Repair, and Adaptation

This section examines the role of regular maintenance, timely repair, and adaptive reuse as fundamental strategies for safeguarding heritage buildings while improving their energy performance. These actions not only preserve cultural value but also contribute to sustainability by extending the lifespan of existing structures and reducing the need for resource-intensive interventions.

Maintenance and benign changes

Maintenance is crucial for safeguarding cultural significance because it is the least invasive method of conserving the historic built environment. The principle of adopting a minimal intervention approach is best summarised by the ICOMOS Burra Charter, "as much as necessary, as little as possible". The conservation principle of reversibility is particular significant for retrofitting projects particularly where new, unproven materials are used.

Maintenance and repair also play an important role in energy conservation and enhancing environmental performance of buildings, leading to reductions of up to 40% in energy use (Ritson, 2020). Put simply, a well-maintained building is more energy efficient. The Historic Town Forum [UK] states that 'One of the most energy efficient ways to preserve historic buildings is to ensure that continued, regular maintenance is carried out to safeguard their historic fabric.'

Both the Historic Town Forum and English Heritage promote the use of small or benign modifications to improve a historic building's environmental performance. (Benign changes are defined as modifications that cause little or no harm to the heritage value of the building or that do not damage the fabric itself or interfere with its functioning or response). Repair and maintenance are generally regarded as energy-efficient measures, both for conserving the building and for reducing energy consumption and carbon emissions.

Lifecycle assessment is a vital tool for promoting circularity and sustainability. For instance, the Flemish Government introduced a comprehensive, process-oriented tool called GRO to evaluate and enhance the sustainability of construction projects. GRO is suitable for both new builds and renovations or redevelopment of existing buildings. Therefore, prioritising the preservation of historic buildings over constructing new ones should be a key focus to decrease energy consumption. The embodied carbon content

and zero-waste principles are crucial in conserving historic buildings, and these concepts should be incorporated into the EPBD actions.

Renovation, along with regular maintenance and repairs of historic buildings, presents a challenge because the integrity of the intrinsic heritage and the building's distinctive character must be preserved. Applying the full range of standard measures is not always feasible. Cultural heritage buildings are subject to special regulations that add a broader national and international interest beyond economic and environmental concerns, often expressed in terms of energy and financial indicators. This wider interest is mostly valued through immeasurable qualities or descriptions. What and how much (if any) improvement or modification is possible without compromising the protected values depends on each individual case.

Repair and Maintenance of Historic Buildings

According to the U.S. Department of Energy (Office of Energy Efficiency & Renewable Energy, 2023 *Report on Cost and Effectiveness of Maintenance vs. Retrofit Measures*), maintenance and operational measures can cost about 20 times less than retrofit interventions while delivering similar levels of energy savings. However, repairing and maintaining historic or listed buildings also pose challenges. One significant issue is the difficulty in calculating the carbon footprint of historic buildings due to limited data availability, although some countries, such as Ireland, are starting to address this gap.

Another vital concern is overheating. Historic buildings were originally constructed using permeable materials that facilitated natural ventilation and helped prevent overheating by regulating thermal mass temperature. Modern interventions, such as insulation and other energy-related upgrades, can be considerably more expensive in heritage buildings, imposing financial pressure on owners.

Additionally, replacing original building elements—like windows—for energy efficiency not only damages heritage fabric but also creates unnecessary construction waste. In addition, many modern insulation products are petro-chemical based and therefore of high embodied carbon compared with many biobased insulation materials.

It is also essential to recognise the differing climatic and cultural contexts between northern and southern countries, which influence both the performance and retrofit needs of historic buildings. Importantly, interventions in such structures should be considered as part of a long-term, phased process. Improvements do not have to be implemented simultaneously; however, in some cases, regulations may require bundled upgrades—for instance, replacing a window may also require installing a ventilation system.

Evidence-Based Strategies

It is important to promote the fact that heritage buildings are already energy efficient, while also acknowledging that there is room for improvement. For instance, Victorian-era buildings in the UK that are not protected can be made up to 46% more energy efficient through simple interventions

In Austria, an ongoing project is investigating the energy efficiency of historical windows, highlighting the potential for preserving original features while enhancing performance. Additionally, Building Renovation Passports could help increase retrofit activities, as noted in a study by the Irish Green Building Council (Building Renovation Passports could contribute to an increase in retrofit activities, Irish Green Building Council's study found) .

Promoting well-suited, heritage-friendly solutions tailored to historic constructions is essential, as demonstrated in case studies such as those presented in Task 59 D.A2--Case-studies-assessment-report.pdf

How the energy efficiency standard EN 16883 is implemented in different countries (This does not refer to threshold values to be achieved but describes the necessary process for the informed energy refurbishment of historic buildings.) The way to use the standard is not clear. In IEA Task 59, a handbook, D.B3—Handbook.pdf, was developed. The publication with best-practice guides the expert on the energy retrofit of historic buildings. It takes a practical approach to the subject, based on the experience of leading international experts in the field.

Energy Performance Certificate (EPC) levels vary between countries. For example, the same house might be rated as B in Belgium and D in the Netherlands. EPCs are becoming less accurate, especially for historic buildings. A key issue is that traditional solutions like adding extra windows are not recognised within current certification systems. In Flanders, a feasibility study was carried out to develop an EPC system for protected buildings .

This study mapped adapted parameters, developed heritage-friendly retrofit recommendations, and established two workable solutions to set energy targets for protected houses. Currently, a free, customised heritage energy advice service is free of charge offered to owners of protected heritage properties in addition to the EPC. Although the EU has highlighted the need for a dynamic modelling package, it also requires a simplified EPC approach that does not account for variations.

In the UK, several organisations publish guidelines for retrofitting buildings. The Retrofit Hub is a nonprofit organisation that brings together stakeholders involved in retrofit activities to support the local delivery of retrofit at scale. . Other examples include the Pioneering Sustainable Home-Updates and the City of London Corporation's innovative open-access Heritage Building Retrofit Toolkit. Aimed at drastically reducing carbon emissions and bolstering climate resilience, this guide offers a lifeline to the owners of over 600 listed buildings in London but might also do this for other Europeans (City of London, 2024).

Conclusion

Repair and maintenance are not only cost-effective but also fundamental strategies for enhancing the energy efficiency of historic buildings. While historic buildings are inherently energy-efficient by design, they require ongoing repair and maintenance to meet the demands of today's technological and environmental conditions.

Across countries, evidence shows that timely, targeted maintenance interventions can substantially reduce energy consumption without compromising heritage values. However, challenges persist, particularly in the form of regulatory constraints, financial burdens, and the lack of standardised methods for assessing energy performance in heritage contexts.

Despite these barriers, ongoing initiatives and the aforementioned approaches demonstrate growing recognition of maintenance as a strategic pillar in climate-resilient heritage management. Ultimately, embedding repair and maintenance practices into broader policy frameworks, including the EPBD, is essential for achieving both conservation and climate goals.

A summary of the repair and maintenance approach to energy efficiency for historical and existing structures across different countries is presented in the appendix section.

1.6 Capacity Building, Innovation & Supporting Tools

Ensuring energy efficiency in historic buildings requires the training of professionals, as well as enhancing the technical and theoretical knowledge of conservation experts already working in the field. Certificate programmes, online courses, and in-situ training should be developed to increase knowledge and expertise. In addition to research and development by universities and research centres, it is essential to incorporate practice-based insights and to identify location-specific opportunities and threats.

Energy efficiency measures—such as active and passive climate control, heating, cooling, renewable energy integration, and the selection of renovation materials—must be considered alongside general ICOMOS conservation approaches. Educational programmes should be designed across different levels to cover a wide range of topics, from technical aspects (mechanical systems, materials, renewable energy, thermal performance) to architectural conservation and project management.

A key requirement is the identification of standard curriculum topics, including technical analysis and preventive measures. Training experts in energy efficiency for heritage values is vital to ensure the development of appropriate solutions for historic buildings. Likewise, it is necessary to train professionals and craftspeople on how to adapt energy infrastructure—such as heating and ventilation—without compromising cultural values, with an emphasis on competence and specialised skills.

Studies conducted in Europe support both energy efficiency and the preservation of cultural heritage. Within this framework, applied research is being carried out in pilot regions established across different countries, innovative solutions are being developed, and research and development projects are being funded. These projects aim not only at technical advancements but also at ensuring the sustainability of cultural heritage. Moreover, the establishment of cross-sectoral partnerships within such projects enables a multidimensional and interdisciplinary approach.

In this way, a mutually beneficial interaction is established between energy efficiency and cultural heritage preservation, and the experiences gained in Europe serve as an example for other regions as well. Europe must play a leading role in this field by setting standards and approaches. In this context, initiatives in EU member states and other European countries provide important examples.

The overview of different national strategies is available in the appendix section A 1.7.

1.7 Good Practices, Models and Guidelines

This section gathers examples of good practices, pilot initiatives, and innovative models that demonstrate how energy performance measures can be successfully combined with the conservation of cultural heritage. These cases provide practical insights and transferable solutions for policymakers, practitioners, and researchers working at the intersection of sustainability and heritage protection.

Preserving the architectural heritage of Europe while aligning with energy efficiency and climate adaptation targets is a complex but increasingly urgent challenge. The significance and protection status of historic buildings imposes significant limitations on the types of interventions that can be applied.

Across Europe, innovative strategies and practical tools have emerged to support the sustainable renovation and adaptive reuse. This chapter offers a curated overview of emerging practices, tested methodologies, and policy-aligned renovation approaches across Europe. By presenting selected national and European case studies, guidelines, and institutional tools, the chapter aims to highlight the diversity of context-specific solutions available as well as the state of international and national efforts.

These include tailored certification systems, adaptive reuse frameworks, material guidance for retrofits, and integrated advisory models. The focus is not only on achieving measurable energy performance improvements but also on ensuring compatibility with heritage values and social use. Collectively, these initiatives demonstrate that reconciling conservation principles with climate goals is both feasible and increasingly supported by cross-sector innovation.

The examples compiled in this chapter underscore the practical feasibility of improving energy performance in historic buildings without compromising their cultural and architectural significance. From policy-driven guidance in France and Flanders to community-scaled renewable energy integration in Portugal and toolkits like HiBERatlas, the initiatives illustrate how interdisciplinary collaboration and evidence-based decision-making are reshaping the renovation landscape. As the EU intensifies its Renovation Wave, these heritage-aligned approaches provide a blueprint for integrating climate resilience and energy efficiency with conservation ethics.

The overview of different guidelines and best practices in the appendix A.1.6.

Appendices

The national reports are based on expert contributions from ICOMOS National Committees and reflect the situation as of 2024–2025. Data availability and comparability vary across countries.

National Reports

A.1.1 Implementation of EPBD in nation states

Reliable data is essential for transparent research and policy-making. There are positive developments: for example, the EU Building Stock Observatory (BSO) collects data on the EU's building stock. Data is however still limited and gathered with different methodologies that challenges the analysis. There is a significant gap of clear data and methodology for historic building stock that is partly explained by the need for interdisciplinary approach. This is critical for example, concerning current initiatives, such as the development of smart readiness indicators (SRI) in buildings.

The research on the implementation of EPBD concerning historic buildings is so far approached from the retrofitting and technological point of view rather than from the cultural and conservation approach. For example, the ECTP Heritage & Regeneration (H&R) Committee was formed in October 2004 to represent research, development and innovation in Cultural Heritage and Urban Regeneration. Its purpose is to identify and implement the RDI needs of the Construction sector concerning the conservation, management and promotion of European built heritage as a valuable asset. It is however not clear what is the approach concerning the conservation of built heritage.

The following data is collected from heritage experts from nineteen countries. Although there was an ambition to collect comparable data, the editors of this research decided to include all relevant information received from respondents as they highlight diverse challenges of repair and renovation of the historical building stock. The respondents were asked about the progress of implementing EPBD; the definition of historical building stock in the context of exemptions and mitigations with EPBD; the data on historical buildings in comparison with the total building stock and the general estimation on the type of buildings that are less energy efficient.

Armenia (non-EU)

Heritage is not mentioned in the context of energy efficiency regulations. No legislative changes are expected in the near future.

Austria

The national building regulation directive OIB6 on energy saving and thermal protection targets new and existing buildings, the focus is rather on non-listed buildings to address the mass.

Heritage is mentioned mainly in the context of legal requirements providing exemptions for listed buildings.

The regulations for listed buildings are being extended to historical building stock as they are performing much better than the EPC would actually show.

Belgium/ Flanders

The transposition of the EPBD requirements is mainly a regional responsibility and therefore carried out by the Flemish, Walloon and Brussels-Capital Regions. Each region has drawn up a general regulatory basis with additional implementing decrees.

In Flanders, the basis is laid in the Energiedecreet of 8 May 2009 (decree of 8 May 2009 containing general provisions on energy policy) and the Energiebesluit of 19 November 2010.

In order to transpose the requirements of the EPBD (2018) and the Governance Regulation (2018), an update of the existing renovation strategies was elaborated by the regions. In Flanders, The long-term strategy for the renovation of Flemish buildings regulates that all single-family homes and apartments purchased from 1 January 2023 with an EPC label E or F must be renovated to label D or better within 5 years of purchase (and other transfers).

Buildings with heritage value (protected as a monument, part of a protected townscape or villageview or mentioned in the established inventory of immovable heritage) are exempt from this renovation obligation.

The implementation of the EPBD in the Flemish Region of Belgium is carried out by the Flemish Energy and Climate Agency (VEKA), which is responsible for the certification of buildings, the enforcement of the Minimum Energy Performance Requirements, and the provision of subsidies and loans for energy efficiency measures.

Flanders Heritage Agency (FHA) is the agency of the Flemish Government that deals with immovable cultural heritage, broadly defined as archaeology, built heritage and cultural landscapes. The agency works together with VEKA to ensure that the energy and climate policy is implemented without damaging immovable cultural heritage.

The updated Flemish Energy and climate plan (12 May 2023) mentions for the first time the exemptions and derogations and all CO2 reduction actions planned for cultural heritage.

Methodology and requirements for the calculation of energy performance of buildings (Articles 3, 4, 6, 7)

The EPBD asks member states to provide a policy instrument to achieve higher energy efficiency and lower greenhouse gas emissions in new buildings and equivalent renovations. To this end, the minimum energy performance level a building must achieve is determined and a methodology to allow for an objective assessment of whether a design meets these requirements developed.

In Belgium, this instrument is known as the EPB or PEB. The energy performance regulations are currently managed by the EPB platform, a collaboration between the three regions; as a result, approximately 90% of the calculation method is the same for all three regions. However, the requirements for energy performance are specific to each region. Separate methodologies and requirements have been defined for residential and non-residential buildings.

Depending on the nature of the works, there are anno 2025 in Flanders derogations or automatic exemptions from the imposed EPB requirements for protected monuments, existing buildings in a protected cultural-historical landscape or townscape and buildings included in the established inventory of immovable heritage.

For **protected monuments and existing buildings in a protected cultural-historical landscape, or townscape,** you can in the case of a standard renovation obtain an automatic exemption for the U-max requirements of existing preserved walls, floors, roofs and exterior joinery/ the U-max requirements of the new, renewed and post-insulated walls and exterior joinery and the requirements for ventilation devices when replacing windows in existing rooms.

A derogation is possible to achieve the U-max requirements of the new, renewed and post-insulated floors and roofs, provided that the application of these requirements would unacceptably change the character or appearance of the building.

Protected monuments, rebuilt according to the original model with the reuse of the existing materials and which cannot meet the EPBD requirements for technical,

functional or economic reasons, can be exempted from one or more of the EPBD requirements. You must always submit a derogation request for this.

For **buildings included in the established inventory of immovable heritage,** there are automatic exemptions for ordinary renovation for the U-max requirement of existing preserved façade components that are visible from the public road and for the air supply requirements when only the windows visible from the public road are replaced. There are no EPB requirements for the renovation of a building that has been identified in the inventory of architectural heritage, if only the windows in the façade, which is visible from the public road, are replaced.

The implementation of the EPBD will get more strict in the following years. It is not decided yet if exemptions and deviations will be still possible for heritage in the inventory or heritage in protected landscapes or cityscapes.

Currently (2025), a process is running to streamline EPC (energy performance certificate required when you sell or rent a dwelling – protected or not) and EPBD (in case of renovation: requirements for insulation, energy performance, ventilation, etc. as required by EPBD).

Flanders Heritage Agency Belgium has defined values (13) and criteria (5) to recognize and protect valuable historic buildings. ()

Czech Republic

The EPBD is fully implemented into national legislation. Cultural heritage is included in the existing legislation to some extent, but only that which is protected by law, i.e. listed areas and monuments under Act on State Heritage Preservation.

Nevertheless, the "small structures" of renewable energy sources do not require a building permit from the building authority since 01.08.2025.

Authorization of renewable energy sources according to **Act No. 283/2021 Coll. (Building Act,**

as amended) Annex No. 1:

(25) Structures for the production of energy from renewable sources with a total installed capacity of up to **50 kW with the exception** of a waterwork structure, **a cultural monument and a structure in a specially protected area, a conservation reserve or a conservation zone** (until 1.08.2025)

In addition to the increase in power from 50 to 100 kW, the exception was abolished. The building permit will no longer be permitted by the building authority, but only as a decision by the state monument preservation authority. If the photovoltaic was installed without permission, the state monument preservation authority will request the regional building authority to remove the illegal construction.

(32 f) construction modifications for a facility using a renewable energy source with a total installed capacity of up to **50 kW** provided that they do not interfere with the load-bearing structures of the structure, do not change the way the structure is used, do not require an environmental impact assessment, and meet the conditions, in particular fire safety, pursuant to the legal regulation governing requirements for the safe facility of electricity generating plants, and **are not construction modifications to a structure that is a cultural monument**. (until 1 August 2025).

In addition to the doubling in power to 100 kW, the exception for cultural monuments was abolished from 1 August 2025.

English version:

Source: Ministry of Regional Development, Monument Inspectorate of Ministry of Culture

Act on the Acceleration of the Use of Certain Renewable Energy Sources and on Amendments to Related Acts (Act on the Acceleration of the Use of Renewable Energy Sources)

Estonia

The consultations on EPBD were conducted by the Estonian Ministry of Climate. The upgraded provisions are in force since 01.07.2025. According to the Building Code **§62** the requirements established for energy performance do not apply to the following buildings:

1) buildings that, according to the relevant comprehensive plan or detailed spatial plan, are located within a built-up area of cultural and historical value or have been recognised as a valuable monument, or buildings which, under the Heritage Conservation Act, have been designated as monuments, are located in a heritage conservation area or included in the UNESCO World Heritage List and in which compliance with the minimum requirements for energy performance would significantly alter the building's nature or appearance;

2) buildings which are mainly used as places of worship or for religious activities;

The renovation funding scheme run by Kredex enables not to demand full renovation for private houses that are monuments and buildings in milieu protection areas (historical suburbs) if the upgrade by one energy class is achieved, for apartment buildings there are higher % of grant for monuments and milieu areas in a scheme that requires the achievement of minimum C energy class.

Finland

According to the Building Act (751/2023 § 37), energy efficiency requirements do not apply to a building that is "protected by the Act on the Protection of the Built Heritage (498/2010), a protection order in a zoning plan or by virtue of its inscription on the World Heritage List under the Convention Concerning the Protection of the World Cultural and Natural Heritage (Treaty Series 19/1987), as part of a designated environment or because of its special architectural or historical merit, to the extent that its character or appearance would be unacceptably altered by compliance with the minimum energy performance requirements."

Ministry of the Environment (webpage, 2025): The requirement to improve energy efficiency will apply only where a building is being renovated for another reason requiring a building permit. The requirements will be set at the cost-optimal level.

Optimal level might mean that you have to conserve your windows etc. New requirements for the renewable energy or solar power in the newer buildings will be important targets in Finland, however, these will not concern historical buildings.

A new building act has the same exceptions as in Sweden to respect the values of the buildings officially protected or not. The new Building Act has not yet reacted to the new Directive. The law on discreet renovation applies to buildings of historical or architectural value or to the urban landscape, even if the site is not officially protected by a zoning plan or by law. Valuable buildings may not be damaged by renovation and alteration work. This provision is unconditional (Building Act 751/2023 § 12).

France

Following the European directive of 2002 to improve the energy performance of buildings, France has implemented various awareness-raising and incentive schemes. Existing buildings subject to energy retrofitting must comply with the thermal regulations for existing buildings, although some exceptions are allowed for old buildings, depending on their location or the construction materials. Protected buildings (and buildings identified with historical merit in protected urbanised spaces) are not subject to these regulations.

Buildings put on the market for sale or rent must provide the result of an energy performance assessment ('Diagnostic de performance énergetique' or DPE in French). In 2021, France passed the law 'Climate and Resilience', which will progressively make it harder for owners of buildings with poor energy performance to rent their properties (rental bans, classification as 'inadequate', and ban on rent increase). The law allows adaptations and derogations for buildings with technical, architectural and heritage constraints (but these are more likely to apply for protected buildings).

The method to calculate the energy performance has also changed. Before 2021, the energy assessment for pre-1948 buildings was based on energy consumption bills. Now, the same method is applied to all buildings and requires describing all the construction elements very precisely, without taking into account the specific features of heritage buildings. Key heritage associations advocate for a better integration of pre-1948 buildings' specificities in the implementation of the law, as well as for a new method to assess energy performance that will lead to adequate energy retrofitting.

The Ministry of Culture has agreed with the Ministry of Ecological Transition to start working on a new procedure to assess pre-1948 buildings. In parallel, the European Committee of Normalisation has decided to revise the existing standard EN 16883 (Conservation of cultural heritage - Guidelines for improving the energy performance of historic buildings). A French 'mirror group' has been created and is coordinated by the French association for normalisation (AFNOR) and the Ministry of Culture.

At the moment, different grant schemes for energy efficiency exist in France, but they do not target heritage buildings specifically. Some of them have known significant budget decreases. With the support of the Ministry of Culture and the French Agency for Ecological Transition, from 2020 to 2022, EFFINERGIE (an association) launched an experimental label for the energy retrofitting of heritage buildings (with dedicated funds in some regions). This incentive is currently on hold and might evolve in the next few years.

In early 2025, a law proposal to adapt the challenges of energy renovation to the specific characteristics of old buildings was submitted to the French Parliament and adopted by the Senate. This law shows that current regulations on thermal renovation do not take into account the specific characteristics of older buildings and the intrinsic qualities of the materials they are made of. The law supports greater consideration of building types in national energy efficiency measures and targets, in particular in energy performance diagnostics and energy audits, to encourage owners of old buildings to carry out work tailored to the specific characteristics of their property.

The law:

- Defines old buildings. Does not require a specific method to assess the energy performance of old buildings, but requires the addition of measures and complementary indicators, such as the hygrothermal characteristics of materials, to existing methods.
- Introduces the concepts of summer and winter interior comfort in the definition of energy-efficient renovation.Requires increasing the training requirements of professionals auditing buildings with heritage interest from January 2027.The commission working on the law has asked the government to produce a report assessing possible changes to the criteria and features of existing grant schemes and energy-saving certificates.

Greece

In Greece, the first regulation on the energy performance of buildings (KENAK) that was adopted in 2010 and its consequent recast on 2017, also exempt listed buildings and protected monuments from energy efficiency retrofitting and minimum energy performance requirements, evoking again the threat of valuable unlisted built heritage to be discounted upon restoration and energy improvement works.

During the 2017 recast of the KENAK regulation, a scientific working group examined the existing pre-1955 Greek building stock and produced a series of Technical Guidelines on energy efficient interventions that focus “on the effort to classify the existing building stock and conclude to accurate interventions specific for each category” in order to facilitate and assist all involved stakeholders and owners in sustainable conservation interventions. The guidelines define extensively the required survey that should be accounted for, prior to any restoration of renovation work.

The scientific working group concluded in the following five categories:

- K1 Listed as Monuments
- K2 Listed Buildings
- K3 Buildings in listed Traditional Settlements, Conservation areas or Historic Urban DistrictsK4 Buildings with particular Architecture Character and Value not in Traditional Settlements, Conservation areas or Historic Urban Districts
- K5 Buildings with no Particular

These guidelines have not been implemented in the directive.

Ireland

The implementation of performance certificates in Ireland is managed by the Sustainable Energy Authority of Ireland (SEAI) and takes the form of Building Energy Rating (BER) for all building types, calculated by the Dwelling Energy Assessment Procedure for dwellings and by the Non-Dwelling Energy Assessment Procedure for other building types.

BER certificates are required for all new buildings and existing buildings undergoing lease or sale. Historic buildings including buildings subject to the National Monuments Acts, protected structures, proposed protected structures, places of worship and other specified building types are exempt from BER requirements. However, all other traditional buildings are required to have a BER certificate when let or sold.

Traditional buildings in Ireland generally include those built with solid masonry walls of brick, stone or clay, using lime-based mortars, often with a lime or earthen-based render finish, single-glazed timber or metal-framed windows and a timber-framed roof usually clad with slate but often with tiles, copper, lead or, less commonly, corrugated iron or thatch. In general, these were the dominant forms of building construction from medieval times until the second quarter of the twentieth century and account for approx. 15% of the building stock.

The Technical Guidance Document L on Conservation of Fuel and Energy provides guidance on complying with Building Regulations for all buildings and includes a section outlining the particular compliance difficulties that may arise for traditional buildings due to their permeable fabric that both absorbs and readily allows the evaporation of moisture. TGD-L states that :

'the aim should be to improve the energy efficiency as far as is reasonably practicable. The work should not prejudice the character of the building or increase the risk of long term deterioration of the building fabric.

' It directs the user to I.S. EN16883:2017 and advises that, in specific cases including replacement of historic windows and insulation of vapour permeable constructions, relaxation of requirements may be acceptable to the local building control authority, if it can be shown to be necessary in order to preserve the architectural and historic integrity of the particular building.

Serbia (non-EU)

In Serbia in 2011, the legislation was issued based on the 2002 version of EPBD. The regulatory basis consists of two documents that define the energy efficiency calculation methodology and the energy certification process:

1) The Rulebook on Energy Efficiency (Official Gazette of the RS, 61/2011) that sets methodology and technical requirements and parameters related to the calculation of energy performance of buildings, and

2) The Rulebook on Conditions, Content and Manner of Issuance of Certificates of Energy Performance of Buildings (Official Gazette of the RS, 69/2012 i 44/2018) which prescribes the process of building certification and introduces the concept of energy classes to indicate the energy performance of buildings in the standardized form of an Energy Passport.

In the named documents the heritage is mentioned and it is the subject of energy efficiency measures, but only in case the fulfilment of the energy efficiency requirements do not contradict the protection conditions.

Ever since their issuance in 2011 the mentioned regulations were not a subject to change.

However, several new documents were issued in 2021 and later, which further define the development of legislation related to the energy efficiency of buildings in Serbia and harmonise it with EU legislation and strategies. These documents are:

- The law on Energy Efficiency and Rational Use of Energy (Official Gazette of the RS, 40 / 2021);
- The law on the use of renewable energy sources (Official Gazette of the RS, 40 / 2021, 35 / 2023, 94 / 2024);
- Integrated national Energy And Climate Plan of The Republic of Serbia for the period up to 2030 with a vision to 2050 (Official Gazette of the RS, 30/18);
- Long-term strategies for stimulating investments in the renovation of the national building stock of the Republic of Serbia until 2050 (Official Gazette of the RS, 27 / 2022);
- Low-Carbon Development Strategy of The Republic of Serbia for the period from 2023 to 2030 with projections until 2050 (Official Gazette of the RS, 46/2023);

The adoption of these documents has not yet been reflected in the content and requirements of the regulation regarding energy efficiency in buildings. However, their

amendments are in process for a certain amount of time, but the publication date is still uncertain.

Slovenia

Slovenia has transposed the content of the EPBD into its legal order by appropriate amendments to three then existing laws, the Building Construction Act (now: Construction Act), the Energy Act (now: Efficient Energy Use Act) and the Environmental Protection Act, and by adopting individual implementing regulations. The requirements of the EPBD, as well as thematic requirements of the Energy Efficiency Directive (EED), are considered in all current national action plans, strategies and related documents.

The Operational Programme for the Implementation of the European Cohesion Policy for the Period 2021-2027 (when describing the specific objective "Promoting energy efficiency and reducing greenhouse gas emissions", states that Slovenia will have to carry out energy renovation of almost 26 million m^2 of building surfaces in the period from 2021 to 2030. Cohesion funds can also finance the energy renovation of buildings protected under regulations on the protection of cultural heritage. When implementing such measures, mitigation measures and environmental protection guidelines from the National Climate and Energy Plan will be considered and mitigation measures in the field of cultural heritage buildings will be adjusted accordingly.

The Long-Term Strategy for the Energy Renovation of Buildings by 2050 (DSEPS 2050) establishes that 39 % of narrow public sector buildings in Slovenia are officially protected as part of a protected environment or due to their special architectural or historical significance, which means a good 347.000 m^2 of floor area. The strategy lists two proposals aimed at strengthening the supporting environment for the comprehensive preservation of cultural heritage. The first proposal includes a review, updating and supplementing the national guidelines for the energy renovation of cultural heritage buildings.

In accordance with the warnings of the Amsterdam Charter and the Granada Declaration on the necessity of creating mechanisms for financial incentives and fiscal relief for both public and private owners of heritage buildings, the second proposal was to introduce changes in the field of local fiscal legislation, so that local communities would gain greater autonomy in creating sources of fiscal revenue and managing them. In this way,

a special fund could be created in the municipality for financial incentives for owners of cultural heritage buildings for their energy renovation.

The Recovery and Resilience Plan was adopted in April 2021. This plan is the basis for drawing funds from the European Recovery and Resilience Fund. The renovation of buildings will include public buildings, divided into individual groups, such as buildings for special purposes, buildings of exceptional social importance, and already partially renovated buildings and residential buildings. Priority will be given to buildings for which sustainable renovation is necessary and possible, e.g. in addition to energy, also earthquake-resistant. Any cultural protection requirements for renovation will also be considered for cases of buildings that are part of the cultural heritage.

The Comprehensive National Climate and Energy Plan (NEPN 2024) () states that sustainable buildings are one of the key areas of research into energy management within a circular economy. This set also includes technological solutions for renewable energy sources (RES) and efficient use of energy in cultural heritage. It is planned to create various financial instruments to encourage investments in the development of solutions that will enable the introduction of RES in cultural heritage while preserving its protected properties. Among the spatial planning measures for the transition to a climate-neutral society, the NEPN lists the preparation of guidelines for the evaluation of interventions related to the placement and operation of wind and solar power plants in cultural heritage protection areas. Instruments for the building sector also include the renovation of cultural heritage buildings and other special groups of buildings.

Guidelines for targeted financing of comprehensive renovations of cultural heritage buildings are being prepared. Analyses of the necessary additional or adjusted financing of comprehensive renovations of cultural heritage buildings are being carried out. An information point for the comprehensive renovation of cultural heritage buildings (energy and material efficiency) is being established. NEPN also provides guidance that in the case of installing solar power plants in settlement centers protected under cultural heritage protection regulations, it is necessary to first prepare a professional basis in the form of a solar cadastre for the entire area of the settlement center and obtain cultural protection conditions and cultural protection consent before installing the solar power plant.

The Act on Efficient Energy Use mentions cultural heritage in two places. In the purpose of promoting energy efficiency, which includes, among other things, reducing energy

consumption and increasing the quantity and share of RES, it is stated that the preservation of cultural heritage is also considered when determining the methods of promotion and the amount of incentives. In the provisions on the long-term strategy for promoting the energy renovation of buildings, it is stated that buildings that are protected in accordance with the regulations on the protection of cultural heritage are treated separately in the strategy.

Public sector entities must establish an energy management system that includes, among other things, goals in the areas of efficient use of energy and RES, and measures to achieve them. This obligation also applies to energy managers in cultural heritage buildings. A cultural heritage building or a building with the status of a monument no longer requires an energy performance certificate only if it is used for ceremonial purposes or religious activities (sacred heritage). Sale or rental, which would entail the obligation to provide an energy performance certificate, is more of a theoretical possibility for such buildings than not, so the inclusion of an exception in the law is logical.

The Rules on the Efficient Use of Energy in Buildings (PURES 2022) and the associated Technical Guideline TSG-1-004: 2022 Energy Efficiency of Buildings explain that exceptions or deviations from the requirements for unprotected buildings may be applied to buildings protected by regulations in the field of cultural heritage protection. Cultural heritage is divided into two groups. The application of these rules is not prescribed for cultural heritage that is not used for other purposes. The rules apply to all other cultural heritage buildings, but to a limited extent. The spaces and elements of the building that are defined in their opinion by the service responsible for the protection of cultural heritage are exempted.

In practice, this means that when renovating a cultural heritage building, the extent to which the PURES requirements are considered depends on the cultural protection conditions prepared by the competent regional unit of the Institute for protection of cultural heritage of the Republic of Slovenia (IPCHS) and the consent issued by it for the renovation project.

The purpose of the Construction Act () is to protect the public interest in the construction of buildings. The protection of cultural heritage is listed among the types of public interest and is at the same time a legitimate objective that justifies the protection of the public interest. Deviations from the essential requirements for buildings and other

requirements (e.g. due to special requirements for the protection of cultural heritage) are possible, but they must not be such that the safety of the building, the life and health of people, neighboring real estate or the environment are directly endangered.

Spain

The Ministry for the Ecological Transition and the Demographic Challenge (MITERD) is responsible for the implementation of the EPBD in Spain, together with the Ministry of Housing and Urban Agenda, in collaboration with the Institute for Diversification and Energy Saving (IDAE). The transposition is generally considered to be complete, and all the local policy should be in place by June 2026. A consultation about the application to existing buildings (listed included) will be closed in September 2025.

In Spain, there is the Existing Building Book (LEEx), and it is proposed to integrate within it a renewal passport for buildings. The smart building indicator (SRI) for gradually digitalizing all buildings and a carbon footprint calculation for a building or housing are introduced for the current Energy Efficiency Certificate. An obligation to establish Rehabilitation Offices will be in place to advise all buildings, especially those with the highest consumption.

Sweden

The new EPBD requires the energy efficiency improvements to be carried out on the existing building stock, which means that cultural values—both in buildings protected under the Swedish Heritage Act (Kulturmiljölagen) and in the remaining building stock—may be affected. The national authority responsible for implementing the directive into national legislation is the National Board of Housing, Building and Planning (Boverket). Boverket cooperates with the Swedish National Heritage Board (Riksantikvarieämbetet) to ensure that the directive does not negatively impact buildings' cultural values and heritage significance.

There are three specific areas in collaboration between Boverket and Riksantikvariämbetet:

- Establishing methods and definitions in accordance with the EPBD.
- Updating the energy performance certification system.
- Developing the basis for implementing requirements related to solar energy.

Heritage issues have in spite of this a rather weak position due to the fact that the number of protected buildings is very small. Most of the buildings within the Swedish building stock are subject under the Planning and Building Act (Plan och Bygglagen).

The regulations that cover buildings are when it comes to the application of the regulations divided into two levels, national/regional and local. The Heritage Act (Kulturmiljölagen) is managed by the administrative boards on a regional level while the Planning and Building Act (Plan och Bygglagen) and the building regulations are managed by the municipalities.

New building regulations have come into force from July 1st 2025. The area still missing is regulations concerning energy efficiency since they will have to align with the work with implementing the EPBD into the Swedish legal system, they are due to be launched later this year. As an example from the regulations dealing with fire safety there is a specific formulation that concerns all alterations to buildings where an assessment if change will have a negative impact on the cultural values of the building and how such a negative impact can be avoided need to be undertaken before going ahead with the alteration. (BFS 2024:7)

Türkiye (non-EU)

Regulation on Energy Performance in Buildings (2008): For improving energy efficiency in buildings registered as cultural property, the opinion of the Council for Conservation of the Cultural and Natural Property (Law on the Conservation of Cultural and Natural Property, 2683) is required. Energy efficiency enhancing practices should be implemented in a manner that does not affect the characteristics and external appearance of the building.

United Kingdom (non-EU)

The legislation and regulations for the protection and conservation of the built and historic environment in the four home countries within the United Kingdom (England, Scotland, Wales and Northern Ireland) are well-developed. The Planning system provides the framework for the management and control of listed buildings and their settings, which is in Local Authority hands.

As an example, the main legislation in Scotland is: the Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997, the Town and Country Planning (Development Management Procedure) (Scotland) Regulations 2013 and The Planning (Listed Building Consent and Conservation Area Consent Procedure) (Scotland) Regulations 2015, setting out the process for applying for and determining applications for listed building consent and conservation area consent. The Historic Environment Scotland Act 2014, sets out

Historic Environment Scotland's role, which includes changes in processes for the designation of scheduled monuments and listed buildings, consents and appeals.

A.1.2 Definitions

Belgium/Flanders

Definitions of buildings with 'protection' on a regional level are noted in the Immovable Heritage Decree:

A **protected monument** is a property that has been created by man, by nature or by both together, including the cultural goods that are an integral part of it. It is of general interest because it possesses one or more heritage values and is provisionally or definitively protected in accordance with the Immovable Heritage Decree.

A **protected townscape** consists of a set of immovable property with surrounding elements such as plantings, fences, watercourses, bridges, roads, streets and squares. It possesses one or more heritage values and is provisionally or definitively protected in accordance with the Immovable Heritage Decree.

Established built heritage (selection from the scientific inventory of immovable heritage) has been established in accordance with the Immovable Heritage Decree. The term "built heritage" is used in the broadest sense of the word: any type of building or building groups and complexes, with associated interiors and (immovable) interior elements. The juridical consequences of established built heritage are more limited than those of protected heritage. (some of the juridical consequences: you always need an environmental permit from your municipality for the demolition of a building or construction from the established inventory of architectural heritage, even if it is a detached building. / For buildings on the established list, you can request a deviation from the standards for energy performance and indoor climate if this is necessary to maintain the heritage value of the building (the Energy Decree of 8 May 2009)/

Other 'non protected' buildings with a certain heritage value on a more local level are added to the scientific inventory

Inventoried built heritage has been described and documented in the scientific inventory of immovable heritage. There are no rights or obligations associated with the inclusion of a property in a scientific inventory: inventoried heritage has no legal consequences. But there is no exception to the EPBD either.

Until 2017, the inventory of immovable heritage in Flanders was the responsibility of the regional government, namely the Flanders Heritage Agency and its predecessors. Since

then, the Flemish government has shared the authority to make an inventory with the local authorities:

1. Cities and municipalities are competent to make an inventory of built heritage on their territory. It is an obligation for recognised immovable heritage municipalities to make an inventory of this heritage in their municipality. Other cities and municipalities take on this task without obligation. Intermunicipal Immovable Heritage Services (IOEDs) can support them in this.

2. The Flemish government supplements the architectural and landscape inventories in research in the context of the Flemish protection policy. The authority for making an inventory of the archaeological heritage, sailing heritage and the landscape wholes (Landscape Atlas) still lies with the Flemish government.

Since 2023, recognised immovable heritage municipalities have the authority to determine architectural and landscape heritage on their territory and to link admission obligations to it.

Czech Republic

There are several options to value non-listed buildings and sites following the Appendix No.1 of Decree No. 157/2024 Coll. Decree on spatial analytical documents, spatial planning documentation and a unified standard. The database of territorial analytical data records monitored phenomena. Besides the legally protected values, non-listed values and buildings are included in the database. These can be incorporated into master/local/zoning plans. Unfortunately, this is used only by the architects and planners. State institutions do not have the capacity, although they struggle to provide data to include these so-called optional phenomena, especially the architectural, urban and landscape value.

The phenomena can be: built-up area; land use; brownfield; immovable national cultural monument, immovable cultural monument and their protection zone; protected area and its protection zone; area with archaeological findings; site inscribed on the World Heritage List and its buffer zone; structure and height of development, significant dominant; building or set of buildings of architectural or urban value, historically significant building, site or set of buildings; urban and landscape value, feature of historical cultural landscape. There are altogether 113 phenomena.

Estonia

ICOMOS Estonia has been involved in the Estonian Ministry of Climate consultations on EPBD and organised a debate in December 2023 to define the historical and architectural

merit. The Estonian National Heritage Board has worked for years on different inventories (farm houses, 20th century heritage, dairies, parsonages, railway stations etc). Despite that the inventories are publicly accessible on the Board's webpage, they are not legally binding unless the sites are either protected by Conservation Act or referred to as valuable buildings in the general and detailed plans on municipality level.

ICOMOS proposed to add the provisions to respect architectural and historic values of any building to the Building Code following the example of Sweden and Finland.

ICOMOS Estonia organised a think tank "Historic buildings in the wind of energy efficiency" in 2023 to bring in the perspective of heritage values in the process. Since October 2025, the Ministry of Culture and Ministry of Climate have been collaborating on rephrasing the exemption of energy performance requirements for culturally valuable buildings for the Amendment of the Building Code. The currently discussed phasing is as follows:

The requirements of this chapter shall apply with relief to buildings of cultural value, which are buildings included in the UNESCO World Heritage List, monuments, buildings of category A and B in heritage conservation areas, valuable buildings in national parks, buildings in an area of environmental value and valuable individual objects designated in general and detailed plans. When applying with relief, all possibilities for improving the energy efficiency of the building shall be considered during the major reconstruction of an existing building and those measures shall be implemented that allow the preservation of the building's distinctive character and exterior, culturally valuable details and structures and are technically and economically feasible.

The purpose for rephasing the exemption is to promote more thorough consideration for improving the energy efficiency of these buildings, provided that the culturally valuable aspects remain unharmed. The condition of technical and economical feasibility is included in order to prevent the interpretation of the legislation in a way that all available renovation measures that are considered respectful of heritage would become mandatory to implement as this would in most cases oblige the use of solar roofing or other financially unobtainable measures for most of the home owners.

France

The law submitted in 2025 has defined old buildings that should be given greater consideration regarding their specialities as such: 'an old building is a building constructed using traditional techniques and materials such as stone, unbaked earth, local brick and wood, giving the exterior walls good permeability to water vapour. For thermal regulations, this includes all buildings constructed before 1948.

However, consideration is also given to post-1945 buildings from the reconstruction period and public policies encouraging innovative construction.

Germany

The constitutive list is for protected monuments and the informational one are the inventories of buildings that are not protected. Municipalities can define with a certificate the architectural merit of the buildings.

However, there is a need for a better system for administrative management to involve heritage authorities. Usually the concern is about buildings that are part of a certain typology and it is possible to work out standard solutions.

Greece

Protected architectural heritage consists of monuments, historic buildings, buildings in traditional settlements and historic and archaeological sites.

Monuments: Ancient and modern immovable monuments declared based on the provisions of Law 3028/2002 (Protection of Antiquities and Cultural Heritage in general)

Listed: Buildings, parts or complexes of buildings, elements or their surrounding environment or of the natural or man-made environment in Law 4067/2012 (New Building Regulations) or other.

Historic site: Historic sites as claimed in Law 3028/2002 (Protection of Antiquities and Cultural Heritage in general).

Traditional settlement: Settlements, parts of cities or settlements or independent residential complexes outside of these.

Buildings that are older than the last hundred years should be evaluated for its historic and cultural importance.

Hungary

Many non-residential buildings, particularly those used by government or institutions, often in central locations and of incredible importance, are always not listed. There is a potential pressure on buildings which are defining the environment. A lot of those types of buildings have already disappeared, there is a threat of destroying urban character.

Ireland

The Building Regulations in Ireland are supported by Technical Guidance Documents (TGD) which provide 'deemed-to-satisfy' guidance on complying with the regulations.

Currently, protected structures, proposed protected structures and buildings subject to the National Monuments Acts are among the building types exempt from compliance with the Building Regulations. TGD-L deals with the conservation of fuel and energy and acknowledges that compliance may pose particular difficulties for buildings that may be of architectural or historical interest including buildings of traditional construction.

TGD-L states that 'the aim should be to improve the energy efficiency as far as is reasonably practicable. The work should not prejudice the character of the building or increase the risk of long-term deterioration of the building fabric.' The guidance also directs the user to I.S. EN 16883:2017, Conservation of cultural heritage — Guidelines for improving the energy performance of historic buildings as providing guidelines for sustainably improving the energy performance of historic buildings, e.g. historically, architecturally or culturally valuable buildings, while respecting their heritage significance.

Slovenia

In Slovenia, as is the case in most national legal arrangements within the framework of heritage protection policies, there is no time limit (age) set for a building to be declared as heritage. It can be said that most older (i.e. pre-WW2) buildings, which exhibit defined heritage values, are formally protected either through the status of registered heritage or monument of local or national importance. However, modern architecture (from WW2 to 1970s or even 1980s) is much less represented in these categories, and many outstanding buildings lack protection.

Spain

The protection of buildings in Spain is via the declaration of Bienes de interés cultural (BIC) and the Inventario del patrimonio cultural (IPCA), and integrated in the Planning system. Protected buildings can also be other buildings considered of local interest and, together with BICs and IPCAs, are included in local catalogues (edificio catalogado). The type of intervention allowed in the building depends on its level of protection. In Madrid, for example, major interventions are subject to the approval of the Comisión para la Protección del Patrimonio Histórico, Artístico y Natural (CPPHAN).

Sweden

Listed buildings (Heritage Act)

All listed buildings need permission if they are to be altered or renovated from the heritage sections at the administrative boards. The administrative board can and often do request that a heritage documentation and assessment should be carried out prior to the alteration/renovation work and that a building conservation expert (there is a certification system for this) be engaged to monitor the project and ensure that cultural values are taken into account in the process.

Highly valuable buildings (Planning and Building Act)

The municipalities can set requirements that the highly valuable buildings (not listed but can be pointed out in the municipal zoning plans) should have been documented and that the cultural values are assessed before decisions about building permits can be given to the property owner. The municipalities can also decide that the alteration/renovation work should be monitored by a building conservation expert.

The Planning and Building Act states that all buildings have to be managed, cared for or renovated carefully, and buildings with particularly high values cannot be distorted. Before renovation, you need a building permit. In that process heritage values are already taken in account.

Section 6. In planning, in matters concerning building permits, and measures regarding buildings that do not require permits in accordance with this Act, built Planning and Building Act Ch. 2 Public and private interests 18 environment and construction works must be designed and placed on the intended land in a manner that is suitable, with regard to: 1. the townscape and landscape, natural and cultural values on the site, and in the interest of ensuring a favorable overall impression;

/…/ In conjunction with planning and other matters, as well as with measures regarding buildings that are not part of matters covered by this Act, the particular values of history, cultural heritage, environment and art of the development area must be protected. Alterations and additions to the built environment must be done cautiously so that existing characteristic features are respected and sustained. Act (2014:477).

/…/ Maintenance and caution Section 14. A construction works must be maintained in a proper condition, so that its design and the technical characteristics referred to in Section 4 are essentially preserved. Maintenance must be adapted to the character of the surroundings and the construction works' value from a historical, cultural-historical heritage, environmental and artistic point of view. If the construction works is of particular value from a historical, cultural historical heritage, environmental or artistic point of view, it must be maintained in such a way as to preserve its particular value.

/…/ Section 17. Alterations to buildings and moving of buildings must be carried out with care, so that the building's characteristics are taken into consideration and its technical, historical, cultural-historical heritage, environmental and artistic values protected.

United Kingdom (non-EU)

English building codes allow a deviation for buildings of a certain type of construction. Especially pre-1919 buildings are considered historically valuable.

There's a mechanism to put a building preservation notice on a building for a 6 month period for unlisted heritage assets that are under threat of demolition whilst impartial assessments are being carried out. It's a local planning authority tool, the local community can influence that decision.

Principles of Selection for Listed Buildings in England (Nov 2018) are age and rarity, some general principles are:

•before 1700, all buildings that retain a significant proportion of their original fabric are likely to be regarded of special interest;

•from 1700 to 1850, most buildings that retain a significant proportion of their original fabric are likely to be regarded of special interest, though some selection is necessary;

•from 1850 to 1945, because of the greatly increased number of buildings erected and the much larger numbers that have survived, greater selection is necessary;

•very careful selection is required for buildings from the period after 1945

There are between 300 and 400 new additions on average per year.

A.1.3 Data on historic building stock

	Data on historic building stock			
	Total building stock	Protected buildings and built areas	Estimation on most non-energy-efficient buildings	References
Armenia (Non - EU)	441.473 buildings • 19 256 residential buildings; • 422 217 private houses; • 1400 schools; • 55 universities; • 619 hospitals [1]	• 3363 protected buildings: • 1495 churches, • 1427 residential houses, • 441 are public and industrial buildings.	In the 1970s- 80s, energy efficiency was notably ignored in Armenia. This has presented challenges that are now being addressed in contemporary efforts to enhance energy efficiency and building sustainability	[1] Source: Social-Economic Situation of the Republic of Armenia in 2021. January-March
Austria	2,4 million buildings Approximately 1,5 % of building stock is protected. [1]	38,973 protected monuments [2]		[1] Austrian statistics; Bettina Fernsebner-Kokert, Andreas Kovar Bessere rechtliche Rahmenbedingungen für Baudenkmäler [2] 29.1.2024

Belgium (Flanders)	4.649.265 buildings in Belgium (residential and non-residential) (2024) 3.379.902 houses in the Flemish Region (2024). These represent 58% of all households in Belgium. (amount of non-residential buildings is not known) [1] The most common type of housing: 29% apartments; 27% detached houses; 21% terraced houses. Estimated ratio of protected houses and houses in the established inventory make up roughly 3% of all homes in the Flemish region Protected buildings and built areas	Protected monuments in the Flemish Region - 11 384 (2024). The majority are buildings but not all, there are also protected trees. Protected townscapes in the Flemish region - 1523 (2024). The number of separate buildings in the protected city and village areas is not known. Built heritage items in the established inventory - 72 580 (2024) Some of these items are also protected. In 2021 a query in the database of protected monuments and the established inventory on the typology 'houses' showed that 50% of the protected monuments had the category 'house' and 73 % of the established inventory UNESCO world heritage: 6 in Flanders [2]	A recent analysis was carried out based on the energy performance certificates drawn up from 2019 to October 2024. Insight was gained into the energy performance of immovable heritage, limited to protected monuments, protected townscapes and townscapes and established architectural heritage. The analysis led to 3 big conclusions: 1) Protected and built heritage in the established inventory do not have significantly worse energy performance scores than non-heritage. For small non-residential building units, the differences are more pronounced. 2) Protected monuments do not have worse energy performance scores than built heritage in the established inventory. The specific status of heritage explains less than 0.005% of the variance in the energy performance score of residential building units.	[1] Statistics Flanders: [2] - protected monuments in the Flemish Region - 11 384 (2024). The majority are buildings but not all, there are also protected trees.

			3) the type of building (open, semi-detached, closed construction) and the destination (apartment, catering, lodging, office, etc.) has a significantly larger impact on the energy score of buildings than the heritage status.	
Bulgaria	107,046,407 buildings of which 104,923,286 are non-residential and 2,123,121 are residential buildings including sheds, stables, chicken, coops, outdoor toilets, barns. [1] Approximately 0,016 % of building stock is protected.	Protected monuments 40 000, out of them 6200 are buildings Ca 22 000 buildings of architectural and historical merit	The buildings from the end of the 19th century and the first half of the 20th century	[1] Source: 2011 national census, Ministry of Regional Development and Public Works
Czech Republic	2 317 276 houses (March 26, 2021) [1] Additional relevant information: Type of heating: More than two-thirds (68.0%) of occupied houses with information on a type of heating had central house heating from a boiler room or from a boiler outside dwellings. About every twentieth (5.6%) occupied	According to the latest data, the conservation areas (reservations, zones, premises, buffer zones, etc.) in total account for 2.5% of the total area of the Czech Republic. UNESCO World Heritage - 16 Heritage reserves - 114. These areas include urban, rural and archaeological reserves. Heritage zones - 503		[1] Census 2021, Czech Statistical Office: [2] English version: [3] The following data is based on National Heritage Institute. Monument Catalog/ Ústřední seznam kulturních památek [4] Ministry of Regional Development, Housing in the Czech Republic in figures (August 2019). English version:

	house was heated by central remote heating from a heating plant or from a community heating centre. More than one-fourth (26.4%) of occupied houses did not have central heating. [2]	These areas include cultural landscape, urban, and rural heritage zones. National cultural property - 388 (incl. 33 movable heritage objects). These can consist of many buildings, sometimes even dozens (i.e., monastery, castle, homestead, etc.). Monument, immovable and movable heritage objects/assets - 39,183 records (incl. 88 movable heritage objects). These can consist of many buildings, sometimes even dozens (i.e., monastery, castle, homestead, etc.) Protective zones (buffer zones in the case of World Heritage Sites) - 454 records (incl. 88 movable heritage objects) [3] Non-protected buildings of architectural merit The average age of occupied multi-dwelling buildings in the CR was 52.4 years, and of family houses 49.3 years. The average age of occupied dwellings at the census date was 46.5 years. In comparison with other EU countries, the CR has a somewhat older dwelling stock.		

Denmark	2 347 178 buildings [1] Approximately 0,3 % of building stock is protected.	7000 protected buildings [2] Ca 350 000 buildings of architectural and historical merit		[1] Denmark statistics [2] Denmark database
Estonia	306 746 residential buildings 459 408 non-residential buildings Approximately 3 % of building stock is protected.	• Protected by Heritage Conservation Act:5260 protected buildings, 4000 buildings on conservation areas, • Protected by Planning Act: The number of valuable buildings and milieu areas in master plans is unknown (est up to 20 000). • Protected by Nature Conservation Act: Ca 2500 traditional buildings in national parks Ca 5 0000 buildings of architectural and historical merit based on inventories [3]. Inventories do not provide protection.	Buildings from 1920s and 1950s-1990s According to the Long-Term Strategy for Building Renovation compiled in 2020 [4], Estonia needs to reconstruct approximately 100,000 detached houses with a total area of 14 million m2, about 14,000 apartment buildings with a total area of 18 million m2, and approximately 27,000 non-residential buildings with a total area of 22 million m2	[Source1] (August 2025) [Source2] [Source3] [Source4]
France	On 1 January 2022, the housing stock in France, excluding Mayotte, amounted to 37.6 million housing units. Around 33% (or more than 10 million) of	On 1 January 2024, 45 080 heritage assets were protected as historic monuments (⅓ is inhabited), including 14 317 'listed' assets ('classé' in French is the highest level of protection for heritage assets of national interest) and		[1] Total building stock:French Institut national de la statistique et des études économiques : [2] Existing housing stock known as 'old buildings':

	the existing housing stock is of a particular type, known as 'old' buildings. This type covers all buildings constructed before the middle of the 20th century (1948), using traditional techniques, skills and materials (stone, timber-framed, mud, etc.) [1 - 4]	30 763 as 'registered' ('inscrit', for heritage assets of regional interest) assets. These numbers include buildings as well as historic gardens, parks, caves and archaeological remains. 50% was public property, 42% was private property, and 8% was managed by private-public organisations. France has progressively extended building protection to whole areas. There are about 1012 (2024) protected urbanised spaces known as 'remarkable heritage spaces' (Sites patrimoniaux remarquables' or SPR in French) managed by urban planning tools such as 94 plans (2024) for safeguarding and enhancement (plan de sauvegarde et de mise en valeur' or PSMV in French) and 838 plans of enhancement of architecture and heritage. They cover areas of cities that are of national interest. They represent around 5 % of the total national territory and 2% of the national urbanised space.		Centre de ressources pour la réhabilitation responsable du bâti ancien (CREBA) : [3] Protected buildings and built areas: French Ministry of Culture (protected monuments and sites key figures): [4] French Ministry of Culture (protected built areas key figures) :
Greece	4,258,084 300,288 (residential) Before 1919: 149.166 1919-1945: 300.313	Documentation of architectural heritage has been a priority since the establishment of the Archaeological Service in 1833. The Ministry of Culture and Ministry of Environment and Energy, both have services that deal		[Source1] [Source2] [Source3]

	1946-1960: 604.540 1961-1970: 658.514 1971-1980: 706.406 1981-1985 (first legislation on thermal insulation): 449.009 1986-1990: 312.747 1991-1995: 255.120 1996-2000: 272.220 2001-2005: 294.068 2006-2010: 151.568 2011-2015: 72.000 2016+: 43.340 Under construction: 16.073 Construction materials Bearing system: Rubble masonry: 726.536 ~17%	with listed buildings. The Directorate for the management of the National Archive of Monuments (DEAM) is the responsible authority for maintaining the national register of movable and immovable monuments. The Ministry of Environment and Energy initiated the Archive of Traditional Settlements and listed buildings and listed buildings and traditional settlements are registered separately [2] However, some buildings are characterized by both ministries, and this number remains unknown as there is no unified list. However, the Electronic Building identity which is already set and running will resolve these issues. There is also an urban non-profit organization for the protection of the natural and architectural heritage in Greece and Cyprus, created in 2006. Finally, current practice and legislation act permit controlled and restricted interventions focused on the energy efficiency improvement of listed buildings and monuments. Also publishes an electronic magazine [3] ~22000 buildings, >900 Traditional settlements		

	Brick masonry: 821.921 ~ 19.2% Reinforced concrete ~60.60% Wood: 21320 ~0.50% Metal: 56434 ~1.32% Other: 62.148 ~1.45% [1]			
Hungary	Ca 4,000,000 Approximately 1.5 % of building stock is protected.	11 000 monuments on national level 50 000 monuments on local level Ca 10 0000 buildings of architectural and historical merit based	Buildings from 1960s-1980s	
Ireland	2.1 million buildings: 2 million residential and 100,000 non-residential or commercial. Estimation is that over 15% of buildings are pre-1945 Approximately 8 % of building stock is protected. A small percentage of buildings are most energy	55,000 buildings are recorded on the National Inventory of Architectural Heritage (NIAH): 25,000 of these are residential, which is 1.25% of the residential stock. 30,000 are non-residential which is 30% of non-residential stock [1] Ca. 250,000 buildings of architectural and historical merit based. In Ireland, protected structures are those listed in the record of protected structures of	Buildings from the 2nd half of 20th century.	[Source1]

	inefficient, these tend to be the oldest buildings.	the 31 local authorities (City and County Councils). The local authorities also designate architectural conservation areas (ACA). There are approx. 45,000 protected structures. We do not have a number of the historic buildings in ACAs. Any works which would materially affect the character of a protected structure (including internal works) or the character of an ACA, require planning permission including many energy upgrading works. Based on figures from the 2016 Census, 15-18% of the Irish building stock are of traditional construction, i.e. built with solid masonry walls of brick, stone or clay, using lime-based mortars, often with a lime or earthen-based render finish, single-glazed timber or metal-framed windows and a timber-framed roof usually clad with slate but often with tiles, copper, lead or, less commonly, corrugated iron or thatch. In general, these were the dominant forms of building construction from medieval times until the second quarter of the twentieth century. We have successfully argued that, in the context of energy upgrading, the way the buildings are constructed and how they manage moisture in the external walls makes them different from modern construction and not whether they have		

		statutory protection. This is to ensure that historic buildings that do not have statutory protection are not subject to interventions that could potentially damage the fabric of the buildings, the character of the architectural heritage and the health of occupants.		
Italy	According to the latest ISTAT Census (2021), Italy has approximately 12.5 million buildings, including more than 11.4 million residential buildings. It is estimated that around 1.7% of the total building stock is protected under the Italian Cultural Heritage and Landscape Code (Legislative Decree 42/2004). [1 - 3]	The protected heritage includes approximately 100,000 cultural and landscape assets, of which more than 65,000 are historic buildings listed in the regional registers maintained by the Soprintendenze. In addition: 61 UNESCO World Heritage sites (2025), about half of which encompass historic urban ensembles or cultural landscapes. Over 6,000 historic centres are subject to urban and landscape protection under local and regional planning regulations. [4 - 6]	The most energy-inefficient buildings in Italy are those constructed between the 1950s and the 1980s, before the introduction of the first energy efficiency regulation (Law No. 373/1976). A significant portion of the pre-1945 historic building stock also presents thermal dispersion issues and limited potential for compatible retrofit solutions. [7-8]	[1] ISTAT, Censimento permanente della popolazione e delle abitazioni 2021; [2] MiC – Directorate-General for Archaeology, Fine Arts and Landscape (National Register of Cultural and Landscape Assets, 2024); [3] MiC – Directorate-General for European and International Affairs (UNESCO Report 2023). [4] MiC – General Catalogue of Cultural Heritage (2024); [5] ISPRA – Report on Land Use and Landscape Protection (2023); [6] UNESCO World Heritage Centre – State of Conservation Database (2024) [7] ENEA, Annual Report on Energy Efficiency 2024

				[8] MiC–ENEA, Guidelines on Energy Efficiency in Cultural Heritage (2022)
Lithuania	440,000 buildings to be renovated according to Lithuanian long-term renovation strategy, 2021 333 or about 0.08% are state-owned (16.5% of all state-owned building stock of 2018 units) [1]. Some protected historical buildings that are not used for living, administrative, or commercial purposes, like old outbuildings belonging to protected residential houses do not fall under the regulation of this directive [2].	2749 protected buildings at state level 110 protected buildings at municipal level [3] 3463 buildings of architectural and historical merit which renovation has started, total number unknown.		[1]2014-01-23 Energy minister order No 1-7 "Regarding the approval of the list of heated and/or cooled buildings belonging to the State and used by state institutions and organizations—state administration subjects". [Source2]) [3] Register of Cultural Heritage
North Macedonia (non-EU)	Approximately 4.01% of building stock is protected.	1329 Register of protected buildings in North Macedonia 3500 estimated buildings of architectural and historical merit	Older residential and non-residential houses, especially in the rural areas, from 1900 to 1990 Byzantine and Postbyzantine churches from the Middle Ages to present times	[1] Ministry of culture - Register of protected buildings in North Macedonia

Norway (non-EU)	4,326,261 [1]	9550 listed buildings [2] 200,000 estimated buildings of architectural and historical merit. [3]	Industrial buildings of the 20th century, different kinds of outbuildings and the stave churches	[Source1] [Source2] [Source3]
Serbia (non-EU)	2,261,051 residential buildings (National census in 2022) [1].	2658 registered immovable cultural properties: ● 2277 monuments of culture, ● 97 spatial cultural-historical units, ● 203 archaeological sites and ● 81 landmarks [2].	In 2011-2013, a detailed study was conducted on the energy performance of the housing stock in Serbia and its potential for energy improvement, which provided data on the number and type of residential buildings from different periods [3]	[Source1] [Source2] [Source3]
Slovenia	Approximately 3 % of building stock is protected. Calculated from data presented in [1]	According to the Cultural Heritage Protection Act (2008; last amendment 2023, awaiting a thorough renewal in 2025), the national heritage register consists of three interconnected parts, which contain basic, protective and presentational data on immovable, movable and intangible heritage. Basic heritage data includes identification, description, dating, location, author or bearer of intangible heritage, a characteristic photograph or recording of the heritage, protection guidelines, and the connection of the heritage unit with other units.		[1]DOI:

		Protection data is kept for monuments and includes protection documents, protection description, protection regime and information about the owner of the monument. Presentation data includes additional information that illustrates the heritage in textual, graphic and other media forms. Immovable heritage shall be entered in the register as an individual property or as a heritage area. A building, structure or other property shall be entered in the register as an individual property, which is either constructed or assembled or formed with natural elements according to the principles of landscape architecture or is an archaeological site. Its components and attachments, which are intended for the use or embellishment of the property or are indispensable for its operation or understanding, shall also be part of an individual property. A heritage area shall be entered in the register as a uniform group of buildings, a settlement or part thereof, a larger archaeological site or an area of cultural landscape which has heritage values and is sufficiently interconnected to constitute a topographically identifiable whole of immovable heritage.		

		The protection regime of a registered cultural heritage building that has not been declared a monument of local or national importance is determined by municipal spatial documents. Slovenia has 30.965 units of cultural heritage listed in the national Register of immovable cultural heritage (status in y. 2025). 8.082 of them are monuments of local significance and 343 are monuments of national significance		
Spain	9,814,000	15 600 protected buildings 1 159 000 buildings built before 1920. Most of them have some protection or historical merit. [1]	Buildings from the 1950s to the early 1980s	[1] National Institute of Statistics
Sweden	The total building stock in Sweden is approximately 2.52 million. Residential buildings: 2.24 million. Non-residential buildings/services 277,000 [1].	5700 building environments/ensembles of which 3400 are churches belonging to the Swedish church. The total number of protected buildings is around 10 000. In terms of energy efficiency, the biggest targets are the buildings of the second half of the 20th century (dating mostly from the period 1961 - 1971. The older buildings stand for a relatively small part of the energy use. The	20th century buildings	[1] the numbers vary between sources because sometimes the property is referred to and not the amount of buildings. Non-residential buildings can be counted per service and not per building. [2] Does age matter? How building age influences energy use in the Swedish residential building stock (p 109 A. Donarelli, T. Broström

		Swedish data is based on actual energy use [2].		
Türkiye (non-EU)	11,598,446 (2020) [1] Number of households: 25,329,833 [2]	Approximately 1 % of building stock is protected. 127,287 in 2024: ● Civil Architecture: 78,167 ● Religious Buildings:11,558 ● Administrative Buildings: 3,452 ● Industrial and Commercial Buildings: 5,121 ● Military Buildings:1,688 ● Cemeteries: 7,003 ● Martyrdoms: 335 ● Monuments and Memorials: 433 ● Streets Under Protection: 98 ● Ruins: 3,750 ● Cultural Buildings: 15,682 [3] 26,128 protected areas: Archaeological Site Area: 25,353	The buildings from 1950 to 2010—the period from the widespread use of reinforced concrete construction until the "regulation on energy performance in buildings" was issued in 2010.	[Source1] [2] Turkish Statistical Institute [3] The website of Ministry of Culture and Tourism [Source4]

		Urban Site Area: 365 Historical Site Area: 242 Urban Archaeological Site Area: 36 Mixed Site Areas: 132 Archaeological and Urban Site Area: 73 Archaeological and Historical Site Area: 18 Archaeological-Historical-Urban Site Area: 7 Historical and Urban Site Area: 34 22 UNESCO WHL areas [4] Approximately 3% of building stock has architectural and historical merit		
United Kingdom (non-EU)	28 million residential buildings 1,755 million non-domestic buildings Around one-quarter of UK's existing building stock are historic buildings; 6 million	over 500,000 listed buildings in UK England: 379,443 listed buildings, 9,969 scheduled monuments, 1,711 Registered Parks and Gardens and 9,907 conservation areas in England (English Heritage, 2024). There were 4,871 entries on the Heritage at Risk Register in 2023	The UK has the oldest housing stock in Europe, with 38% of homes dating from before 1946 (BRE, 2016). In England, 8.97 million homes (35% of the total) were constructed before 1945 and 5.15 million homes (or 20%) predate 1919 (English Heritage, 2024). Numbers in 2018 SHEA are: One in five (483K) of	

	are traditionally built buildings	Scotland: According to the 2024 Scotland's Historic Environment Audit (SHEA), it is ranked 10th out of 60 nations for historic buildings and monuments, but 2,226 buildings are at risk. It does not provide specific numbers, more than 55,000 protected places in Scotland. Numbers in 2018 SHEA were: More than 56K protected places: • 6 World Heritage Sites • 8,000 scheduled monuments • 47,000 listed buildings • 363 Gardens and Designed Landscapes • 8 Marine Protected Areas • 8 Scheduled wrecks • 668 Conservation Areas • 40 Historic Battlefields • 40 National Scenic Areas • 2 National Parks	Scotland's dwellings are more than 99 years old (built pre-1919). BEFS (Built Environment Forum Scotland) published that: In 2022, 49% of dwellings had some disrepair to critical elements, and 18% of all dwellings had an urgent disrepair to critical elements (SHCS 2022) 32% of pre-1919 dwellings had an urgent disrepair to critical elements in 2022 (SHEA 2024) Traditional dwellings constructed before 1919 make up approximately 18% of Scotland's building stock, a decrease by 1% since 2021 (SHCS 2022) 41% of dwellings failed the Scottish Housing Quality Standards in 2022, a decrease by 1.9% since 2019 (SHCS 2022) 29% of homes in Scotland failed the SHQS due to Energy Efficiency in 2022 (compared to 31.8% in 2019), while 10% (12.2% in 2019) failed due to not being	

			Healthy, Safe and Secure properties (SHCS 2019) 5% of A-listed buildings are on the Buildings at Risk Register (HES 2018) In 2023, 90% of Scotland's scheduled monuments were in optimal or satisfactory condition (SHEA 2024) 52% of Scottish homes were currently rated as EPC band C or better (SHCS 2021) The oldest, pre-1919, properties are the least energy efficient: 29% rated C or better (60% rated D/E and 11% rated F or G) (SHCS 2022) The average Scottish home was estimated to produce 6.5 tonnes of carbon dioxide (CO2) per year in 2022 (SHCS 2022) Modelled annual carbon emissions of pre-1919 buildings of all dwelling types was 9.2 tonnes of carbon dioxide (CO2) per year in 2022 (SHCS 2022)	

Helpful sources :

Building preservation notices and certificates of immunity – Historic England

FuturHist Documentation

Heritage Research Hub _ ARCHE

Heritage Hub Krakow

Concerned Action - Energy Performance of Buildings Outputs

Confluence

3encult Concerned Action – CT3 Existing building status in 2022

ENSV-AEGSETE ERAMUTE TÜPOLOOGIA KOLME EESTI ALEVI NÄITEL

HEREIN For European Heritage Policies / HEREIN "*Background variables on the contribution of the physical cultural heritage to gross value added and to jobs generated*" 23/06/2016. In particular, the HEREIN project monitored Heritage Legislation and on the website there are reports from 35 European countries (most date from 2011 and 2013).

CIRCA BC Estonia Energy performance of buildings

Energy EC Europa

IEA-SHC. n.d. *Task 59 – Case Studies Assessment Report (D.A2).* Accessed August 2, 2025. .

IEA-SHC. n.d. *Task 59 – Handbook for Energy Retrofit of Historic Buildings (D.B3)*. Accessed August 2, 2025.

A 1.4 Energy Efficiency Interventions and Strategies

The examples from national reports complement chapter 1.2 Energy Efficiency Interventions and Strategies.

UNESCO World Heritage Convention report Understanding Renewable Energy

Austria

UNESCO-Welterbe Empfehlungen bei Errichtung von Photovoltaik (PV) - Anlagen

Belgium (Flanders)

The Flemish long term renovation strategy for buildings 2050 foresees by 2050 a Reduction of greenhouse gas emissions for buildings with more than 80%. The primary energy consumption of a residential home is set at 100 kWh or less per square metre per year. (label A). Non-residential buildings must reach Carbon neutrality

The Flemish long term renovation strategy for buildings 2050 mentions that for protected buildings a long-term objective must be determined that is achievable and desirable, with respect for heritage values and adapted tools and interventions need to be developed.

As a first step the minister responsible for immovable heritage decided in October 2022 that for the coming period of 3 years it is possible to **install solar panels on all roofs of protected heritage** (, other than World Heritage Sites or in the core zone of Bruges protected as World Heritage, where the assessment framework 'Solar energy in a heritage context' needs to be applied. The Flemish policy line is based on the point of view that solar panels have a visual impact on the amenity value of a building or site, but their placement is in principle reversible. Once there are new techniques and collective low-CO2 facilities, solar panels may disappear from the streets, probably in about 30-40 years. This time span is limited in the lifespan of heritage.

The installation of solar panels must be reversible and not lead to the removal or damage of heritage elements (e.g. dormer window, weather vanes, roofing, side boards, specific roof shapes, etc.). A heritage municipality can develop its own policy on this matter.

Czech Republic

Photovoltaic systems in heritage protection

Methodological Guidelines for the assessment of photovoltaic and other solar installation projects (hereinafter as "PV Installations") on cultural monuments, protected heritage sites and in conservation areas and their buffer zones

Examples of placement and regulate approach to the assessment of photovoltaic systems on cultural monuments and in protected heritage sites and conservation areas including buffer zones.

Cultural Heritage and Climate Change Symposium, Czechia, Norway and Slovakia

State-of-the-art in the Czech Republic

Placement, building permit, and use of photovoltaics - methodical instruction - Ministry of Regional Development

Placement, building permit, and use of heat pumps - methodical instruction - Ministry of Regional Development

CSN - Czech state standards - The standard is valid. Issue: 5/2024, Effective: 6/2024 - until now

ČSN P 73 0847 (730847) Fire safety of buildings - Photovoltaic (PV) systems

Cyprus

Handbook on the energy performance of heritage buildings - Project Violet Interreg Europe.

France

The French Ministry of Culture released in December 2023 a guide with recommendations for the architectural and landscaping integration of photovoltaic projects on buildings and on the ground.

Germany

Amendment of Bavarian law on the protection of historical monuments (adoption planned for July 2023).

Ireland

The national Climate Action Plan includes an objective to upgrade 500,000 homes to a B2 Building

Energy Rating (BER) or cost-optimal or carbon-dioxide equivalent by 2030. There are also challenging targets for upgrading non-residential buildings, and for reducing energy demand and greenhouse- gas emissions.

Where a historic building has statutory protection, for example where it is a protected structure or is located within an architectural conservation area, planning permission is required from the local authority for any works which would materially affect the character of the building or the area. This includes the addition of solar panels or other renewable energy systems to buildings or erecting free-standing installations within the grounds. Guidance on low-carbon heating and renewable energy sources (including solar PV and district heating) is included in Improving Energy Efficiency in Traditional Buildings. Further guidance on considerations regarding the installation of solar PV systems on historic buildings is proposed to be published by the National Built Heritage Service shortly.

Slovenia

Due to the national orientation towards decarbonisation of the building stock, based on the EU directives and long-term strategies, heritage buildings in Slovenia have been given special attention. Not only individual buildings, but groups of buildings, settlements and cultural landscape may have less or more strict limitations regarding any interventions into their appearance, including assessment of visual impression from various narrow or distant points of view.

The **Act on the Introduction of Devices for the Production of Electricity from Renewable Energy Sources (ZUNPEOVE)** () is the fundamental law regulating the issues of the introduction of devices for the production of electricity from RES. In the introduction, it prescribes priority areas for the placement of photovoltaic devices and the obligation to install photovoltaic devices in new buildings and reconstructions. Exceptions to the mandatory installation of photovoltaic devices, when the installation of photovoltaic devices is not permissible or feasible, include the requirements of protecting cultural heritage.

The existence of an exception to the mandatory installation of a photovoltaic device is proven by the owner of the facility either by a refused permit or consent or a negative opinion of the competent authority (protection of interest), or by an expert basis, a feasibility study, from which it follows that the installation of a photovoltaic device is economically or technically unfeasible. Cultural heritage is also the subject of the RES study in the prescribed priority areas for placement.

When placing and erecting devices in the installation areas, the investor must ensure that a draft RES study for the placement of these devices, prepared by an authorized spatial planner, is published on the website of the state administration and the website of the municipality in whose area the installation is planned, and the public and municipalities have the opportunity to submit comments on it within thirty days. The RES study that is being published must also contain, among other things, solutions and measures for the protection of cultural heritage.

The **Guidelines for the Installation of Renewable Energy Source Systems on Buildings and Cultural Heritage Areas in Slovenia** () address the issue of installing devices for generating electricity from renewable sources (RES) on cultural heritage buildings. In the introduction, they summarize the content of current international documents on cultural heritage and its threat due to various interventions and list the provisions of current Slovenian legislation and strategic documents. They then discuss the role of cultural heritage in reducing the carbon footprint, primarily for the purpose of preserving natural resources, the environment and space.

Successful examples from abroad and current guidelines or conditions for installing photovoltaic devices on cultural heritage buildings in individual EU countries are presented. The description of the types of cultural heritage in Slovenia is followed by guidelines presented in text and image form for activities prior to the installation of photovoltaic devices, restrictions for the installation of photovoltaic devices and other RES systems, and general and detailed guidelines for the protection of architectural and settlement heritage.

The **Regulation on detailed rules for spatial planning for the installation of photovoltaic devices and solar energy collectors** () sets out detailed rules for arranging the space for placing photovoltaic devices in new buildings and reconstructions of buildings and exceptions to their mandatory placement, detailed rules for arranging the space for placing photovoltaic devices in prescribed priority areas and detailed rules for

arranging the space for placing photovoltaic devices and solar energy receivers in other areas and buildings.

Photovoltaic devices under this Regulation are photovoltaic devices that are placed on, in or next to an existing legally constructed building or on, in or next to a planned building, or if they are placed as an independent building. The general rules for placing photovoltaic devices prohibit significant changes in the size, purpose or capacity of the basic existing or planned building and preventing the fulfilment of essential requirements of the existing or planned building.

The identity and recognizable values of space that form characteristic shapes and patterns in the space (structural arrangement of the space, colors and materials) must be preserved and maintained. On cultural heritage and in areas of influence of cultural heritage, the placement of photovoltaic devices is permissible after obtaining cultural protection conditions and obtaining cultural protection consent in accordance with the regulations governing cultural heritage. The general obligation to install photovoltaic devices does not apply if it is not possible to implement solutions that would preserve the protected values of cultural heritage and consider the protection regime. A special document, Recommendations, is used together with the regulation, which explains the requirements of the regulation in more detail with the help of textual descriptions and graphic displays.

Spain

"Guidelines for the installation of infrastructure and equipment related to renewable energies and their potential impact on Cultural Heritage" 2022

The English translation

Türkiye

Tamir Evi - Mardin Case from KORU project

Life in Historic Homes (Turkish)

PROcesses for sustainable retrofit of Traditional dwellings in Türkiye for Climate-resilience, Conservation and ComforT

United Kingdom (non-EU)

Technical advice for installing photovoltaics – Historic England

And ongoing work in buildings such as York Minster:

And Edinburgh Castle:

A 1.5 Maintenance, Repair, and Adaptation

Greece

Current practice and legislation acts permit controlled and restricted interventions focused on the energy efficiency improvement of listed buildings and monuments.

Even though they are excluded from the minimum energy performance requirements, they could be and many are already, energy upgraded, even partially, with pointed low impact reversible interventions, under specific circumstances, regulation and audit, without compromising their inherent qualities and heritage value. The works include replacement of windows, insulation on roofs and internall or external insulation depending on the buildings characteristics, integration of heat pumps and fan coils for heating and cooling and a few others. Energy_Efficiency_in_Historic_Buildings_2018_Technical_guidelines_for_energy_efficiency_interventions_in_buildings_constructed_before_1955_in_Greece

Greek Government Exoikonomoneon site

Guide to the "Save-Be Independent" program by the Greek Mistery of Economy

Website for the I SAVE – I WORK action of the Ministry of Environment and Energy

Ireland

General guidance for the repair and adaptation of historic buildings is included in the Architectural Heritage Protection Guidelines published by the government in 2011. Guidance on maintenance, damp and remediation measures can be found in the Advice Series Maintenance: A guide to the care of older buildings (2007).

Maintenance defects can have a significant effect on the building's thermal performance and the fabric of the building can take considerable time to dry out before any insulation can be added.

National guidance on improving the energy performance of historic/traditional buildings is predicated on the notion that the building is well maintained and free from defects before energy-upgrading measures are considered, to improve U-values. The guidance advises, for instance, that if the building is exhibiting significant moisture issues, appropriate risk mitigation measures may include the appointment of an accredited conservation architect or conservation consultant and the commissioning of specialist surveys, such as timber decay surveys, to identify the remedial maintenance works that may be required.

Research has shown that increased moisture in the fabric of a building reduces its ability to insulate and leads to a higher rate of heat loss. As a result, the effective heat loss through the wall can increase by up to 30%. Common causes of moisture ingress include damp penetration in walls due to leaking gutters, cracked sills, defective render or through the removal of render, poorly fitting windows and frames, and defective chimneys.

Slovenia

An approach is encouraged in Slovenia in which all parts of buildings and elements that do not have heritage features are maintained, repaired or renovated with technological solutions with a high level of energy efficiency, while for building parts or elements with heritage value, energy efficiency improvements are only permissible to the point where the heritage features of the building are not compromised.

Slovenian national technical guidelines for energy efficient renovation of cultural heritage buildings base their content on the fact that the fundamental goal of protection is to preserve the integrity and originality to the greatest extent possible. Replacing protected elements with copies is only appropriate in exceptional cases. The emphasis is therefore on timely and professionally appropriate maintenance and repairs, i.e. elimination of existing deficiencies. This highlights the importance of professional verification of the possibility of restoring individual building elements.

The lack of own financial sources for regular maintenance and repair is usually the main bottleneck. The preface to one of the earlier versions of the Slovenian Cultural heritage protection act stated that the costs of renovating a cultural heritage building are on average 40 % higher than for unprotected buildings. This ratio can also be considered with some certainty for the costs of regular maintenance and repairs.

More than 90% of apartments in Slovenia (in single- and multi-apartment buildings) are owned by natural persons. If a property has more than two owners and more than eight individual parts, the owners must establish a reserve fund to cover future regular management costs. The funds of the reserve fund are the joint property of the owners. The criteria for determining the owner's contribution to the reserve fund and the minimum value of the contribution are set out in special regulations. The reserve fund can only be used to cover the costs of maintenance and necessary improvements and to repay loans taken out for these purposes. Owners may also increase their contributions to the reserve fund at their discretion and upon reaching the legally prescribed percentage of approvals.

Regular maintenance and repairs are therefore entirely within the domain of building owners and their financial capabilities, but much also depends on their general awareness of the values of the building in which they reside.

In the capital of Slovenia, Ljubljana, it has been possible to apply for a tender for co-financing major maintenance works, i.e. the renovation of a dilapidated facade or roof of a cultural heritage building, since 1989. The dedicated programme "Ljubljana my city" (*Ljubljana moje mesto*) (enables the acquisition of co-financing funds in the amount of 25 to 50% of the investment value, depending on the specific criteria for evaluating the significance and location of the building. The scope and dynamics of co-financing depend on the available budget funds.

Individual Slovenian municipalities periodically publish tenders for co-financing renovation and maintenance works on cultural heritage buildings. The available funds are usually not very high (a maximum of a few tens of thousands of euros per individual tender), which is also related to the very limited local fiscal autonomy in Slovenia.

In individual cases, it makes sense to combine urgent maintenance and repairs with broader renovation measures, which also include energy renovation. For this purpose, it is possible to obtain loans and subsidies from the Eco Fund; commercial banks are also involved in these co-financing mechanisms.

City of Ljubljana. n.d. "Ljubljana My City – Co-Financing Renovation Works on Cultural Heritage Buildings." Accessed August 2, 2025.

A 1.6 Good Practices, Models and Guidelines

European Recommendations, Guides and Policies

Cultural Heritage Green Paper

Discussions on retrofitting frequently neglect the detailed characteristics of the buildings themselves. Even within a single building, wall thickness and other structural variations can differ significantly. It is essential to prioritize a thorough understanding of the existing building fabric before implementing any retrofit measures. Many historic buildings were originally constructed with high-quality materials and craftsmanship; therefore, retrofit interventions should be driven by detailed building analysis rather than standardised assumptions and benchmarks or commercial pressures (European Heritage Green Paper, 2021).

Renovation and retrofitting of old buildings in times of climate crisis

This guide comprehensively presents a wide array of technological and material solutions to reduce the environmental impact of individual building elements. Enhancing the usability and energy performance of existing building stock is a key approach to reducing the demand for new construction and minimizing the carbon footprint of the building sector.

The guide includes algorithms developed by Jeleński (see chapter 7) to identify the optimal range of energy renovation, helping to avoid common renovation mistakes and tailor solutions to specific building conditions. (Algorithms are available in an electronic version.)

This guide is the product of a two-year collaboration with the Croatia Green Building Council under the project *Mitigation of Climate Change in Historic Buildings* (2022). The book is available in three languages: English, Polish and Croatian.

Strengthening cultural heritage resilience for climate change

The EU Open Method of Coordination (OMC) expert group report synthesizes key policy recommendations aimed at increasing cultural heritage resilience to climate change. The report is supported by an annex summarizing 83 best practice examples from 26 European countries, providing a valuable resource for policymakers and practitioners seeking to integrate heritage conservation with climate adaptation strategies (European Commission, 2022).

Davos Baukultur Declaration

The Davos Baukultur Declaration advocates for a comprehensive approach to the built environment, highlighting cultural heritage as a critical component of sustainable development. It promotes interdisciplinary collaboration to ensure architectural quality and urban design respect historical contexts while addressing modern sustainability challenges (Davos Baukultur Declaration, 2018).

Hiberatlas

The Historic Building Energy Retrofit Atlas, commonly known as HiBERatlas, is an open-access online database developed and managed by EURAC Research under the EU-funded ATLAS project (Interreg Alpine Space) in partnership with the International Energy Agency's IEA-SHC Task 59 ("Renovating Historic Buildings Toward Zero Energy"). Launched in September 2019, HiBERatlas serves as a repository of best-practice retrofits of historic and traditional buildings, showcasing how high levels of energy efficiency can be achieved while preserving heritage significance.

Each case study within the Atlas includes detailed documentation on architectural context, heritage assessment, construction characteristics, energy savings before and after renovation, building services, and user comfort. The database is intended as a resource for architects, engineers, conservationists, and building owners seeking examples and inspiration for sensitive retrofit strategies.

Complementing HiBERatlas, the HiBERtool offers an interactive decision-support interface allowing users to explore more than 150 retrofit solutions—ranging from insulation to solar integration—through a filter-based system tailored to Alpine building types. Users can generate printable PDFs of individual solutions and link to full case studies documented in the Atlas.

Together, these tools support policymakers and practitioners by bridging local heritage cases with scalable, transnational retrofit solutions.

National Reports

Armenia (non-EU)

A substantial number of regulatory norms and roadmaps are currently being developed in Armenia with regard to the energy efficiency of buildings (IEA, 2023). However, decisions specifically addressing heritage buildings have yet to be clearly established. Given the unique nature of these structures, strict energy efficiency standards may not be directly applicable, as such regulations could compromise the historical integrity and architectural value of heritage sites. As such, there is a pressing need for tailored solutions that harmonise the goals of energy efficiency with the preservation of cultural heritage.

The Holy Etchmiadzin Cathedral Complex, a distinguished World Heritage site situated in present-day Armenia, is currently undergoing reconstruction. As part of this restoration initiative, a modern and energy-saving HVAC (Heating, Ventilation, and Air Conditioning) system is being implemented to enhance the preservation and sustainability of this historic landmark.

Austria

As the construction and real estate sectors intensify efforts toward decarbonization, the focus is shifting beyond operational energy use to encompass whole-life carbon emissions, including the embodied carbon associated with building materials and construction processes. Recognizing this, the Austrian Sustainable Building Council (ÖGNI) established a dedicated working group in 2023 under the title: "Energy is not everything – from energy performance certificate to CO_2 certificates."

This initiative reflects growing recognition that energy performance certificates (EPCs) alone are no longer sufficient to guide sustainable decision-making in the built environment. A more holistic, CO_2e-based certification system is required to accurately represent buildings' climate impacts over their full lifecycle.

Conceptual Framework: From Operational Energy to CO_2e Accounting

The proposed CO_2e certificate aims to introduce a depreciation model for embodied emissions, analogous to how construction costs are depreciated over a standard 50-year period. Under this model:

- Buildings constructed more than 50 years ago - such as one completed in 1974 - would be considered to have fully amortized their embodied carbon emissions.

- Consequently, the environmental assessment of such buildings would focus solely on operational emissions, while the embodied CO_2e from construction materials would be excluded from current accounting.

This approach has significant implications for comparative sustainability evaluations. In particular:

- Data from the 1990s indicate that combined operational and material emissions of buildings at that time were approximately three times higher than contemporary buildings, with material-related emissions comprising 30–70% of the total (IEA, 2020; DGNB, 2022).

- Thus, under the proposed methodology, a well-maintained building constructed prior to 1990 could, in some scenarios, exhibit a lower overall CO_2e profile than a newly constructed building - despite advanced energy performance - due to the high upfront carbon inherent in new materials.

This perspective supports policies favoring refurbishment and adaptive reuse over demolition and new construction, provided operational efficiencies can be maintained.

Data Challenges and Material Traceability

A critical challenge in operationalizing the CO_2e certificate lies in the lack of historical data concerning the material composition and supply chains of buildings constructed prior to 2009. Before the widespread adoption of Environmental Product Declarations (EPDs) and Life Cycle Assessment (LCA) frameworks, manufacturers rarely documented the carbon intensity of their production processes.

This absence of data hinders efforts to quantify the embodied carbon of existing building stock, particularly for materials such as:

- Concrete and cement, which account for over 8% of global CO_2 emissions.

- Steel, aluminum, glass, and other energy-intensive materials.

- Synthetic insulation and petrochemical-based products, whose life-cycle emissions are difficult to retroactively assess.

To address this, the ÖGNI working group proposes a two-phase approach:

1. Development of typological datasets based on construction periods and regional building practices. These would serve as proxies where specific material data is unavailable.

2. Engagement with manufacturers and industry associations to gather historical production data and retroactive estimates of emission factors, especially for commonly used materials.

This methodology aligns with international best practices such as the Level(s) Framework of the European Commission and the EN 15978 standard, which underpins many LCA-based certification systems (European Commission, 2020).

Policy Implications and Future Outlook

The introduction of a CO_2e certificate carries several policy and regulatory implications:

- Building codes and renovation incentives may need to be restructured to account for embodied carbon and incentivize preservation over new construction.
- Taxation or subsidies could be linked to CO_2 amortization periods, rewarding low-carbon retrofits.
- Data governance frameworks must be developed to ensure standardized, verifiable CO_2e reporting across the construction industry.

Looking forward, the working group is expected to publish a position paper outlining preliminary methodological guidance and stakeholder consultation outcomes by the end of 2025. This will likely include:

- Proposed calculation methodologies.
- Integration paths into ÖGNI/DGNB certification.
- Recommendations for integrating CO_2e data into public procurement criteria.

Such a transition will be essential to align Austria's building sector with the EU's Climate-Neutral Europe by 2050 goal and to meet interim targets for whole-life carbon reductions across the built environment.

Belgium (Flanders)

The Energy Performance Certificate (EPC) system, mandated by the European EPBD, classifies buildings into energy efficiency categories from A+ (very efficient) to G (very inefficient).

Each region in Belgium has drawn up its own methodology and definition for the various label categories. In the Flemish Region, the energy performance certificate is known as

'the EPC'. Separate certification systems have been drawn up for residential, non-residential and public buildings.

Recognizing this, a 2021 feasibility study was carried out to develop a specific energy presentation certificate for protected buildings in Flanders (OAR, 2021).

Adapted parameters for heritage buildings were mapped, a set of heritage-friendly retrofit recommendations were developed and 2 workable solutions defining an energy target for the protected housing were set up. All this was tested on 10 representative cases. The policy decision was not to develop a special EPC but an addition to the regular EPC namely a tailored Energy advice for Historic Buildings.

This customized advice indicates per shell part (roofs, floor, façades and windows) the insulating measures that can be implemented without damaging the Heritage value. It gives the owner a view of the heritage-friendly energy-efficient recommendations that he can implement on his property. The Energy Advice for Historic buildings was developed in collaboration with the Flemish Energy and Climate Agency. The Advice is free for owners of protected buildings with a recent Energy Prestation Certificate and an Energy Label F, E or D.

Improving the energy performance of your heritage requires customization. For smaller protected heritage buildings, the owner can apply for an Energy Advice for Historic Buildings.

For large and complex protected heritage buildings, this advice is insufficient. In that case, we recommend owners to use an Energy Audit built Heritage in order to map out the possibilities for energy-saving interventions in more detail. Just like an energy advice, an energy audit aligns the energy objectives and the preservation of heritage values. However, the energy audit goes even further and analyzes the energy efficiency and losses of your building. You will receive a detailed overview of the energetic profile, and the analysis of your savings potential in line with the heritage values. An Energy Audit Built Heritage is based on the European Directive EN16883. This guideline describes a method to improve the energy performance of heritage buildings. An EPB report can serve as the basis for the energy part of the Energy Audit. There is a template developed to draw up an Energy Audit.

In Belgium the provision of financial support for energy renovations is a regional competence.

In terms of financial incentives, Flanders offers a heritage loan intended for interventions to improve the sustainability and energy performance of protected buildings and buildings included in the established inventory. The interest rate is 1 percent for a loan

between 25,000 euros - 250,000 euros with a fixed term of minimum 3 and maximum 20 years and an own contribution that amounts to at least 20% of the total investment.

Complementary to loans, a heritage grant supports twofold:

1. The grant is on the one hand intended for the development of an energy audit for built heritage (- protected buildings /- buildings in a transition zone for protected heritage /- buildings in a heritage landscape). Owners are subsidised to develop an energy audit It amounts to 80% of the accepted cost estimate with a max. of 25,000 euros.

2. The grant is on the other hand intended for adaptations to the windows and the extra cost of certain adaptations necessary to (facilitate) retrofit (eg. secondary window, secondary glazing, special replacement glazing, adaptation of walls in order to make roof insulation possible, ..) It amounts to 40+ 10% of the accepted cost estimate with a Max of 250,000 euros

Flemish Government. n.d. *GRO Tool: Sustainability Tool for Construction Projects*. Accessed August 2, 2025.

Onroerend Erfgoed. n.d. *Feasibility Study for Energy Performance Certificates for Protected Buildings*. Accessed August 2, 2025.

Estonia

LIFE IP BuildEST project goal is pursuing Estonian national climate ambition through smart and resilient renovation as part of EU funded LIFE IP program. During the project, long-term renovation strategy of Estonian buildings (LTRS) will be updated and BuildEST has a crucial role implementing the strategy.

The ongoing research project LIFE heritageHOME (2023-2026), conducted jointly by ICOMOS, the Ministry of Culture and the Ministry of Climate, targets the national building register to develop easements and related guidelines specific to historic buildings (Ministry of Culture Estonia, 2024). Within the project, recommended solutions as well as the clarification on harmful measures (for physical as well as cultural reasons) are disseminated and training programmes compiled and carried out for specialists in the public sector (heritage advisers, local municipality officials) as well as for architects, energy efficiency consultants, contractors etc.

A significant output under development is an Estonian Heritage Green Paper aimed at setting strategic policy directions for heritage conservation aligned with climate goals. As EU Member States are required to prepare their national strategies for creating renovation one-stop-shops that provide support to home owners in their renovation

journey, the LIFE heritageHOME project partners are negotiating with the Ministry of Climate (in charge of the strategy) to clearly indicate in the strategy the requirement to provide sufficient assistance also to culturally valuable historic buildings.Such a model would also facilitate experimentation with energy efficiency measures adapted to traditional building typologies, promote knowledge sharing, and streamline regulatory navigation.

In addition to in-person advisory services, online platforms and tools are currently under development in Estonia. These include:

- Renovation Guide - a free access platform for home owners and specialists with well structured and clear instructions on suitable renovation solutions for building types. This Guide, planned to be launched in 2026, will include a designated section on heritage buildings.

- Renovation Atlas - a user-friendly online catalogue of renovation solutions for heritage buildings for homeowners will be launched on the National Heritage Board's webpage in 2026.

- Renovation Passport - the Estonian ambition is to develop an interactive Renovation Passport tool which can be used for thorough consideration of the possible renovation solutions (deep renovation as well as step-by-step retrofitting). It will use the available data of the building from the Building registry and provide calculators to evaluate the potential energy savings as well as necessary investments for each measure. The specialities of heritage buildings will be built into this tool to provide only adequate information for suitable solutions for these buildings. Also, traditional insulating measures (egg for window restoration) will be included for the heritage buildings' tool.

France

Since the end of 2022, the French Ministry of Culture has been engaged in a process of reconciling and coordinating the two objectives of ecological transition and heritage preservation with the Ministry of Ecological Transition and Territorial Cohesion and the Ministry of Energy Transition. Several areas have been prioritised

1) Reconciling the development of renewable energies with heritage preservation.

2) Raising awareness of energy-efficient renovation that takes into account old

buildings;

3) Training and adapting the skills of the Ministry of Culture staff;

4) Promoting aid to local authorities and individuals for renovation projects adapted to

old buildings and heritage.

Under the aegis of CEREMA, the interministerial Guide to energy performance certificates and energy audits in housing. Energy performance improvement works, co-produced with the Ministry for Ecological Transition, was published in March 2025. It is aimed at diagnosticians and auditors, elected officials and project leaders.

Following the publication of the guide to the architectural and landscape integration of photovoltaic panels for use by planning authorities and project developers at the end of 2023, interministerial work will continue with the publication, in winter 2025-2026, of the Guide to the energy renovation of old buildings, not to mention the ongoing expansion of the CREBA Portal's documentation section.

As part of the Effinergie Patrimoine collective, a note entitled 'Heritage diagnosis - framework elements' was produced in October 2025, before any renovation project, to combine heritage preservation and energy performance. This heritage diagnosis will be required for all Effinergie Patrimoine projects.

At the European level, the revision of European standard EN 16883: 2017 'Conservation of cultural heritage – Guidelines for improving the energy performance of heritage buildings' is actively ongoing. An 'Energy Performance' expert group has been set up by AFNOR since April 2023, within the French commission for the standardisation of cultural property conservation.

The Ministry of Culture has updated the specialised training catalogues (INP, Ecole de Chaillot, ENSA) for its agents and all stakeholders, in particular architects and design offices, to include the EPC and the consequences in terms of works.

The Centre de Ressources pour la Rénovation Responsable du Bâti Ancien (CREBA) serves as a national resource centre targeted at building professionals (project managers, architects, design offices, craftsmen, specifiers, technicians, experts, researchers, etc.) and, more generally, all those involved in any project to rehabilitate, renovate or restore old buildings. Their website offers various resources (in French) including technical and scientific information, tools, training modules and case studies (CREBA, n.d.).

The ATHEBA factsheets ('Amélioration thermique du bâti ancien' or thermal improvement of ancient buildings) are resources edited by Maisons paysannes de France, a national association for the safeguarding of rural heritage, and the French Centre for Studies and Expertise on Risks, the Environment, Mobility and Urban Planning (CEREMA). These factsheets help understand historic buildings, clarify regulatory frameworks and outline

good (and bad) retrofit practices regarding thermal improvement (Maisons Paysannes, n.d.).

AJENA is a French association promoting energy savings and renewable energy. It released a guide for the rehabilitation of old buildings in city centres (AJENA, n.d.).

In 2024 French Ministry of Culture and the Ministry of the Ecological Transition together with other national entities in the field of construction, urban planning, architecture and housing launched a national programme called REHA-HERITAGES to address the renovation of housing estates that require special attention because of their specific heritage, architectural or construction features. This includes buildings built before 1948 with traditional techniques and post-1948 buildings from the reconstruction period. Considering public policies encouraging innovative construction the programme aims to:

- develop forward-looking, low-carbon and frugal architectural and technical proposals that respect the original characteristics of buildings, enhance their value for residential use and significantly improve their energy performance;
- develop facilitating tools to enable operational and institutional stakeholders to carry out these operations successfully from a regulatory, financial, technical and legal point of view;
- put in place innovative methods of collaboration between operational and institutional stakeholders at the local level to support operations and develop networks of expertise.

The programme will make it possible to identify the needs specific to these operations (tools, frameworks, methods), to support the development of a shared culture of ecological transition for buildings of architectural or technical interest, and to establish a doctrine reconciling thermal renovation, architecture and use. It relies on pilot operations on a selection of buildings suggested by public and private owners. The initiative will also study the current state of play and design tools to successfully plan these operations, review the current scientific state of the art and organise an assessment to identify specific needs with a first phase carried out until 2027.

Greece

The Hellenic Ministry of Environment and Energy introduced a new program “Preserve” for the consolidation and restoration of historic buildings with the scope to protect and enhance listed and historic buildings through a financial tool addressed to the owners or direct beneficiaries of these properties. The program is not yet put into action and will be funded by NSRF 2021-2027 (EU funds) and carries the aim to establish a financial

instrument of support for maintenance, conservation and restoration of the significant building stock of Greece.

The program will involve interventions in listed monuments, historic buildings within historic sites, historic centers and traditional settlements. Energy efficiency improvement is not directly addressed in the program as it encompasses works for the preservation, repair and restoration of the building shell (facades and roof), foundations, masonry, roof, coatings, balconies, plastic decoration, replacement of frames etc., as well as restoration of interior (floors, stairs, changes in partitions ect).

Similar initiatives have been taken in the past from the Ministry of the Environment and Energy such as the "Aesthetic upgrade program of building facades / implementation proposal with co-financing (PDE - individuals)" which provided the possibility to a private subsidy from the state or the relevant local authorities for the restoration and maintenance of building facades (cleaning, painting, replacement of individual TV Antennas with central ones and the removal of illegal advertisements.

Other state initiatives and programs are: "I Save" and "I Save and Preserve for Young People" which have been introduced several years back but are not addressing historic or listed buildings. However it has been applied on non listed buildings constructed prior to 1955 (the year of entry into force of the 1st Greek Building Code) that retain historic and architectural value and/or comprise representatives of local architectural traditions. Some of the works performed on the basis of these two programs may and have already affected in many cases the architectural character of such buildings.

Ireland

Under Ireland's national Climate Action Plan, guidance was published in December 2023 on Improving Energy Efficiency in Traditional Buildings. The guidance was prepared by a steering group, chaired by the National Built Heritage Service, including representatives from Building Standards, the Department of the Environment, Climate and Communications, the Sustainable Energy Authority of Ireland (SEAI) and the Office of Public Works. This guidance applies to all buildings of traditional construction with vapour-permeable fabric regardless of their statutory protection and sets out approaches on how the energy upgrading of these buildings can be achieved in appropriate ways. The guidance outlines the relevant statutory requirements, recommended skills and expertise for energy upgrading works, relevant performance

assessment methods and sets out how to specify safe and effective energy upgrading measures including choosing low-carbon heating and renewable energy sources.

Based on Improving Energy Efficiency in Traditional Buildings, the Sustainable Energy Authority of Ireland (SEAI) established a pilot grant scheme for the energy upgrading of traditional homes in 2024. This scheme is operated through the One Stop Shops. Grants for certain energy upgrading works may also be applied for through the National Built Heritage Service's conservation grant scheme.

One practical challenge Ireland faces is the lack of Agrèment certification for the local market of appropriate materials for use on traditional buildings.

The approach to energy efficiency in historic and traditional buildings strongly emphasises the embodied carbon and lifecycle assessment (LCA) through several case studies. Recent research encourages to move away from changing the fabric of the building and looking towards decarbonizing the heat source - a perspective that aligns with trends seen in other European countries.

A notable contribution to retrofit strategies is the concept of Building Renovation Passports (BRPs), which serve as comprehensive information packages guiding owners through staged energy upgrades tailored to their buildings. The Irish Green Building Council has conducted studies indicating that BRPs could significantly stimulate retrofit activity by providing clarity, planning, and confidence for owners and stakeholders (Irish Green Building Council, 2023).

Irish Green Building Council (IGBC). n.d. "Building Renovation Passports Ireland." Accessed August 2, 2025.

Portugal

The Shining Examples – 2nd Edition report (Annex 56 of the IEA-SHC Task 59) compiles 58 exemplary renovation projects of historic buildings across Europe that demonstrate how energy efficiency can be improved without compromising cultural and architectural values. The report highlights strategies, technologies, and tools used to balance sustainability goals with heritage conservation.

One of the most notable Portuguese examples is a project led by the University of Coimbra, which illustrates a sensitive and innovative approach to integrating renewable energy within heritage contexts. In this case, photovoltaic (PV) panels were not installed directly on the historic building but were instead placed at a nearby location

approximately two kilometers away. This strategic decision allowed the institution to power infrastructure supporting electric mobility—such as electric car and bicycle parking facilities—while preserving the visual integrity and cultural value of the protected area. The project serves as a compelling model for how community-scale energy solutions can align with both sustainability targets and heritage conservation principles.

Slovenia

Compared to other EU Member States, Slovenia is characterised by an above-average share of energy expenditure in total household consumption (5.2% compared to 4.1%). At the same time, Slovenia ranks among the countries with the highest proportion of the population that is late in paying housing costs and/or living in energy-inefficient housing, where there is dampness, mould, draughts, etc.

Many cultural heritage buildings fall into the energy-inefficient housing category, which is logical from the technical perspective. This does not mean that their protection regime is to be weakened to allow implementation of energy efficiency measures not compatible with the cultural heritage protection conditions defined for each case. Still, some sensible interventions can almost always be found to improve the existing state without compromising the historical features. The Guidelines for energy renovation of cultural heritage buildings provide a lot of useful information and guidance on this matter.

Energy poverty is indeed related to homeowners, not buildings. But homeowners not capable of covering energy (and related) costs are most likely also not capable of covering maintenance and renovation costs. This neglect can lead to gradual deterioration of the building's condition and loss of its valuable features. Due to often higher maintenance costs, owners of heritage buildings are in less favourable condition than owners of non-protected ones. Here, the predominant share of privately-owned buildings in Slovenia, both protected and non-protected, is to be considered, too.

A special Decree sets out the following criteria for defining and assessing the number of energy-poor households in Slovenia:

- material vulnerability: income below the at-risk-of-poverty threshold,
- low energy efficiency of household premises: heat required for heating premises is more than 150 kWh/m2 per year,

- inadequate living conditions: leaking roof, damp walls, floors or foundations, cracked window frames or floors, etc.,

- large share of energy expenditure in disposable income or exceeding the average share of energy expenditure: the share of energy expenditure exceeds at least 50% of the household's disposable income.

The Decree defines energy poverty as "a situation in which a household whose income is below the at-risk-of-poverty threshold is unable to meet its basic energy needs due to inadequate living conditions or the inability to meet these needs at affordable prices or the low energy efficiency of living spaces."

The national Action plan to reduce energy poverty for a three-year period (2023) () presents an Energy Poverty Alleviation Scheme, which comprises a key set of measures to reduce energy poverty. These are implemented simultaneously and are mutually supportive, as this is the only way to ensure a comprehensive reduction of energy poverty in the long term at a systemic level. It builds on existing measures and programmes and on previous experience. It includes the following measures:

- investment incentives for energy efficiency measures and the use of RES for the energy poor, which are the central financial measures for reducing energy poverty;

- energy consulting for the energy poor, which involves comprehensive support for this target group in implementing energy efficiency measures and the use of RES, including for solving problems that are not necessarily of a technical nature;

- informing the energy poor through actors in an informal network for information and awareness-raising at the regional level;

- a project office with regional advisory points for alleviating energy poverty, which provides comprehensive multidisciplinary assistance.

For many years, the public Eco Fund has been making a significant contribution to alleviating and reducing energy poverty, by providing 100 % incentives for the energy renovation of buildings owned by socially vulnerable citizens and incentives for new wood biomass heating systems with an upward limit.

The oldest measure implemented by energy consultants of the ENSVET network (managed by the Eco Fund) at the homes of socially vulnerable citizens and which significantly contributes to alleviating energy poverty is free energy consulting. Citizens who are recipients of extraordinary financial social assistance or financial social assistance and/or protection allowance can register with a professional worker at the social work center or on the Eco Fund website for a free home visit by an energy consultant.

For recipients of financial social assistance and/or protection allowance who live in an apartment building, the Eco Fund provides 100 % incentives for their share of the cost of the entire investment for the implementation of joint measures in the energy renovation of apartment buildings or the renovation of common boiler rooms.

In 2025, a new Climate Act is planned to be promulgated, transferring several recent thematic EU directives into the national legislation. This would enable the establishment of a dedicated social fund, which will be the basis for drawing down 350 million EUR for the period from 2027 to 2032. This sum would be intended exclusively for the poorest households to alleviate energy and transport poverty, including of course households in heritage buildings.

Neighbourhood solutions are based on protection regimes as defined by Slovenian legislation (). This distinguishes between a regime for cultural heritage buildings and a regime for settlement heritage. The latter is related to the policy of treating groups of buildings, neighbourhoods and settlements.

Basic legal protection regime

The following general protection guidelines apply in heritage areas:

• promoting the sustainable use of heritage, i.e. the use of heritage in a manner and to an extent that does not cause the loss of its cultural properties in the long term,

• promoting sustainable development of heritage, which enables the needs of the present generation to be met without compromising the preservation of heritage for future generations,

• promoting activities and actions that preserve the cultural, social, economic, scientific, educational and other meanings of heritage,

• preserving the characteristics, special nature and social significance of heritage and its material substance,

• interventions in heritage that take into account and permanently preserve its protected values are permitted,

• interventions that enable the establishment of permanent economic foundations for the preservation of heritage while respecting its special nature and social significance are permitted.

In heritage areas, the law prescribes:

• such treatment of heritage that ensures the greatest possible preservation of its cultural values for the future,

• consideration of the protection regime and other criteria and conditions for carrying out interventions in heritage areas in the procedures for preparing and adopting spatial documents.

• assessment of impacts on heritage based on environmental protection regulations,

• consideration of guidelines and opinions in the procedures for preparing spatial documents,

• consideration of heritage preservation in spatial documents and in spatial measures issued based on spatial planning regulations,

• prohibition of removal (demolition) of heritage.

Additional legal protection regime for heritage areas

In areas of architectural heritage, an additional legal protection regime applies, which prescribes the preservation of their protected values, such as:

• floor plan and elevation design (dimensions),

• materials (building materials) and structural design,

• exterior design (structure of buildings and facades, shape and slope of roofs, roofing, facade colours, facade details),

• functional design of the interior and associated outdoor space,

• components and attachments,

• building joinery and interior fittings,

• communication and infrastructural connection to the surroundings (associated open space with the elevation of surfaces and the location, purpose and design of associated buildings and surfaces),

• appearance and views (especially in the case of spatially exposed buildings),

• integrity of the heritage in the space and

• soil layers with possible archaeological remains.

The protection regime for settlement heritage places particular emphasis on protecting the external appearance of a particular building in a protected area and its features, such as facades and roofs with joinery and special details. The fact is that the majority of buildings in settlement heritage areas are distinguished by exceptional elements both on the external surfaces and in the interior. It is precisely this type of, most often anonymous, architecture that best characterizes the habits, tastes and lifestyle of a nation and has been one of the most important elements of settlement form throughout history.

The general protection regime for settlement heritage prescribes the preservation of the following characteristics of a settlement or part of it:

• settlement design (parcelling, communication network, arrangement of open spaces of the settlement);

• relationships between individual buildings and the relationship between buildings and open space (location, density of buildings, ratio between built-up and unbuilt space, building lines, characteristic functional units);

• spatially significant natural elements within the settlement (trees, watercourses, etc.);

• recognizable location in space or landscape (according to relief characteristics, paths, etc.);

• natural and other growth limits and edges of the settlement;

• image of the settlement in space (building masses, dimensions, roof shapes, roofing);

• relationships between the settlement and the surroundings (views of the settlement and views from it);

• building fabric (dominant building type, public equipment, street facades, etc.).

It should be emphasized that this is a general protection regime that cannot be applied to the entire architectural or settlement heritage, but rather that each intervention in real estate must be considered separately in the process of cultural protection conditions and consents (cultural protection acts). The protection regime also depends on the specific identification of protected values in an individual object or area and its construction and technical condition.

Legal protection regimes must be considered when preparing plans and interventions in cultural heritage areas. In this regard, the Guidelines for the planning of municipal detailed spatial acts from the perspective of cultural heritage protection must also be taken into account.

The Guidelines for the Energy Renovation of Cultural Heritage Buildings were first published in 2016. An updated and extensively expanded edition was published in December 2025. The guidelines address all cultural heritage buildings, regardless of whether the individual building is located within a settlement heritage or is protected as a built heritage. This term is used uniformly throughout the document and covers all buildings that are protected by regulations on the protection of cultural heritage. It includes the entire gradation of heritage regardless of the type of legal basis, i.e. registered cultural heritage, cultural monuments of local importance, cultural monuments of national importance and buildings that are protected as an integral part of a cultural heritage area, specifically built heritage areas and built heritage areas.

The two key principles on which the substantive preparation of the guidelines was based are:

1. In accordance with the principle of good stewardship, the energy renovation of a cultural heritage building must also include other reasonable measures to improve the condition of the building (e.g. static renovation, fire protection, etc.).

2. The energy renovation of a cultural heritage building must seek an appropriate balance between the preservation of protected values and the energy efficiency.

With this, it was pointed out that the renovation must be approached holistically and prevent (subsequent) damage and devaluation of buildings and the destruction of architectural and functional properties. In the explanatory text to the principles, the need for an interdisciplinary approach and the awareness and cooperation of building owners and users was emphasized. The aim of the energy renovation of the cultural heritage is to reasonably improve the energy consumption of the building with interventions that are still acceptable from a conservation point of view. The guidelines contain, among other things, extensive explanations of building physics fundamentals and the effects of individual renovation measures. They define the starting points for making decisions about them, and special attention is also paid to the impact on living comfort after the renovation.

The main criterion of acceptability/admissibility of the measures is their impact on the protected values and cultural-historical characteristics of the building, not (exclusively) their contribution to the improvement of the energy indicators. The five levels of impact of the measures are marked in the guidelines with the appropriate colour, from green to red, i.e. from the acceptable impact (small or no intervention in substance and appearance) through small impact, partially acceptable impact and significant impact to the unacceptable impact (significantly harmful intervention in substance and appearance). It should be added that this evaluation is not absolute; it also allows for logical exceptions, since a single intervention can have a different impact depending on the specific building or its element.

The guidelines introduced a new term “comprehensive energy renovation of cultural heritage buildings”. It describes the specialty of comprehensive energy renovation of cultural heritage buildings, from which all measures that would unacceptably change their character or appearance are excluded. This definition further enabled the drafters of tenders to formulate classic criteria and requirements for buildings that are not subject to the protection regime, while for cultural heritage buildings it is sufficient to implement measures permitted by the previously obtained cultural protection conditions and consent for the implementation project.

In this way, Slovenia can also include protected buildings in the common quota when reporting to the European Commission on the fulfilment of the obligation of annual

renovation of 3 % of the surfaces of buildings owned and used by the public sector, and thus more easily achieve the set goals.

The updated guidelines highlight the role of energy renovation of cultural heritage buildings in the context of wider building renovation. They emphasize the importance of meeting essential requirements for buildings, particularly in the areas of structural and seismic resistance, moisture protection, and fire and electrical safety. Among other things, the aspect of universal accessibility and construction is included. This new content has been added with the aim of presenting a comprehensive and holistic approach to renovation, which aims to ensure the structural and technical functionality of cultural heritage buildings while enhancing their energy performance, thereby extending and improving their usability, all without compromising their protected values.

In parallel, in December 2025 Recommendations for the installation of photovoltaic devices in areas of architectural and settlement heritage were prepared. These recommendations are intended to be used either with the aforementioned guidelines or on their own, depending on the renovation project type.

Energy advisory network and one-stop shops in Slovenia

Free of charge and professionally independent advisory services for households have a long tradition in Slovenia. Starting in the mid-1990s, the network of advisory offices (ENSVET) has grown, and now there are 60 municipal offices active, covering all regions of Slovenia. The target group now includes companies and local communities. The network is managed by the Eco Fund, public fund (Eco Fund, 2024). The focus of the services is energy renovation and its co-financing possibilities.

Related to EED and EPBD, the ENSVET network is planned to be linked with newly established municipal one-stop shops (OSS). These OSS will lead building owners through various stages and aspects of the building renovation process aimed also at achieving a better resilience to extreme weather events and climate changes, thus focusing not only on energy efficiency measures. The starting point is an adequate assessment of the existing state based on preliminary investigations (static, moisture etc.), including obtaining cultural protection conditions in case of a heritage building.

This concept corresponds to the definition of “wider renovation”, as defined in the Slovenian Long-term energy renovation strategy until 2050: “A wider renovation is a renovation that, in addition to the energy aspect, also includes other aspects of

renovation (for example, earthquake-, fire- and flood-proofing aspects, indoor environmental quality, etc.)".

As such, OSS will require specifically skilled professionals from various fields (architects, engineers, urban planners, administrative procedures and finance experts, and similar). Two LIFE projects are dedicated to this topic, BUSHROSSs (Building Up Skills for Home Renovation One-Stop-Shops; 2024-2027) and Renov-AID (2024-2027).

BUSHROSSs (European Commission, 2024a) builds up skills of relevant bodies (national, regional and local authorities, municipalities, energy agencies, etc.) providing them with specific knowledge and capacity for a successful establishment and operation of OSSs to assist building owners during the entire process of (energy) renovation. This will lead to acceleration of renovation rates, contribution to delivering the European Green Deal and improving the well-being and health of citizens and future generations.

This aim will be achieved through the development of qualification and upskilling schemes and their pilot testing via delivering of training courses to relevant stakeholders, relevant to OSS establishment and operation, including "training of trainers" activities. The trainings will follow modular approach to cover various aspects of home renovation and will be easily adaptable to the various local needs in the participating countries, and around Europe.

Renov-AID (IRI UL, 2024) is revolutionizing the building renovation process by introducing the OSS concept in Slovenia, making sustainable renovation simpler, more accessible, and more efficient for everyone involved. The OSS concepts will be developed in three pilot municipalities (Ljubljana, Kranj and Velenje) and will subsequently scale up the approach for nationwide adoption across other municipalities in Slovenia. In pilot municipalities, Renov-AID will provide citizens with integrated services for comprehensive renovations, offering a unified approach from information and consultation to financing and technical advice. Renov-AID aims to raise awareness and accessibility of renovation-related technical and financial services for individuals, while also enabling local municipalities and other stakeholders to establish a stable and sustainable infrastructure for renovation (OSS model).

Spain

Spain has developed a detailed "Guide of Good Practices for Renewable Energies and Cultural Heritage", produced by ICOMOS Spain and recently translated into English

(ICOMOS Spain, 2024). This guide provides comprehensive recommendations for integrating renewable energy technologies in historic contexts without compromising cultural values.

Key principles include:

- Prioritizing non-invasive technologies and reversible installations.
- Careful site selection and design to minimize visual and physical impacts.
- Consideration of heritage significance and regulatory frameworks in planning renewable energy interventions.
- Engaging stakeholders early to balance conservation and energy goals.

The guide also features case studies demonstrating successful renewable energy adoption in protected buildings, including solar thermal systems, small-scale PV, and biomass heating, adapted to Spain's diverse heritage environments.

Sweden

In Sweden, capacity building efforts related to energy efficiency and cultural heritage are somewhat fragmented.

The Swedish National Board of Housing, Building and Planning (Boverket) provides an online energy guide (Energiguiden). This guide includes information on how to consider heritage and cultural values when working with buildings. Boverket also offers online training on the Planning and Building Act (PBL) through the PBL Academy. One of the webinars focuses specifically on cultural heritage and how it is addressed in different stages of the planning and construction process in accordance with the PBL. The course is primarily intended for municipal staff working with PBL matters, but it is also relevant for professionals in other roles who encounter cultural heritage issues, as well as for staff at County Administrative Boards and cultural heritage institutions.

PBL Academy Webinar

Energiguiden

The Swedish National Heritage Board provides limited information on energy efficiency in high-value historic buildings on its website. However, in June 2025, the Board updated the Building Register (Bebyggelseregister) — a database containing information on built cultural heritage, including both listed and unlisted buildings. This information is contributed by regional museums, the Church of Sweden, County Administrative Boards, municipalities, universities, and other institutions.

The Swedish Energy Agency previously ran a research programme called Spara och Bevara (Save and Preserve), which explored various approaches to improving energy efficiency in historic buildings. This programme, which began in 2006, concluded in 2024. Although the reports are available, they can be difficult to locate within the project database. Additionally, the Energy Agency has initiated educational networks for residential buildings (BeBo) and non-residential buildings (BeLok).

Many of Sweden's 24 regional museums have developed information materials and guidelines to help homeowners in their regions understand how to approach energy improvements in a historic buildings and environments

Some of the country's 290 municipalities also provide information related to building permit applications. But also as part of the cultural environment programmes that inform decision-making regarding the built environment.

Finally, the Swedish Building Conservation Association published The Energy Book in 2011, which served as an important starting point for educating both homeowners and professionals. The book remains in use today, and several workshops have been held since its initial release A. Donarelli, T. Broström, Does age matter? How building age influences energy use in the Swedish residential building stock. In: EEHB2022 The 4th International Conference on Energy Efficiency in Historic Buildings 2022. Proceedings. Ed Ralf Kilian, Sara Saba, Caroline Gietz (Hrsg.) Fraunhofer IRB

Life cycle assessment and renewable energy solutions allow a more innovative approach.

The buildings built before 1990 are more energy consuming, the older buildings of E,F and G class could be improved with solutions like vacuum glazing, insulation etc - bringing down the energy consumption is more efficient, cheaper and sustainable than new energy solutions. The grants should be based on the level of saved energy.

Türkiye (non-EU)

Türkiye is an earthquake prone zone. The reconstruction is always promoted to make the building resilient, but there is a need to think more about circularity and promote discussions about the positive energy districts. There are groups of buildings which are energy flexible in the urban areas. The historical buildings are often connected and they

are providing and producing some surplus production of energy, also renewable energy. For example, in Evora there is a case study to make interventions to the buildings that produce renewable energy that will influence the whole district.

In Türkiye, growing attention has been given to educating homeowners and users of historic buildings about energy efficiency within the context of cultural preservation. The Association for the Protection of Cultural Heritage (KMKD) has published two key manuals, both in Turkish:

- "Energy Efficiency Handbook" – A guide designed for residents of historic homes, offering practical strategies to improve heating performance, lower fuel costs, and reduce carbon emissions (KMKD, n.d.-a).

- "Life in Historic Homes" – This publication provides insights into daily life in historic buildings, encouraging proper maintenance and responsible adaptation (KMKD, n.d.-b).

United Kingdom (non-EU)

In the UK, several organizations publish guidelines on the retrofitting of buildings. The Retrofit Hub is a nonprofit organisation that brings together stakeholders involved in retrofit activities to support the local delivery of retrofit at scale. More information can be found here.

Historic England emphasizes that every traditional building can become more energy efficient, provided that a holistic approach is adopted. Retrofitting historic buildings presents significant opportunities for contributing to the UK Government's net zero targets. However, a comprehensive and considered strategy is essential to achieving these goals effectively. A whole-building approach ensures that all interventions are coordinated by taking into account the building's fabric, services, environmental conditions, and occupants. A thorough understanding of the building and its context can help identify balanced solutions that achieve energy savings, preserve heritage values, and support a healthy indoor environment. For further reference, click here.

There is extensive research highlighting the technical and qualitative benefits of repairing and maintaining historic buildings and their services (see Historic England, 2023; 2018; 2017; SPAB, various years). However, relatively few studies quantify the scale of energy savings from these practices. This lack of quantitative data partly explains why maintenance and repair are often overlooked in current climate change policies (Rizos et al., 2017). The difficulty in quantification arises from the diversity and scale of interventions, the range of materials involved, the limited analytical focus, and the general absence of long-term monitoring (Hertwich et al., 2019).

The few existing studies suggest that proper maintenance and continuous repair can help identify malfunctioning equipment and deteriorating building components early, enabling timely interventions that improve energy performance and reduce energy use (Firdaus et al., 2019). For example, a study of 20 pre-1919 suburban dwellings using both computer modelling and live data found that maintenance, periodic renewal, and benign changes (i.e., interventions with little or no impact on the visual or material heritage) could result in up to a 40% reduction in energy consumption (Ritson, 2020).

Pioneering Sustainable Home-Updates, the City of London Corporation introduces an innovative open-access Heritage Building Retrofit Toolkit. Aimed at drastically reducing carbon emissions and bolstering climate resilience, this guide offers a lifeline to the owners over 600 listed buildings in London but might also do this for other Europeans (City of London, 2024).

Historic Environment Scotland, the lead public body set up to care for and promote Scotland's historic environment has now a great focus on retrofittings, including publications such "Guide to Energy Retrofit of Traditional Buildings" (Historic Environment Scotland,2023).

In July 2024, Historic England published Advice Note 18: "Adapting Historic Buildings for Energy and Carbon Efficiency", which outlines principles for sympathetic upgrades to historic structures, balancing sustainability goals with preservation standards. The document provides practical guidance on improvements such as insulation, glazing, and renewable energy integration, focusing on compatibility with the historic fabric of buildings (Historic England, 2024).

The Retrofit Hub. n.d. *National Retrofit Hub*. Accessed August 2, 2025.

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A 1.7 Capacity Building, Innovation & Supporting Tools

Experts training and certification in European Countries

Armenia (non-EU)

A new master's specialization, *Restoration of Architectural Heritage*, has been introduced at the National University of Architecture and Construction of Armenia (NUACA). The program includes courses that address energy efficiency in the restoration of heritage buildings.

Austria

In terms of capacity building a notable initiative is the specialized training program for heritage building consultants developed by the Federal Monuments Authority in cooperation with the European Heritage Academy. The program equips energy experts and heritage professionals with advanced knowledge on energy refurbishment techniques that respect the conservation requirements of protected buildings (BDA, 2023).

Belgium (Flanders)

In the framework of the Flemish Climate Fund a specialised 5 days training course and a question portal were developed for conservation architects seeking to improve the sustainability and energy performance of heritage buildings (De Bouw *et al*, 2023)

The project *'Specialized Energy Consultants for Built Heritage'* (also known as *'ErfgoedEnergieLoket'*) aims to train and support restoration architects in carrying out such energy optimizations in heritage buildings

The training course is also available online in Dutch and French through the Buildwise Renovatieacademie platform.

On the other hand, the regular Master programmes for Architects or the Advanced Master of Conservation of Monuments and Sites focuses also on energy efficiency of monuments.

France

L'Ecole de Chaillot is a public institution of higher education under the aegis of the Ministry of Culture, open to architects who have already graduated. It trains architects with a vocation to become professionals in the rehabilitation, restoration, reuse and enhancement of old buildings or sites. They propose a two-day training module on the energy and environmental improvement of older buildings with sessions on national regulations, bio-sourced materials, thermal insulation and lime and hemp-based coatings. They also familiarise students with the OSCAR software developed by the National Council of the Order of Architects, a free tool for simulating a building's thermal performance.

The French Ministry of Culture has also published a report listing training courses available in France on the energy and environmental renovation of the architectural heritage (July 2023). They organised in five categories: challenges of the ecological transition (energy retrofitting, carbon footprint etc.), energy and climate, resources and materials, regulatory framework and public policies for energy retrofitting, and biodiversity ((French Ministry of Culture 2023).)

Besides, the French Ministry of Culture and the Ministry of the Ecological Transition worked with the CEREMA to release in early 2025 a guide for professionals auditing and assessing the energy performance of buildings. It compiled the main regulatory, methodological and technical resources needed to carry out quality diagnostics and audits. It also presents practical recommendations for undertaking effective, sustainable work tailored to the specific characteristics of buildings, including those of heritage interest (French Ministry of Culture and Ministry of Ecological Transition 2025).

The law adopted by the Senate in early 2025 also requires an increase in the training requirements of professionals auditing buildings with heritage interest from January 2027.

Finally, regional professional organisations known as "Envirobat" have been created to encourage the ecological and energy transition in the construction and urban planning sectors. They provide resources, support services, and assistance, organise events for practice sharing and training, and coordinate observatories to study current practices and share knowledge. Today, Envirobat organisations can be found in four regions (Occitanie, Centre, Grand Est, Provence-Alpes-Côte d'Azur). They also address issues related to heritage buildings.

It is worth mentioning the orders and decrees setting out the conditions for the initial selection and training of assessors and auditors, revised in 2024 (joint work by the Ministry of Ecological Transition and the Ministry of Culture). A Decree of 16 June 2025

amending the decree of 20 July 2023 defines the certification criteria for diagnosticians working in the field of energy performance diagnostics, their training organisations and the requirements applicable to certification bodies, and amending the decree of 24 December 2021 defining the certification criteria for technical diagnostics operators and training and accreditation bodies for certification bodies

Also, it is worth mentioning that a study is currently being conducted in France to measure and reduce the carbon footprint of historic buildings restoration works:

Germany

A further notable initiative is the training of *Energy Consultants for Heritage Buildings and Buildings of Architectural and Historical Merit* (*Energieberater für Baudenkmale und besonders erhaltenswerte Bausubstanz*). This program provides specialized guidance for professionals working on the energy refurbishment of historic structures (WTA 2014).

Greece

National Technical University of Athens (NTUA) offers a postgraduate program, "Protection of Monuments," which is an interdisciplinary Master of Science (MSc) degree and provides advanced education for engineers, architects, archaeologists, and other scientists in the field of conservation and restoration of architectural heritage. It features two specialization directions: A) Conservation and Restoration of Historic Buildings and Complexes, and B) Materials and Conservation Interventions. The curriculum implements courses on the energy efficiency of historic buildings.

Several initiatives such as conferences, workshops e.t.c under the auspices of the Ministry of Environment and Energy and the Ministry of Culture have been carried out the last 10 years, focusing on the implementation of energy efficiency upgrades or protected and non protected historic buildings.

Ireland

In 2018, a research report Deep Energy Renovation of Traditional Buildings: addressing knowledge

gaps and skills training in Ireland was jointly published by the Heritage Council and ICOMOS Ireland with funding from the Sustainable Energy Authority of Ireland. The report reviewed the state of knowledge and risks relating to the energy upgrading of historic/traditional buildings. It identified technical and non-technical barriers inhibiting the effective implementation of energy renovation in Ireland; knowledge gaps and areas for further research; and proposed future courses of action.

A Continuing Professional Development course was held in Dublin in 2019-20 entitled Fundamentals of Energy Renovation for Traditional Buildings which included 10 modules covering many of the aspects from conservation principles to case studies.

Technical University Shannon runs a part-time certificate course in Energy Renovation for Traditional Buildings to up-skill building professionals to develop knowledge and skills that allow them to identify, analyse, and develop high quality, energy-efficient renovations and address the challenging defects and risks associated with applying energy methods to renovate traditional buildings. It also addresses the principles of architectural conservation and the statutory protections applying to historic buildings.

The FabTrads/TradFabs research programme at University College Dublin, funded by the Sustainable Energy Authority of Ireland, is focussed on the testing and characterisation of the thermal and hygrothermal properties of individual traditional Irish building stones and mortars. The programme is currently investigating the hygrothermal behaviour of masonry composites of brick and mortar, and stone and mortar through extensive laboratory testing and numerical validation. The research also includes expanded in-situ measurements, investigating the hygrothermal performance of a select number of insulated and uninsulated traditional walls using interstitial moisture monitors, in- situ U-value measurements and hi-spec thermal imaging.

Serbia (non-EU)

At present, in Serbia, there is no particular course (neither academic nor training) that connects the architectural heritage and energy efficiency. However, since 2012, at the University of Belgrade-Faculty of Architecture, there is a Specialised academic programme – Energy Efficient and Green Architecture, which is recognised as an official training program for obtaining a license for energy certification of buildings, as well as the title of LEED-G(reen) A(ssociate). Depending on the specific interest of students, on several occasions, there were students who studied the problem of energy renovation of protected buildings or traditional buildings for their final work.

The evident need for better connection of problems of heritage with problems of sustainability in architecture, i.e. in architectural education, was a subject of the ERASMUS+ project HERSUS: Enhancing of Heritage Awareness and Sustainability of Built Environment in Architectural and Urban Design Higher Education that ran from November 2020 to August 2023, with the University of Belgrade-Faculty of Architecture as a leading partner.

Slovenia

There are no formal/mandatory training programmes in place in Slovenia dedicated specifically to renovation of cultural heritage buildings. However, this topic is included in various trainings and actions of a more general character, i.e. on sustainable practices in construction and renovation of buildings, and also in other more specific events, including workshops and conferences. Attendees are issued with attendance certificates, which can in some cases be treated as micro-certificates or micro-credentials, although their status has not yet been formally sorted out.

One example of such interdisciplinary training has been developed within the LIFE IP CARE4CLIMATE project (2019-2026;). Through awareness-raising, education and training of key stakeholders, it aims to encourage the implementation of measures to help Slovenia meet its greenhouse gas emission reduction targets by 2020 and 2030. The project involves a series of 36 extensive online and in situ trainings () organized by the Building and Civil Engineering Institute ZRMK for different target groups including investors, owners, designers, energy managers, energy advisors, decision makers and others, covering all sorts of thematic topics. An important part of the training consists of content directly related to integrated conservation of cultural heritage buildings, including their energy renovation. Attendees can take part in a voluntary final exam.

Energy renovation of cultural heritage buildings is included in the curriculum of periodic training for existing and new energy advisors - members of the national energy advisory network ENSVET -, managed by the national Eco Fund (). The Eco Fund is responsible among others for programmes of subsidies and loans for environmentally friendly investments for households, companies and local communities. The training is followed by an exam.

The School of Renovation () is a training programme for quality renovation, which, along with informing, consists of a series of workshops. The theoretical content takes place at the Faculty of Architecture in Ljubljana, while the practical work is organized at selected locations and cultural heritage buildings and sites. The School of Renovation also awards outstanding examples of cultural heritage renovation.

The annual Summer School of Sustainable Heritage (co-organized by ICOMOS Slovenia, Faculty of the Architecture of the University of Ljubljana, Interdisciplinary Interfaculty Institute of the University of Ljubljana for Sustainable Heritage Protection and other stakeholders is as a valuable knowledge-gaining and -expanding source for students, young professionals and experts. Each year a specific topic is chosen and analysed from different perspectives.

In 2024, the Slovenian National Building and Civil Engineering Institute (ZAG) organized its first Summer School titled In situ techniques in preservation of built heritage (). The event covered multiple-scale non-invasive techniques for assessment and in situ characterization of heritage, and was based on lectures, experimental presentations and a guided tour with a presentation of techniques.

As lecturers and trainers, various experts and institutions are involved in these actions, including the Institute for the Protection of Cultural Heritage of Slovenia (), the Historical Towns of Slovenia association (the Ministry of Culture, the Ministry of Environment, Climate and Energy, several faculties, institutes, professional associations etc.

Besides the above-mentioned trainings and similar events, it must be noted that the University of Primorska, Faculty of Humanities, has developed a specific double-discipline bachelor's study programme Cultural Heritage). It offers students an introduction to tangible and intangible cultural heritage and an interdisciplinary perspective on the professional maintenance and preservation of cultural heritage. It is designed as an interweaving of archaeology, art history, ethnology, architecture and history.

Türkiye (non-EU)

In Türkiye, there is not any certificate program and training curriculum on energy efficiency and cultural heritage assets. Although sustainability and energy efficiency in the conservation/ restoration of cultural assets are included within the mission and vision of several programs, specific courses on the issue are not yet prevailing. According to the Regulation Amending the Regulation on Energy Performance in Buildings, published on 28 April 2017, for buildings registered as cultural assets to be preserved, it is recommended that energy efficiency improvement measures and applications be carried out in line with the opinion of the Cultural Heritage Preservation Board.

These measures should be implemented in a way that does not affect the characteristics or external appearance of the building. In addition, the Directive on Training to be Provided to Energy Performance Certificate Experts and Training Institutions makes a distinction only between new and existing buildings; historic buildings are excluded from its scope. In this field, organizations such as the Association of Historical Towns and the Foundation for the Protection and Promotion of the Environment and Cultural Heritage (ÇEKÜL –), as well as the Association of Conservation and Restoration Specialists (KORDER –), carry out training activities and initiatives. Although not focusing directly

on energy efficiency, they provide information on sustainability and energy efficiency ().Furthermore, postgraduate studies in this field are being conducted at universities.

United Kingdom (non-EU)

The EnergyTrust provides a series of retrofitting courses and qualifications (EnergyTrust):

There are various organisations providing retrofitting training, for example City&Guilds (Retrofit qualification and training courses) and UK's national heritage bodies.:The UK's national heritage bodies have issued a new handbook to support learners pursuing retrofit qualifications, reflecting their renewed commitment to advancing the nation's transition to net zero (Historic England, Cadw, and Historic Environment Scotland 2025). Historic England also published its own version of the *Course Handbook: Level 3 Award in Energy Efficiency Measures for Older and Traditional Buildings* (Historic England 2025). In addition, Cadw released *Energy Efficiency Measures in Older and Traditional Buildings* (Cadw 2024).

ICOMOS

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