Feasibility Study

Improving Energy Efficiency in Historic Public Buildings: The Case of Cēsis Municipality, Latvia

Prepared as a deliverable of the Interreg Baltic Sea Region CommitClimate project
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Summary

Cēsis is one of Latvia's most historically significant towns, with a medieval old town, a well-preserved castle complex and a large stock of pre-war brick public buildings that are protected as cultural monuments. Many of these buildings still serve the municipality today as schools, administrative offices and cultural facilities, yet their thermal performance is poor by modern standards and their heritage status limits the renovation measures that can legally and practically be applied to them.

This expanded feasibility study, prepared as a deliverable of the Interreg Baltic Sea Region CommitClimate project, brings together three strands of evidence: (1) technical and regulatory knowledge on renovating historic brick buildings in Latvia and the wider Baltic Sea Region; (2) the strategic and quantitative baseline for Cēsis municipality, drawn from its Sustainable Energy and Climate Action Plan (SECAP/IEKRP2030) and its Development Programme 2022-2028; and (3) municipality-wide sector modelling carried out with the CommitClimate CO2 Simulator, which projects energy consumption and emissions to 2050 under baseline and policy scenarios for municipal buildings, residential buildings, public infrastructure, transport and waste.

The assessment concludes that historic public buildings in Cēsis cannot be renovated using conventional deep-retrofit packages such as external insulation or full window replacement, because these measures are prohibited or heavily restricted under Latvia's Law on Protection of Cultural Monuments wherever a building or urban area carries protected status. Instead, feasible energy savings of roughly 20-40% can be achieved through packages of heritage-compatible measures: internal (interior-side) insulation with vapour-open materials, secondary glazing that leaves historic window frames untouched, heat-recovery ventilation, modernised heating and controls, and non-invasive digital monitoring. When combined with the renewable energy and efficiency measures already modelled for the wider municipal building stock, these interventions can make a meaningful contribution to the municipality's target of a 20% reduction in CO2 emissions by 2030 and climate neutrality by 2050, while preserving the architectural and cultural value that makes Cēsis a nationally significant heritage town.

The study sets out the technical solutions available, the complexities specific to heritage buildings, the current municipal energy baseline, and a set of recommendations for policymakers, the municipality and building owners, positioning Cēsis as a transferable pilot case for other historic towns around the Baltic Sea.

1. Introduction and Project Context

The Interreg Baltic Sea Region Programme supports cooperation between municipalities, research institutions and public authorities across the Baltic Sea Region on shared challenges, including the transition to climate-neutral and energy-efficient territories. Within this framework, the CommitClimate project works with partner municipalities to strengthen local climate action planning and to test, through a purpose-built CO2 Simulator, how different combinations of policy measures affect long-term energy consumption and greenhouse gas emissions across all sectors of a municipality. Cēsis Municipality is one of the CommitClimate project partners.

Cēsis Municipality territory combines an ambitious climate-neutrality vision with an unusually dense concentration of protected cultural heritage. This creates a policy tension that is common across the Baltic Sea Region's historic towns: national and EU climate and energy-efficiency targets call for a rapid reduction in the energy demand of public buildings, while heritage protection legislation constrains the physical interventions that are normally used to achieve such reductions. This feasibility study was commissioned to examine that tension in detail for Cēsis and to set out a realistic, heritage-compatible pathway for improving the energy performance of the municipality's historic public building stock.

The study explores energy efficiency in historic buildings in Latvia, based on the pilot activities and measurements carried out in the pilot territory. It combines: a description of the historic buildings themselves and the legal and physical complexities involved in renovating them; a review of the technological solutions available, drawing on Latvian, EU and Northern European experience; the current municipal energy baseline and strategic targets set out in the Cēsis Integrated Sustainable Energy and Climate Action Plan to 2030 (IEKRP2030) and the Cēsis Development Programme 2022-2028; sector-level projections produced with the CommitClimate CO2 Simulator; and a set of recommendations addressed to policymakers, the municipality and building owners.

2. Cēsis Municipality Profile

Cēsis lies in the Vidzeme region of northern Latvia, around 90 kilometres northeast of Riga, on the edge of Gauja National Park. Following the 2021 administrative-territorial reform, Cēsis Municipality was formed by merging the former Cēsis, Amata, Jaunpiebalga, Vecpiebalga, Pārgauja, Līgatne and Priekuļi municipalities into a single administrative unit with a population base centred on the historic town of Cēsis and a large surrounding rural territory of roughly 65% forest, natural land and water bodies.

The municipality's guiding long-term document, the Cēsis Sustainable Development Strategy 2022-2035, sets out five strategic goals, of which Strategic Goal 4 - "an environmentally friendly, sustainable and climate-neutral municipality" - frames all of the municipality's energy and climate work, including this feasibility study. The medium-term Development Programme 2022-2028 translates that vision into concrete action lines, including energy-efficient and sustainable infrastructure development and the preservation of cultural-historical heritage, both of which are directly relevant to the renovation of historic public buildings.

The municipality's energy and climate ambitions are set out in detail in its Integrated Sustainable Energy and Climate Action Plan to 2030 (IEKRP2030), adopted as an update to the original 2016 Sustainable Energy Action Plan. Cēsis joined the Covenant of Mayors for Climate and Energy in 2015 and has committed to a climate-neutral municipality by 2050, with an intermediate target of reducing municipal CO_2 emissions by 20% by 2030 against a 2021 baseline of approximately 89,000 tonnes CO_2, and to reducing energy consumption in municipal buildings by 14% and municipal energy costs by a similar margin over the same period. Achieving these targets requires the renovation of a significant share of the municipality's 172 publicly owned buildings, a portion of which are protected historic structures for which conventional renovation packages are not available.

3. Historic Buildings in Cēsis: Description and Heritage Context

3.1 The historic town and its building stock

Cēsis is among the oldest towns in Latvia, its origins tracing back to the fortress built by the Livonian Brothers of the Sword in the 13th century. Although the town's medieval buildings were largely lost to war and fire over the centuries, its historic centre retained its medieval street layout and today presents a coherent townscape of stone and brick buildings dating mainly from the 18th to early 20th centuries, interspersed with courtyards and squares. Notable heritage structures in the town centre include the City Hall, the Merchant House, the Harmony House on Rīgas iela, the Princess House, and St John's Church, one of the oldest and largest medieval basilicas in Latvia outside Riga. The Cēsis Castle complex - the best-preserved medieval castle ruin in the country, together with the 18th-19th century Cēsis Manor House - anchors the townscape and remains a defining element of the municipality's identity and tourism economy.

Beyond the individual landmark buildings, the wider municipality holds a substantial inventory of protected cultural monuments: 271 objects of state significance and 148 of local significance across the seven territorial units that make up the merged municipality, of which 81 (66 of state significance and 15 of local significance) are located in Cēsis town and Vaive parish alone. A large share of these objects are pre-war brick public and administrative buildings, together with churches, manor houses and residential structures, many of which remain in active municipal use as schools, administrative offices, cultural centres and libraries.

3.2 Heritage protection status

Cultural monuments in Latvia are protected under the Law on Protection of Cultural Monuments and regulated by the State Inspection for Heritage Protection (National Heritage Board), under the Ministry of Culture. The law divides monuments into five typological groups - archaeological, architecture and urban construction, art, industrial, and sites of historical events - and prohibits the destruction of cultural monuments outright. Modification or replacement of original elements of a protected building is permitted only where it represents the best available means of preserving the monument, or where it does not reduce the monument's historical and cultural value; any such work requires a permit from the heritage authority. Protection extends not only to individually listed buildings but also to designated protection zones around them, meaning that construction and renovation activity in the immediate vicinity of a monument - including much of the Cēsis old town - is also subject to heritage oversight.

In practice, this legal framework rules out, or makes extremely difficult to authorise, the renovation measures that are standard practice for improving the energy efficiency of ordinary building stock: external wall insulation, which would obscure historic façades and architectural detailing, and full replacement of historic window joinery, which is treated as a loss of authentic material. This constraint is not unique to Cēsis - it mirrors the situation across protected historic centres in Latvia and the Baltic states more broadly, including UNESCO-listed old towns such as Riga and Kuldīga - but it is felt with particular weight in Cēsis given the density of protected structures still in daily municipal use.

3.3 Technical condition and typical building characteristics

The historic brick public buildings that make up much of Cēsis's protected stock share a set of technical characteristics that shape their energy performance. Solid masonry walls, typically 380-640 mm of unreinforced brick with limited or no cavity insulation, provide poor thermal resistance compared with modern construction. Historic timber-framed single- or double-glazed windows, while often finely crafted, have significantly higher heat-loss coefficients than modern glazing. Heating is frequently supplied through ageing, oversized boiler plant or a mix of individual and district heating connections, and mechanical ventilation is largely absent, relying instead on natural infiltration through the building fabric. As a result, historic public buildings in Latvia typically consume in the order of 30% of the total heat energy used across the public building sector, despite accounting for a smaller share of total floor area, and several of the individual buildings with the highest specific energy consumption recorded in the Cēsis municipal building stock in 2022 are identified in municipal records as historic structures.

4. Complexities of Improving Energy Efficiency in Historic Buildings

Renovating a protected historic public building for energy efficiency is a fundamentally different undertaking from renovating an ordinary building of the same age, because at least four sets of constraints must be reconciled simultaneously.

4.1 Legal and regulatory complexity

- Any intervention affecting the façade, roofline, window openings or other protected features of a listed building requires prior approval from the State Inspection for Heritage Protection, adding a permitting stage that does not apply to non-listed buildings and that can significantly extend project timelines.
- Energy-efficiency requirements under Latvia's Law on Energy Performance of Buildings are, in effect, voluntary for cultural monuments wherever compliance would compromise heritage value, which removes a normal driver of renovation but also removes a source of standardised technical guidance.
- Protection zones extend heritage oversight beyond individually listed buildings to their immediate surroundings, meaning that adjacent municipal infrastructure works (e.g., street lighting, pavements) may also require heritage clearance.

4.2 Physical and technical complexity

- Internal insulation, the main heritage-compatible alternative to external insulation, changes the moisture and thermal balance of solid masonry walls and can create interstitial condensation and mould risk if not designed with vapour-open materials and adequate ventilation.
- Reducing air infiltration through window and envelope upgrades removes a source of passive ventilation that historic buildings have relied on for over a century, so mechanical ventilation with heat recovery is usually required alongside insulation measures, adding cost and space requirements that solid masonry buildings were not designed to accommodate.
- Internal insulation reduces usable floor area and can alter the thermal inertia of a building, with knock-on effects for indoor comfort that must be modelled rather than assumed.

4.3 Financial and administrative complexity

- Heritage-compatible renovation packages generally cost more per square metre than conventional retrofits, both because of the specialist materials involved and because of the additional design, permitting and craftsmanship required, while the achievable energy savings are typically lower than for a full conventional retrofit.
- EU and national co-financing instruments for building renovation are frequently designed around standard energy-performance-certificate savings thresholds that heritage-compatible measures may struggle to meet, complicating access to funding.

- Municipal records for Cēsis show that detailed energy-consumption and technical-condition data are not available for all publicly owned buildings, which limits the ability to prioritise and design renovation packages with confidence.

4.4 Institutional and knowledge complexity

Successful heritage-compatible renovation depends on the availability of specialised expertise - conservation architects, moisture engineers and contractors experienced with historic materials - which is in short supply relative to demand across Latvia and the wider Baltic Sea Region. Municipalities such as Cēsis, which combine a large historic building stock with a comparatively small technical administration, are particularly exposed to this capacity gap, reinforcing the case for shared, transferable guidance and pooled expertise of the kind the CommitClimate project is intended to support.

5. Technological Solutions for Energy Efficiency in Historic Buildings

A review of Latvian, EU and Northern European practice - including the EU-funded RIBuild project on internal insulation of historic buildings - points to a consistent set of heritage-compatible measures. None of these measures alone delivers the savings achievable through conventional deep retrofit, but combined into integrated renovation packages they can deliver substantial reductions in energy use while preserving protected fabric.

5.1 Internal (interior-side) insulation

Vapour-open natural materials such as mineral wool or wood-fibre board are applied to the inside face of exterior walls and ceilings, leaving the historic façade untouched. Properly designed and combined with moisture modelling, this can improve wall thermal resistance by 50-70% and reduce heating energy use by roughly 9-43%, though it reduces usable floor area, requires precise moisture calculations, and carries a risk of interstitial condensation and mould if ventilation is inadequate.

5.2 Secondary (interior) glazing

An additional glazed unit is installed on the interior side of the existing historic window, improving the effective window U-value from roughly 3.0 to about 0.97 W/m²K and cutting window-related heat loss by up to 60-70%, without altering the external appearance of the historic frame. Costs vary with the design and materials chosen.

5.3 Window restoration

Repairing and re-sealing original wooden windows, rather than replacing them, is the preferred heritage approach and typically delivers energy savings of 10-30%. Full replacement can achieve larger savings but risks damaging the building's authentic materials, its microclimate and its heritage value, and is generally more expensive once permitting and craftsmanship costs are included.

5.4 Ventilation modernisation

Heat-recovery ventilation systems can reclaim 70-90% of the heat that would otherwise be lost through exhaust air, improving indoor air quality and reducing overall energy use by an estimated 20-40% where installed alongside envelope upgrades. Ductwork and equipment must be designed carefully to fit within the constraints of a protected building's layout and airtightness.

5.5 Heating system upgrades

Replacing outdated boiler plant with condensing boilers, heat pumps or micro-cogeneration units, ideally in combination with renewable energy sources, can improve heating system efficiency by 10-20% without any change to the visible fabric of the building.

5.6 Digital monitoring and building management

IoT sensors and building information models allow real-time monitoring and optimisation of indoor climate and energy use, supporting predictive maintenance and non-invasive efficiency gains that require no physical alteration to protected fabric.

5.7 Northern European experience and expert consensus

Experience from the RIBuild project and from Latvian and Nordic heritage practice converges on a similar message: façade preservation takes precedence, external insulation is rarely if ever permitted on protected buildings, and window replacement is discouraged wherever restoration is feasible. Properly designed internal insulation can safely deliver in the order of 15-20% energy savings when moisture control and ventilation are addressed from the outset. Simple, reversible measures - improved curtains, blinds and draught-proofing - are recommended as a first step before any structural intervention is considered.

5.8 Summary of measures

Measure	Typical energy saving	Key constraint
Internal insulation	9-43% (heating)	Moisture risk; loss of floor area
Secondary glazing	up to 60-70% (window heat loss)	Cost varies with design
Window restoration	10-30%	Skilled labour required
Heat-recovery ventilation	20-40%	Space for ductwork
Heating system upgrade	10-20%	Capital cost
Digital monitoring / BMS	Non-invasive, supports other measures	Requires sensor investment

Table 1. Indicative ranges for heritage-compatible energy-efficiency measures, based on Latvian, EU and Northern European experience.

5.9 Recommendations for policymakers, municipalities and building owners

- Develop national guidelines and financial instruments specifically tailored to heritage buildings, rather than applying standard renovation-programme criteria.
- Encourage low-impact, reversible solutions - internal glazing, thermal curtains, draught-proofing - before committing to structural interventions.
- Invest in public awareness of the value of preserving original materials, alongside technical training for architects and contractors.
- Combine technical, regulatory and educational measures into integrated strategies rather than pursuing single interventions in isolation.
- Ensure renovation planning processes weigh energy efficiency and heritage preservation together from the outset, and simplify the administrative process where possible.
- Support building audits, monitoring and access to restoration specialists as a standing municipal service rather than a one-off project cost.

6. Municipal Energy Baseline and SECAP Context

Cēsis Municipality's climate and energy planning rests on two complementary evidence bases. The first is the bottom-up municipal-infrastructure inventory compiled for the IEKRP2030, which draws on metered data for municipal buildings, street lighting, the municipal vehicle fleet and water utilities. The second is a municipality-wide sector baseline and set of policy scenarios produced with the CommitClimate CO2 Simulator, covering municipal buildings, residential buildings, public infrastructure, other sectors, transport and waste management. The two data sets use different scopes and methodologies - the IEKRP2030 figures cover metered municipal assets only, while the CO2 Simulator estimates apply representative parameters across the full building and territorial stock - and are therefore presented separately below, but both point in the same direction: buildings and heating dominate the municipality's energy footprint outside private transport, and historic public buildings represent a disproportionately energy-intensive share of that footprint.

6.1 IEKRP2030 targets and municipal infrastructure baseline

The IEKRP2030 records total municipal infrastructure energy consumption of 23,311 MWh in 2022, of which building heat energy accounted for 65% and building electricity for 16%, with street lighting, water utilities and the municipal vehicle fleet making up the remainder. Of the municipality's 172 publicly owned buildings, at least 49 have already been renovated, but several of the highest specific-energy-consumption buildings recorded in 2022 are historic structures for which conventional renovation was not an option. The plan sets a 2030 target of reducing energy consumption in municipal buildings and street lighting by 14% (2,889 MWh) against the 2021 baseline, cutting related CO2 emissions by 43% (720 tCO2), and raising the share of renewable energy used in municipal infrastructure, including through renovation, heat pump and solar PV investment programmes budgeted at over EUR 23 million to 2030.

6.2 Municipality-wide sector baseline (CommitClimate CO2 Simulator)

The CO2 Simulator baseline and policy-scenario results for Cēsis, developed for this study, cover six sectors and project outcomes to 2050 under a defined package of measures, each phased in from 2025 at a 10% annual implementation rate unless otherwise noted.

Municipal buildings

Total floor area of municipal buildings modelled is approximately 1.86 million m², with schools, kindergartens and related building groups making up the largest share. Total energy consumption in 2021 was 394,198 MWh, equal to 32.1% of the municipality's total energy consumption - the largest single sector. Centralised heat supply accounts for 49.2% of this consumption, individual heating for 27.3% and equipment electricity for 23.5%. Average specific consumption is 150 kWh/m²/year for heat and 50 kWh/m²/year for electricity. CO2 emissions from municipal buildings were 10,445 tonnes in the baseline year (7.2% of municipal emissions), of which 79.7% is attributable to electricity.

A policy package combining building-envelope upgrades (windows, wall insulation), lighting efficiency, ventilation and appliance optimisation, and 10 MW each of solar PV, air-source and ground-source heat pumps is projected to cut annual energy use by 706,649 MWh (17.9%) and CO2 emissions by 1,782 tonnes (17.0%) by 2050. Wall insulation delivers the largest energy saving (11.7%) but a comparatively small CO2 reduction (3.1%), because centralised heat in Cēsis already has a relatively low carbon intensity; lighting replacement, by contrast, delivers a smaller energy saving (2.8%) but a much larger CO_2 reduction (9.4%), because it targets carbon-intensive electricity. This asymmetry is directly relevant to prioritising renovation of historic buildings: measures that reduce electricity use, such as LED lighting and appliance efficiency, offer disproportionate emissions benefits and are far easier to implement in a protected building than fabric-level heating measures.

Residential buildings

Residential floor area modelled is 976,572 m², dominated by detached and attached family houses. 2021 energy consumption was 303,096 MWh (24.6% of municipal energy consumption), with district heating (52.2%) and individual heating and hot water (33.0%) dominating, and appliance electricity making up 14.5% (43,946 MWh). Specific consumption is 250 kWh/m²/year for heating and hot water and 45 kWh/m²/year for electricity. CO_2 emissions were 10,741 tonnes (7.3% of municipal emissions), with individual heating responsible for 47.8% of the total.

A combined renovation and electrification package - building renovation at 5% (single-family) to 10% (multi-family) per year with 40% assumed savings, a 30% electricity-saving measure for appliances, and 20 MW each of solar PV, air-source and ground-source heat pumps - is projected to deliver 88,000 MWh (29.1%) in annual energy savings and 2,804 tonnes (26.1%) in annual CO_2 reductions by 2050. As with municipal buildings, the electricity-efficiency measure delivers a smaller share of energy savings but a disproportionately large emissions benefit.

Public infrastructure

Public lighting, drinking-water preparation and wastewater treatment together consume 6,673 MWh per year, a small 0.5% share of total municipal energy use, generating 526 tonnes of CO_2 annually (0.4% of municipal emissions). A package combining LED street-lighting replacement, renewable energy integration in lighting infrastructure, wastewater treatment efficiency improvements and wastewater generation reduction, each phased in at 0.5-5% per year, is projected to cut sectoral energy use by 8.0% (536 MWh) and CO_2 emissions by 12.7% (67 tonnes) by 2050, with LED lighting replacement contributing the single largest impact.

Other sectors

Commercial and territorial, industry and construction, agriculture and forestry, and other minor sub-sectors are not included in the baseline inventory or projection for Cēsis, and no policy analysis was carried out for this category.

Transport

Private transport dominates the sector, consuming approximately 403.1 GWh per year (72.4% of it private cars) and generating 105,300 tonnes of CO_2 annually - roughly 69% of the municipality's total emissions. The municipal vehicle fleet (55 light and 38 heavy-duty vehicles, plus 14 others) consumes around 6,865 MWh per year (1,714 tonnes CO_2), while public transport, at roughly 12% of passenger-kilometres, consumes 4,956 MWh per year (1,308 tonnes CO_2). Targeted policy packages - fleet electrification and eco-driving for the municipal fleet, route optimisation for public transport, and car-sharing and freight-efficiency measures for private transport - are projected to deliver energy savings ranging from 11.4% (private transport) to 82.6% (municipal fleet) and comparable CO_2 reductions by 2050, though private transport remains by far the dominant source of transport emissions even after these measures are applied.

Waste management

Municipal waste generation in the baseline year is approximately 17.9 thousand tonnes, associated with 18.1 thousand tonnes CO_2eq of emissions - 14.1% of the municipality's total GHG emissions. Under the baseline scenario, waste generation is projected to rise 5.9% and emissions 13.8% by 2050 as population grows even as per-capita waste generation falls. A 0.5%-per-year reduction in per-capita waste generation from 2025 is projected to cut 2050 waste volumes by 11.8% and associated emissions by 2.0% relative to the no-policy baseline.

6.3 Reading the two baselines together

Read together, the IEKRP2030 and CO2 Simulator results confirm that municipal and residential buildings, driven principally by heating demand, are the largest controllable sources of energy consumption and emissions in Cēsis outside private transport, and that historic public buildings sit within the highest-consuming segment of that stock. They also confirm the electricity-versus-heat asymmetry that is central to prioritising historic-building renovation: because Cēsis's district and local heating systems already draw heavily on renewable biomass, heat-saving measures in historic buildings deliver smaller CO_2 benefits per MWh saved than electricity-saving measures such as LED lighting, appliance efficiency and non-invasive digital monitoring - all of which can be implemented in a protected building without heritage-permitting complications. This reinforces the case, developed further in Section 7, for sequencing renovation of historic public buildings around low-impact, high-value measures first, moving to internal insulation and secondary glazing where feasibility and funding allow.

7. Feasibility Assessment: Renovation of Historic Public Buildings in Cēsis

7.1 Role of the CommitClimate CO2 Simulator

Within the CommitClimate project, Cēsis Municipality used the CO2 Simulator to test different renovation scenarios for its historic public buildings against the sector-wide baseline described in Section 6. Because detailed metered energy data are not available for every municipal building - a gap the municipality itself has flagged as a priority to close - the simulator applied representative parameters and average values, drawn from the wider municipal building stock and from comparable Latvian and Baltic heritage-renovation case studies, to estimate energy demand and emission-reduction potential for the historic subset of the stock. This approach allowed the municipality to compare alternative policy measures, evaluate their contribution to IEKRP2030 targets, and identify the most feasible pathways for reducing emissions from historic buildings while respecting heritage protection requirements.

7.2 Priority measures for Cēsis

The assessment concludes that the greatest potential for historic public buildings in Cēsis lies in integrated renovation packages rather than single interventions. Priority measures, in the sequence in which they are recommended for implementation, are:

- Low-impact, high-value first steps: LED lighting replacement, appliance efficiency improvements and non-invasive digital monitoring, all deliverable without heritage permitting complications and disproportionately effective at reducing carbon-intensive electricity use.
- Window-level measures: restoration of historic wooden windows combined with secondary (interior) glazing, preserving the external appearance of protected façades while materially improving thermal performance.
- Envelope measures: internal insulation using vapour-open materials, applied selectively where moisture risk can be properly managed and where the loss of internal floor area is acceptable to the building's function.
- Systems upgrades: heat-recovery ventilation and modernised, smart-controlled heating, including replacement of inefficient heat sources and connection to renewable district or local heating where technically feasible.
- Continuous energy monitoring and building management, to track performance, verify savings and inform the phasing of further investment.

7.3 Expected impacts and integration with SECAP targets

Applying this heritage-compatible measure package to Cēsis's historic public building stock is expected to deliver energy savings in the order of 20-40% per building, consistent with the ranges established in Section 5, contributing directly to the IEKRP2030 target of a 14% reduction in municipal building energy consumption and a 43% reduction in associated CO2 emissions by 2030. Because historic buildings are concentrated among the higher-consuming assets in the municipal stock, targeted renovation of this subset offers a cost-effective way of moving toward these targets without requiring interventions that heritage law would in any case prohibit. Digital monitoring and building-management systems can further optimise energy use across the historic stock without affecting the historic appearance of the buildings, complementing the physical renovation measures.

7.4 Transferability

The methodology piloted in Cēsis - combining a bottom-up municipal building inventory, municipality-wide CO2 Simulator scenario modelling, and a heritage-compatible measure package sequenced from low-impact to more invasive interventions - is directly transferable to other Latvian and Baltic Sea Region municipalities with significant historic building stock, particularly those that, like Cēsis, combine ambitious climate-neutrality targets with a high density of nationally protected cultural monuments.

8. Policy Relevance and Recommendations

The experience of Cēsis demonstrates that municipalities with extensive cultural heritage assets require dedicated decision-support tools capable of balancing climate-neutrality objectives with heritage conservation. The following recommendations follow from the analysis in this study.

8.1 For national and regional policymakers

- Develop dedicated national guidelines and financial instruments for energy efficiency in cultural heritage buildings, distinct from the standard renovation-programme criteria applied to non-listed building stock.
- Ensure co-financing schemes for building renovation can accommodate the lower savings thresholds and higher unit costs typical of heritage-compatible measures, rather than applying uniform performance criteria across all building types.
- Support the training and certification of conservation architects, moisture engineers and contractors experienced with historic building materials, to close the specialist-capacity gap identified in Section 4.4.

8.2 For Cēsis Municipality

- Close the municipal building energy-data gap identified in the IEKRP2030, prioritising metering and energy audits for historic buildings so that renovation decisions can be based on verified consumption data rather than representative averages.
- Sequence historic-building renovation investment around the priority measures set out in Section 7.2, starting with low-impact, high-value electricity-efficiency and monitoring measures before committing to more costly and complex envelope interventions.
- Continue to use the CommitClimate CO2 Simulator and its successor tools to test renovation scenarios before investing, quantify expected CO2 reductions, and prioritise measures according to technical feasibility, cost and local development objectives.
- Ensure renovation plans for historic buildings are developed jointly by the municipality's property management, development and heritage-liaison functions from the outset, rather than sequentially, to reduce permitting delays.

8.3 For building owners and managers

- Begin with simple, reversible measures - improved curtains, blinds, draught-proofing and behavioural changes - before committing to structural interventions.
- Commission moisture and building-physics assessments before specifying internal insulation, to avoid condensation and mould risk.
- Engage with the heritage authority early in project planning to agree on the scope of permissible interventions before detailed design work is commissioned.

9. Conclusion

Cēsis illustrates, in concentrated form, a challenge facing many historic towns around the Baltic Sea: how to meet binding climate-neutrality commitments without compromising the architectural and cultural heritage that defines a place. The evidence assembled in this study - from Latvian and Northern European technical practice, from the municipality's own SECAP and development-planning targets, and from municipality-wide CO2 Simulator scenario modelling - points to a clear, if incremental, pathway. Heritage-compatible measures, sequenced from low-impact electricity and monitoring interventions through to internal insulation and secondary glazing, can deliver energy savings in the order of 20-40% for individual historic buildings and make a material contribution to the municipality's 2030 and 2050 targets, without recourse to the external insulation or full window replacement that heritage protection law rules out. Sustained progress will depend on closing the municipal data gap, building specialist renovation capacity, and aligning national and EU financing instruments with the realities of heritage-building retrofit - work that this Interreg BSR CommitClimate deliverable is intended to support, both for Cēsis and for comparable municipalities across the region.

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