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Towards Sustainable Refurbishment and Renovation of Valuable Built Environment Buildings in Lithuania

National study



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Towards Sustainable Refurbishment and Renovation of Valuable Built Environment Buildings in Lithuania

Prepared by:
Assoc. prof. Jūratė Žaltauskaitė (Vytautas Magns University, Environmental Science department)
Assoc. prof. Renata Dagiliūtė (Vytautas Magnus University, Environmental Science department)
Assoc. prof. Gintarė Sujetovienė (Vytautas Magnus University, Environmental Science department)
PhD Vaidas Petrulis (Kaunas University of Technology, Institute of Architecture and Construction)
PhD Ramūnas Gatautis (Lithuanian Energy Institute, Laboratory of Energy Systems Research)

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1. Introduction

Built environment is one of the drivers for climate change, at the same time this sector experiences the impact of climate change markedly. Temperature fluctuations, floods, heatwaves/cold spells, heavy rains, and extreme wind negatively affect building sector and its maintenance.

The building sector accounts for 5-12% of total European Union (EU) greenhouse gas (GHG) emissions from the construction and renovation of buildings. Due to higher energy efficiency standards for new buildings, energy efficiency improvements in existing buildings, and ongoing warming, GHG emissions from the building sector in the EU markedly fell between 2005 and 2023, but still this sector is responsible for around 33% of GHG emissions in EU (EEA, 2025). These emissions are mainly from the direct use of fossil fuels for heating and from the production of electricity and heat for use in buildings (Ibid).

Sustainable reuse and refurbishment of the existing building stock is one of the key strategies to lower the demand for new construction and, consequently, reduce the building sector's impact on the environment through GHG emissions. Revised 2040 GHG reduction targets at the EU level (EU, 2025) impose that faster changes in the energy efficiency of the building stock are needed. It is estimated that in the EU almost 75% of the building stock is currently energy inefficient, though recent standards and recommendations mostly focus on new buildings, while the large volume of existing building stock, including historic buildings, is neglected.

Culture in a broad context is a fundamental dimension of sustainable development. In general, cultural heritage is considered equally important for sustainability as economy, social and environmental protection not only from the resources and pollution generated, but also from intrinsic value it creates for society perspectives (CHCfE, 2015). This study focuses on the valuable built environment (VBE), which encompasses buildings listed in the official registers of cultural heritage and historic buildings that are not officially listed but are older than 50 years and possess historical, architectural, social or cultural value. One-third of Lithuania's 2.65 million buildings were constructed prior to 1961. More than 26,000 buildings are listed in the Lithuanian Register of Immovable Cultural Heritage. Sustainable refurbishment of historic buildings could increase their resilience to climate change related threats and reduce the need for new construction resulting in lower GHG emissions. At the same time, it highlights the great potential not only to increase energy savings in the building sector, but also to contribute to increasing social welfare, through strengthening an identity and sense of place, being a source of pride for society, providing economic input, etc. (Al-Alawi et al., 2022). Recent studies have shown that regular proper maintenance along with repair could reduce energy consumption by 30-40% while prolonging the building's lifespan and reducing embodied carbon (Ritson, 2018). At the same time, maintenance and repair being less invasive way of preserving the valuable built environment are essential for preserving cultural significance.

Therefore, sustainable refurbishment (renovation) of VBE buildings requires holistic approach by integrating energy performance improvement along with the application of circular economy principles, increasing usage of renewable energy sources, local materials, while enhancing climate resilience and preserving integrity and valuable features of building.

The EUKI REPAIR project corresponds to the aforementioned challenges and policies and aims to transform the repair practices and approaches of valuable built environments (VBE) in North Macedonia, Estonia, Lithuania, Serbia, and Germany while reducing carbon emissions and strengthening climate resilience.

***Valuable built environment (VBE) encompasses historic buildings (structures older than 50 years with historical, architectural, social or cultural value) and cultural heritage buildings (legally protected buildings important for their cultural, social and historical value, and listed as part of the national or international heritage sites)**. Definition by EU-REPAIR project.*

Project focuses on a transnational exchange of skills and knowledge on energy efficiency, renewable energy, and the concept of circular economy for valuable built environments. The project will develop a comprehensive toolkit promoting the knowledge and application of low impact repair techniques, maintenance cycles, digital technologies, and the use of local and renewable resources. By enhancing the expertise of professionals (craftsmen, builders, heritage professionals, students, and educators, etc.) the EU-REPAIR will foster the development of high-quality courses, research, and outreach programmes, facilitate collaboration and networking among organizations in these regions.

This study is part of the project activities reviewing state of the art of buildings' energy efficiency and renovation, legislation, governmental framework and stakeholder analysis in Lithuania. The current report also aims to analyse the current VBE refurbishment framework in Lithuania and to delineate a thorough needs analysis for sustainable VBE management identifying main obstacles and challenges this sector is facing.

2. Methodology and scope

2.1. General approach to study

A study on Lithuania's valuable built environment provides a systematic perspective on the renovation and refurbishment of valuable buildings. Based on the desk research, overview of aspects of VBE renovation and refurbishment is provided, including the state of art of building stock, energy efficiency, renovation rates, different policies, guidelines and standards related to cultural heritage, energy efficiency, building renovation, climate change, environmental protection, digitalization, existing financing opportunities and formal education regarding the VBE renovation. The comprehensive overview is backed by a stakeholders' survey and the presentation of best practices as well as case studies demonstrating the potential of sustainable renovation and refurbishment, safeguarding valuable building characteristics and improving the state of the buildings in climate friendly, circular, energy efficient way. The theoretical framework of the study is presented in Fig. 1.

Reviews of literature and policy documents (as of 2025 September), publicly available data and data from various reports were used in the study to reveal trends in building stock changes, energy efficiency, renovation rates, existing financing instruments, formal educational programmes on heritage, climate change and other relevant fields. Sustainability practices, challenges, barriers and needs were listed based on literature review, personal communications with experts, and stakeholder survey.

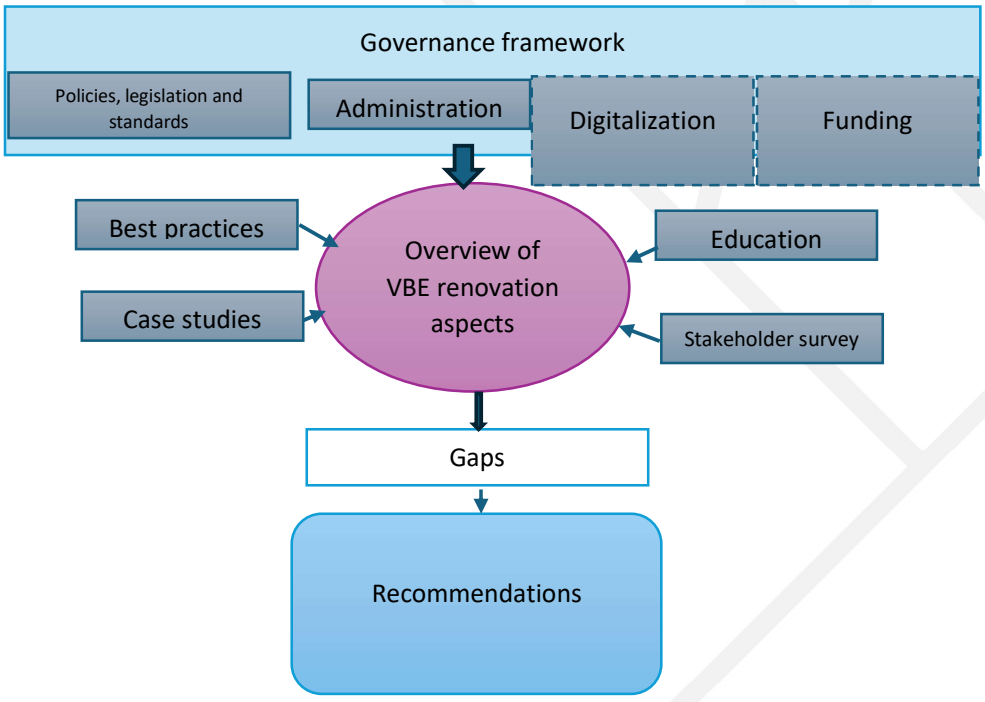


Fig. 1. General framework of the study

2.2. Stakeholder survey analysis

To reveal views, needs and experiences of VBE stakeholders, survey was conducted. A uniform questionnaire for all project countries was prepared and adapted in the national languages. Link to the survey was distributed to compiled contacts from governmental and municipality institutions related to cultural heritage protection, also architects, engineers, conservators, NGO representatives, teachers/researchers and students in VBE related fields as well as owners of such

buildings. Some of the questionaries during the meeting with stakeholders and other events (conference) were distributed in printed form. Survey was conducted in autumn 2025. In total 69 responses were received from Lithuanian stakeholders (66.6% women, 33.3% men). Most dominant age group was 51 - 60 yrs group (27.9%), followed by the age group 20 – 30 yrs (23.5%). The third largest age group was that of 41 – 50 yrs (22.1%). Most of the respondents reside in big towns (85.5%). Majority of respondents hold degrees of higher education, with some 49.3% of master's degree and even 20.3% of doctoral degree. 29% of respondents indicated to have educational background as architecture and some 23.2 % as engineers. The rest included higher institution teachers, students in related study fields, historians, art historians, art critics, public institutions servants and specialists, heritage conservationists, restorers etc. In relation to refurbishment majority of respondents are government representatives on municipality level (42%) (Fig. 2).

Analysis focuses on the descriptive statistics to reveal main attitudes, barriers and needs for more sustainable valuable building refurbishment and renovation.

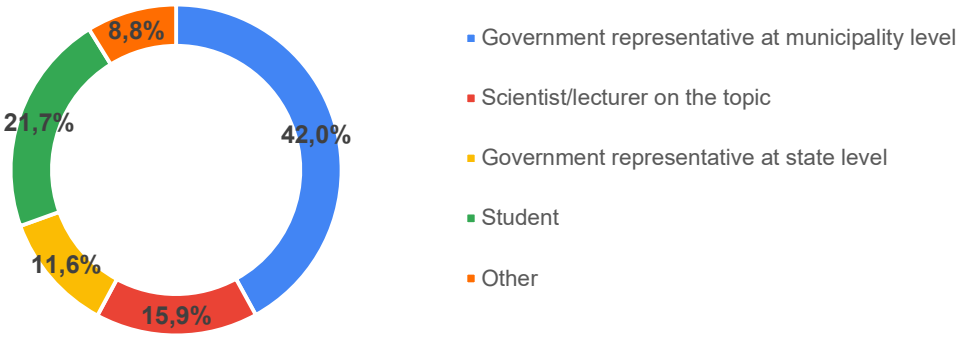


Fig. 2. Distribution of respondents in relation to building refurbishment (N=69).

3. Peculiarities of building stock, renovation rates and VBE in Lithuania

3.1. Current state of building stock and renovation

The building stock of Lithuania is comprised approximately of 2.65 million buildings with a total area of 249,7 million m^2 (Fig.3). Only 5.07% of the total building stock is public. Residential, non-residential and mixed-use buildings represent 30.94% of total building stock accounting for 98.26% of the building area (Centre of Registers, 2025). 59.1% of population live in multi-apartment buildings while in rural areas most of the population live in one-apartment buildings (78.3%) (Statistics Lithuania, 2021).

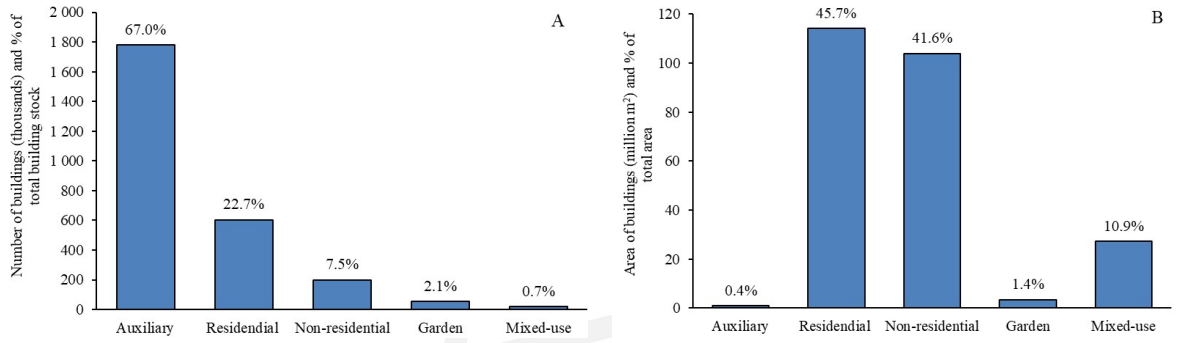


Fig. 3. Building stock distribution according to the number of buildings (thousands, A) and building area (million m^2, B). The numbers above the columns are given as a percentage of the total number and area of buildings, respectively (Data: Centre of Registers, 2025)

Buildings that are not subject to the requirements of the Construction Technical Regulation (STR 2.01.02:2016) regarding energy performance are not included in the Lithuania long-term renovation strategy (2021). Therefore, cultural heritage buildings and religious buildings, are excluded from Lithuania's long-term renovation strategy creating a data gap in the building stock, building area and corresponding calculations of CO_2 emissions and their mitigation potential. It is estimated that such buildings account for approximately 10 % of the building stock's area.

According to the data provided in Lithuania Long-term Renovation Strategy (2021), Lithuania has a total of 661 thousand buildings, with a total area of 201.7 million m^2, subjected to renovation measures. Residential one-apartment and multi-apartment buildings represent the biggest share of the building stock, i.e. 86.2 % of the number of buildings and around 64.0 % of the total area of the building stock. Although multi-apartment buildings account only for 6.2% of total building stock, their share in the total area reaches 29.2%. The biggest share of non-residential buildings by the total area is taken by industrial buildings (18%), administrative buildings (5%) and research/educational buildings (4%). Only 2% of all buildings constituting around 9% of the total building area are owned by the State and municipalities. Almost half (45%) of the building stock by the area of buildings is classified as mixed ownership, i.e. joint ownership by several owners (natural persons, legal entities, the State and municipalities). Natural persons own 64% of total buildings by number and 31% by the building area.

The majority of the building stock, both in terms of number (80%) of buildings and building area (75%), was built before 1993. The largest share (45% by number and 58% by building area) of Lithuania's building stock by year of construction is made up of buildings constructed between 1961 and 1992. Regarding the multi-apartment buildings, which share a substantial part of building stock, around 90% of them (37051 buildings) and 83.1% of their area were built before 1993. In the group of non-residential buildings, approximately 84% of administrative and industrial buildings (73.4 and

76.6% by the area, respectively) and 94% of research buildings (91.1% by the area) were built before 1993.

The biggest part of buildings is brick and block buildings (48% by the number and 59% by the area). 18% of the total building stock area consists of buildings made of reinforced concrete slabs and monolithic concrete of which more than a half are multi-apartment buildings. Although as many as 37 percent of all buildings are wooden, since most of them (almost 96%) are individual houses, therefore, by area, wooden buildings only make up 11% of the total building stock area. Most of wooden individual houses are old: 72% percent of them were built before 1960, another 23% - in the period of 1960 – 1992. Given that wooden buildings make up only a small part of the building stock area and their renovation is very expensive due to their poor condition, they are not considered a priority group for the renovation programme. However, 1700 wooden buildings are on the list of cultural heritage objects in Lithuania[1] and in some territories, they are an important factor shaping the identity of the area. For example, in Kaunas, the identity of Žaliakalnis district (Fig. 4) is formed by brick and wooden houses of the homestead and villa type, representing Kaunas modernism (Lukšionytė, 2013). In the territory of the 1st Žaliakalnis Cultural Reserve 780 brick and wooden buildings are present. There are 170 cultural heritage objects in the territory (22% of all buildings) of which 20 objects are listed in the Lithuanian Register of Immovable Cultural Heritage (Kaunas municipality, 2012).



Fig. 4. Kaunas, Žaliakalnis district: wooden buildings (photos by Almantas Bružas)

To date, 430,666 energy performance certificates are registered in Lithuania (as of September 2025), however half of certified dwellings are rated G and only 8.4% of them have A, A+ or A++ class (Fig. 5) (Construction Sector Development Agency, 2025). By 2023, it was required to reach at least energy performance class C when renovating buildings, and around 6.6% of buildings are now rated as class C. Currently, state support for the renovation of buildings is only possible if at least energy performance class B is achieved. Therefore, the energy savings potential for the building segment of class C is not high and it is not a priority in Lithuania's Long-term Renovation Strategy (2021), however, it could be important in reaching long-term goals. Two thirds (66%) of the building stock

[1] EEA Grants website: https://eeagrants.org/archive/2009-2014/programmes/LT06

area consist of buildings with an energy performance class lower than C, of which almost 32% are multi-apartment buildings.

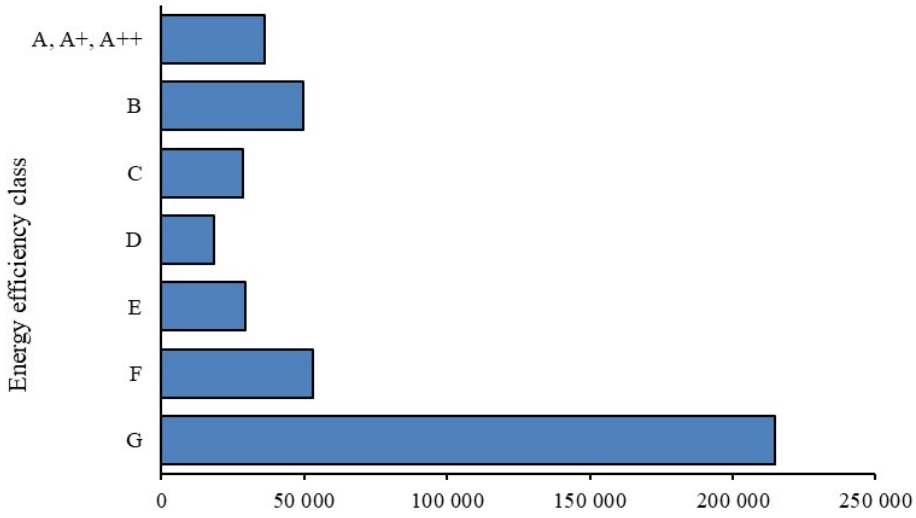


Fig. 5. Distribution of building stock units according to the energy performance class (number of buildings) (Data: Construction Sector Development Agency, 2025).

In today's context, buildings built before 1992 are energy inefficient (annual heat consumption up to 160-180 kWh/m^2), do not meet today's thermal performance requirements (class D and lower), and building engineering systems are worn out. The poor condition of buildings built during the Soviet period can also be explained by the fact that less stringent technical requirements were in force at that time, and the quality of materials and construction work was poorer. Although according to Soviet Union era technical standards GOST (Euro-Asian Council for Standardization, Metrology and Certification (EASC)) buildings must undergo major renovation after 25 years of operation, this requirement was not met. According to the legislation of the Republic of Lithuania, multi-apartment buildings built before 1991 must be renovated. Therefore, these buildings requiring deep renovation have the greatest potential to reduce energy consumption and contribute to the building stock decarbonization.

The building stock consumes ~40.8 TWh of primary energy per year, of which 26.4 TWh is from fossil fuels. 63% of the primary energy consumption of the total building stock is consumed by residential buildings, 34% by single-family houses and 29% by multi-family houses. There are about 18,000 multi-apartment residential buildings in Lithuania, supplied with district heating, of which about 3,000 houses are in very poor condition (LDHA, 2025). In the sector of non-residential buildings, the biggest primary energy consumers are industrial (18%), administrative (5%) and research buildings (4%). Buildings below Energy Performance Class C consume 78% of the primary energy consumption of the total building stock, with individual houses (31%), multi-apartment buildings (30%) and industrial buildings (21%) being the largest consumers in this group. Taking into account that residential buildings of Energy Performance Class D and below consume almost half (47%) of the total primary energy consumption, this sector is prioritized in Lithuania. Buildings built before 1940 because of poor condition and very expensive, i.e., non-cost-effective, renovation, are not attributed to the priority group of buildings. Some of these buildings might be temporarily or permanently non-used/inhabited and non-heated, but no reliable data are collected. However, this group includes a number of historic buildings with valuable features, including those in the Lithuanian Register of Immovable Cultural Heritage. For example, Kurnėnų Lauryno Radziukyno

school[2] (built 1936) was closed in 2008 and stood abandoned for almost a decade until it was renovated in 2020 (Fig. 6). In such cases, energy efficiency and savings could not be evaluated.



Fig. 6. Kurnėnų Lauryno Radziukyno school: before and after renovation (photos: A - Northern facade before, B - Southern facade before (photos by Marius Skerniškis), C - Northern facade after renovation, D - Southern facade after renovation (photos by Rima Kašelionienė))

Annual CO_2 emissions generated by Lithuania building stock are approximately 5.3 Mt. Emissions from residential buildings account for 54% of total building stock CO_2 emissions, industrial buildings release another 22% of CO_2 emissions of building sector. Buildings with energy performance class lower than C emit more than 77%, those of class B and higher – only 10% of the total CO_2 emissions of the building stock. One-apartment houses and industrial buildings, around 31-32% each, are the biggest consumers of fossil fuel in the building sector. Thus, residential buildings with energy performance class lower than C and all buildings using fossil fuels are considered a priority segment in the context of reducing CO_2 emissions in the building sector.

Systematic renovation of buildings at the state level in Lithuania began in 1996. Renovation of private buildings before the start of state-supported programmes and afterwards was mostly carried out at the expense of the building owners with the aim of improving building conditions and reducing heat demands and related costs. However, in most cases owners of these buildings implemented only some renovation measures (such as heating system renovation, roof and/or walls insulation, installation of new windows (roof or wall)) and did not perform deep renovation. As multi-apartment buildings are outlined as priority group, most of the previous and ongoing renovation programmes (such as Programme for Increasing the Energy Efficiency for Public Buildings, Programme of Energy-efficiency Renewal of Urban areas (blocks)) are aimed at the renovation of multi-apartment buildings. Regarding the renovation of valuable historic multi-apartment buildings, the state funded programme was initiated only in 2025.

The launch of state funded programmes for the renovation has speeded up the rate of renovation of multi-apartment buildings (Fig. 7). In total, from 2005 to 2025 (autumn), 4363 multi-apartment

[2] Register of Cultural Property: https://kvr.kpd.lt/#/static-heritage-detail/D2DFB86B-00C7-45B1-B444-0D514C4193D4

buildings (14.9% of the total number of multi-apartment buildings) were renovated, which resulted in heat energy savings of 62.9%.

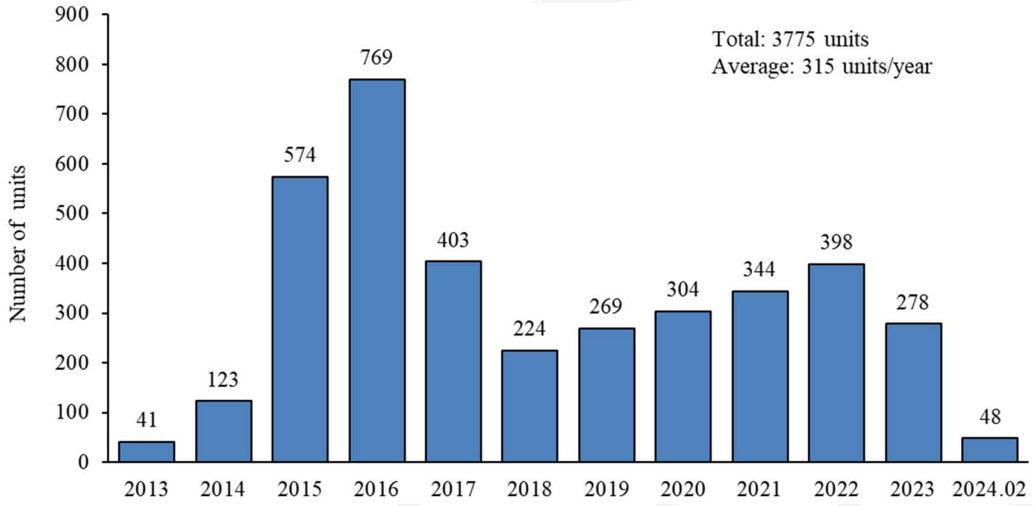


Fig. 7. Statistics on renovated multi-apartment buildings in Lithuania (Data: APVA, 2024).

The targets of Lithuania Long-Term Renovation Strategy regarding energy efficiency and sector decarbonization are in coherence with other national strategic documents: National Energy Independence Strategy (NEIS, 2012, 2024), National Energy and Climate Action Plan of the Republic of Lithuania 2024-2030 (2024), National Progress Strategy Lithuania 2050 (2024). The Lithuania Long-Term Renovation Strategy envisages a 60 % reduction, to 16.2 TWh/year, in the annual primary energy consumption of the building stock by 2050 compared to 2020, along with a phase-out of fossil fuel use and a 100% reduction in CO_2 emissions (Table 1).

Table 1. Target indicators of renovation rate, estimations of investment required, energy consumption in buildings and CO_2 emissions according to Lithuania's long-term building renovation strategy.

Indicator	Unit	2021-2023	2024-2030	2031-2040	2041-2050
Renovation rate	Buildings/year	8086	10717	15614	18059
	Building area thousand m^2/year	2248	3011	3941	4230
Investment required	M Eur/year	867	1286	2071	2767
Primary energy consumption	GWh/year	40 827	34 759	25 888	16 162
CO_2 emissions	$ktCO_2$	5 287	4 003	2 108	22

Over the next three decades, more than 75% of the building stock must undergo comprehensive renovations to meet set indicators. Given the current renovation rate, additional measures boosting renovation rates are needed to meet the targets set in the national strategic documents.

According to the EEA (2025), energy related GHG emissions from building stock in Lithuania over 2005-2023 decreased the least in EU (only by 4%, the same as in Romania).

3.2. Specific features of VBE in Lithuania

According to 2025 data, more than 26,000 objects are listed in the Lithuanian Register of Immovable Cultural Heritage[3]. Large historic urban areas, as well as more recent territories such as the Lazdynai micro-district in Vilnius[4], are protected at the scale of urban territory. While there are some individual differences, in general buildings located within valuable areas are recognized for their volume, materiality, plot density, and other significant characteristics. This constitutes an extensive body of heritage-recognized built structures representing various historical periods and functional typologies. Archaeological sites and architectural heritage up to the 20th century, with some exceptions from the 19th century, are systematically included in the Register of Cultural Values. By contrast, 20th-century architecture, whose diversity and abundance make comprehensive inclusion impractical, is often regarded as valuable built environment but remains outside formal protection. Such unprotected sites are particularly common in rural areas, small towns, and the peripheries of large cities. Situated outside the framework of legal protection, these buildings offer greater scope for experimental approaches to adaptive reuse, including the application of strategies that directly address climate-related challenges.

Among the most consequential climate-related challenges in the heritage sector is energy efficiency, the feasibility and risk profile of which depend strongly on the materiality of historic fabric. In Lithuania, a concise typology (excluding archaeological assets) can be outlined as follows: (i) masonry architecture, predominantly solid brick or stone walls in historic towns; (ii) vernacular wooden and other traditional-material architecture (timber, clay, stone); and (iii) Soviet-period reinforced-concrete and panel-system buildings. These categories manifest in diverse forms, including urban and rural housing, manor houses and estate ensembles, religious heritage (churches, synagogues, monasteries, chapels, cemeteries), industrial heritage (factories, mills, warehouses, infrastructure), and military heritage (fortifications, bunkers, and related structures). Each typology has its own internal functional logic, material constraints, and tolerance for energy efficiency oriented adaptive reuse.

External insulation, plastic windows, and other interventions intended to reduce energy demand mark the most visible impacts on the built environment in recent decades. While Soviet panel-system and industrial structures, at least from a traditional heritage value perspective, are relatively less sensitive, masonry structures from the 19th and first half of the 20th century become aesthetically vulnerable during renovation. External “wraps” seriously threaten the defining values of these buildings. The Estonian Pavilion at the 2025 Venice Biennale, titled *Let Me Warm You*, brings this issue into sharp international focus: the curators “cover the façade of a Venetian building with insulation panels, replicating how they are commonly installed in Estonia for mass housing renovations”[5] to question whether these large-scale insulation projects are merely compliance or could enhance spatial or social quality. The integration of renewable energy technologies such as photovoltaic panels or geothermal heat pumps is similarly challenging, as their visual and physical impacts may conflict with conservation principles, particularly in protected urban zones. By contrast, wooden architecture, where breathability, airtightness, and ventilation measures typically outperform heavy insulation, may offer greater potential for improving energy efficiency while preserving aesthetic qualities.

[3] Register of Immovable Cultural Heritage. Interactive map: https://kvr.kpd.lt/#/static-heritage-search
[4] Lazdynai micro-district. Register of Immovable Cultural Heritage: https://kvr.kpd.lt/#/static-heritage-detail/B1F98A5A-1EFA-4133-A22C-CD33D6DF349D
[5] ArchDaily: https://www.archdaily.com/1029140/the-estonian-pavilion-at-the-2025-venice-biennale-questions-massive-insulation-projects-through-a-facade-installation

Therefore, although energy efficiency is frequently cited as the primary driver of building renovation in Lithuania, its application to heritage assets remains highly contentious. Despite the aforementioned attempts by the Department of Cultural Heritage to prepare methodological recommendations, the integration of energy efficiency measures and their impact on cultural value remains one of the most pressing unresolved challenges for the future. This dilemma is both strategic and value-based and it is analogous to the debate between giving environmental priority to migratory fish or heritage priority to preserving dams that are architecturally and technically significant (KPD, 2025). Similarly, in many cases improved energy efficiency in practice entails compromising architectural quality. Developing less aesthetically invasive solutions therefore remains one of the key challenges for the sector.

A circular economy offers significant potential for VBE adaptation in Lithuania. Traditional practices of reusing wooden beams, clay bricks, and lime mortars align with contemporary goals of material reuse and waste reduction. The research on this potential, and active involvement with communication and supporting programmes is a future challenge.

Masonry architecture including historic brick and stone buildings, as well as interwar modernist structures, because of its material longevity have a wide potential for adaptive reuse. From the perspective of the circular economy, non-demolition strategies are crucial, as these buildings embody substantial *grey energy* in their solid masonry walls. Positive interventions that seek to extend life spans through repair of traditional plaster, window restoration instead of replacing with plastic ones, or internal insulation allow for the conservation of both heritage value and embedded carbon. Demolition and replacement would not only erase historical character but also release considerable waste material with limited recycling potential. In this category, circularity therefore means prioritizing reversible techniques and maintaining authenticity while optimizing environmental performance.

Vernacular wooden architecture and buildings constructed with other traditional materials (such as clay or stone) illustrate another dimension of the non-demolition principle. These structures are fragile, vulnerable to neglect, and often considered economically inefficient by owners, leading to a high risk of demolition. Yet they represent a living laboratory for circular practices, as timber, clay, and stone are inherently recyclable and repairable. Repair of original structure of these buildings should be preferred to replacement. Conservation and reuse strategies, ranging from log replacement with traditional carpentry to adaptive reuse of farmsteads, demonstrate how maintaining breathable envelopes and repairing with similar materials can both preserve cultural value and minimize waste. Within this typology, non-demolition approaches reinforce a regenerative material cycle, keeping heritage alive while reducing reliance on new, high-carbon construction products. No less important is the fact that the repair of wooden buildings is an old tradition, which essentially corresponds to the concept of authenticity as defined in the Nara Document (1994). The maintenance and preservation of wooden buildings is highly dependent on the supply of high-quality materials and requires highly skilled professionals[6]. Given natural renewable resources, the potential for repair and recycling of the structure, and a healthy indoor climate, wooden buildings can be a valuable model of sustainability.

Soviet-period reinforced-concrete and panel-system buildings constitute the largest segment of Lithuania's 20th-century stock, and they are often targeted for large-scale demolition due to perceived low cultural value and poor thermal performance. However, from a circular economy

[6] Wooden Heritage in Lithuania. 2011. Compiled by Alfredas Jomantas. Department of Cultural Heritage under the Ministry of Culture. URL: https://www.kpd.lt/uploads/wooden_architecture.pdf [accessed 2025, September]

perspective, retaining and upgrading this stock avoids the massive environmental costs of demolition and new construction. Selective refurbishment, structural strengthening, and facade improvement allow these ensembles to meet contemporary comfort standards while preserving the social and spatial patterns embedded in housing estates. While not all buildings may merit strict heritage protection, applying non-demolition principles here aligns cultural, social, and environmental sustainability by reducing construction waste and embodied carbon.

Taken together, the three typologies demonstrate that non-demolition and circular economy principles can serve as unifying strategies across the Lithuanian heritage landscape. Whether dealing with highly valued masonry structures, vulnerable vernacular ensembles, or mass housing from the Soviet era, prioritizing reuse over replacement keeps embodied carbon locked in existing structures, reduces waste flows, and maintains cultural continuity. Circularity in the heritage sector thus goes beyond technical efficiency: it reframes buildings as long-term cultural and material resources rather than disposable assets. For Lithuania, integrating non-demolition into heritage policy provides both an environmental imperative and a cultural opportunity to align preservation with climate-conscious urban development.

In summary:

- *Since apartment buildings make up a major part of the building stock by area and most of them are old, they were set as a prioritized sector for building renovation at the state level to achieve goals for the improvement of energy efficiency in the buildings and the reduction of CO_2 emissions.*
- *Given that the bulk (75%) of the building stock was constructed prior to 1992, by 2050, most of the current buildings will exceed 60 years of age, necessitating renovation for continued operation.*
- *Cultural heritage buildings, buildings built prior to 1940, wooden, old and/or poor condition buildings despite that they might possess valuable features or be important in conveying local identity are not included in the Lithuania long-term renovation strategy and are not prioritized.*
- *According to the Lithuania long-term renovation strategy, architectural and structural diversity of the buildings built in 1961-1992 is likely not large, implying potential for implementing repetitive (standard) renovation solutions. However, it raises concerns about preserving valuable historical architectural features.*
- *Current rate renovation is not sufficient to achieve the ambitious goals of energy saving, reducing the impact of building sector on climate change. To meet the established goals promptly, the renovation must be substantially accelerated, the implemented energy efficiency techniques must be broadened, financing must be augmented, and an effective communication programme for renovation promotion must be implemented.*

4. Heritage Governance Framework

The study covers Lithuania's main strategic documents, laws, codes and standards regulating the management of environment, construction sector and cultural heritage.

4.1. General features of heritage governance framework in Lithuania

Considering the heritage policy system, the relationship between climate change and heritage can be examined from several perspectives. Heritage policy is shaped at the state level and is primarily represented by the Ministry of Culture and the State Commission for Cultural Heritage. Meanwhile, executive functions are assigned to the Department of Cultural Heritage under the Ministry of Culture and to the municipalities. At the state level, among the main documents reflecting the interconnection between climate change and heritage should be mentioned Lithuania's Vision for the Future 'Lithuania 2050' (2024), the Lithuania's 2021–2030 National Progress Plan (NPP) (2020), the National Environmental Protection Strategy (2016), and the Lithuanian Strategy for Cultural Policy (2019).

The overarching strategic planning document Lithuania's Vision for the Future 'Lithuania 2050', among key geopolitical shifts and main future challenges for the state indicates "*climate change and the crisis of the planet's ecosystems*" (p. 15). In most explicit manner link between heritage and climate change is described in the context of urban and landscape planning, emphasizing "focus on fostering ecological balance, preserving cultural heritage, and creating high-quality public spaces in all our cities (p. 84)". It is noteworthy that the strategy expresses an idea not mentioned in other documents, namely that *"one of the most important elements of Lithuanian identity – alongside our multiculturalism, language, common heritage, and history – is the connection with nature"* (p. 27). The recognition of nature as part of Lithuanian identity could serve as a useful political argument for developing a "green" narrative in heritage protection. Nevertheless, it must be acknowledged that a more explicit relationship between heritage and climate change is not indicated in this document.

Lithuania's 2021–2030 National Progress Plan (NPP) is a medium-term strategic document designed to determine the key changes to be pursued in the state over the coming decade in order to ensure progress in the social, economic, environmental, and security spheres. In the NPP, the impact of climate change on cultural heritage is not addressed directly, but the broader environmental and sustainability agenda establishes a relevant policy framework. Strategic Goal 6 emphasizes ensuring an environment suitable for sustainable living for all forms of life, which includes measures related to resource efficiency, the circular economy, pollution reduction, biodiversity conservation, and climate resilience. The tasks under Strategic Goal 6 emphasize improving the energy efficiency of buildings, which, while environmentally necessary, may pose a potential threat to the authenticity of cultural heritage structures if implemented through uniform technical standards. At the same time, the goal aims to "enhance public environmental awareness to foster behavioural change and reduce environmental pollution", which can be indirectly related to heritage, as increased public consciousness may foster more sensitive approaches to conservation and encourage the building sector, for example, to preserve 20th-century buildings rather than demolish them. Thus, even though cultural heritage is not explicitly addressed, elements of the goal reveal both risks and opportunities for aligning climate and heritage policies.

In the National Environmental Protection Strategy (NEPS), considerable attention is devoted to integrating environmental protection into other areas of national governance and societal life. The NEPS emphasizes that for Lithuania's development to be sustainable, environmental measures must become an integral part of all sectors of the national economy, where "*stakeholders act united and*

cooperate (including public authorities, international organizations, local authorities, non-governmental organizations, national economic sectors (through their associations), businesses, consumers, members of the public, etc.)" (p. 19). This indicates that the cultural heritage sector should also be part of this overall process. However, among the key policy implementation directions, no measures are identified that specifically address cultural heritage, revealing a significant policy gap in integrating the sector into Lithuania's broader climate and environmental strategies.

A strategic goal of some relevance to cultural heritage within the document is the improvement of the urban environment, which aims to achieve "*a good quality of urban environment and simultaneously ensure sustainable development of the areas in the country as well as favourable conditions for the socio-economic development of urban areas"* (p. 64). However, heritage in this context is mentioned without any connection to the Green Deal strategies, and its function is defined instead through traditional lenses of identity and cultural tourism: *"sustainable urban development and the planning and expansion of urban areas should ensure the protection of architectural and urban heritage, its rehabilitation and use for the full improvement of the quality of life of the population and for educational and cultural tourism needs"* (p. 67).This limited framing reduces heritage to a secondary function within urban policy, rather than positioning it as an active component of climate adaptation and sustainability agendas.

The lack of a strategic connection between climate change and the cultural heritage sector is clearly reflected in the fact that the Ministry of Culture is not assigned any responsibilities related to the implementation of the Green Deal objectives or climate change policies. This omission is also evident in the Lithuanian Strategy for Cultural Policy, which emphasizes the role of culture in fostering critical, community-oriented, and creative individuals capable of addressing future challenges (Aim 3), yet does not explicitly identify climate change as one of those challenges. The absence of the Green Deal in the Ministry of Culture's 2019 strategic document highlights the need for its revision to strengthen cross-sectoral cooperation, an approach emphasized in the Environmental Protection Strategy, and to ensure that cultural heritage is integrated into addressing major national challenges, including climate change.

In 2020, conception of The Cultural Heritage Preservation and Actualization Policy (2020) was adopted, the aim of which is to form the policy directions for the preservation and actualization of cultural heritage based on the principles of sustainable development. The following objectives of this Cultural Heritage Preservation and Actualization Policy and their implementation directions can be distinguished: "*to promote the maintenance and management of tangible cultural heritage using environmentally friendly means, thus contributing to sustainable development and the prevention of climate change*" (item 41.3.8) and "*to reconcile urban change and cultural heritage protection, the interests of society and heritage owners, heritage protection and environmental protection goals with urban change and spatial development, ensuring the sustainable development of Lithuania*" (item 41.5.3).

Adopted Lithuania Long-Term Renovation Strategy (2021) stipulates that the renovation of the national building stock must be implemented while ensuring efficient energy consumption, phasing-out fossil fuel by 2050 and all Lithuanian building stock will have to become fully decarbonized and have a zero-carbon footprint by 2050. However, cultural heritage is not fully addressed in the strategy. According to Implementation Plan for the Long-Term Building Renovation Strategy (2022) integrated district renovation is an essential element of the implementation plan.

Along with the goals of increasing energy efficiency and reaching climate neutrality, the renovation of buildings is planned to be implemented in accordance with the principles of the circular economy (Guidelines for Lithuania's Transition to a Circular Economy by 2035, 2023). Sustainability requirements are applied to the renovation works and materials used, with the emphasis on the reduction of the use of resources required for renovation, their reuse and recycling.

National Energy and Climate Action Plan of Lithuania (2019, 2024) in general focuses only on the renovation, mainly multi-apartment and public buildings. Cultural features of buildings and sites are addressed in Lithuania Law on Waste Management (June 16, 1998, No. VIII-787), i.e., waste must be managed without causing a negative impact on the landscape or areas of environmental, natural and/or cultural importance.

4.2. Implementation level

While the heritage policy is shaped and implemented by the Ministry of Culture, for the practical implementation of this policy the responsible institutions are the Department of Cultural Heritage, the National Commission for Cultural Heritage, and municipalities (Fig. 8). The Department, which is responsible for implementing the national policy for the protection of immovable cultural heritage and movable cultural properties included in the Register of Cultural Property, carries out a wide range of functions. These include coordinating and organizing heritage accounting and inventory processes and maintaining the Register of Cultural Property, providing methodological guidance and consultations on heritage protection and others[7]. In this way, the Department functions as the central operational body that translates legislative and strategic provisions into everyday practice.

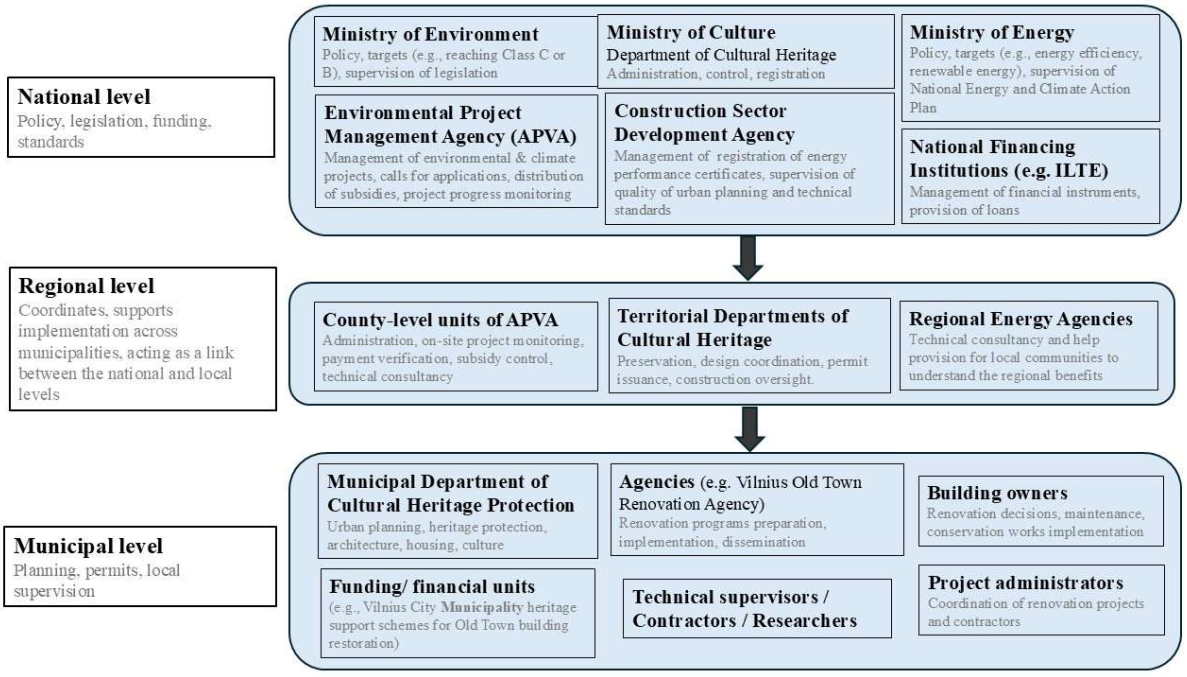


Fig. 8. Administrative and supervisory institutions involved in the renovation process at the national, regional, and municipal levels in Lithuania

The principal legal framework underpinning the activities of the Department and all stakeholders in the built cultural heritage sector is the Law on the Protection of Immovable Cultural Heritage of the

[7] https://kpd.lrv.lt/lt/apie-mus/apie-departamenta/

Republic of Lithuania (1994*)*. The law defines built heritage as buildings, complexes, or sites valuable from the perspective of archaeological, anthropological, ethnological, mythological, memorial, religious, architectural, technical and technological, urbanistic, or other historical, artistic, or scientific significance. Despite ongoing debates over the past decade on drafting a new law, the legislation originally adopted in 1994, albeit with subsequent amendments, remains in force today. Notably, this document contains no references to sustainability, climate change, circular economy or related policies.

At the level of methodological recommendations, two recent (2022, 2023) orders issued by the Department of Cultural Heritage – concerning energy efficiency[8] (2023) and the installation of solar panels[9] (2022) – provide important practical instruments that complement broader state strategies.

The methodological recommendations concerning how energy efficiency measures can be applied to buildings within cultural heritage sites, ensuring that interventions do not compromise authenticity or valuable features. The document stipulates detailed criteria for approving insulation and other efficiency-related solutions, requiring consideration of historical construction materials, decorative details, and the possibility of reversibility. By setting these requirements, the order acknowledges that improving energy performance, a central goal of Lithuania's climate and energy policy, cannot be implemented through uniform standards without risking damage to cultural values. Instead, it introduces a framework for balancing technical upgrades with conservation principles, thereby positioning heritage-sensitive energy efficiency as part of the wider sustainability agenda.

Similarly, the methodological recommendations addressing the installation of solar power plants, solar thermal collectors, and related engineering equipment in cultural heritage sites, establish strict conditions for integrating renewable technologies into heritage environments, prohibiting or discouraging visible or intrusive installations in protected zones, UNESCO World Heritage properties, and buildings with rare or unique architectural features. Instead, the guidance encourages the use of off-site solar plants or non-invasive technical solutions, thereby aligning renewable energy deployment with conservation requirements.

Taken together, the two orders transform the abstract commitments of national and European sustainability strategies into concrete, practice-oriented instruments. By setting clear rules for energy efficiency upgrades and renewable energy installations, they provide practitioners with the tools needed to reconcile conservation principles with climate objectives. In doing so, they aim to demonstrate that cultural heritage can serve not only as a sector requiring protection from the risks of climate policy but also as an active contributor to climate action. However, it must be noted that so far there are no official documents monitoring the practical application of these recommendations, leaving their actual impact on heritage management and climate objectives uncertain.

[8] Methodological recommendations on the compliance of building projects and/or management work project solutions on the improvement of energy efficiency of cultural heritage objects, cultural heritage buildings and buildings located in cultural heritage objects territories and cultural heritage sites with heritage protection requirements (2023) Order of the Director of the Department of Cultural Heritage Under the Ministry of Culture. No. Nr. Į-29. URL: https://www.e-tar.lt/portal/lt/legalact/de55ce4097ee11eea5a28c81c82193a8 (accessed September 2025)

[9] Methodological recommendations on the installation of solar power plants, solar thermal energy collectors and other engineering equipment in cultural heritage buildings, cultural heritage objects, their territories and protection zones, cultural heritage sites and their protection zones. 2022. By order No. Į-207 of the Director of the Department of Cultural Heritage under the Ministry of Culture of 29 August 2022. URL: https://www.e-tar.lt/portal/lt/legalAct/0f3e0d30abb111eea5a28c81c82193a8 (accessed September 2025)

At the municipal level, one of the most significant examples of local involvement in heritage protection is Kaunas Municipality, which has run a dedicated heritage programme since 2015 to co-finance the upkeep of protected buildings and those within designated areas such as Naujamiestis (New Town)[10] and Žaliakalnis (Green Hill) [11]. According to the official programme description, it *"provides the opportunity to obtain full or partial funding for façade renovation, decorative lighting installation, and building adaptation to the needs of people with disabilities. This helps preserve the city's heritage, highlights its aesthetic and historical value, and creates an even more attractive environment for residents and visitors"*[12]. The programme further specifies the scope and funding rates: up to 100% for urgent works on municipal heritage, up to 50% for most properties, and up to 75% for wooden architecture projects. Comparable programmes exist in Alytus, Birštonas, Joniškis, Kaunas district, Kėdainiai, Klaipėda city and district, Neringa, Plungė, Šilutė, Telšiai, Ukmergė, and Vilnius (State Cultural Heritage Commission, 2024), yet with a cumulative investment of €4.7 million by 2024, Kaunas Municipality has taken a leading role.

Focusing on Kaunas, a UNESCO World Heritage city[13], as a case study, it is evident that the municipal programme currently prioritizes visual impact and streetscape quality, such as façades, architectural elements, and decorative lighting, without direct emphasis on the Green Deal or sustainability policy. Neither municipal communications nor the programme itself incorporates climate-risk criteria (e.g., moisture and heat diagnostics, life-cycle carbon assessments, or reuse targets). Moreover, no publicly available studies currently document how funded works reduce risks or CO_2 emissions over time. Climate-change resilience is addressed only indirectly by maintaining existing buildings in use rather than replacing them, thereby supporting the logic of avoided emissions from new construction. Particularly significant is the higher co-financing rate for wooden architecture (up to 75%), which is vital for a vulnerable typology that is consistently at risk of demolition. Therefore, while the programme clearly produces some positive effects in relation to climate change, a deeper study from this perspective would provide valuable evidence and help shape the future priorities of such municipal programmes.

4.3. Formal education in building renovation and cultural heritage preservation in Lithuania

In Lithuania, the majority of bachelor and master study programmes in the field of cultural heritage (Cultural Heritage and Tourism, Heritage: from Globality to Local Culture, etc.) generally do not include specific courses related to climate change, sustainability or circular economy. These programmes tend to focus more on cultural, historical, and management aspects of heritage, rather than on the technical challenges of building renovation and environmental performance. In contrast, engineering architectural study programmes, such as Civil Engineering, Architecture, Landscape architecture, cover topics related to sustainable development, environmental requirements in the construction sector and, to some extent, cultural heritage protection. These programmes provide a stronger technical foundation for understanding building performance, materials, and construction processes, which are essential for renovation and modernisation. Some programmes in this study field are provided by non-university higher education institution (colleges). For example, The Lithuanian Engineering College offers Sustainable Construction

[10] Cultural Heritage Register. Unique object code 22149. URL: https://kvr.kpd.lt/#/static-heritage-detail/A1C598E4-FEC0-45CD-96AB-6AB549A4B7F4

[11] Cultural Heritage Register. Unique object code 22148. URL: https://kvr.kpd.lt/#/static-heritage-detail/F8678BD5-A025-4858-8AE1-080C45E9A136

[12] Heritage management programme. Kaunas Municipality. URL: https://www.kaunas.lt/kultura-turizmas/parama-kulturos-paveldo-statiniu-valdytojams-kauno-miesto-savivaldybes-paveldotvarkos-programa/ (accessed August 2025)

[13] UNESCO list. Dossier: 1661. Modernist Kaunas: Architecture of Optimism, 1919-1939. URL: https://whc.unesco.org/en/list/1661/

programme, focusing on practical skills in construction and energy-efficient building solutions. Such programmes contribute to preparing professionals for the implementation of sustainable practices in the built environment, particularly at the applied level.

In recent years, higher education programmes in Lithuania have increasingly reflected the interconnection between energy-efficient building design, renovation of the existing built environment, cultural heritage preservation, and climate change challenges. For instance, at Kaunas University of Technology, the master's programme Sustainable and Energy-Efficient Buildings provides students with competences in building life cycle assessment, energy modelling, advanced building systems, and renovation strategies, taking into account the impact of climate change on renovation techniques and solutions. However, although some programmes incorporate elements of building renovation and heritage conservation, these are often fragmented or introductory in nature. Most programmes do not fully integrate technical renovation skills, heritage conservation principles, and climate-adaptive renovation methods into a single, coherent curriculum. As a result, students often need to combine knowledge from different fields or pursue further specialisation to address complex real-world challenges, such as renovating heritage buildings to meet modern energy and climate requirements. Thus, there is a clear need for more advanced and integrated interdisciplinary study programmes (curricula) that cover all these areas of knowledge.

According to the Law of the Republic of Lithuania on the Protection of Immovable Cultural Heritage (1994), specialists in the protection of immovable cultural heritage must have qualification certificates that give the right to carry out activities in the protection of immovable cultural heritage of the relevant specialization. The qualification is assessed by the Certification Commission and certificates are issued by the Ministry of Culture. Natural persons who have received a qualification certificate of a specialist in the protection of immovable cultural heritage must improve their qualifications at least every 5 years by attending at least 20 hours of lectures in qualification improvement courses. Thus, certified training programmes are provided by the Ministry of Culture together with higher education institutions. For example, the Association of Cultural Heritage Experts, together with the Vilnius University, implemented a three-year qualification improvement course programme for immovable cultural heritage protection specialists "Experts for Specialists" in 2023-2025.

In summary:

- *General strategic long-term documents (Lithuania's Vision for the Future "Lithuania 2050", the Lithuania's 2021–2030 National Progress Plan, the National Environmental Protection Strategy) of Lithuania do not indicate explicit relationship between cultural heritage and climate change and do not address directly climate change impact on cultural heritage.*
- *Indirectly long-term policies address climate change and cultural heritage via energy efficiency of buildings, pollution reduction, etc. No measures address cultural heritage in climate and environmental long-term strategies and plans.*
- *The Ministry of Culture is assigned no responsibilities related to the implementation of the Green Deal or climate change policies. Furthermore, The Lithuanian Strategy for Cultural Policy does not explicitly identify climate change as one of the challenges for cultural heritage.*
- *Practical implementation of cultural policy is responsibility of the Department of Cultural Heritage, the National Commission for Cultural Heritage, and municipalities.*

- *The main document regarding heritage buildings - The Law on the Protection of Immovable Cultural Heritage of the Republic of Lithuania - contains no references to sustainability, climate change, circular economy or related policies.*
- *The most recent (2022, 2023) orders of the* Department of Cultural Heritage concerning energy efficiency and the installation of solar panels remain only *as recommendations* with no monitoring of the practical application and actual impact on heritage management and climate objectives.
- *Municipalities in general play an important role in cultural heritage protection, initiating various funding programmes, however, focus is given to visual impact and streetscape quality, without direct emphasis on the Green Deal or sustainability policy or incorporation of climate-risk criteria.*
- *Overall, while Lithuania's higher education system provides a solid foundation in sustainable construction and building modernisation, there remains a clear need for more advanced, interdisciplinary study programmes that comprehensively integrate heritage preservation, building renovation, energy efficiency, and climate change adaptation within a unified framework.*
- *Formal education programmes in Lithuania in the field of cultural heritage do not incorporate the specific courses related to climate change, sustainability, circular economy, etc. Engineering programmes and architectural study programmes cover some topics of sustainable development, environmental requirements for the construction sector, cultural heritage and its protection. However, comprehensive and integrated approach that combines climate considerations with cultural heritage preservation is still lacking.*

5. Legislative framework and standards

Legislative framework and standards are reviewed regarding five topics (energy efficiency, circular economy, risk assessment, climate change mitigation/adaptation) with focus on valuable built environment.

Depending on the type of immovable asset and the type of construction works, there might be general or specific requirements for the valuable build environment refurbishment applied.

According to the Regulation for Cultural Heritage Structures (STR 1.01.01:2005) (Table 2), in cases where only maintenance construction works are carried out during the management of immovable cultural heritage structures or structures are constructed, reconstructed, overhauled or demolished in the territory of a cultural heritage structure or in a protection zone, or construction works for the management of the environment of this territory are carried out, the requirements established by the Law on Construction of the Republic of Lithuania (1996, 2017) and the technical regulations on construction approved by the Minister of the Environment of the Republic of Lithuania and supplemented by the requirements established by the heritage management regulations (directly or by reference to them) shall be followed.

In cases where maintenance construction works are carried out during the maintenance of immovable cultural heritage structures, while also applying heritage protection technologies, the requirements established by the Law on Construction of the Republic of Lithuania (1996, 2017); Law on Protection of Immovable Cultural Heritage of the Republic of Lithuania (1994); Technical construction regulations approved by the Minister of the Environment of the Republic of Lithuania and supplemented by the requirements established by heritage management regulations (directly or by references to them), and legal acts approved by the Minister of Culture of the Republic of Lithuania – heritage management regulations, prepared in accordance with the provisions of the Rules for the Preparation of Heritage Management Regulations (2005) should be followed.

In all other cases, when maintenance work on immovable cultural heritage structures is carried out only in accordance with the requirements of heritage protection technologies and/or construction work for simple repairs of this structure is carried out, as defined in the Construction technical regulation STR 1.01.08:2002, the requirements established by the Law on the Protection of Immovable Cultural Heritage of the Republic of Lithuania and legal acts approved by the Minister of Culture of the Republic of Lithuania – heritage management regulations, prepared in accordance with the provisions of the Rules for the Preparation of Heritage Management Regulations (2005) – should be followed.

Though general construction documents mostly address conventional buildings, Construction Technical Regulation STR 2.02.01:2004 "Residential Buildings" (Table 2) foresees general requirements for sustainable designing of buildings. Among others, functional solutions for the housing must be based on types of structures, materials, products and systems and their quantitative and qualitative characteristics, saving materials, energy and other resources used in the building, maximum use of renewable resources, maximum possibility of recycling construction products of structures, elements and equipment of the demolished building into the same or another product. In addition to that Technical Building Regulation STR 2.01.12:2024 "Construction Climatology" asks to consider set climate parameters while designing the building.

Table 2. Documents analyzed in the study:*

No.	**Document**	**VBE/sustainability aspects**
1	Construction Technical Regulation STR 1.01.01:2005 "Regulations for maintenance construction works of a cultural heritage building"	General requirements to follow certain regulations for the buildings of cultural heritage maintenance construction works
2	Construction Technical Regulation STR 2.02.01:2004 "Residential Buildings" (not applicable for private houses)	Requirements for balanced (sustainable) designing
3.	Technical Building Regulation STR 2.01.12:2024 "Construction Climatology"	Requirements to consider setting climate variables for new building design.
4.	Law on immovable cultural heritage protection (1994, 2005, consolidated version 2025)	-
5.	Heritage Management Regulation PTR 2.02.03:2007 "Management of Stone Masonry and Natural Stone and Brick Masonry Heritage"	Extant materials to be used; traditional techniques of a certain period.
6.	Heritage management regulation PTR 2.01.01:2010 "Construction of the contact zone "masonry/soil". Strengthening of foundations"	Damage from environmental factors
7.	Heritage management regulations PTR 2.03.01:2010 "Management of concrete, clay, wooden structures"	Traditional methods
8.	Heritage management regulation PTR 2.06.01:2010 "Management of decorative facades coatings, decorative plaster, plastered and painted surfaces"	Avoiding harmful materials, Traditional materials recommended.

*All main technical regulations for construction can be accessed here (in Lithuanian) https://vtpsi.lrv.lt/lt/teisine-informacija/teises-aktai-2/statybos-techniniai-reglamentai/

As already mentioned before, next to the general requirements, cultural heritage buildings are regulated by a variety of specific regulations and rules. The main law in the field is Law on Protection of Immovable Cultural Heritage (1994, 2005, 2025). It states that a permit document to carry out maintenance construction work on a cultural heritage structure is issued when such a project does not conflict with heritage protection requirements and is approved by representatives of the Cultural heritage protection department and the municipality. However, nothing is said about sustainability, energy efficiency, climate neutrality and circularity.

Heritage Management Regulations (PTRs) is a set of various requirements regarding cultural assets from various documents preparation, heritage protection maintenance projects, implementation of maintenance works, including research, conservation and restoration of valuable features. List of heritage management regulations (2010) covers 69 different regulations across beforementioned areas. None of them directly address (in the title) topics under reach: energy efficiency, circularity, climate change mitigation adaptation, sustainability.

Analysis of some selected regulations (Table 2) indicates that still some aspects of sustainability are taken into account. For example, when performing ongoing maintenance of a cultural heritage structure or minor ongoing masonry repairs extant or similar materials and technologies are used for repairs (Heritage Management Regulation PTR 2.02.03:2007 "Management of Stone Masonry and Natural Stone and Brick Masonry Heritage" (Table 2)). The characteristics of brick bonding methods according to the styles and historical period and techniques for different bonding materials (mortar) are also presented here. Heritage management regulations PTR 2.03.01:2010 "Management of concrete, clay, wooden structures" (Table 2) provides traditional approaches for example of wood preservation – whitening with lime water or milk of lime. According to heritage

management regulation PTR 2.06.01:2010 "Management of decorative facades coatings, decorative plaster, plastered and painted surfaces" the use of paints containing harmful components (e.g. lead white) is prohibited, and organic solvents hazardous to health must be reduced to a minimum. Though need to protect from environmental factors is foreseen, specifically climate change is not addressed (for example Heritage management regulation PTR 2.01.01:2010 "Construction of the contact zone "masonry/soil". Strengthening of foundations" (Table 2). More or less similar approaches are dominating in most of regulations, particularly for maintaining traditional materials and /or methods for conservation, restoration. Environmental factors are mostly mentioned as the ones affecting cultural heritage objects.

According to the Law of the Republic of Lithuania on Increasing Energy Efficiency (2016) and its amendments (2025) requirement for renovated public buildings to achieve nearly zero energy consuming state is not applicable in several cases. One of these is the case when buildings are entered into the Register of Cultural Properties, also then buildings are in territories or protection zones of immovable cultural properties entered into the Register of Cultural Properties, if compliance with energy performance requirements would change the valuable properties or appearance of such buildings.

When renovating building supplied with district heating, Law on Heat Sector (2003) outlines principles of heat supply and consumption, relevant for upgrading heating systems during renovation. More specifically energy efficiency and renewable issues are addressed in the orders of Department of Cultural Heritage to the Ministry of Culture. Particularly order on energy efficiency[14] provides recommendations for improving the energy efficiency of cultural heritage objects, cultural heritage structures and structures located in the territories of cultural heritage objects and cultural heritage areas in compliance with heritage protection requirements. The document foresees that decisions regarding the insulation of external structures, should consider that the equipment provided for has been selected taking into account the materials, finishes and their properties used in the construction of the Building, also whether the materials to be used are natural, environmentally friendly, water vapor permeable and healthy microclimate-supporting materials that are compatible with the authentic materials.

Other recommendations on the installation of solar panels, solar collectors as well as other engineering equipment[15] in cultural heritage buildings, cultural heritage objects, their territories and protection zones, cultural heritage areas and their protection zones aim at achieving better energy efficiency of buildings and at the same time ensure the preservation of the authenticity and valuable properties of cultural heritage objects, cultural heritage buildings and cultural heritage areas. Nevertheless, cases where it is not recommended to install solar technologies are also listed.

Despite recommendations, it should be acknowledged that not all valuable build environment objects are listed in the Lithuanian Register of Immovable Cultural Heritage, hence the general requirements apply for them. For multi-apartment family houses the energy performance of the building must be improved, and a higher energy efficiency class achieved. Renovation process of

[14] Methodological recommendations on the compliance of building projects and/or management work project solutions on the improvement of energy efficiency of cultural heritage objects, cultural heritage buildings and buildings located in cultural heritage objects territories and cultural heritage sites with heritage protection requirements. 2023. URL:https://www.e-tar.lt/portal/lt/legalAct/5fd7fae09d8311ed8df094f359a60216 (in Lithuanian).

[15] Methodological recommendations on the installation of solar power plants, solar thermal energy collectors and other engineering equipment in cultural heritage buildings, cultural heritage objects, their territories and protection zones, cultural heritage sites and their protection zones 2022. URL: https://www.e-tar.lt/portal/lt/legalAct/0f3e0d30abb111eea5a28c81c82193a8 (in Lithuanian).

such houses necessitates Energy efficiency certificate and Investment plan. Though preparing an investment plan requires to take into account requirements for the protection of architecture, the environment, the landscape, immovable cultural heritage values and their territories, the risks of losing valuable features of such buildings exist, calling for a wider discussion and commitments to fulfil both cultural heritage and Green Deal (2019) aims.

VBE building management, maintenance and refurbishment work in Lithuania must comply with key international standards, listed in Table 3. When conducting tenders for the procurement of technical design services and construction contract works for building renovation, the procurement conditions require that "the supplier must have implemented and certified an environmental management system in accordance with the standard LST EN ISO 14001 "Environmental management systems. Requirements and guidelines for use" (hereinafter – LST EN ISO 14001) or the European Union Eco-Management and Audit Scheme (hereinafter – EMAS) or other environmental management standards based on relevant standards adopted by European or international standardization organizations.

The contractor shall also provide a certificate as a standard that the company meets the requirements of the following standards: ISO 9001:2015 "Quality management system. Requirements"; ISO 14001:2015 "Environmental management systems. Requirements and guidelines for use"; ISO 45001:2018 "Occupational health and safety management systems. Requirements and application instructions." The developer of the technical project provides a certificate of conformity complying with the ISO 9001:2015/LST EN ISO 9001:2015 standard.

Table 3. List of relevant Lithuanian standards regarding VBE refurbishment.

No.	Standard
1.	EN 15757:2010 *Conservation of cultural property – Specifications for temperature and relative humidity to limit climate-induced mechanical damage in organic hygroscopic materials*
2.	EN 15759-1:2011 *Conservation of cultural property – Indoor climate – Part 1: Guidelines for heating churches, chapels and other places of worship*
3.	EN 15759:2018 *Conservation of cultural heritage – Indoor climate – Part 2: Ventilation management for the protection of cultural heritage buildings and collections*
4.	EN 16096:2012 *Conservation of cultural property – Condition survey and report of built cultural heritage*
5.	EN 16883:2017 *Conservation of cultural heritage – Guidelines for improving the energy performance of historic buildings*

Legislative framework and regulatory documents are constantly updated to comply with core strategic documents of the EU and Lithuania. For example, in coherence with Guidelines for Lithuania's Transition to a Circular Economy By 2035 (2023) amendments regarding construction waste management were adopted and in 2024, a system of criteria was developed according to which recycled inert construction waste will no longer be considered waste (Ministry of Environment, 2024). It also should be acknowledged that according to the EU EIA directive (2011/92/EU) and the Law on Environmental impact assessment of Lithuania[16] (1996, 2017), impact

[16] Republic of Lithuania Law on Environmental Impact Assessment of the Proposed Economic Activity. 1996. 2017.Consolidated version as of 2021. https://e-seimas.lrs.lt/portal/legalAct/lt/TAD/97e1a98200d711ecb4af84e751d2e0c9?jfwid=11wjp6hpi4 (Accessed September 2025)

on immovable heritage, i.e. including buildings, of planned economic activities should be assessed. However, nothing is said about VBE.

Data base on energy performance certificates at Construction Sector Development Agency[17] provides some data on energy efficiency class, annual energy consumption and heating type. However, yearly CO_2 estimations are not available in most cases not only for VBE, but also for common buildings despite it is required to be provided in energy efficiency certificate (Technical regulations for construction STR 2.01.02:2016 Design and certification of energy performance of buildings).

Despite inconsistencies, sustainability in the construction sectors gains more attention beyond official regulations in general. The Lithuania Green Building Council[18], working on the sustainability assessment of construction works, also provides trainings on sustainability assessment in the construction sector in the line of Lithuanian Buildings Sustainability Assessment System, LEED, BREEAM and other. The council also suggests tools for embodied carbon assessment etc. Nevertheless, focus is given on the new buildings. According to the data as of August 2025 provided by the Council there are 74 certified according international and national criteria buildings in Lithuania. However, these certificates in the case of VBE renovation are not applied in practice (based on the personal consultations with the VBE and renovation experts).

In summary:

- *Though Law on construction in general address sustainability principles, revised cultural heritage protection documents barely mention them.*
- *There are a huge number of requirements regarding renovation and refurbishment of cultural heritage buildings.*
- *Regarding the climate change mitigation measures there are only recommendations, and no legal obligations for cultural heritage renovation/refurbishment projects. Focus is given to preserving and maintaining valuable features rather than energy efficiency or renewable energy as exemptions in the regulation suggest.*
- *VBE is not given specific attention and in most cases general regulation for renovation, energy efficiency applies.*
- *CO_2 calculations for renovation projects are not obligatory. Also, in most cases there is no such data available in the database on buildings energy efficiency certificates. This limits comparison and showcasing good practice.*

[17] Data base on energy performance certificates at Construction Sector Development Agency. URL: https://www.ssva.lt/registrai/pensreg/pensert_list.php?goto=9

[18] Lithuanian Green Buildings Council. https://www.lzpt.lt/about-us/

6. Financing the renovation of buildings in Lithuania

6.1. General framework for financing the renovation

The renovation of buildings in Lithuania has become a national priority, driven by the need to improve energy efficiency, improve living conditions, and meet the European Union climate targets. Much of Lithuania's building stock—particularly multi-apartment buildings constructed during the Soviet era—suffers from poor insulation, outdated heating systems, and structural wear, leading to high energy consumption and discomfort for residents. To address these challenges, Lithuania has developed a comprehensive framework for financing renovations that combines state budget resources, European Union structural funds, climate-related programmes, and private sector investment.

Given the characteristics and state of Lithuania's building stock, it is recognized need to renovate both single-family and multi-apartment buildings. However, the fastest and most significant impact in reducing energy consumption and improving energy efficiency is achieved through the renovation of multi-apartment buildings. Considering the building stock area and buildings' energy efficiency class, renovation of multi-apartment buildings by 2030 will allow energy savings up to 5.29 TWh, while the savings in the sector of public buildings will reach up to 0.41 TWh (National Energy and Climate Action Plan 2021–2030, 2024). Consequently, the Government of the Republic of Lithuania allocates most of its efforts and financial resources to promoting the renovation of multi-apartment buildings.

The primary objective of building renovation projects is to reduce energy consumption, thus the greatest attention and financial resources are allocated to the thermal improvement of the building envelope, including roof, façade, and plinth insulation, as well as the replacement of windows and external doors. Since a building is an integrated engineering system, in order to achieve sustainable long-term efficiency, the space heating system of the building is modernized in line with the increased thermal resistance of the envelope structures. In Lithuania, approximately 53% of all buildings and 70-80% of buildings in urban areas are supplied with heat through district heating systems (LDHA, 2018); therefore, buildings are equipped with heat substations and connected to district heating network. In many cases, the deep renovation of multi-apartment buildings also involves the modernization of other engineering systems, such as ventilation, hot and cold-water pipelines, domestic wastewater pipelines, drainage systems, electrical installations, lightning protection equipment, and elevators.

Nevertheless, the most expensive renovation measure is the installation of a new thermal envelope, which typically accounts for more than half of the total project cost. At present, several pilot projects are being implemented in Lithuania for the renovation of multi-apartment and public buildings using prefabricated panel technologies. It is expected that this approach may, in the future, contribute to reducing costs and accelerating roof and façade insulation works. However, such technologies could not be applied when renovating VBE buildings, possessing historically valuable roofs or façades.

Governmental support is also provided for single-family home renovation, although the financial scope of these programmes is smaller compared to those targeting multi-apartment buildings. Reliable statistics on renovated single-family homes are lacking, as their renovation projects are subject to less stringent requirements—for example, building permits are not required, nor are public procurement procedures, as is the case with multi-apartment building projects. Although, single-family houses are renovated at a similar pace as that of multi-apartment buildings, though typically only specific components of the building are upgraded (for example, such as heating

system, especially when state support is available for new boilers and heat pumps). Full thermal insulation of the single-family building envelope remains relatively uncommon. Furthermore, the lack of strict regulation and control makes it difficult to ensure that all the valuable properties of the building are maintained.

Financing mechanisms are designed to cover the entire renovation process, from energy audits and project design to construction works and post-renovation monitoring, through a combination of grants, preferential loans, and subsidies. The national programme is implemented mainly through the Environmental Projects Management Agency (APVA), which is the primary institution responsible for administering and enforcing building renovation programmes in Lithuania. APVA administers calls for proposals, evaluates project applications, oversees project execution, disburses funds sourced from the Climate Change Programme, EU structural instruments, and the Modernization Fund, and encourages homeowners' associations to take collective action, often supported by long-term, low-interest loans and substantial co-financing from EU sources. In recent years, the approach to renovation financing in Lithuania has evolved towards more comprehensive, integrated upgrades, including the integration of renewable energy and smart energy management systems. This shift reflects both the country's climate commitment and the broader EU vision for a carbon-neutral building sector by 2050.

Besides governmental financing programmes there are some municipality level programmes dedicated to renovation of cultural heritage buildings, i.e., some VBE buildings are renovated/refurbished with finance from local funds. For example, in 2015 Kaunas Municipality initiated the Heritage Management Programme, which funds only heritage management and simple building or repair works of its parts. However, wall insulation and other similar works (heating, ventilation systems) are not financed, but can be carried out with private funds simultaneously with maintenance works (Kaunas City Municipality Council, 2014). Private investors also contribute to the refurbishment of VBE buildings. For example, in 2018, House of Jurgis and Aleksandra Iljinai (Fig. 9), one of the most well-known modernist buildings of the Interwar period in Lithuania, holding the European Heritage Label and included in the list in the Lithuanian Register of Immovable Cultural Heritage [19], was renovated by a private investor.



A B

Fig. 9. Iljinai house (Kaunas) before (A) and after (B) renovation (photos: Sabina Strazdienė (A), Rokas Tenys (B))

Main state support programmes in relation to renovation and cultural heritage are presented in the next subsection.

[19]Register of Immovable Cultural Heritage. Unique object code 27993. URL: https://kvr.kpd.lt/#/static-heritage-detail/a4bfa895-b96a-45e0-b912-59f4f078f560

6.2. State support programmes

Multi-Apartment Building Renovation (Modernisation) Programme

Purpose - to modernize the old Soviet-era housing stock, reduce energy consumption, and improve living standards. The evolution in energy efficiency financing for multi-residential buildings in Lithuania represents a process of transformation over the course of 20 years – from a pilot through a basic grant-based programme to effective and efficient financial instruments. Over half of the programme's financial resources in 2020 originated from private sources, whereas private support was absent twenty years ago (Novikova, Olshanskaya, Dunkel, 2020).

The programme was launched back in 2005, and since then, amendments to the laws regulating the renovation of multi-apartment buildings have been prepared several times, and the programme rules and conditions have been reviewed and updated in order to create the most favourable conditions for participating in the programme.

Initial conditions for participation in the apartment building renovation (modernization) programme:

- Only apartment buildings can participate in the programme (an apartment building is a residential building with three or more apartments, which may also include non-residential premises - commercial, administrative, catering and others);
- An apartment building must be built following the technical construction standards in force before 1993.

Currently, homeowners can choose whether to implement an apartment renovation project under a programme approved by the Government or under corresponding municipal programmes:

- *Renovation at the initiative of apartment building administrators or community chairmen:* According to this model, apartment building renovation is implemented at the initiative of residents through the community chairmen, apartment building administrators or apartment building management company. The residents' initiative and consent to participate in the programme are important here.
- *Renovation at the initiative of municipalities*: Municipalities, on their own initiative, select the most energy-inefficient apartment buildings (in some cases, residents propose the most energy-inefficient houses) and appoint programme administrators who implement the renovation of these apartment buildings. The essence of this model is that homeowners themselves do not need to assume any organizational and credit obligations and project implementation risks.

From May 2025, with the amendment to the call for proposals for the modernization of apartment buildings, it has become possible to receive state support for apartment buildings with cultural heritage status. These buildings are not required to achieve energy efficiency class A or B and thermal energy savings of at least 40%; to receive state support, it is sufficient to save 25% of thermal energy.

The methods of providing state support can be divided into two possible options – subsidy and fee. Part of the funds allocated for renovation is covered by the state, providing partial compensation. There is also the possibility of using a preferential loan.

After the renovation is completed, the state finances the project if the apartment building has achieved at least the building energy efficiency class specified in the invitation and at least 40% of thermal energy costs are saved after the renovation of the building. Most often, the minimum savings requirements are exceeded and after the modernization of the building, on average 50–70% and more of thermal energy costs are saved.

Preferential loan – 3% annual interest for the first 5 years. Preferential interest is paid for 5 years from the first payment, if the loan is taken for a longer period, after 5 years the interest agreed with the bank is paid. A loan for renovation is called preferential because:

- No real estate mortgage, guarantees or suretyship are required.
- It is guaranteed that the annual interest rate will not exceed 3% for the first 5 years.
- No loan signing, loan disbursement or other fees are applied.
- The loan or part of it can be repaid before the specified time without additional fees.
- It is possible to postpone the loan repayment and interest payment (i.e. the loan repayment begins only after all construction work is completed and state support is received).

The support consists of:

- 100% of the cost for preparation of a renovation (modernization) project or part of it: the costs of preparing an investment plan; the costs of a building energy performance certificate prepared and issued before and after the implementation of renovation measures; the costs of preparing a technical work project for renovation, including the costs of preparing a technical (design) task, preparing a topographic plan, obtaining connection conditions, special requirements, and issuing a construction permit; the costs of supervising the implementation of the project; the costs of conducting a project expertise.
- 100% of the costs for administering the project implementation.
- 100% of the costs of technical supervision of construction.
- 100% the costs of testing the tightness after the construction contract works have been completed.
- 100% of all renovation costs for indigent residents and defenders of independence.
- 100% of technical solutions.
- up to 30% of the investments for the measures specified in the Annex to the Programme that increase energy efficiency, if the building's energy efficiency class C or higher is achieved.
- 20% (additional subsidy) is compensated by the state:
    - Upon installation of a separate or modernized non-automated heat point.
    - Upon installation of balancing valves on risers.
    - Upon arrangement of the heating system.
    - Upon installation of individual heat metering devices, a system of dividers or thermostatic valves.
    - Upon renewal (modernization) of the hot water system.

An additional subsidy is additional financial support that is allocated to the main subsidy to finance a certain purpose or activity. Up to 30% and 20% state compensation applies to Subsidy Calls. In a fixed-rate call, the state compensates according to fixed unit rates. When participating in a renovation process where payment is made based on a fee, the state covers a fixed fee, which is calculated per 1 m^2 of usable area of the house. These amounts are divided into two parts:

- one fixed fee is intended for *services* (preparation of the project or part of it, administration of project implementation, technical supervision of the construction) (Table 4);
- the second fee is intended for the *implementation of energy efficiency measures* (Table 5).

Table 4. Fixed unit costs for the preparation of a project for the renovation (modernization) of an apartment building or part of it, the administration of the project implementation and the technical maintenance of the construction.

Energy efficiency class of the apartment building renovation (modernization) project or the minimum mandatory energy performance requirements for buildings do not apply after the project is implemented	**Fixed unit costs of the project based on the usable area of the renovation (modernization) of an apartment building, Eur/m²**				
	< 499,99 m²	**500 - 999,99 m²**	**1000 - 1499,99 m²**	**1500 - 2999,99 m²**	**> 3000 m²**
Energy efficiency class B	120	104	89	54	42
Energy efficiency class B or A (flat rate applies if the apartment building is renovated (modernized) using panels)	142	123	105	64	50
Energy efficiency class A	142	123	105	64	50

Table 5. Fixed unit costs for the implementation of measures to increase energy efficiency in an apartment building renovation (modernization) project.

Energy efficiency class of the apartment building renovation (modernization) project or the minimum mandatory energy performance requirements for buildings do not apply after the project is implemented	**Fixed unit costs of the project based on the usable area of the apartment building renovation (modernization) project, Eur/m²**				
	< 499,99 m²	**500 - 999,99 m²**	**1000 - 1499,99 m²**	**1500 - 2999,99 m²**	**> 3000 m²**
Energy efficiency class B	153	137	120	115	112
Energy efficiency class B or A (flat rate applies if the apartment building is renovated (modernized) using panels)	220	197	172	165	160
Energy efficiency class A	246	220	192	185	179
Energy efficiency class A (flat rate applies if the apartment building is renovated (modernized) using panels)	291	261	227	218	212

When the renovation of an apartment building is properly implemented, both costs are paid, even if savings were made in some parts. This means that if less than the planned cost for services is used, the cost will still be paid; it can, for example, be used to cover the credit part in addition. If the planned cost is insufficient for the services and they are purchased at a higher price, the owners of apartments and other premises are responsible for the additional expense.

Climate Change Programme for the provision of Compensation for Renovation (Modernization) of Residential (one or two apartments) Buildings

The programme aims to reduce the costs of thermal energy consumption in private buildings – to renovate (modernize) the building (to achieve an energy efficiency class of at least B and to reduce the calculated thermal energy consumption costs (kWh/per square meter of useful area of the building (part thereof) per year) by at least 40% compared to the calculated thermal energy costs before the renovation (modernization).

The maximum compensation payment for one Project is up to 14,500€. The amount of the compensation payment is calculated by multiplying the useful area of the house before renovation (modernization) by a fixed amount. The fixed amount per 1 square meter of useful area of the house is 75€.

Individuals who own a one- or two-apartment residential building, the construction of which has been completed in accordance with the procedure established by law and registered in the Real Estate Register (the percentage of completion of the building is indicated as not less than 100%), will be able to apply for compensation payments. When implementing the project, the applicant undertakes to comply with the requirements of the Law on Construction of the Republic of Lithuania, other laws and legal acts of the Republic of Lithuania, and to obtain all necessary permits, consents, approvals, and/or other documents.

Climate Change Programme for the provision of Compensation for Modernization of Internal Heating and Hot Water Systems in Multi-Apartment Buildings

The main objective of the measure is to reduce greenhouse gas emissions in the household sector and increase energy efficiency. Owners of apartments and other premises in multi-apartment buildings constructed under building regulations valid before 1993. A single compensatory payment can be granted per multi-apartment building. The project must be approved by a majority vote of the residents in accordance with Article 4.85 of the Civil Code of the Republic of Lithuania. The project must be implemented within 12 months from the date the implementation contract enters into force. Support is provided in the form of compensatory payments. The maximum amount of compensation is up to 30% of the cost.

State support is provided for the following measures:

- replacement of heating substations to a new automated heating system, including the installation of balancing valves on heating and hot water risers - a mandatory activity to be implemented.
- modernization of heating system (including replacement of radiators, installation of thermostatic valves, replacement and/or insulation of pipelines, preparation of balancing valves).
- installation of individual heat metering devices or smart metering capable of remote data collection.
- reconstruction of the hot water system, replacement of related elements (towel dryers, etc., including replacement and/or insulation of pipelines).

Programme for Increasing the Energy Efficiency of Public Buildings

This national programme, under Lithuania's 2021–2030 National Energy and Climate Action Plan, aims to improve the physical and energy properties of public buildings and their engineering systems

by increasing energy efficiency at central (managed by national ministries and agencies, funded from the state budget) and municipal (owned and managed by city/district municipalities (e.g., local schools, municipal libraries, community centres) levels. Targets by 2030 include renovating approximately 510,000 m² of central government buildings and 450,000 m² of municipal buildings (at least 85% of administrative building stock), achieving 80 GWh annual primary energy savings, and installing renewable energy systems and improving both the physical and energy performance of these structures. Energy efficiency goals include increasing buildings to at least a B energy class, with priority given to projects covering multiple buildings totally ≥10,000 m².

In December 2024, Lithuania allocated 67 million € for public building renovations. Financing structure: up to 70% grants and at least 30% loans to ensure sustainable modernisation and improve energy independence.

Energy-efficient renewal of urban areas (quarters) programme

This programme aims to improve energy efficiency in the urban area on quarter renovation approach, reduce GHG emissions, improve the living environment quality, and the city appearance. Programme objects are to encourage complex renewal of the most energy-consuming public buildings, multi-apartment buildings and other buildings and reduce their yearly heat expenditure; to encourage alternative energy sources in all buildings, especially in one-flat and two-flat dwelling houses; to reduce yearly heat loss in quarter heat networks by renewing most damaged parts. Aim achievement is evaluated according to quarter energy usage (expressed in MWh/a year) and greenhouse gases emission (expressed in tonnes/a year) decrease during the accounting period in comparison to the basis year and inhabitant opinion research on living conditions and living environment quality change.

When selecting a block (quarter) for renovation, it is necessary to assess:

- the energy efficiency of buildings and infrastructure facilities in the blocks (energy consumption and losses by energy sources, condition of buildings and infrastructure facilities) and compare the impact of the block's energy consumption in relation to the residential area.
- buildings, the nature of their ownership and management.
- the social and demographic situation (number of residents living in the blocks, age, employment, relative energy consumption per resident of the block).
- the position and importance of the block in the residential area (historical, social, cultural development, development of residential areas, transportation, provision of public services, etc.).
- the impact on the environment (fuel used for energy production and its impact on air pollution, greenhouse gas emissions into the atmosphere).
- the needs of the block's residents.
- other important aspects that would increase the energy efficiency of neighbourhoods and reduce the negative impact on the environment.

A block is selected in which, by implementing measures to increase energy efficiency, the most optimal energy saving goals would be achieved, the attractiveness of the residential area would increase, conditions would be created for the development and growth of this territory, and the economic, social and cultural needs of the residents of the quarter's community would be better met.

To achieve the programme's goal of increasing the energy efficiency of a block by at least 20%, at least two (2) of the following energy efficiency-increasing measures must be provided: renovation (modernization) of apartment buildings, increasing the energy efficiency of public buildings, modernization of the street lighting network, and modernization of heat transmission networks. Measures for the renovation (modernization) of apartment buildings and the improvement of energy efficiency of public buildings are implemented in accordance with the Multi-Apartment Building Renovation Programme and the Public Buildings Energy Efficiency Improvement Programme, respectively.

Heritage Management Programme

The programme of management of immovable cultural assets (heritage management) finances the preservation of monuments, state-protected and registered cultural heritage objects from the state budget. Financing for applied research, preparation of a management project or management works can be received by both natural and legal persons who manage a cultural heritage object by right of ownership or trust. The manager of a state-protected object must sign a protection agreement with the Department of Cultural Heritage under the Ministry of Culture (hereinafter referred to as the Department) with the established conditions for visiting the object.

The project is prepared by the Department of Cultural Heritage for a three-year funding period. The programme is implemented by the budgetary institution Culture Infrastructure Centre on behalf of the Minister of Culture of the Republic of Lithuania. State funding for heritage management works of registered objects consists of:

- 90% of the total amount of the applied research, but not more than 100,000 €.
- 80% of emergency threat elimination works, but not more than 100,000 €.

State funding for heritage management works of state-protected objects consists of:

- 90% of the applied research, but not more than 100,000 €.
- Maintenance work, preparation of a maintenance project and applied research required for these works:
    - Up to 60% for public legal entities (except for religious communities), but not more than 600,000 €.
    - Up to 80% for private natural or legal entities, religious communities, but not more than 600,000 €.

The value of funding for heritage management work over a three-year period cannot exceed 300,000€ (calculated from all possible sources.

The costs of research, maintenance work and project preparation for heritage protection work on privately owned, state-protected immovable cultural heritage objects that are *accessible to the public* may be compensated from the state budget. Apart from repair costs, the following costs may be compensated for: research (applied), elimination of the threat of an accident, conservation, restoration, designing these works. The compensation consists of:

- 100% of the research (applied) costs.
- 50-70% of the maintenance work and design of wooden architectural cultural heritage objects costs.
- 30-50% of the maintenance work and design of other cultural heritage objects costs.

The amount of compensation is determined taking into account: 1. The levels of significance of the objects, criteria of authenticity, probability of preservation, use, display and visiting possibilities, personal initiative of the managers and condition; 2. The importance of the work carried out to preserve the object; 3. The quality of the maintenance work carried out and their design documentation. Priority for compensation is given to objects of cultural heritage of wooden architecture, objects in which fire safety engineering systems are installed or are planned to be installed during the works, objects on which applied research has been carried out, objects in which the maintenance work projects mainly include the maintenance (restoration) of authentic parts and the complex (integral) maintenance of the object.

In summary:

- *Lithuania's building renovation strategy relies on a well-structured mix of state subsidies, EU funding, climate programmes, and private investment.*
- *Key programmes target multi-apartment buildings, private houses, public buildings, urban blocks, and cultural heritage sites, offering grants, preferential loans, and full or partial cost compensation.*
- *The financial instruments cover all stages of renovation, from planning and technical supervision to construction and post-renovation monitoring and are designed to improve energy efficiency, reduce emissions, lower energy costs, and enhance living conditions.*
- *Recent efforts increasingly focus on integrated solutions, including renewable energy and smart energy management, to ensure coherence with broader national and European energy and climate strategies, contributing to a sustainable, carbon-neutral building sector by 2050.*

7. Digitalization of Building Renovation in Lithuania

Digitalization in building renovation refers to the integration of digital technologies into the planning, approval, execution, and maintenance of renovation projects. In Lithuania, this approach is increasingly applied not only to modern residential blocks but also to complex cultural heritage structures. By utilizing digital tools, stakeholders can achieve more efficient workflows, minimize human error, and ensure strict compliance with both energy efficiency and heritage preservation standards.

Department of Cultural Heritage provides digital access to Register of Cultural Property[20], in which data on Lithuania's immovable and movable cultural property are stored. In this portal detailed information about listed cultural heritage buildings can be found address, registry date, status, object significance level, building area, date of construction, information about reconstruction, object characteristic and valuable properties.

7.1. Digitalization of administrative renovation processes

Lithuania is actively digitalizing the administration, management, and monitoring of building renovation through a national initiative known as Building Renovation Digitalisation (liet. *Pastatų renovacijos skaitmenizavimas*). This programme focuses on modernizing the processes of multi-apartment building renovation by developing an integrated digital information system within the existing Environmental Project Management Information System platform (APVIS, liet. *Aplinkos projektų valdymo informacinė sistema*)[21]. By replacing fragmented, paper-based procedures with integrated digital workflows, the system increases efficiency, transparency, and consistency across renovation programmes.

The digitalization platform includes two main modules. A central component of the system is a digital planning tool designed to support renovation administrators, municipal authorities, and technical experts in preparing investment plans. This tool is intended to enable structured data collection, facilitate the selection of energy efficiency measures, and support the preparation of technical specifications and procurement documentation. This tool will assist in preparing investment plans, selecting innovative and environmentally friendly renovation solutions, and generating technical documentation for procurement procedures. The administrative information systems module digitalises key procedures, such as grant applications, contract management, monitoring of implementation progress, payment requests, and reporting related to state support for renovation. Automated data integration with national registries reduces manual work and improves accuracy. By simplifying processes and improving data flow, the system reduces administrative burden and shortens project timelines. Importantly, these functions apply not only to standard multi-apartment buildings but also to buildings of cultural value that require renovation under specific regulatory conditions.

The creation of data integration interfaces with other national information systems and registers, such as the Centre of Registers, enabling automated data exchange, including with the EU investment administration information system (INVESTIS - Data exchange website[22]), and to the Lithuanian Renovation Map[23] to support and promote building renovation initiatives. Although the

[20] Register of Cultural Property. URL: https://kvr.kpd.lt/#/
[21] Environmental Project Management Information System platform (APVIS, liet. Aplinkos projektų valdymo informacinė Sistema). URL: https://apvis.apva.lt/
[22] Data exchange website. URL: https://dms.investis.lt
[23] Lithuanian Renovation Map. URL: https://renomap.apva.lt

development of these digital products and systems is not yet complete, their full implementation and practical use will be realized in the near future.

7.2. National Building Data Bank

Lithuania is also developing a national Building Data Bank[24] that centralizes information about the country's building stock, including cultural heritage buildings. The system is designed to systematically collect, store, and manage data about buildings, including multi-apartment residential buildings and public buildings owned by municipalities. It integrates information on building characteristics, technical maintenance history, condition assessments, energy consumption, and conservation requirements from various official sources and registers into a unified digital repository. The system supports data-driven decision-making for building maintenance and renovation, enables analysis of the building's condition and energy efficiency, and provides access to relevant information for stakeholders. It aims to improve transparency, facilitate building renovation and energy efficiency planning, and optimize processes related to the lifecycle management of buildings. The information system can be accessed via the national planning and construction portal at www.planuojustatau.lt under the section "Vertinu pastatus" ("Assess My Building").

For policymakers and municipal authorities, the system offers an analytical tool for identifying renovation priorities, estimating investment needs, and modelling expected energy savings. The inclusion of cultural heritage buildings is particularly important, as these buildings have unique preservation requirements and often face specific constraints in renovation planning. Centralised and accurate data enables better coordination between energy-efficiency goals and heritage protection regulations.

For renovation administrators and technical specialists, the data bank supports more precise diagnostics and facilitates the selection of appropriate renovation measures. In the case of cultural heritage buildings, digitalized information, such as protected elements, previous restoration interventions, and structural characteristics, helps ensure that renovation proposals respect heritage values while improving usability, safety, and energy performance where permissible.

7.3. Digitalization of technical renovation processes

Technical processes in Lithuanian building renovation are increasingly enhanced through digital technologies. The first stage of renovation typically involves surveying and documenting the current condition of buildings. Technologies such as 3D laser scanning and photogrammetry allow the creation of precise digital models of building geometry, while ground-penetrating radar allows the detection of hidden structural elements without intrusive investigation.

Advanced technologies such as Building Information Modelling (BIM) and 3D laser scanning are increasingly applied, particularly for multi-apartment or technically complex buildings. BIM enables the creation of detailed digital building models that support renovation planning, energy performance analysis, and lifecycle management. When combined with 3D laser scanning, BIM models can accurately represent existing building geometry and structural elements. These technologies improve accuracy, reduce errors, and enable more informed decision-making throughout the renovation process.

[24] Building Data Bank project by Construction Sector Development Agency. URL: https://www.ssva.lt/cms/en/administrative-information/vykdomi-projektai/pastatu-duomenu-bankas

For cultural heritage buildings, Heritage BIM (HBIM) is used. HBIM adapts BIM methodology to heritage structures by incorporating detailed information about historical materials, construction techniques and architectural features. These digital models support restoration planning, documentation, and long-term maintenance while preserving cultural value. For example, historic buildings in Kaunas, such as the Mikas and Kipras Petrauskas House, have been digitally documented using these methods, resulting in HBIM models that assist restoration planning (Svytytė, Bocullo, Seduikyte, 2026).

Another emerging approach is the development of digital twin technologies, which create dynamic virtual representations of buildings. Unlike static models, digital twins integrate real-time or periodically updated data from sensors to monitor structural health, energy performance, and environmental conditions. In Lithuania, the Kaunas Digital Twin integrates information on buildings, infrastructure, and environmental data, enabling the simulation of development scenarios and supporting planning decisions related to building renovation and energy efficiency improvements[25].

Digital twin technologies are also being applied in the documentation and preservation of heritage buildings. For example, photogrammetry and laser scanning are used to create high-resolution 3D models of historic structures, allowing detailed documentation and virtual preservation. By digitizing these historic structures now, they can be preserved digitally even if they suffer deterioration or collapse in the future, enabling authentic renovations that preserve their historical authenticity. This initiative includes culturally significant buildings such as the Church of St. Michael the Archangel in Kaunas, which is listed in Lithuania's Register of Cultural Values[26].

Digital simulation and analysis tools are used to evaluate, predict, and optimize building performance virtually before and during renovation works. These tools allow stakeholders to assess how different renovation measures may affect a building's energy performance and indoor environment. For example, energy simulation models are used to analyze heating demand, cooling needs, insulation performance, and potential energy savings under different renovation scenarios. This supports decisions regarding façade insulation, window replacement, heating system upgrades, or the integration of renewable energy sources.

Simulation tools are also applied to assess thermal comfort and indoor climate conditions, including temperature distribution, ventilation efficiency, and moisture risk. In more complex cases, they may be used for structural analysis, for instance by evaluating the impact of additional loads caused by insulation systems or new equipment on existing building structures. When combined with BIM models or digital building data, these tools enable scenario testing and comparison, helping to select cost-effective and energy-efficient renovation solutions while reducing technical and financial risks. Overall, they support evidence-based planning and improve the quality and sustainability of renovation outcomes.

As examples of the use of digital technologies in Lithuania, the renovation projects of the Vilnius St. Archangel Rapol Church and St. Anne Church, and the Bernardine Monastery could be mentioned.

[25] Kaunas Digital Twin. URL: https://eu.opencitiesplanner.bentley.com/www_ktu_edu/kaunasdigitalcity-stage1
[26] St. Michael the Archangel's Church by Saulius Zaura 2025. URL: https://sketchfab.com/3d-models/kauno-soboras-church-photogrammetry-0ac56f28cbb5409cba282c9408d39371

During the renovation project, all problems have been solved by using complex laser scanning techniques and high-resolution photogrammetry (Fig. 10)[27]. A large-scale cultural heritage digitisation project is currently being implemented in Lithuania, where important historic objects are recorded using 3D laser scanning and photogrammetry technologies. In total, 71 cultural heritage sites (around 380 individual buildings and structures) are planned to be digitized, and their 3D models will be made available to the public through the national cultural platform "ekultūra"[28].

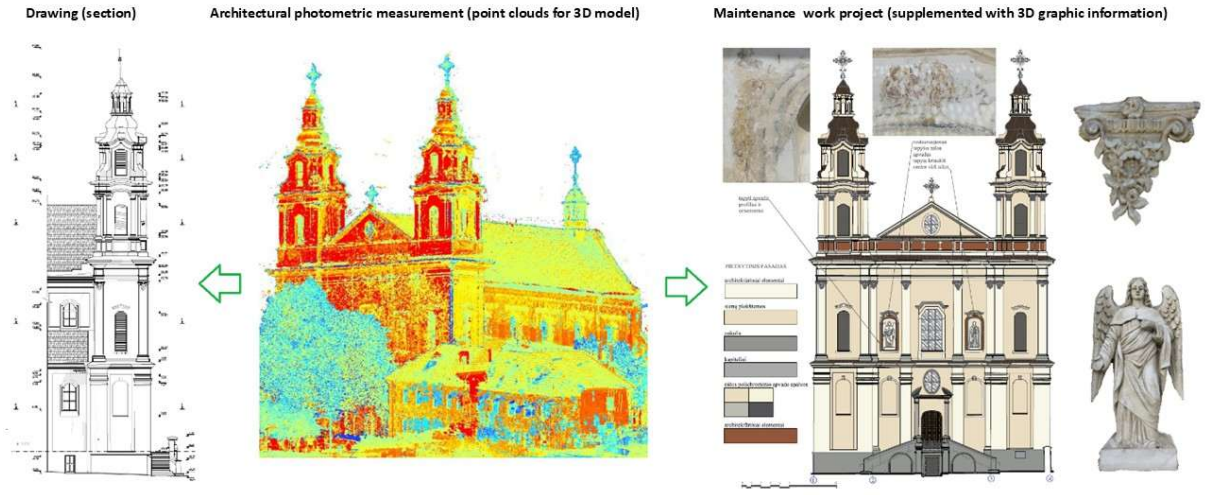


Fig. 10. Images of the renovation project of the Vilnius St. Archangel Rapol Church in Vilnius, Lithuania (Source: Migilinskas 2019).

The benefits of digitalization in Lithuanian building renovation include greater accuracy in measurements and modelling, reduced administrative burdens, improved stakeholder collaboration, safer heritage preservation through virtual testing of interventions, and the creation of digital archives for research and future maintenance. Challenges remain, particularly regarding the adoption of advanced digital tools, training skilled personnel capable of combining technical and heritage expertise and ensuring interoperability and standardization across administrative and technical platforms.

In summary:

- *Digitalization in building renovation in Lithuania involves the integration of digital tools across all stages of the renovation process – from planning and administration to technical execution and long-term maintenance. National initiatives focus on replacing fragmented, paper-based procedures with integrated digital systems, improving efficiency, transparency, and data accuracy, particularly through platforms such as APVIS and interconnected national registries.*

[27] Migilinskas, D. 2019. Application of BIM technologies in projects of historic and cultural heritage buildings. Digital construction [in Lithuanian]. BIM technologijų taikymas istorinių ir kultūros paveldo pastatų projektuose. Skaitmeninė statyba. URL: https://skaitmeninestatyba.lt/aktualijos/d-migilinskas-bim-technologiju-taikymas-istoriniu-ir-kulturos-paveldo-pastatu-projektuose/ (accessed September, 2025)

[28] Ekultūra project led by Martyno Mažvydo National Library of Lithuania. URL: https://www.ekultura.lt/

- *The development of systems like the Building Data Bank enables centralized data collection and supports data-driven decision-making for both standard and cultural heritage buildings. These tools help stakeholders better assess building conditions, plan renovations, and balance energy efficiency goals with heritage preservation requirements.*
- *At the technical level, advanced technologies such as BIM, HBIM, 3D laser scanning, and digital twins enhance the accuracy of building analysis, simulation, and renovation planning. Overall, digitalization improves project quality, reduces risks and administrative burden, and supports more sustainable and well-coordinated renovation processes, although challenges remain in terms of implementation capacity, skills, and system integration.*

8. Insights from stakeholders

This section presents the key findings from the stakeholder survey conducted in Lithuania under the EU-REPAIR project.

Motivation for engagement in VBE refurbishment and experience

The main motivation for engaging in projects for refurbishment of valuable built environment (VBE) is maintaining the VBE value (37.5%) (Fig. 11). It is interesting to note that none of the respondents indicated financial or investment return as motivation for engaging into refurbishment projects.

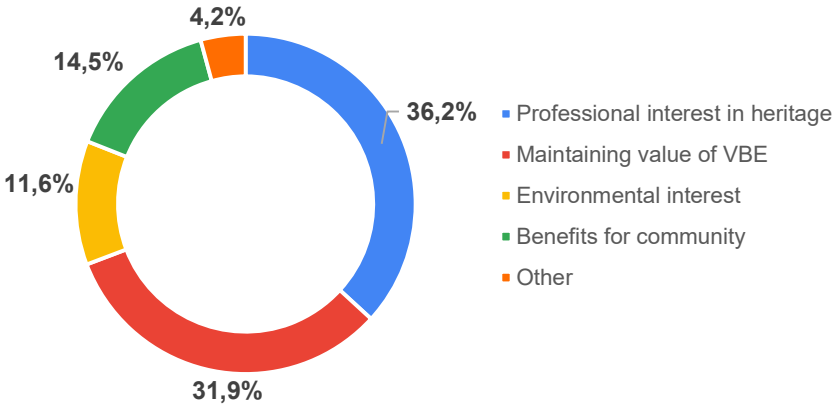


Fig. 11. Main motivation for engaging in projects for refurbishment of valuable built environment (VBE) (N=69)

However, majority of the respondents have no experience in renovation projects (73.9%). 10.1% of respondents have experience of 5 or more projects, 8.7% – 1-2 projects, 7,2% – 3-5 projects. Within provided examples reconstruction of the interwar wooden architecture of Žaliakalnis (Kaunas city district), adapting it to the new needs of the residents without destroying the existing architecture, adaptation of former stables to the needs of the university while maintaining architectural and structural elements, Antazavė Manor Palace, Alanta Manor Palace Tower, Alanta Synagogue, Kurkliai Synagogue. Some respondents indicated to be involved in Projects for the maintenance of cultural heritage objects (buildings) (and construction works), which included improved energy efficiency indicators.

Only four (4) respondents had experience in applying for financial support from municipality, national, and international programmes and funds. Unfortunately, those attempts were only partially successful. Two of four have received partial support for their projects. Main reasons for partial support were depletion of the support budget (when funding is limited), lack of funding for heritage management programmes, limited funding due to the large number of applicants. Unsuccessful applications were due to violation of heritage refurbishment requirements and failure to meet energy-saving objectives and just not been given an EU grant.

Policy and legal framework awareness

It should be acknowledged that respondents are rather aware about policy and legislation regarding the VBE refurbishment in general. In total more than 58.4% of respondents state they are *very well familiar* or are *somewhat familiar* with national regulation in the field of VBE renovation (Fig. 12). Energy efficiency topic seems to be also important, as more than 55% of stakeholders stated to be familiar with the energy efficiency regulation requirements regarding VBE. This topic has the highest share of those stating they are *very familiar* with (21.7%) compared to the other topics. Climate

change mitigation legislation is another well-known topic for the respondents. In total 60.9% of the respondents stated they are *very or somewhat familiar* with national legal framework on climate change mitigation. However, those *somewhat familiar with* constitute larger share to compare to those *very familiar with*. Respondents are least familiar with risk assessment, as only 36.2% (Fig. 12) of them stated to be *very* or *somewhat familiar* with national legal framework on this topic. Second least familiar topic is circular economy legislation. Hence, results indicate that despite relatively high level of awareness, stakeholders need more knowledge on VBE and sustainability related topics, particularly beforementioned *risk assessment*. It also should be acknowledged that legislation regarding those topics is very limited or non-existent in Lithuanian case.

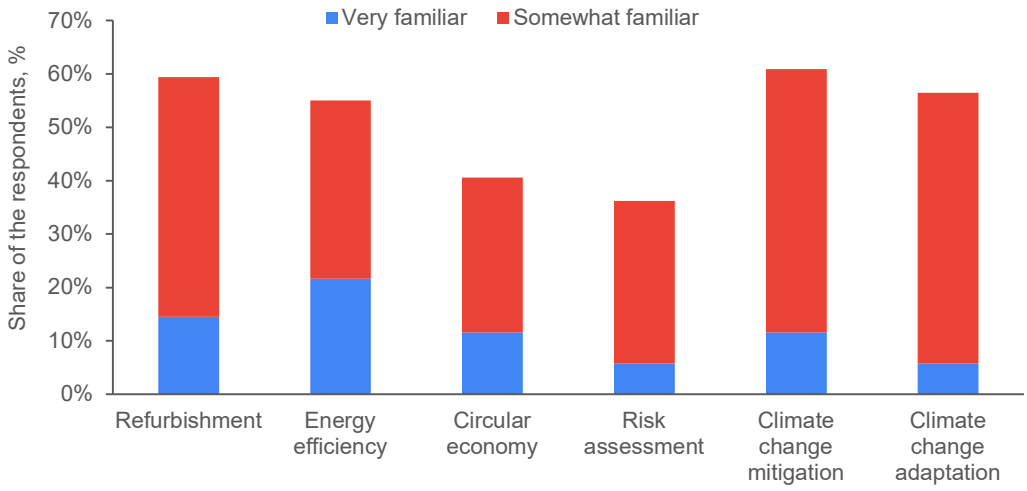


Fig. 11. The share of very and somewhat familiar with national legal framework in particular topics regarding VBE respondents (N=69).

According to the respondents, measures of beforementioned areas are usually promoted only *moderately.* Areas which are *extremely* or *very promoted* by national legal framework as most often indicated by the respondents are energy efficiency (24.6%) and climate change mitigation (14.5%). It should be acknowledged that more than 20% of respondents state that risk assessment is not promoted at all, some nearly 19% say the same about climate adaptation. Moreover, 35.7% of the respondents say they *do not know* if national legislation promotes circular economy, 24.6% *do not know* if risk assessment and 17.3 % if climate adaptation is promoted. It could be generalized that sustainability topics regarding VBE are not promoted or promoted insufficiently by national legal framework according to the respondents. And this could be attributed to one of the obstacles for Lithuania to reach climate change and sustainability targets within VBE.

In their activities, respondents most often rely on *national cultural heritage/VBE specific acts* (Fig. 13). In the case of Lithuania most often this is cultural heritage legislation, as specific acts regarding VBE are lacking. *National codes* are second most often used documents. Least applied are *sustainable building standards, EU directives and EN/ISO/DIN standards*. It is interesting to note that according to personal communication with the field experts sustainable building standards are not applied in the practice, however, some respondents indicated that (Fig. 13).

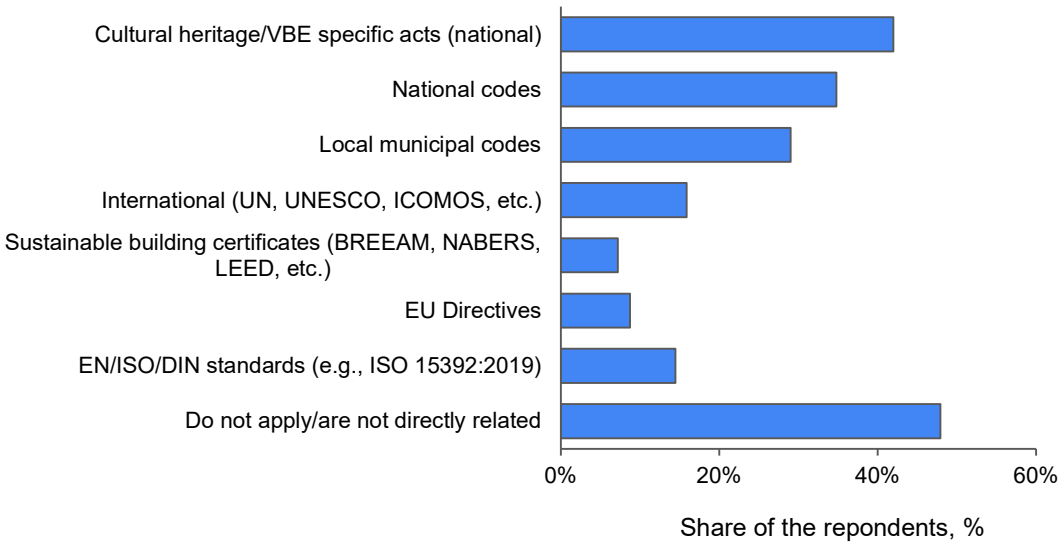


Fig. 12. Standards or norms applied by the respondents when working on refurbishment of VBE (%) (N=69)

As the biggest gap in the legal framework regarding valuable built environment (VBE) refurbishment most often is indicated to be *vague or conflicting responsibilities between institutions* (21.7 %) (Fig. 14). The second most often stated gap is the *lack of integration between heritage laws and environmental goals* and the *lack of harmonized guidelines* (each 20.3%). Some 23.2% of respondents stated they do not know gaps in the legal framework. It is worth noting that only one respondent agreed that *outdated technical standards* are a gap, indicating that this legislation topic is up to date and corresponds to practice in refurbishment.

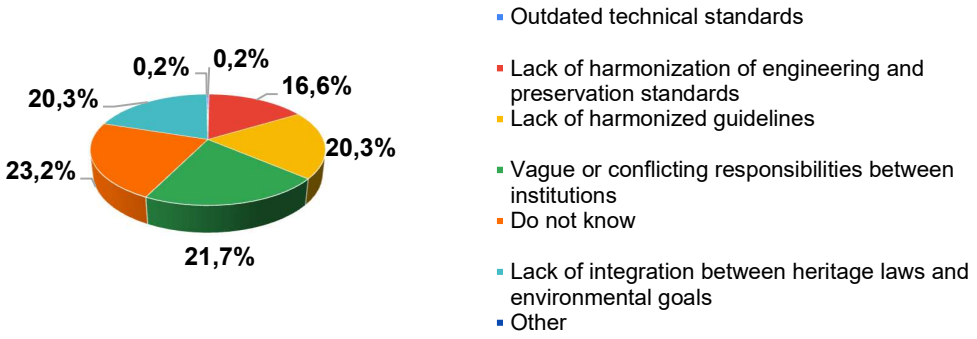


Fig. 13. The biggest gap in the legal framework regarding valuable built environment (VBE) refurbishment according to the respondents (N=69).

Practical challenges and opportunities

Majority of the respondents agreed on potential biggest obstacles they see in refurbishment projects involving valuable built environments. Most often respondents indicated that various obstacles are most common *in general* regarding VBE refurbishment. Respondents agreed that *high costs* (85.7%), *complex permitting processes* (too many regulations) (84.3%), *complicated communication with authorities* (80%) and *lack of digitalization* (80%) are the biggest obstacles they see in the refurbishment of VBE. The least indicated obstacles were *Lack of technical knowledge/skills* (52.9%) and *Lack of high-quality appropriate materials* (both 57.1%). However,

contrary to the general trends, in the area of energy efficiency and climate change mitigation and adaptation measures *Lack of technical knowledge/skills* and *Lack of high-quality appropriate materials* were most often indicated as obstacles. In the field of circular economy implementation *Lack of technical knowledge/skills* and *Lack of access to appropriate technologies* were most often indicated as obstacles.

The most helpful for sustainable/climate friendly future refurbishment projects support is considered to be *financial incentives or subsidies* (78.3% of respondents) (Fig. 15). The second most helpful is indicated to be *access to case studies and best practices* (73.9 % of respondents). *Digital tools for simulation and risk assessment* least often are considered as most helpful support (42% of respondents).

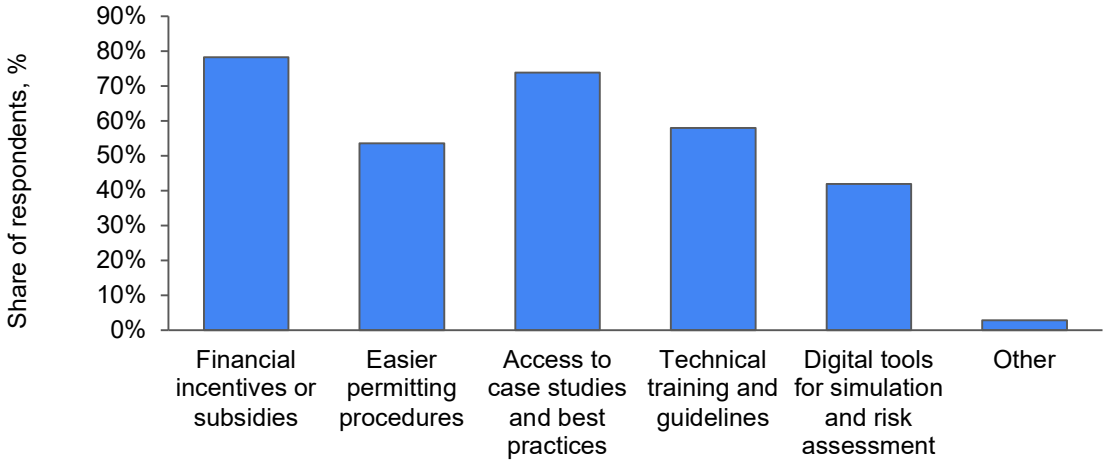


Fig. 14. The most helpful support for sustainable/climate friendly future refurbishment projects (N=69).

Regarding financial support, which would most improve sustainable/climate friendly refurbishment rates, most of the respondents (62.9%) agreed that *project-specific EU or other funding* would be most beneficial (Fig. 16). Some 61.4% of respondents indicate that *direct grants for renovation* would improve the sustainable refurbishment the most. *Low-interest loans or credit lines* are indicated least often (35.7%) as a form of financial support.

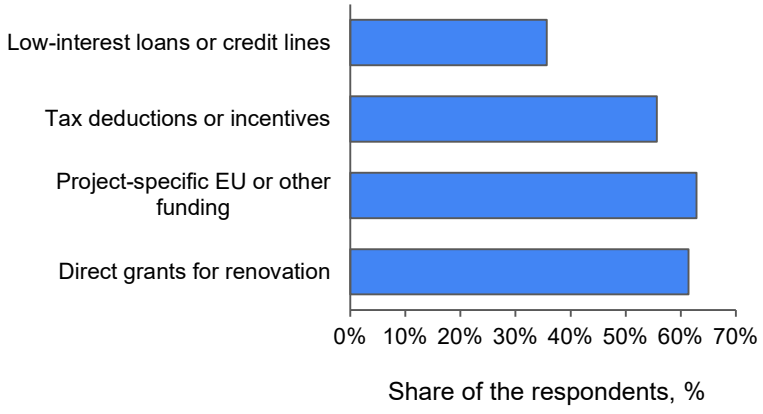


Fig. 15. Financial support forms which would improve sustainable/climate friendly refurbishment rates the most (N=69).

Sustainability measures

Natural ventilation and daylight are most often used by the respondents in previous their VBE refurbishment projects from suggested energy efficiency, renewables, circular economy, risk assessment, climate change mitigation/adaptation measures. The second most often used measure is *energy-efficient windows and insulation* and *use of traditional materials* (each 27.5%) (Fig. 17) followed by *renewable energy sources* (e.g., solar panels, heat pumps) *use* (18.8%). Least often used measures include *Water efficiency measures* (10.1%) and *Circular economy principles (reuse of materials, design for disassembly, waste classification etc.)* (8.7%) (Fig.17).

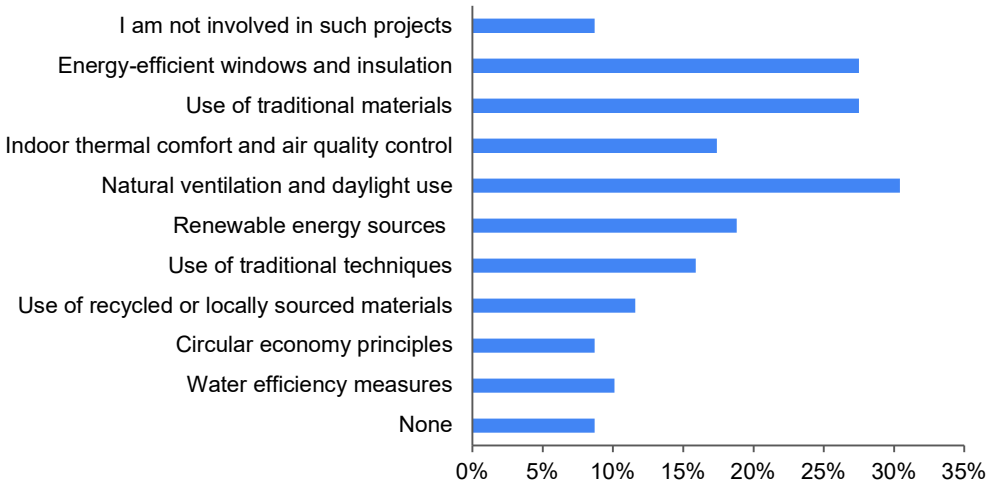


Fig. 16. Sustainability strategies applied by the respondents in previous refurbishment projects (%) (N=69).

More than half of the stakeholders have used none of the impact assessment approaches (Fig. 18). Those who have used some, most often indicated *energy efficiency assessment* (41.7%). Second most often used approach for project impacts assessment was *risk assessment* (16.37%). Least often respondents stated to use *environmental impacts assessment* tools (8.3%).

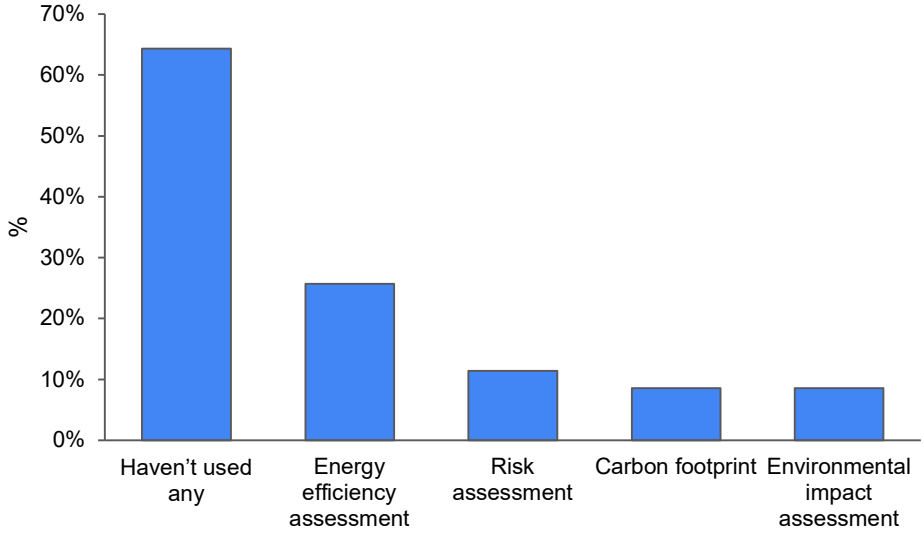


Fig. 17. Techniques used to assess the impact of refurbishment projects by the respondents (%) (N=69).

Public perception and community engagement

According to the opinion of the respondents' valuable built environment is perceived slightly positively by society in general (mean 3.53). Some 45.5% think that society perceives VBE *positively*, some 12.1% - *very positively* (Fig. 19).

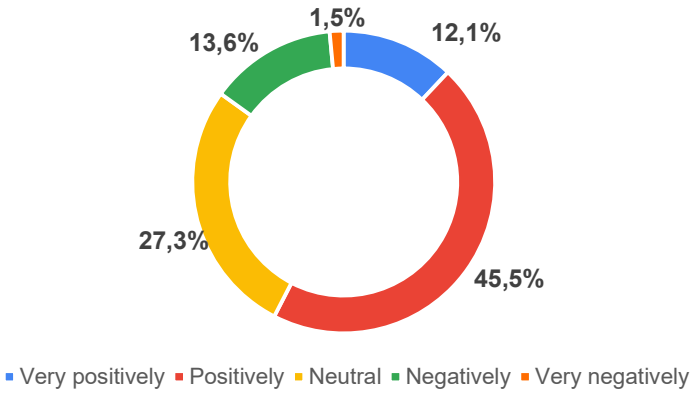


Fig. 18. Citizens' perception on the value of preserving valuable built environment (VBE) (%) (N=69).

Also, majority of respondents think that community involvement is important for the successful implementation of refurbishment projects. 50,7% of respondents say it is *very important*, 34,2% - *somewhat important* (Fig. 20).

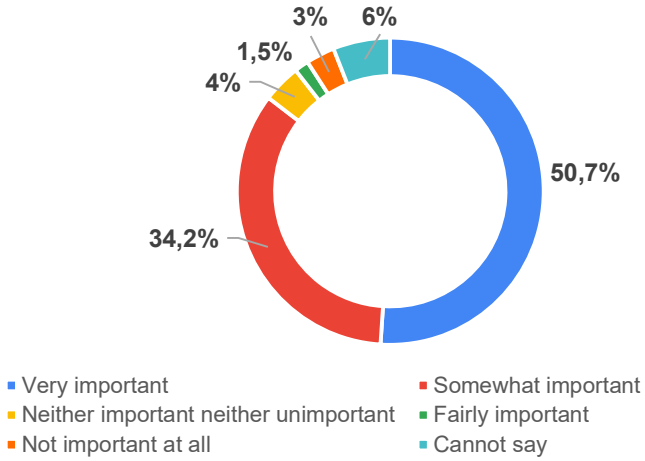


Fig. 19. Importance of community involvement for the successful implementation of refurbishment projects (%) (N=69).

Though all indicated methods are seen as potential for increasing public interest and participation in preserving valuable built environment, *meetings with society* (mean 4.44) and *seminars/workshops* (mean 4.1) are those most preferred ones. These two methods were indicated most often as *very relevant* or *relevant* methods for society's inclusion into preservation of VBE (Fig. 21) and received no extreme negative opinions. Least desirable are *representatives' committees* (mean 3.6) and *online survey* (mean 3.63).

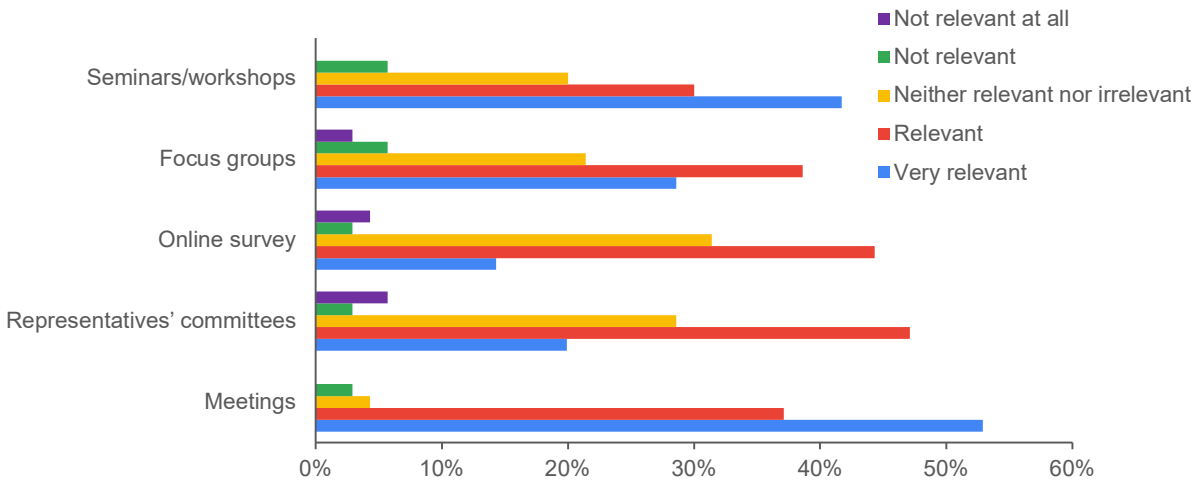


Fig. 20. Methods increasing public interest and participation in preserving valuable built environment according to the respondents (%) (N=69).

The main social challenges of refurbishing VBE buildings in a more sustainable manner are *lack of adequate finance* (87.1%), and *lack of awareness* (70%) (Fig. 22). *Aging society* and *opposition to the heritage protection restrictions* (each 34.3%) are least seen as a societal challenge. Among other challenges *lack of a strategy for the renovation of valuable buildings in the cultural heritage system* is indicated.

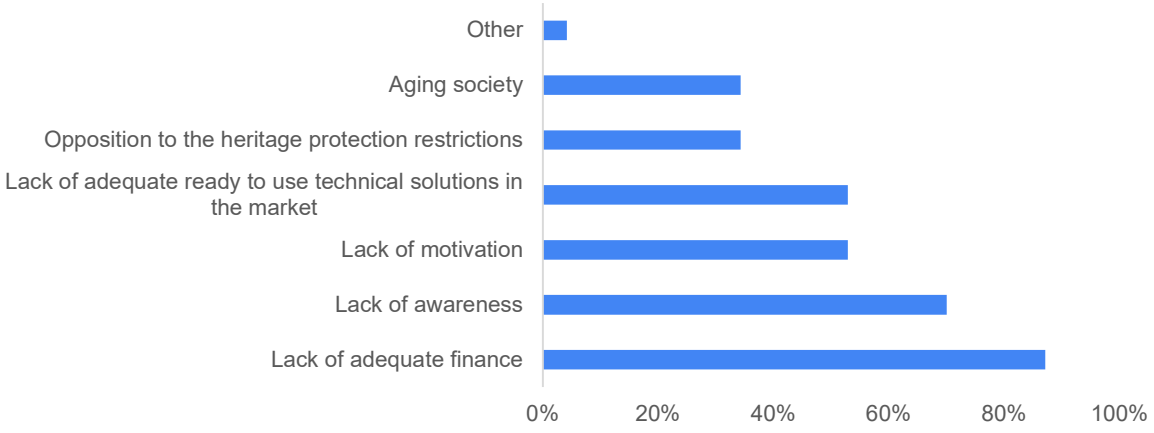


Fig. 21. Main social challenges of refurbishing VBE buildings in a more sustainable manner (%) (N=69)

Future needs

Most desirable training or capacity-building measures regarding VBE indicated by stakeholders are *technical skills in refurbishing valuable built environment (VBE) buildings* (81.2%), *legal and regulatory compliance workshops* (69.6%), and *project management for heritage objects and sites* (58%) (Fig. 23). The least desirable topic is *risk assessment* (30.4%). This might be related to the fact that risk assessment is less often used while assessing project impacts (survey results) and there are no formal requirements for that.

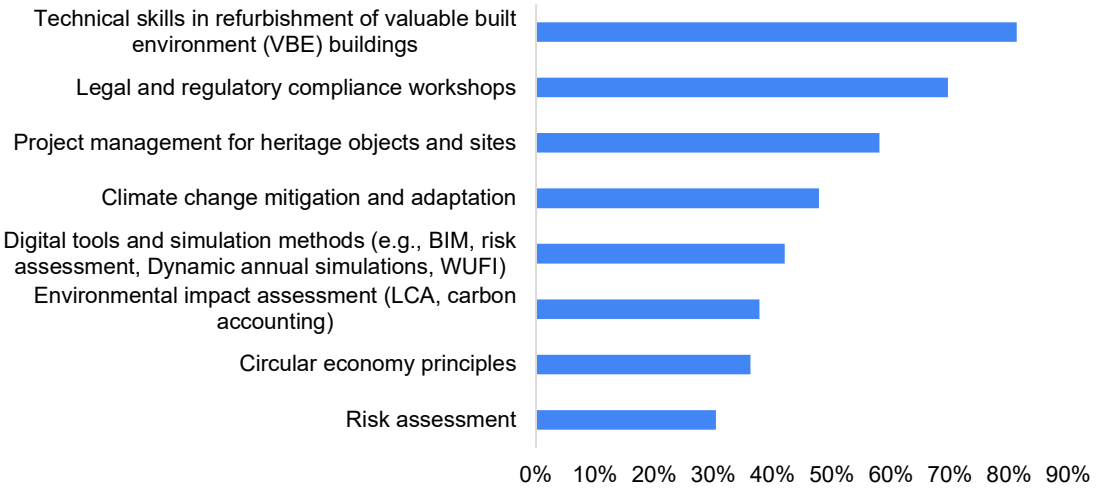


Fig. 22. Training or capacity-building measures (topics) regarding VBE needed according to the stakeholders (%) (N=69).

Respondents indicated willingness to participate in future activities on environmentally/climate friendly refurbishment of valuable built environment (VBE), particularly on *technical skills in refurbishment of valuable built environment (VBE) buildings* (77.6% *yes* and *maybe* in total), *project management for heritage objects and sites* (76.1% *yes* and *maybe* in total), and *climate change mitigation and adaptation* (74.6% *yes* and *maybe* in total) (Fig. 24). At least respondents indicated willingness to participate in activities on *digital tools and simulation methods* (53.8%) and *environmental impacts assessment tools* (57.6% each).

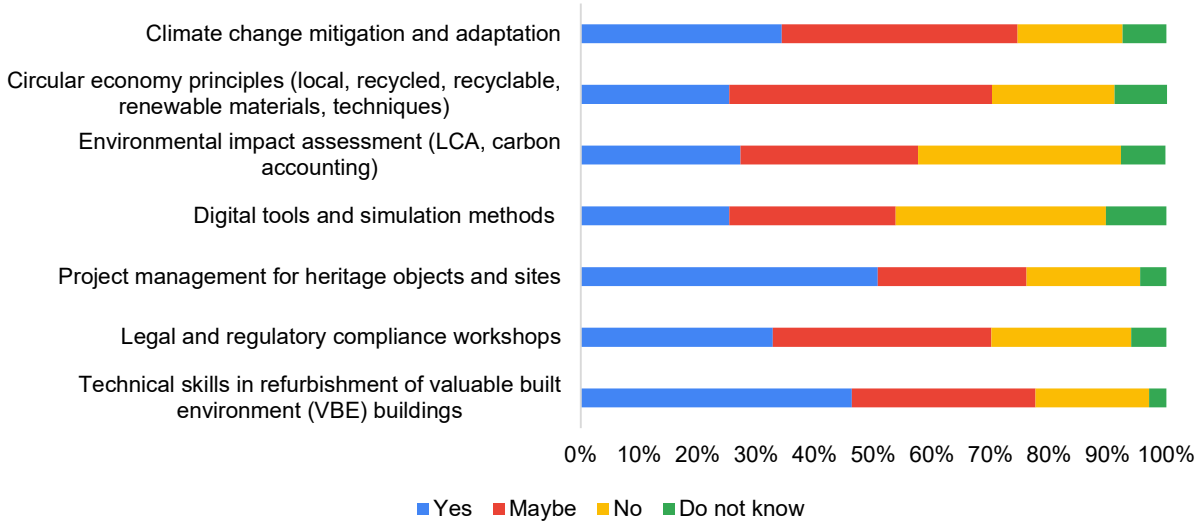


Fig. 23. Willingness to participate in future activities (focus groups, interviews, or project co-design sessions, workshops) on environmentally/climate friendly refurbishment of valuable built environment (VBE) (%) (N=69).

In summary:

- *Respondents are rather aware of the VBE refurbishment in general. But stakeholders need more knowledge on VBE and sustainability related topics, particularly risk assessment.*

- *In their activities, respondents most often rely on national cultural heritage or VBE specific acts.*
- *As the biggest gap in the legal framework regarding valuable built environment refurbishment most often is indicated to be the vague or conflicting responsibilities between institutions (21.7 %), as well as the lack of integration between heritage laws and environmental goals and the lack of harmonized guidelines.*
- *All respondents agreed that high costs, complex permitting processes (too many regulations), and complicated communication with authorities are the biggest obstacles they see in the refurbishment of VBE.*
- *The most helpful for sustainable/climate friendly future refurbishment projects support is considered to be financial incentives or subsidies.*
- *From sustainability measures (energy efficiency, renewables, circular economy, risk assessment, climate change mitigation/adaptation measures), natural ventilation and daylight, energy-efficient windows and insulation, and use of traditional materials are most often used by the respondents. Circular economy measures are the least addressed.*
- *More than half of the stakeholders have used none of the impact assessment approaches on VBE projects. Those who have used some, most often indicated energy efficiency assessment.*
- *To increase their knowledge and skills stakeholders would prefer to participate in activities on technical skills in refurbishment of valuable built environment (VBE) buildings, project management for heritage objects and sites and climate change mitigation and adaptation.*

9. Best practices

9.1. Centre for Wooden Architecture, Vilnius

In 2019 Vilnius City Municipality decided to restore the building of the Centre for Wooden Architecture and as part there establish a new cultural institution - the Museum of Urban Wooden Architecture as a cultural infrastructure meeting the needs of contemporary society[29].

The Centre for Wooden Architecture, located at Polocko St. 52 in the Užupis district, is important in preserving Lithuania's cultural identity. The institution is housed in a meticulously restored 19th-century wooden residence that stands as a testament to the sophisticated craftsmanship once prevalent in the historic suburbs of Vilnius (Fig. 24). In 2006 the building was included in the Register of Cultural Properties. The Centre functions as both a museum and a living laboratory where the values of authenticity and community engagement are prioritized through specialized workshops and public consultations on heritage maintenance. Beyond its role as an exhibition space, the institution serves as a vital resource for owners of wooden buildings, offering expert guidance on sustainable restoration and traditional craftsmanship[30]. By integrating hands-on educational programmes with professional consultancy, the Centre ensures that the practical knowledge required to preserve Vilnius's wooden legacy is actively shared with the public.



Fig. 24. The Centre for Wooden Architecture before and after renovation (Source: Vilnius municipality[31])

The reconstruction of the building, which was completed in 2022, serves as a premier example of modern conservation ethics (Fig. 25). The building's reconstruction and adaptation project was awarded internationally (international European Heritage Award/Europa Nostra Award 2023) and in Lithuania (Paveldo DNR (Heritage DNR) and the National Architecture Prize). Rather than replacing old structures with contemporary imitations, the renovation adhered to a philosophy of

[29] Vilnius: Museum of Urban Wooden Architecture. Reviving traditional techniques for an environmentally friendly city. URL: https://culture.ec.europa.eu/cultural-and-creative-sectors/architecture/living-spaces/catalogue/vilnius

[30] The Centre for Wooden Architecture. Vilniaus miesto muziejus. URL: https://vilniausmuziejus.lt/en/museum-branch/the-centre-for-wooden-architecture/

[31] Vilnius municipality. Projects. Medinės architektūros paveldo muziejus Vilniuje, Polocko g. 52. URL: https://vilnius.lt/projektai/medines-architekturos-paveldo-muziejus-vilniuje-polocko-g-52 (accessed September 2025)

maximum preservation. The preservation of original architectural details, including intricate window frames and shutters, with approximately 80% of the exterior woodwork being carefully repaired rather than replacement.



Fig. 25. The Centre for Wooden Architecture, Vilnius (Source govilnius.lt [32])

During the works, the building (façades and roof) was insulated, façades were also covered with wind insulation film. The foundation is compacted gravel and sand. A significant historical discovery during the process was the uncovering of rare polychrome wall paintings inside the building, which provided new insights into the interior aesthetics of the period. The decorations were stabilized and integrated into the permanent exhibition to showcase the sophisticated interior aesthetics (Fig. 26).

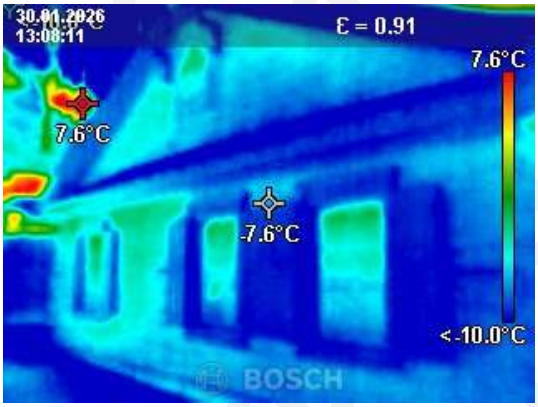
[32]The Centre for Wooden Architecture. GoVILNIUS. URL: https://www.govilnius.lt/visit-vilnius/places/centre-for-wooden-architecture



A


B


C



D

Fig. 26. The Centre for Wooden Architecture – the wall fragments (A, B photos by Jūratė Žaltauskaitė), exterior façade and its thermographic image (C, D photos by Vilius Mateika)

The building of the Centre for Wooden Architecture stands as a premier example of how historical tradition can be successfully adapted for 21st-century public use. Today, the building operates as a "living laboratory" where a resident restorer provides public consultations and hands-on workshops, directly bridging the gap between traditional craftsmanship and modern urban sustainability. By showcasing that wooden structures are not only relics of the past but viable, eco-friendly assets for the future, the centre actively engages the public in the preservation of the city's identity. Through these initiatives, it raises critical awareness and provides the practical knowledge necessary for the authentic maintenance and restoration of Vilnius's wooden legacy.

9.2. Building of the Faculty of Chemical Technology, Kaunas University of Technology, Kaunas

The former research laboratory of the Faculty of Chemical Technology at Kaunas University of Technology (KTU), located at Radvilėnų Rd. 19 in Kaunas, is a significant object of Lithuanian modernist architectural heritage. The building, constructed in 1937, originally served as an advanced scientific research facility for the Lithuanian military and industry, intended to support the development of the national defence industry. It was considered one of the most modern research laboratories in the Baltic region at the time.

The building is also one of the most significant examples of interwar modernist architecture in Lithuania. It is included in the national Cultural Heritage Register and is recognized for its architectural, historical, and technological value. The building's architecture is distinctive, combining functions and aesthetics characteristic of interwar modernism. It features ribbon and corner

windows, as well as a flat roof with protruding brass ventilation chimneys from the fume hoods (Fig. 27).



Fig. 27. Building of Kaunas University of Technology, Faculty of Chemical Technology, Kaunas (Photos by Martynas Plepys

Although several interventions were done in the building, the laboratory retains many authentic interior elements, including wall and floor tiles, stair railings, lifts, lighting fixtures, furniture, lamps, and small laboratory details. The building has preserved authentic interior elements, original equipment, and spatial structure, which reflect early 20th-century scientific infrastructure[33]. In 2015, it was awarded the European Heritage Label.

Today, the building is used by Kaunas University of Technology and has undergone careful conservation and renovation. Rather than extensive reconstruction, the approach has focused on preserving authenticity while adapting the building to contemporary needs. Between 2019 and 2021, a major project funded by the Getty Foundation's "Keeping It Modern" programme supported detailed research and the preparation of a long-term conservation and management plan.

During the last works, started in 2019, the façade plaster was replastered rather than restored, and its surface did not comply with the original standard, new ventilation system was installed. The outer doors were restored, most windows were replaced with new the replicas being filled with the contemporary insulated glass ones, old original windows were completely restored in three rooms. The building was not insulated (estimated thermal resistance (R-value) could be as low as 0.85m^2K/W) resulting in low energy efficiency (Fig. 28).

[33] Chamber of KTU Faculty of Chemical Technology. Kaunas University of Technology. [in Lithuanian]. URL: https://ctf.ktu.edu/mokykloms/ginklavimo-valdybos-tyrimu-laboratorijos-pastatu-komplekso-tyrimu-laboratorija/ (accessed September 2025)

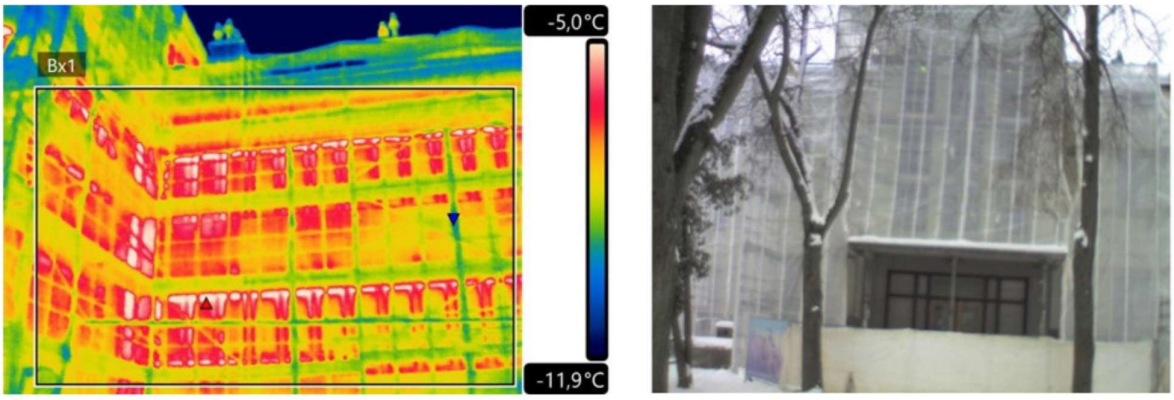


Fig. 28. Exterior thermographic image made during the renovation works (Conservation Management Plan for the Military Research Laboratory in Kaunas, Ed. V. Petrulis, 2021)

Overall, the KTU chemistry laboratory stands as a rare example of preserved scientific heritage, combining architectural modernism with the history of applied chemical research and technological development in Lithuania.

9.3. Kaunas Town Hall, Kaunas

Kaunas Town Hall is one of the oldest and most important historic buildings in Kaunas Old Town. Its construction began in the 16th century, and over time it became the centre of public life, hosting administrative offices, courts, and ceremonial events (Fig. 29). Throughout its history, the building was reconstructed several times due to fires and structural damage, especially during the 18th century, which gave it elements of late Baroque style. Today, it remains an important cultural symbol of the city, reflecting both its historical significance and architectural evolution.

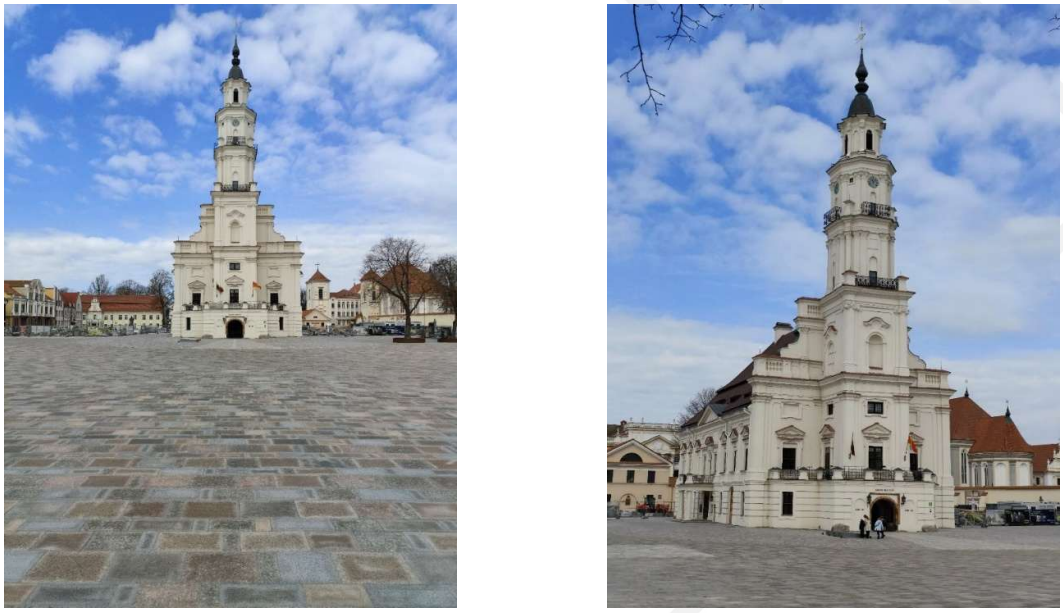


Fig. 29. Kaunas Hall Town (photos by Almantas Bružas)

The renovation of Kaunas Town Hall, which was carried out between 2022 and 2024, is a significant example of how historic architecture can be preserved while adapting it to modern needs – for contemporary cultural and public use. As one of the most important buildings in Kaunas Old Town, the renovation placed strong emphasis on heritage protection, ensuring that the building's historical and cultural value would be maintained for future generations. The renovation was implemented in

line with heritage protection requirements, focusing on preserving authenticity, minimizing interventions and ensuring the preservation of original materials.

A central aspect of the project was the preservation of authenticity. The renovation focused on preserving authenticity and restoring valuable historic elements, while maintaining the building's original character. Instead of replacing original architectural elements, restaurateurs focused on carefully repairing and maintaining them. Historical research was conducted to accurately restore original colours, surfaces and decorative details, allowing the building to retain its historical character dating back several centuries (Fig. 30) (Kaunas municipality, 2022)[34]. This approach ensured that the Town Hall continues to preserve and reflect its historical evolution over time rather than presenting a modernized version of the building. The reconstruction used technologies that combine authentic and modern architectural materials.



Fig. 30. The reconstruction works of Kaunas Hall Town (left photo by Kaunas municipality (2022) during reconstruction, right photo by Norbert Tukaj after reconstruction (Statyba ir Architektūra, 2024[35]))

The project also emphasized improving accessibility and usability. A lift was installed to connect different floors, and previously unused or inaccessible areas, such as the attic and basement, were opened to visitors. These changes allowed the building to become more functional while maintaining its cultural and architectural significance (Statyba ir Architektūra, 2024).

At the same time, the renovation included the modernization of engineering systems and the adaptation of the building for public functions. New functions such as museum exhibition spaces, educational areas, a café, and a tourism information centre were integrated into the structure without compromising its historical character. Modern engineering systems, accessibility solutions, and exhibition spaces were integrated in a way that does not disrupt the historical environment (Fig. 31). This allowed the Town Hall to become a multifunctional cultural space while maintaining its symbolic identity.

[34] Kaunas Municipality. 2022.The renovation of Kaunas Town Hall gained momentum: more functional spaces and preserved authenticity. URL: https://en.kaunas.lt/news/the-renovation-of-kaunas-town-hall-gained-momentum-more-functional-spaces-and-preserved-authenticity

[35] E journal Construction and Architecture [in Lithuanian, Statyba ir Architektūra]. 2024. Archbook. Kauno Rotušes rekonstrukcija [Kaunas Town Hall renovation]. URL: https://sa.lt/archbook/kauno-rotuses-rekonstrukcija/



Fig. 31. The renovation of Kaunas Town Hall (Source: Kaunas municipality, 2022)

Overall, renovation demonstrates a successful balance between preservation and innovation. It shows that heritage buildings can remain relevant and functional without compromising their historical value, ensuring that they continue to serve both present and future generations.

10. Gaps, obstacles and lessons learned

Main gap in sustainable refurbishment and renovation of VBE buildings in Lithuania is insufficient integration of **climate change and cultural heritage aspects in key strategic documents**. Existing policies address climate change only in terms of energy efficiency improvements and general pollution reduction in building sector. However, climate change impacts on cultural heritage or valuable buildings are not addressed, as well as potential contribution of such buildings and whole sector to climate change mitigation and adaptation is not considered.

Furthermore, **climate change is not seen as a significant threat to cultural heritage in cultural heritage policy** and legislation. Although recommendations on energy efficiency and solar panels installation were adopted recently (2022, 2023), they **are not obligatory**, therefore their implementation is not monitored or enforced. The main document regarding heritage buildings - The Law on the Protection of Immovable Cultural Heritage of the Republic of Lithuania (1994 and amendments) - contains no references to sustainability, climate change, circular economy principles or related policy objectives.

One more gap is that while municipalities play a crucial role in cultural heritage protection and immovable heritage renovation, their funding programmes for support valuable building refurbishment and renovation mainly **focus on visual improvements**, with limited emphasis on sustainability or incorporation of climate change risk criteria. In addition, these municipal programmes exist only in several municipalities and are relatively **limited in regarding the funding**. Therefore, building owners must search for other financial resources to implement energy efficiency or climate friendly building refurbishment solutions. Although national renovation programmes exist, valuable buildings not always can reach required improvement in energy performance due to the need to preserve valuable features. However, failure to meet energy-saving objectives might be the reason of not receiving financial support for building renovation.

CO_2 emissions calculations for renovation projects are not obligatory. Also, in most cases such data are not available in the databases on building energy efficiency certificates. This limits opportunities for comparison, the showcasing of good practices and the monitoring of progress.

Lack of integration between heritage and environmental goals, legislative inconsistencies are also seen as a gap regarding VBE renovation. Not all valuable built environment objects are listed in the Register of Cultural Properties; hence the general construction and energy efficiency requirements apply for them. This may lead to the situations where energy efficiency aims are reached at the expense of valuable architectural or cultural features. Furthermore, stakeholders highlight **vague or conflicting institutional responsibilities**, which hinder effective coordination and implementation of VBE buildings renovation**.**

Another important gap is the **lack of harmonized guidelines** that would align climate change mitigation, energy efficiency, circular economy principles with protection of immovable cultural heritage. Although VBE building management, maintenance and refurbishment work in Lithuania comply with key international **standards**, national cultural heritage or VBE specific acts are relied on the most. Sustainability related standards such as LEED, BREEAM are in generally rarely applied, even in the case of new building.

In addition, the current legislation framework for building maintenance and renovation, including that of VBE, remains **insufficient**. Mandatory building (multi-family building) renovation works (organized without separate coordination of the house owners) and the accumulation of funds for

them include only essential maintenance works related to deformations, defects or non-compliance with essential structural requirements, which pose a risk to human health or the environment or may cause significant material losses. Meanwhile, other works and the accumulation of funds for them are mainly provided at the discretion of the premises owners as **obligatory contributions to the accumulation of funds are rather low**. In addition, there are no clear criteria for mandatory renovation and long-term investment planning - renovation is voluntary and in the case of multi-apartment buildings require majority approval from owners, which can hinder the implementation of more comprehensive renovation measures.

Financial obstacles represent one of the most significant ones to sustainable renovation of VBE buildings. Even when state or other financial support is available, owners are required to provide their own input. In addition, the renovation of valuable buildings requires more specific expertise, knowledge, skills, and particular materials, which further increases costs. Existing funding programmes are often insufficient to fulfil demand. Quite often the stakeholders indicate that lack of assigned overall funding for heritage management programmes, depletion of the support budget due to the large number of applicants is the reasons of insufficient rates of VBE buildings renovation.

Another major obstacle for VBE buildings renovation is the complexity of administrative procedures. Communication with authorities is difficult and permitting processes are long and complicated. Renovation projects involving cultural heritage buildings must comply with **huge number of different regulations**, making the process complicated in terms of time, finance and expertise. In addition, during the renovation or refurbishment of valuable historic building greater focus is given to preserving and maintaining valuable features rather than to energy efficiency, integrating renewable energy or circular economy solutions. **VBE is not given specific attention** and in most cases general regulation for renovation and energy efficiency requirements are applied. Due to complicated process for project preparation and permit issuing as well as high costs and lack of financial support, a lot of buildings, even those included in the Cultural heritage list, remain abandoned and are not adequately preserved for future generations.

Educational gaps also contribute to the problem. Formal education programmes in Lithuania in the field of cultural heritage generally do not include dedicated courses addressing climate change, sustainability, or the circular economy. While engineering and architectural study programmes incorporate certain aspects of sustainable development, environmental requirements in the construction sector, and cultural heritage protection, **a comprehensive and integrated approach linking climate considerations with cultural heritage is lacking**. This results in a **limited number of qualified professionals in the field** of sustainable refurbishment and renovation of valuable buildings and contributes to higher service cost.

Demographic trends, particularly an **ageing population**, may also pose an additional obstacle to sustainable building renovation. Older property owners may have limited financial capacity, lower willingness to invest in long-term renovation projects, or less access to information and support mechanisms, which can slow down renovation processes, especially in multi-apartment buildings.

Lack of awareness among property owners and stakeholders also can impede proper renovation and its rates. Limited understanding of the benefits of energy efficiency, climate adaptation measures, and circular economy practices reduce motivation to invest in comprehensive and sustainable renovation solutions. Limited understanding of the role and value of cultural heritage buildings results in inaction or impingements of the legislation and intentional activities damaging historic building, for ex. imitating an accident, etc.

Despite identified gaps and obstacles, positive shifts can be observed. First, the goals of Lithuania Long-Term Renovation Strategy are in coherence with key national strategic documents. Lithuanian higher education is beginning to address the interconnection between energy-efficient renovation, heritage preservation, and climate change, though there is a clear need of the development of advanced, interdisciplinary holistic curricula. Some informal trainings are provided by specifically tailored course programmes provided by Association of Cultural Heritage Experts, Lithuania Green Building Council or other organisations. A developed comprehensive framework for financing building renovation combining state budget resources, European Union structural funds, climate-related programmes, and private sector investment is increasingly addressing and allocating funds for the cultural heritage sector. Lithuania is actively digitalizing the administration, management, and monitoring of building renovation and the usage of advanced digital technologies are highly prioritized. To improve the management of cultural heritage and promote sustainable preventive care of VBE buildings new initiatives were created. For example, Cultural Infrastructure Center from 2019 successfully implement the initiative FIXUS Mobilis aiming to create a new system of preventive monitoring and maintenance for cultural heritage objects, including raising heritage managers' and owners' awareness of the subject and strengthening practical skills. Still, it has to be admitted that focus only on listed cultural heritage buildings is given.

11. Recommendations

In order to ensure sustainable renovation of VBE in Lithuania, it is recommended to address several key issues to strengthen the integration of cultural heritage into building renovation and climate policy systems in Lithuania.

Cultural heritage should be clearly integrated into national climate and environmental strategies. Current long-term policy documents lack a clear link between cultural heritage, sustainable development and climate change, therefore future strategies should define the role, risks and opportunities of cultural heritage in the context of climate change mitigation and adaptation. The Ministry of Culture should be more actively involved in the implementation of climate policy, including the European Green Deal.

The legal framework also needs to be significantly improved. **The Law on the Protection of Immovable Cultural Heritage should be updated to include sustainability principles, climate change mitigation and adaptation measures and circular economy concepts.** In addition, clearer institutional responsibilities and better coordination of heritage and environmental policies are needed, based on harmonised guidelines for the renovation of heritage buildings.

Renovation of cultural heritage buildings should be better integrated into national renovation strategies. Specific renovation methods and support schemes are needed to take into account specific characteristics of cultural heritage and not listed historical buildings, while ensuring a balance between heritage preservation and energy efficiency objectives. Consideration should also be given to the inclusion of CO_2 and broader impact assessments in renovation projects.

Financial mechanisms should be strengthened. Although various funding instruments exist, resources for cultural heritage buildings remain limited. More funding, targeted subsidies and more flexible financial schemes are needed, as well as stronger integration of sustainability and heritage objectives into funding programmes. Not listed though valuable historic buildings should also be considered for the specific financial support.

Further **development of digitalisation** in the renovation sector should be encouraged. While Lithuania is making significant progress in this area, efforts should focus on improving system integration, increasing data accessibility and building user capacity. The wider application of advanced technologies should be supported.

Education and capacity building should be strengthened. Interdisciplinary study programmes are needed that combine heritage conservation, building renovation, energy efficiency and climate change. In addition, targeted training for specialists should be developed, especially in areas such as risk assessment, sustainable renovation and project management of heritage buildings.

Finally, **stakeholder involvement** and practical implementation should be strengthened. Stakeholders need clearer guidelines, simplified procedures and better communication with public authorities. Greater attention should also be paid to **promoting circular economy practices and developing comprehensive impact assessment methods beyond energy efficiency**.

12. Summary

Multi-apartment buildings make up a major part of the building stock by area and most of them are old, therefore they are set as a prioritized sector for building renovation at the state level to achieve goals for the improvement of energy efficiency in the buildings and the reduction of CO_2 emissions. Given that the bulk (75%) of the building stock was constructed prior to 1992, by 2050, most of the current buildings will exceed 60 years of age, necessitating renovation for continued operation. However, cultural heritage buildings, buildings built prior to 1940, despite that they might possess valuable features or be important in conveying local identity are not included in the Lithuania long-term renovation strategy and are not prioritized.

General strategic long-term documents (Lithuania's Vision for the Future "Lithuania 2050", the Lithuania's 2021–2030 National Progress Plan, the National Environmental Protection Strategy) of Lithuania do not indicate explicit relationship between cultural heritage and climate change and do not address directly climate change impact on cultural heritage. Indirectly long-term policies address climate change and cultural heritage via energy efficiency of buildings, pollution reduction, etc. No measures address cultural heritage in climate and environmental long-term strategies and plans. The Ministry of Culture is assigned to none of responsibilities related to the implementation of the Green Deal or climate change policies. Furthermore, The Lithuanian Strategy for Cultural Policy does not explicitly identify climate change as one of the threats for cultural heritage.

Practical implementation of cultural policy in Lithuania is responsibility of the Department of Cultural Heritage, the National Commission for Cultural Heritage, and municipalities. The main document regarding heritage buildings - The Law on the Protection of Immovable Cultural Heritage of the Republic of Lithuania - contains no references to sustainability, climate change, circular economy or related policies. The most recent (2022, 2023) orders of the Department of Cultural Heritage concerning energy efficiency and the installation of solar panels remain only as recommendations with no monitoring of the practical application and actual impact on heritage management and climate objectives.

Though Law on Construction in general address sustainability principles, cultural heritage protection documents barely speak about this. There are a huge number of requirements regarding renovation and refurbishment of cultural heritage buildings. VBE is not given specific attention and in most cases general regulation for renovation, energy efficiency applies. CO_2 calculations for renovation projects are not obligatory.

Despite some beforementioned shortcomings, in general Lithuania's building renovation funding strategy relies on a mix of state subsidies, EU funding, climate programmes, and private investment. Key programmes target multi-apartment buildings, private houses, public buildings, urban blocks, and cultural heritage sites, offering grants, preferential loans, and full or partial cost compensation. The financial instruments cover all stages of renovation, from planning and technical supervision to construction and post-renovation monitoring and are designed to improve energy efficiency, reduce emissions, lower energy costs, and improve living conditions. However, funds are limited.

Digitalization in building renovation in Lithuania is one of the strongest features and involves the integration of digital tools across all stages of the renovation process – from planning and administration to technical execution and long-term maintenance. National initiatives focus on replacing fragmented, paper-based procedures with integrated digital systems, improving efficiency, transparency, and data accuracy, particularly through platforms such as APVIS and interconnected national registries. The development of systems like the Building Data Bank enables

centralized data collection and supports data-driven decision-making for both standard and cultural heritage buildings, helping to assess better building conditions, plan renovations, and balance energy efficiency goals with heritage preservation requirements. At the technical level, advanced technologies such as BIM, HBIM, 3D laser scanning, and digital twins enhance the accuracy of building analysis, simulation, and renovation planning. Nevertheless, challenges remain in terms of implementation capacity, skills, and system integration.

Lithuania's higher education system provides a solid foundation in sustainable construction and building modernisation, but there remains a clear need for more advanced, interdisciplinary study programmes that comprehensively integrate heritage preservation, building renovation, energy efficiency, and climate change adaptation within a unified framework. Formal education programmes in Lithuania in the field of cultural heritage do not incorporate the specific courses related to climate change, sustainability, circular economy, etc.

Stakeholder analysis reveals that they are rather aware of the VBE refurbishment in general. But stakeholders need more knowledge on VBE and sustainability related topics, particularly risk assessment. As the biggest gap in the legal framework regarding valuable built environment refurbishment the vague or conflicting responsibilities between institutions, as well as the lack of integration between heritage laws and environmental goals and the lack harmonized guidelines most often are indicated. All respondents agreed that high costs, complex permitting processes (too many regulations), and complicated communication with authorities are the biggest obstacles they see in the refurbishment of VBE. From sustainability measures (energy efficiency, renewables, circular economy, risk assessment, climate change mitigation/adaptation measures), natural ventilation and daylight, energy-efficient windows and insulation, and use of traditional materials are most often used by the stakeholders surveyed. Circular economy measures are the least employed. More than half of the stakeholders have used none of the impact assessment approaches on VBE projects. Those who have used some, most often indicated energy efficiency assessment. To increase their knowledge and skills stakeholders would prefer to participate in activities on technical skills in refurbishment of valuable built environment (VBE) buildings, project management for heritage objects and sites and climate change mitigation and adaptation topic.

Recommendations to promote sustainability and circularly in VBE buildings refurbishing and renovation in Lithuania include strengthening the integration of cultural heritage into climate and environmental policies, improving the legal and institutional framework, and ensuring better alignment of renovation strategies with heritage conservation goals. They also involve enhancing financial support mechanisms, advancing digitalisation, promoting education and capacity building, and improving stakeholder involvement and practical implementation, while encouraging circular economy principles and comprehensive impact assessment approaches.

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