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RENOINVEST
sustainable renovation of buildings

D2.1 - Policy context and market capacities for sustainable building renovations

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Version 2

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List of acronyms / abbreviations

Acronym	Original	English explanation
ADA		Austrian Development Agency
AEE INTEC	AEE Institut für Nachhaltige Technologien	Institute for Sustainable Technologies in Austria
AI		Artificial Intelligence
AR		Augmented Reality
AV		Augmented Virtuality
AWS	Austria Wirtschafts Service	Austrian Federal Promotional Bank
BMF	Bundesministerium für Finanzen	Federal Ministry of Finance
BMK	Bundesministerium für Klimaschutz	Federal Ministry for Climate Action
CCF		Climate Change Fund
CD		Cooling Demand
CE		Central European
CEC		Comprehensive Energy Contracting
CED		Cooling Energy Demand
COVID-19		Coronavirus Disease 2019
CO_2		Carbon Dioxide
CIP		Competitiveness and Innovation Framework Program
CLC		Co-Location Center
CPR		Construction Products Regulation
CSOK	Családi Otthonteremtési Kedvezmény	Family Housing Allowance Program
DHW		Domestic Hot Water
DR		Demand Response
DSEPS 2050	Dolgoročna Strategija za energetsko prenovo stavb do 2050	Long-term Strategy for Energy Renovation of Buildings until 2050
EAB		External Advisory Board of Renoinvest
EAFRD		European Agricultural Fund for Rural Development
EAG	Erneuerbaren-Ausbau-Gesetz	Renewable Energy Expansion Act
EBRD		European Bank for Reconstruction and Development
EC		European Commission
Eco Fund		Slovenian Environmental Public Fund
ECTP		European Construction Technology Platform
EE		Energy Efficiency
EED		Energy Efficiency Directive
EEEOP		Environmental and Energy Efficiency Operative Programme
EEffG	Energieeffizienzgesetz	Energy Efficiency Act
EEG	Energiegemeinschaften	Renewable Energy Communities

Acronym	Original	English explanation
EEN		Energy Efficiency Networks
EIB		European Investment Bank
EIF		European Investment Fund
EKD	Egyedi Kormánydöntés	Individual Government Decision
ELENA		European Local Energy Assistance
ÉMI	ÉMI Építésügyi Minőségellenőrző Innovációs Nonprofit Kft.	ÉMI Non-Profit Limited Liability Company for Quality Control and Innovation in Building
EnPC[1]		Energy Performance Contracting
eNu	Energieagentur und Umweltagentur des Landes Niederösterreich	Energy Agency and Environmental Agency of the State of Lower Austria
EPBD		Energy Performance of Buildings Directive
EPC[1]		Energy Performance Certificate
ERDF		European Regional Development Fund
ESC		Energy Supply Contracting
ESCO		Energy Service Company
ESF		European Social Fund
ESF+		European Social Fund Plus
ESG		Environmental, Social and Governance
ESIF		European Structural and Investment Funds
ESPR		Eco-design for Sustainable Products Regulation
ETA		European Technical Assessment
ETICS		External Thermal Insulating Contact System
EU		European Union
EWG	Energiewirtschaftsgesetz	Renewable Heat Supply in New Buildings Act in Austria
FFG		Austrian Research Promotion Agency
FlexCo		Flexible Corporation
FM		Facility Manager
FMA	Finanzmarktaufsicht	Austrian Financial Market Authority
FMSG	Finanzmarktstabilitätsgesetz	Financial Market Stability Act
FoF		Fund of Funds
GBS		Green Building Solutions
GEFF		Green Economy Financing Facility
GHG		Greenhouse Gas
GINOP	Gazdaságfejlesztési és Innovációs Operatív Program	Economic Development and Innovation Operational Program
GPP		Green Public procurement
GWh		Giga Watt Hour
HCSO		Hungarian Central Statistical Office

[1] In this document, the abbreviation EnPC stands for Energy Performance Contracting and the abbreviation EPC is used for Energy Performance Certificate.

Acronym	Original	English explanation
HED		Heating Energy Demand
HUF		Hungarian Forint
HuGBC	Magyar Környezettudatos Építés Egyesülete	Hungarian Green Building Council
HUHA	Hulladékhasznosító Mű	Waste Utiliser / Waste Recycling Plant
IBO	Österreichisches Institut für Baubiologie and Ökologie	Austrian Institute for Building Biology and Ecology
ICAAP		Internal Capital Adequacy Assessment Processes
JRC		Joint Research Centre
k		kilo
KEHOP	Környezeti és Energiahatékonysági Operatív Program	Environmental and Energy Efficiency Operational Program
KIM-VO	Kreditinstitute-Immobilienfinanzierungsmaßnahmen-Verordnung	Credit Institutions Real Estate Financing Measures Ordinance
kW		kilo Watt
kWh/m²		kilo Watt hour per square meter
kWh/(m²a)		kilo Watt hour per square meter per year
LED		Light Emitting Diode
LPH		Limited-Profit Housing
LPHA		Limited-Profit Housing Association
LTRS		Long-Term Renovation Strategy
MEng		Master of Engineering
MFB	Magyar Fejlesztési Bank	Hungarian Development Bank
MFFEE		Municipal Finance Facility Energy Efficiency
MFH		Multi-Family House
MNB	Magyar Nemzeti Bank	Central Bank of Hungary
MRG	Mietrechtsgesetz	Tenancy Law
Mtoe		Million Tonnes of Oil Equivalent
MW		Mega Watt
NECP		National Energy and Climate Plan
non-ETS GHG emissions		GHG emissions not covered by the European Union's emissions trading system
NRRP		National Recover and Resilient Plan
nZEB		Nearly Zero Energy Building
OeAD	Österreichs Agentur für Bildung und Internationalisierung	Austria's Agency for Education and Internationalisation
OeNB	Österreichische Nationalbank	Austrian National Bank
OIB		Austrian Institute of Construction Engineering
OSS		One-Stop-Shop

Acronym	Original	English explanation
OÖ Energie-sparverband	Ober Österreich Energiesparverband	Upper Austria Energy Saving Association
OP ECP		Operational Program for the Implementation of the EU Cohesion Policy
OTP	Országos Takarékpénztár	Largest commercial bank of Hungary
PE		Private Equity
PJ		Peta Joule
PPP		Public-Private Partnership
PVC		Polyvinyl Chloride
REN	Register nepremičnin	Registry of Real Estate
RES		Renewable energy source
ROG	Raumordnungsgesetz	Spatial Planning Act
RRF		Recover and Resilient Fund
RRP		Recover and Resilient Plan
RTI		Research, Technology and Innovation
SECAP	Fenntartható Energia- és Klímaakcióterv	Sustainable Energy and Climate Action Plans
SEI Forum		Sustainable Energy Investment Forum
SFH		Single-family house
SID Bank	Slovenska izvozna in razvojna banka	Slovenian Export and Development Bank
SME		Small and Medium-sized Enterprises
SREP		Supervisory Review and Evaluation Process
S3		Smart Specialisation Strategy
TDS		Transversal Deployment Scenario
TJ		Tera Joule
TNM	Tárca nélküli miniszter	Hungarian Minister Without Portfolio
TREA		Total Risk Exposure Amount
TU	Technische Universität	Technical University
UBA	Umweltbundesamt	Federal Environment Agency
UN		United Nations
VAT		Value Added Tax
VC		Venture Capital
VEKOP	Versenyképes Közép-Magyarország Operatív Program	Competitive Central Hungary Operational Programme
VIS		Vienna International School
W/(m^{2}K)		Watt per square meter per kelvin
WEG	Wohnungseigentum	Condominium Association
WKO	Wirtschaftskammer Österreich	Austrian Federal Economic Chamber
€c/kWh		Euro cent per kilo Watt Hour

List of terms

Term	EU	Austria	Hungary	Slovenia
Energy efficiency	…is the ratio of output of performance, service, goods or energy to input of energy. [1] …means the more efficient use of energy at all the stages of the energy chain from production to final consumption. [2]	…is the ratio between the achieved efficiency, service, goods, or energy in relation to the energy supplied, which reflects how effectively energy resources are utilized to produce a certain level of output or service. [3]	…is the result expressed in performance, service, product or energy and the ratio of the energy invested. [4]	…is the ratio between the achieved efficiency, service, goods, or energy in relation to the energy supplied. [5]
Energy efficiency / performance of building	…means the calculated or metered amount of energy needed to meet the energy demand associated with a typical use of the building, which includes energy used for heating, cooling, ventilation, domestic hot water and lighting [6].	…is one of key figures specified in the mandatory energy performance certificate for buildings; factors such as the building envelope, heating system, ventilation and energy sources used play a role in the assessment of energy efficiency.	…is the calculated or measured energy demand related to the normal use of the building, including, but not limited to, energy for heating, cooling, ventilation, hot water supply.	…is the calculated or measured amount of energy required to meet the energy needs associated with the normal use of the building, which includes, among other things, energy for heating, cooling, ventilation, domestic hot water preparation and lighting. [5]
Energy renovation of building	…does not exist as EU-wide definition. …as widely acknowledged it should lead to certain energy savings after the intervention work is carried out; it is a link between the depth of the energy savings and resulting energy savings is not clear [7].	…means improving the energy efficiency and sustainability of buildings through comprehensive refurbishment measures.	…is the retrofitting, replacement or addition of a building element affecting the energy performance of an existing building, or a change to the essential characteristics of a building element, or conservation, repair or maintenance work that results in energy savings. [8]	…covers measures in the building which includes all building elements that have impact on energy use and operation of building. [9]
Comprehensive / deep energy renovation of building	…means a renovation which is in line with the 'energy efficiency first' principle, which focuses on essential building elements, and which transforms a building or building unit: (a) before 1 January 2030, into a nearly zero-energy building; (b) from 1 January 2030, into a zero-emission building. [6]	… involves a holistic approach to improve the energy efficiency and sustainability of existing buildings through a range of measure; this includes the entire lifecycle of the building, aiming to minimize the environmental impact during construction, operation, and eventual deconstruction / recycling.	…is renovation that involves at least 25% of the total surface area of the boundary structure. [8]	…is the coordinated implementation of efficient energy use measures on the building envelope (facade, roof, floor) and on the building's technical systems (heating, ventilation, air conditioning, DHW) in such a way that as much as possible utilize all the economically justified potential for energy renovation. [9].
Energy from renewable energy sources	…is the energy from non-fossil renewable energy sources: wind, sun, aerothermal, geothermal,	…is the energy from renewable, non-fossil energy sources, i.e. wind, solar (solar thermal and	…is the energy from non-fossil renewable energy sources: wind, sun, aerothermal, geothermal,	…is the energy from renewable non-fossil sources: wind, solar (solar thermal and solar PV sources),

Term	EU	Austria	Hungary	Slovenia
	hydrothermal, as well as energy obtained from the ocean, water energy, biomass, energy from gases and biogas generated in landfills and wastewater treatment plants. [10]	photovoltaic), geothermal energy, ambient energy, tidal, wave and other ocean energy, hydropower and energy from biomass, landfill gas, sewage gas, biogas, and renewable gas. [11]	hydrothermal, as well as energy obtained from the ocean, water energy, biomass, energy from gases and biogas produced in landfills and wastewater treatment plants. [12]	geothermal energy, ambient energy, tidal, wave and other sea energy, water energy and energy from biomass, landfill gas, gas, obtained from sewage treatment plants, and biogas. [13]
Sustainable renovation of building	…describes working on existing buildings to improve their environmental performance using sustainable methods and materials. [14]	…means renovating buildings in such a way that ecological, economic and socio-cultural factors are taken into account over the entire life cycle; the objectives are the reduction of energy consumption, resource efficiency, circular economy and consideration of the entire building life cycle.	…is dissemination of complex building rating systems that include life-cycle analysis of buildings, and through this, preferential promotion of environmentally friendly and sustainable building technologies and building materials industry that save resources throughout the life cycle of buildings. [15]	…means the renovation of a building in which the criteria and indicators of sustainable construction are taken into account. [16]
Smart /sustainable / green investment	…means an investment in one or several economic activities that qualify as environmentally sustainable. [2]	…is a form of investment that aims to maximize returns while minimizing risk; it enables investors to invest their capital profitably by combining various investment instruments and tailoring them to their personal needs.	…are investments that directly or indirectly support environmental protection; the investment targets projects that aim to protect the environment. [17]	…means that in addition to the financial aspects of the investment, the aspects of the environment, society and good business management are also considered. [18]
Energy performance contracting	…means a contractual arrangement between the beneficiary and the provider of an energy efficiency improvement measure, verified and monitored during the whole term of the contract, where the works, supply or service in that measure are paid for in relation to a contractually agreed level of energy efficiency improvement or another agreed energy performance criterion, such as financial savings. [1]	...refers to the outsourcing of energy-related services and projects to specialized providers; it involves a contractual agreement between a client (typically a building owner or facility manager) and an energy service company (ESCO) to improve energy efficiency and reduce energy costs.	…is established between the beneficiary and the service provider providing the energy efficiency improvement measure; it is a contractual agreement under which payment for an investment in a given energy efficiency improvement measure is made in relation to the level of energy efficiency improvement agreed in the contract[2].	…is a model of investment in the energy renovation of buildings with the inclusion of private capital from business entities that provide energy services. [19] [9].

[2] Definition by professional organizations.

1 RENOINVEST PROJECT

The RENOINVEST project is co-funded by the European Union under the LIFE programme. The project intends to reflect cross-border challenges and opportunities for sustainable building renovation in the private and public sectors. The main aim of the project is to develop action plans on smart investments in sustainable renovation of buildings for 2025-2030 for Austria, Hungary and Slovenia by establishing three national roundtables building on the activities of the Sustainable Energy Investment Forums.

RENOINVEST provides a platform for open dialogue involving key financial, private and public experts through the green finance thematic working group activities to identify barriers to the upscaling of long-term financing instruments and propose improvements to support the development of large-scale investment programmes in existing private and public buildings. Three national policy briefs and a cross-border recommendation package will also be delivered.

Assessing the implementation of the Long-term building renovation strategies and documents and reviewing existing financial solutions and market conditions for stimulating financing of energy efficiency improvement of the existing building stock is an important starting point of the project.

Sharing knowledge among project partners, experts, national stakeholders and similar EU projects three international cross-border exchange events with site-visits will be organized in order to showcase collected 50+ good practices and elaborate six case studies to foster the roll out of smart financing possibilities.

The added value of RENOINVEST is that the consortium is providing specific technical knowledge by engaging key actors representing legislative advisory organizations, research institutes, large engineering manufacturers, SMEs and financial experts in three CE countries fostering sustainable investments.

Originating from a collective vision to address cross-border challenges and unlock opportunities for sustainable building renovation in both private and public sectors, RENOINVEST seeks to craft action plans for smart investments in sustainable renovation from 2025 to 2030. This project serves as a testament to collaborative innovation, bridging key financial, private, and public expertise through green finance thematic working groups. These platforms are instrumental in identifying barriers and proposing enhancements for large-scale investment programs, thereby revitalizing existing infrastructure with an emphasis on energy efficiency. The RENOINVEST project not only fosters and environment of knowledge sharing among its partners and stakeholders but also positions itself as a beacon for sustainable investment in the CE region.

2 PROJECT CONSORTIUM

1. ÉMI Építésügyi Minőségellenőrző Innovációs Nonprofit Kft. (ÉMI) – HUNGARY, coordinator

2. Solar Tech-Investment Tervezési Fejlesztési Tanácsadó Kft. (ARCHENERG CLUSTER) – HUNGARY

3. Zavod za gradbeništvo Slovenije (ZAG) – SLOVENIA

4. Gospodarska zbornica Slovenije (CCIS) – SLOVENIA

5. RENOWAVE.AT e.G. (RENOWAVE) – AUSTRIA

6. Institut für Immobilien, Bauen und Wohnen GmbH (IIBW) – AUSTRIA

3 EXECUTIVE SUMMARY

This Deliverable is a study of the political context and market capacities for sustainable building renovations of the existing building stock in three European countries, Austria, Hungary and Slovenia. It provides the information relevant for the financing processes to increase the sustainability aspects of the existing building stock in partner countries with emphasis on energy efficiency and renewable energy sources. It briefly describes the EU policy context for financing sustainable renovation and provides overview of EU financial mechanisms for renovations.

Furthermore, it gives insight into policy context, building stock features, most common renovation technologies and interventions, and into types of existing funding for all three participating countries. For each country the analysis of existing financing solutions of building stock is provided, highlighting the various good and bad sides of the procedures.

A very important part of the study is a short comparative analysis that identifies and highlights areas needing improvement in each country. The latter indicated the strengths and weaknesses in policies, market capacities, and financial mechanisms related to energy efficiency and sustainable building renovations for the countries. It showed similarities, but also significant differences between them.

The area financial resources (utilization of indirect EU funding, and national funding availability) is particularly critical in Hungary. All three countries are emphasizing that the price of energy in comparison to renovation technologies is a large gap which is not addressed at all. The same applies for the commonly recognized gap “fragmentation among decision-makers in the construction sector”. The “adaptation of legislation to accommodate new technologies” is a recognized as a slow process in all three countries. The fire safety and seismic safety are identified issues only for Slovenia.

The comparison showed that various weaknesses are eliminated more often in Austria than in Slovenia and Hungary, which are almost equal. Austria appears to be a bit more advanced, as it estimates that almost half of the gaps are addressed to a large extent. In total, quite large number of gaps was identified, and no country was assessed to have a gap that would be completely eliminated.

The questions and shortcomings highlighted by this study are a key substantive basis for consideration in discussions and analyses during the project. The results will be summarized in three national policy documents, with which the RENOINVEST project aims to promote sustainable investment practices and strengthen building renovation efforts in the participating countries.

4 INTRODUCTION

4.1 The structure of the study

The study was prepared by the RENOINVEST project consortium with the aim of assessing national framework conditions in the sustainable renovation sector in participating countries. It provides a critical and organized overview of current information, including policies, regulations, barriers and market assessment of existing financial models in Austria, Hungary and Slovenia.

The study first describes the policy context and financial mechanisms of the European Union (Chapter 5), followed by a national situational analysis. Chapter 6 focuses on Austria, Chapter 7 on Hungary, and Chapter 8 on Slovenia. Each country-specific description and analysis is divided into two parts:

- The first part (Task T2.1 of the project) covers a systematic review and analysis of the main characteristics of existing policies and practices relevant to financing energy efficiency or sustainability measures and the integration of renewable energy sources (RES) in building renovation. It also presents the national building renovation targets.
- The second part (Task T2.2 of the project) highlights market capacities for sustainable building renovations, barriers and opportunities in the existing construction market, and the potential for improving energy efficiency or sustainability of buildings and integrating RES in participating countries. Additionally, it includes existing financial solutions and programs for stimulating financing of sustainable improvements in building stock. Each national context concludes with an analysis of the gaps hindering the fulfilment of building energy and climate goals for both private and public buildings.

Chapter 9 is devoted to a brief comparative analysis based on the national characterization of the situation, while Chapter 10 provides conclusions and basis for further work in developing country-specific and cross-border policy recommendations to foster financing mechanisms in building renovation.

The methodologies for compiling the content are explained in section 4.2.

The study was prepared using a literature review, expert knowledge, and information from a wide range of stakeholders. For the Slovenian content, contributions were made by participants from both the RENOINVEST project and the SMAFIN EXPANDED project, which covers similar topics for Slovenia. The sections written by SMAFIN EXPANDED participants are marked with *Italic*, while the rest were written by RENOINVEST participants.

The content of the study was reviewed by the members of the RENOINVEST External Advisory Board (EAB), Dr. Winfried Braumann (Austria), Gábor Gyura (Hungary), Assoc. Prof. Dr. Marjana Šijanec Zavrl (Slovenia). In accordance with EAB members' comments, the report's content was corrected and refined.

4.2 Common methodology of the report

The common methodology for review and analysis of policies, legislation and other relevant documents related to measures to increase the sustainability aspects when renovating the existing buildings is presented in Figure 1.

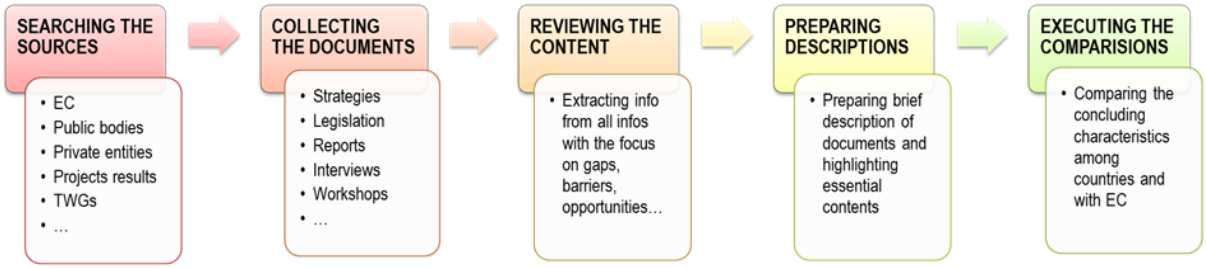

Figure 1: Common working methodology of the study.

The first step in the process is searching for sources and specific information at both the EU level and the level of individual project partner countries. The review in each country includes policies and legislation from ministries, resources from public and private entities, research results, project work, and more. The second step involves collecting specific documents such as strategies, regulations, studies, reports, etc. This is followed by reviewing the contents and extracting details, focusing on gaps, obstacles, and shortcomings related to financing sustainable building renovations. Special emphasis was placed on content related to four main topics: 1) staged renovation processes, 2) circular economy and nature-based solutions, 3) renewables, district heating, and energy communities, and 4) energy consumption monitoring and visualization. In the fourth step, a brief description of each document is prepared based on the analysis, highlighting essential content. Finally, comparisons of the main characteristics between countries and with the EC are prepared for inclusion in Chapter 9 of this report.

A special uniform procedure was developed for analyzing the focus area "financing building renovation" in the participating countries. This procedure was based on a SWOT analysis shown in Figure 2.

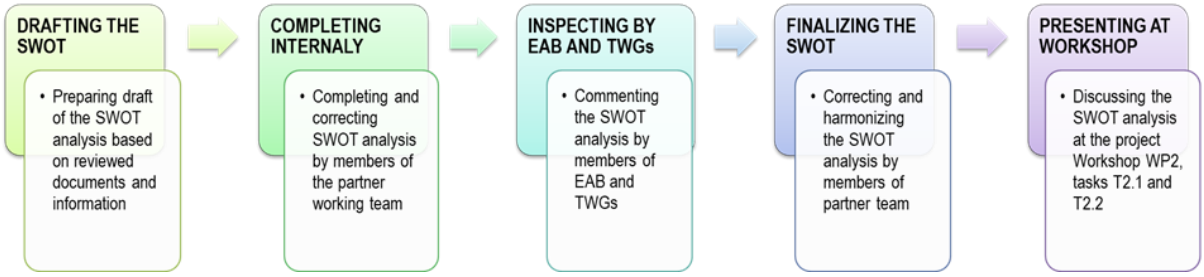

Figure 2: Common working methodology for analysis of "financing building renovation".

In the initial phase, a draft SWOT analysis was developed for each country based on a comprehensive review of all relevant information and documents. This draft analysis underwent internal revision and refinement by members of each project partner's working group. Following this, the refined SWOT analysis was shared with the Technical Working Groups (TWGs) and the EAB for further review, and it was also discussed and refined during workshops involving TWG members to ensure completeness and consistency. The final version of the SWOT analysis was formally presented during the workshop of Work Package 2 (WP2), Task 2.1, and Task 2.2 within the RENOINVEST project in July 2024.

5 EUROPEAN UNION

5.1 Policy context relevant for financing sustainable renovation

5.1.1 Global challenges

We are in a challenging era with a global energy crisis. The rapid post-pandemic economic recovery tightened energy markets in 2021, and the Ukraine war in early 2022 caused record high natural gas and oil prices. Europe, heavily dependent on Russian gas, is particularly affected. This pressures governments to coordinate actions for a carbon-neutral energy transition.

Adrian Joyce, Director of the Renovate Europe Campaign [20], notes that Central and Eastern Europe is especially impacted due to its dependence on Russian fossil fuels. Energy efficiency and other sustainability measures are crucial for the region's security and citizens' living conditions, ensuring comfortable, healthy and energy-efficient homes.

Buildings are key to achieving the EU's carbon neutrality, energy efficiency, and renewable energy targets, as they account for 40% of energy consumption and 36% of EU greenhouse gas emissions. The building sector plays a crucial role in transforming European living, working, and consumption habits. By 2030, EU Member States aim to foster innovation and investment in clean energy which is triggered and supported by EU level policies and initiatives.

5.1.2 Context with direct impact in financing sustainable building renovations

European Green Deal [21] is about Europe to become climate-neutral by 2050, with a growing economy, improving the well-being of people and protecting our natural habitat and not leaving anyone behind. It is necessary to decarbonize the energy sector, to renovate buildings, to help people cut energy use and energy bills, to support industry in innovations and to become global leader in the green economy.

Renovation Wave [22] action is one out of six actions included in the European Green Deal's Clean energy transition, aiming to improve EE, boost the economy and deliver better living-standards for Europeans. Renovating both public and private buildings was singled out as a key initiative to drive EE in the sector and deliver the objectives. EC document, Support from the EU budget to unlock investment into building renovation [23] was prepared.

European Green Deal Investment Plan [24] mobilises at least €1 trillion of private and public sustainable investments over the upcoming decade. To achieve the current 2030 climate and energy targets the investments are evaluated to €260 billion annually. It is predicted that the Cohesion Fund and the European Regional Development Fund will invest at least €108 billion in climate and environment related projects over the next 7 years (2021-2027).

InvestEU [25] is aiming to support sustainable investments in a targeted manner to de-risk projects and leverage private financing, and to spread-out sustainable practices among private and public investors. **European Investment Bank** [26] (EIB) plays a key role in financing the shift to sustainable economy together with International and National Financial Institutions.

Public actors are the main investors in certain sectors, especially infrastructure and public services. The minimum mandatory green criteria or targets for public procurements are necessary to be set [27]. However, **private companies** and **households** need to provide the bulk of the sustainable investments. Therefore, it is crucial to launch clear long-term signals to guide investors to sustainable investments.

Just Transition Mechanism [28] is providing targeted support to generate the necessary investments in these territories. It consists of three pillars: 1) A Just Transition Fund, 2) A dedicated just transition scheme under InvestEU, and 3) A new public sector loan facility for additional investments to be leveraged by the EIB.

According to the EU **Recovery and Resilience Facility** [29] the green transition should be supported by reforms and investments in green technologies and capacities, including in biodiversity, EE, building renovation and the circular economy.

Fit for 55 [30] legislative package is to enable the EU to become a world leader in the development and deployment of clean technologies, including energy efficiency solutions, in the global energy transition.

Legislative framework from EU includes the revised **Energy Performance of Buildings Directive** [31] (EU/2024/1275) that helps to increase the rate of renovation in the EU, particularly for the worst-performing buildings. The directive also supports better air quality, the digitalisation of energy systems for buildings and the roll-out of infrastructure for sustainable mobility.

The revised **Energy Efficiency Directive** [32] (EU/2023/1791) provides a series of measures to help accelerate energy efficiency, including embracing the **"energy efficiency first"** principle in the energy and non-energy policies.

Both directives promote policies to help to achieve a highly energy efficient and decarbonised building stock by 2050, to create a stable environment for investment decisions and to enable consumers and businesses to make more informed choices to save energy and money.

EU Taxonomy Climate Delegated Act [33] sets criteria for the EE of buildings to be considered environmentally sustainable, which in turn is the basis of definitions for green finance in the EU.

5.1.3 Context with an indirect impact in financing the sustainable building renovation

The **Energy efficiency first principle** [34] is an overarching principle that should be followed in all sectors, at all levels (policy, planning, investment decisions), including the financial sector. The principle should benefit people affected by or at **risk of energy poverty**.

In **green public procurement** (GPP) environmentally friendly products, construction works and services should be chosen.

Revised **Construction Products Regulation** [35] (CPR) requires making sustainable products the norm in the EU, boost circular business models and empower consumers for the green transition. The manufacturers will be obliged to submit the product's environmental sustainability performance over its life cycle.

Ecodesign for Sustainable Products Regulation [36] (ESPR) establishes the framework for setting eco requirements for specific product categories to significantly improve their circularity, energy performance and other environmental sustainability aspects, e.g.: durability, reliability, reusability, upgradability, reparability, no harmful substances, ease of disassembly and recycling, waste minimizing.

Digital product passport will be the norm for all products regulated under the ESPR, enabling products to be tagged, identified, and linked to data relevant to their circularity and sustainability.

Circular business models need to be invested and incentivise. They may include product-as-a-service models, peer-to-peer sharing and reverse logistics, on-demand manufacturing, repair services, etc.

Public authorities should be encouraged to consider wider benefits beyond energy savings, such as **indoor environment quality**, adaptation to climate change, building automation, control systems and solutions as well as improving people's **quality of life** and **comfort**.

The national adaptation of a common EU framework for sustainable building evaluation, **Level(s)** [37]**,** should be encouraged. In **Slovenia** this process is already in progress (Kazalniki trajnostne gradnje [38]).

5.1.4 Targets for renovation of the building stock

The EC has adopted a set of proposals included in the **European Green Deal** [21] to make the EU's climate, energy, transport, and taxation policies fit for reducing net greenhouse gas emissions by at least 55% by 2030, compared to 1990 levels, and reaching **climate neutrality by 2050**. 85% of EU buildings were built before 2000, and 75% of these have poor energy performance. Improving building EE is essential to save energy, reduce bills for citizens and small enterprises, and achieve a zero-emission, fully decarbonized building stock by 2050. **Renovating public and private buildings** was singled out in the European Green Deal as a key initiative to drive EE in the sector and deliver on objectives. **Renovation Wave action** [22] for Europe with an action plan aims to at least double the annual energy renovation rate by 2030 and in addition to reduce emissions and create green jobs in the construction sector, which is dominated by local businesses. This will improve overall living standard for Europeans.

Since 2014, EU countries must establish and submit Long-Term Renovation Strategy to the EC to support the renovation of their national building stock into a highly EE and decarbonised building stock by 2050. This requirement is set out in the Energy Performance of Buildings Directive (EPBD). The strategies are part of EU countries' integrated NECPs. In the report goals for each of participating country – Austria, Hungary and Slovenia are summarized.

The **revised EPBD** [39] facilitates more targeted financing to investments in the building sector, complementing other EU instruments and fighting energy poverty by supporting vulnerable consumers. It helps to increase the rate of renovation in the EU, as it sets a binding target to decrease the average energy performance of the national residential building stock by 16% by 2030 in comparison to 2020, and by 20-22% by 2035, based on national trajectories.

EU Taxonomy targets in case of major renovation of existing buildings (ownership and renovations): at least a 30% reduction in PED or meet criteria under the EPBD and must have an EPC rating of at least 'B' or be in the top 15% of the national or regional building stock. In addition, DNSH criteria also needs to be adhered too: resilient to physical climate risks, efficient use and reuse of water resources, minimizing pollution during construction and operation, avoiding adverse effects on biodiversity and ecosystems.

5.1.5 Research and development

EU RESEARCH PROJECTS

Numerous research projects have been funded by various EU programs, including Horizon 2020, Horizon Europe, and LIFE, to enhance the EE of buildings, addressing multiple aspects of this challenge. These projects focus on developing innovative technologies, practices, and policies to improve building performance. The following compilation highlights some of these projects and showcases studies, whose results are highly beneficial for the RENOINVEST project and further research in this field.

Accelerate SUNShINE [40] is about how to reduce the risk and capital associated with deep EE renovations.

AUNA Forum [41] aimed to create a Spanish permanent, multilevel, multilateral discussion FORUM, fully focused on sustainable buildings.

Be-Smart [42] is developing a solution for integrating solar panels into building façades and roofs enable the substitution of traditional building materials.

BeSMART [43] is Bulgarian EE Forum on Smart Finance for Smart Buildings.

CitizEE [44] aimed at supporting European public authorities to scale up investments for EE in the building sector through attracting citizen private investments. For this they are establishing national and/or regional Investment Platforms.

CRREM [45] is building a framework for science-based decarbonisation pathways, i.e. a toolkit to identify stranded assets and push sustainable investments. The project provides country- and asset-type specific decarbonisation pathways to real estate owners and stakeholders to assess, manage and avoid carbon risk.

EuroPACE [46] is bringing an innovative toolkit for households that can and will help actors develop scalable and integrated financing EE retrofit model for their homes, based on on-tax financing.

ESI Europe [47] brings solutions for SMEs in the risk of investing in energy efficiency. It provides the web-based platform that reports on and monitors the performance of each project to facilitate the exchange of information between stakeholders.

E-FIX [48] provides training modules that cover didactics, crowdfunding, leasing, energy performance contracting and project finance to activate private sector finance for increased investments in sustainable energy projects.

F-PI [49] aimed in promoting and speeding up the development of private investments in EE, sustainable mobility, and self-consumption.

FinEERGo-Dom [50] implements guaranteed financing mechanism to renovate public and private buildings across 7 countries, through connecting building owners, energy consultants and financial institutions.

GREENROAD [51] aims at facilitating the dialogue between Italian public and private key actors on financing issues related to energy efficiency in the existing and new buildings sector.

GREEN Home [52] connects all relevant stakeholders from politics, business and civil society that are related to energy efficient renovation in German homeowner associations.

GreenDeal4Buildings [53] is setting up roundtables to implement Smart finance for Smart buildings initiative (SF4SB) in Slovakia and the Czechia.

QualitEE [54] defined quality assessment criteria that can be applied in the assessment of an EE service of any size or scope or based on any approach, namely building trust in EE services is key to increasing investment in sustainable buildings.

Refine [55] contributed to the supply of sufficient and attractive financing sources to energy efficiency investments by enhancing the refinanceability of EE service projects and amplifying the use of refinancing schemes in EE service business practice.

Ren-on-Bill [56] developed simple and practical online tool for calculating the costs of EE renovation in households.

RoundBaltic [57] deals with the implementation of the Smart Finance for Smart Buildings (SFSB) initiative in the Baltic Sea Region. This includes maximising the use of available public funding via financial instruments and de-risking of EE investment by revealing the real risks and benefits of sustainable energy investments based on market evidence and performance track record.

SMAFIN [58] connected smart financing with energy efficient projects in buildings, industry, and SMEs in the Balkan and created a roundtable methodology on energy investment topics as permanent discussion forums to advance cross fertilisation between key stakeholders.

SMARTER Finance for Families [59] implemented Green Homes & Green Mortgage programs in 12 European countries with the goal to help families think about the financial benefits of EE measures and to provide investors with a better understanding of energy performance criteria.

Smarter Together [60] focuses on large-scale EE renovation of residential buildings, energy savings, e-mobility and information and communication technology in 8 large European cities.

RenoHUb [61] established six RenoPont offices in Hungary following the One-Stop-Shop model and the RenoHUb Business Model that is the organizational framework of integrated home renovation services addressing the entire customer journey.

SUPER-i [62] supports the funding of EE renovation of social housing stocks across Europe while increasing the share of RES in the final energy consumption following these specific objectives.

RetrofitHUB [63] raised the level of awareness, motivation and provided capacity building for the main stakeholders (facility managers, legal representatives, owners) involved in building renovation or deep renovation.

STUNNING [64] creates a stakeholder community around a Renovation Hub designed as a knowledge sharing platform, providing information on innovative solutions for building renovation and novel business models for their adoption and large-scale replication.

Transparense [65] developed the European Code of Conduct for EnPC which defines the basic values and principles that are considered fundamental for the successful preparation and implementation of EnPC projects. It provided also Recommendations on Quality Certification for EnPC Services and 37 EnPC pilot projects that included testing the Code of Conduct.

There is a possibility to actively join the currently running projects focusing on roundtable for sustainable energy investments, such as the RAISE-PT [66] in Portugal, LIFE BE FREE [67] in Belgium, FR-BS [68] in France, SMAFIN Expanded [58] in several Balkan countries and RENOINVEST [69] as well.

STUDIES AND REPORTS AT EU LEVEL

Study on energy subsidies and other government interventions in the European Union – 2023 edition [70] is a report on energy subsidies in the EU. It provides approaches to them and the trends of energy subsidies.

Road to net zero: Bridging the green investment gap [71] is proposing measures to financially support the adoption of the circular economy (e.g. service-based models). In renovation, it is proposing to support the efficient housing energy renovations with 50% average public ratio, to provide owners with preferential-rate loans to cover the remaining costs, to provide technical support for individual housing renovation, and to support the efficient renovations in the private tertiary sector (30% average public ratio).

Report on the evolution of financing practices for energy efficiency in buildings, SME's and in industry [72] exposes that collaborative way to increase the number of EE measures are Energy Efficiency Networks (EEN). The document provides several good practices showing possible approach to the EE investment issues and overview of EE financial instruments and activities.

Stimulating Consumers' Demand for Energy Efficiency Investments [73] is assessing the barriers hindering the demand for EE investments and providing best practices for stimulating consumers and final energy users' demand for EE investments. Part of the report is also a list of recommendations to sector stakeholders, Member States, EU institutions and financial institutions.

5.1.6 Empowerment activities

Several EU initiatives focus on EE, sustainable development and innovation in the construction sector. Empowerment activities within these initiatives aim to address climate change and improve quality of life through policy, financing, and technological advancements. Just a few are mentioned here:

Renovate Europe [74] is a political communications campaign with the ambition to reduce the energy demand of the EU building stock by 80% by 2050 through legislation and ambitious renovation programmes, taking a technology neutral, integrated and holistic approach to EE renovations.

SEI Forums [75] - Sustainable Energy Investment Forums initiative has been working with national stakeholders to enhance access to finance for sustainable energy investments**.** A series of public events and online discussion and knowledge sharing forums bring together stakeholders with the aim of focusing on boosting large-scale investment and financing for EE at the national level.

EEFIG [76] is the EU Energy Efficiency Financial Institutions Group, that is aimed to create an open dialogue and work platform for public and private financial institutions, industry representatives, and sector experts to identify the barriers to the long-term financing for energy efficiency and propose policy and market solutions to them.

BUILT4People (B4P) [77] is a European partnership with the EC, ECTP, and WorldGBC Europe. It operates under Horizon Europe with the aim to promote sustainable buildings and urban development to enhance the quality of life for urban residents, with a focus on people-centred approaches and interdisciplinary collaboration.

BUILD UP Skills Initiative [78] is supporting the EU energy and climate goals by focusing on the availability of skilled workforce and motivating the improvement of qualification and training schemes.

ECTP [79]**,** the European Construction and sustainable built environment Technology Platform is a construction stakeholder organization with committees that are aiming to develop new R&D&I strategies to improve competitiveness, meet societal needs & take up environmental challenges through an Innovative Built Environment.

NEBULA [80] is the new European Bauhaus initiative, the project that aims to drive innovation and transformation in the construction sector, focusing on decarbonization, digitalization, innovation clusters, social housing, and circular technologies. It is activating and nurturing a network of B4P Innovation Clusters.

5.2 Overview of financial mechanisms for renovations

5.2.1 Review of most common financial mechanisms

The European Commission is promoting the use of financial instruments in combination with grants to achieve the scale of investment needed for the **EU's Renovation Wave strategy** [22]. Mobilizing private capital is essential to close the estimated EUR 275 billion annual investment gap to meet the 2030 climate targets for buildings.

The most common financial mechanisms for building renovations in Europe include:

- **Grants and Subsidies:** Grants are often needed to help overcome barriers like high upfront costs and long payback periods for energy efficiency projects.
- **Loans:** Loans, often combined with grants improve the financial viability of renovation projects. They can be structured so that costs are at least partially covered by energy savings.
- **Tax Incentives:** Tax credits, deductions, rebates and VAT reductions help address the lack of incentives for building owners to prioritize efficiency upgrades.
- **Energy Efficiency Obligations and White Certificates:** The Energy Efficiency Directive is expected to increase the use of these instruments across Europe.
- **Innovative Financing Solutions:** On-bill and on-tax financing schemes are emerging as innovative ways to facilitate building renovations. Energy performance contracting is being used to target public buildings and social housing.

Financial instruments can use Cohesion policy resources alongside the Recovery and resilience facility and Invest EU to leverage additional funding as shown in Figure 3.

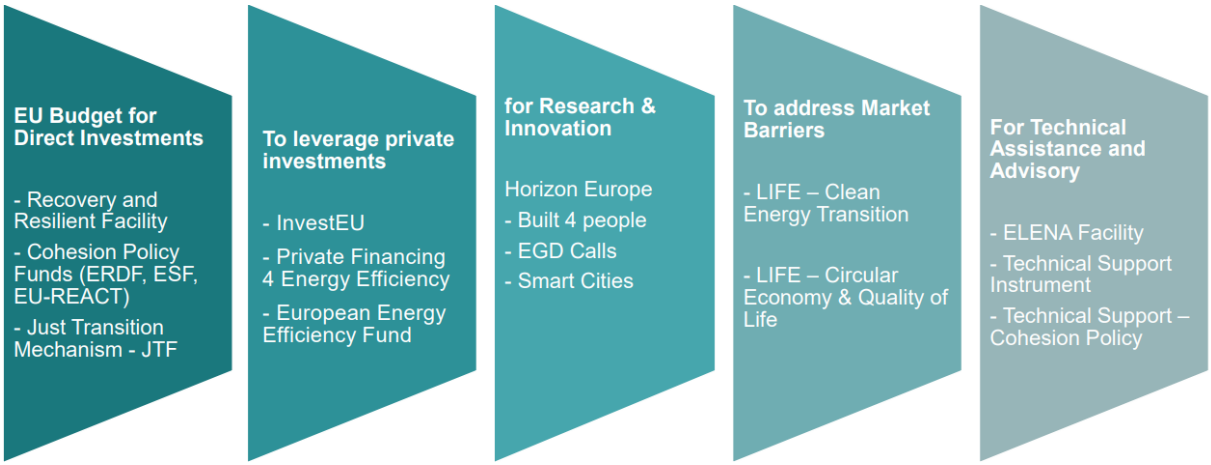

Figure 3: EU financial instruments for renovation of buildings [81]

5.2.2 EU budget for direct investments

Recovery and Resilient Facility (RRF) [82], the key instrument of NextGenerationEU to help the EU emerge stronger and more resilient from the current crisis, has a budget of €672.5 billion in loans and grants available to support reforms and investments undertaken by Member States. RRF regulation requires that at least 35% of the total allocation of each recovery and resilience plan (RRP) shall support measures that contribute to climate objectives.

Cohesion Policy Funds' (ERDF, ESF, EU-REACT) [83] proposed budget for the 2021-2027 period is €330 billion. These Cohesion Policy Funds, which include the **European Regional Development Fund (ERDF)** [84] and the Cohesion Fund, are being better targeted to deliver high energy performance in buildings, in line with the **National Energy and Climate Plans (NECPs)** [85] and **Long-Term Renovation Strategies (LTRSs)** [86] of EU member states. The combination of Cohesion Policy Funds with other financial instruments and technical assistance is seen as crucial to mobilize the estimated €275 billion in annual investment needed to meet the EU's 2030 climate and energy efficiency goals for the building sector.

European Social Fund (ESF) [87] is one of the EU's main funding instruments for promoting employment in the Member States.

REACT-EU [88] is an EU recovery assistance program with a budget of €47.5 billion in 2018 prices (€50.6 billion in current prices). It provides the **European Structural and Investment Funds** [89] **(ESI Funds)** with additional resources until 2023 to tackle the consequences of the pandemic and support the transition to a digital and environmentally sustainable economy and society.

The main objective of the **Just Transition Mechanism (JTM)** [28] is to mitigate the socio-economic impact of the transition in regions and sectors that are most affected, such as those heavily dependent on fossil fuels or carbon-intensive industries. JTM consists of three pillars:

- The **Just Transition Fund (JTF):** Provides grants to support economic diversification, job creation, training and reskilling of workers, and investments in clean technologies in the most affected regions, grants to territories most negatively affected by the transition, supporting economic diversification, reconversion, and adaptation to the new economic environment. It has a budget of €17.5 billion for 2021-2027.
- The **InvestEU Just Transition Scheme**: Mobilizes private investment to support projects that contribute to a just transition, such as in energy and transport infrastructure, decarbonization, and economic diversification.
- The **Public Sector Loan Facility (PSLF):** Combines loans from the European Investment Bank with grants from the EU budget to support public sector entities in making investments that are not commercially viable on their own but are needed for a just transition.

Key elements of the JTM include allocation of funds based on the socio-economic impact of the transition, support for economic diversification and sustainable job creation, training and reskilling programs for affected workers, promotion of investments in clean technologies and renewable energy and coordination and cooperation between regions, institutions, and stakeholders.

5.2.3 For research and innovation

The **European Green Deal** is a key priority for the EU, and research and innovation play a central role in driving the transformative change needed to achieve its ambitious goals. The EC made €1 billion available under the Green Deal call, the last and biggest call under **Horizon 2020**.

Horizon Europe [90] research and innovation program for 2021-2027 with a budget of €95.5 billion is key to leveraging national public and private investment and fostering new technologies, sustainable solutions and disruptive innovation. Over 35% of Horizon Europe spending is allocated to address climate change.

European Green Deal calls [90] in Horizon Europe aim to support climate action by promoting research and innovation projects that contribute to achieving climate neutrality and reducing GHG emissions in line with the EU's climate goals and seek to foster sustainable development by funding projects that align with the Sustainable Development Goals (SDGs) and contribute to a more sustainable and resilient future for Europe. By focusing on green technologies and sustainable practices, the EGD calls aim to enhance the competitiveness of European industries, promote job creation, and stimulate economic growth in a sustainable manner.

One of the 5 mission areas under Horizon Europe is **Climate-neutral and Smart Cities** [91]**.** The mission aims for "100 Climate-Neutral Cities by 2030: by and for the citizens". It involves research projects, policy measures and legislative initiatives to achieve the goal of climate-neutral cities. It takes a bottom-up approach, engaging local authorities, citizens, businesses, investors and national governments to co-create Climate City Contracts. The **112 selected Mission Cities** are receiving support from the NetZeroCities project to develop and implement their Climate City Contracts. The Cities Mission aims to create experimentation and innovation hubs to enable all European cities to **become climate-neutral by 2050**.

BUILT4People (B4P) [77] as a co-programmed partnership under Horizon Europe's Cluster 5 (Climate, Energy and Mobility) offers EU research and innovation funding for the built environment with the aim to catalyse the transition to a people-centric, climate-neutral, sustainable and smart built environment.

5.2.4 To address market barriers

The LIFE program, specifically the **Clean Energy Transition and Circular Economy and Quality of Life sub-programs**, aims to address market barriers and facilitate the transition towards a sustainable, low-carbon economy in Europe.

LIFE Clean Energy Transition [92] is a sub-program with a budget of nearly €1 billion from 2021-2027 to support coordination and support actions that break market barriers hampering the socio-economic transition to sustainable energy. It funds projects in five key areas: building policy frameworks, accelerating technology roll-out and skills development, attracting private finance, supporting local investment projects, and empowering citizens.

LIFE Circular Economy and Quality of Life [93] is a sub-program under LIFE, addressing market barriers to the adoption of circular economy practices and technologies. It aims to catalyse the transition to a sustainable, low-carbon, energy-efficient, renewable energy-based, and climate-resilient economy. Funding priorities are circular economy and waste management, business and consumption models, New European Bauhaus and environmental governance.

Standard Action Projects implement innovative or best practice solutions at an operational scale.

Strategic Integrated Projects support the implementation, monitoring and evaluation of EU environmental policy and law.

5.2.5 Technical assistance and advisory services

The European Union provides several instruments to support technical assistance and advisory services for Member States, which help to build capacity and facilitate investments to achieve the EU's climate and economic objectives.

European Local Energy Assistance (ELENA) [94] is a joint initiative by EIB and EC under the Horizon 2020 program. It provides grants to local and regional authorities to support technical assistance for the preparation and development of investment programs in EE and renewable energy. ELENA grants can cover up to 90% of the technical support cost needed to prepare, implement, and finance the investment program.

Technical Support Instrument (TSI) [95] is an EU program that supports reforms in a wide range of policy areas, including public administration, green and digital policies, and implementation of the Recovery and Resilience Plans. The TSI is demand-driven, meaning Member States request support, and it does not require co-financing.

Technical Support for Cohesion Policy includes support for project preparation, capacity building, monitoring and evaluation, and exchange of good practices. Technical assistance is funded through dedicated technical assistance programs under the **European Regional Development Fund** (ERDF) and **Cohesion Fund.**

5.3 Market capacities in the EU relevant for financing sustainable renovation of buildings

EU building market investment characterization with market size and opportunities with building market segmentation according to commercial, private residential and public buildings can be found in **Report on the evolution of financing practices for energy efficiency in buildings, SME's and in industry** [96], together with approaches and instruments to energy efficiency investments in buildings.

This report by the Energy Efficiency Financial Institutions Group (EEFIG) provides a comprehensive analysis of the current state of energy efficiency investments in buildings, SMEs, and industry, and identifies the critical actions necessary to enhance these investments. It reveals that despite considerable potential for energy savings, the finance sector faces challenges in boosting energy efficiency investments due to low demand, complex project replication, and a lack of standardization. Furthermore, many building renovations are self-funded by owners, who often focus on quick payback improvements like equipment renewals or immediate value enhancements. To achieve the EU's heightened climate goals for 2030, energy efficiency investments in buildings must more than triple to exceed €275 billion per year. Achieving this target will require significant mobilization of private capital and a transformative change in the market regulatory framework to overcome existing barriers.

The anticipated increase in demand will likely be driven by mandated building energy performance standards, minimum local government standards, incentive programs, and the adoption of de-risking and bundling models. Although financial institutions have made notable progress in the last decade by developing various financing instruments such as credit lines and dedicated funds, the energy efficiency market remains small, fragmented, and difficult to scale compared to its potential size. Despite these advancements, further efforts are needed to fully realize the market's potential.

6 AUSTRIA

6.1 Policy context relevant for financing sustainable renovation

6.1.1 Policies and strategies

The Austrian federal government has set the goal of achieving climate neutrality by 2040 in its government program for 2020 - 2024 [97]. This includes the following objectives and strategies concerning Austria's building stock:

- **Austria's Climate Change Mitigation and Adaptation Strategy** - are detailed roadmaps and strategies to address climate change, including a comprehensive action plan for climate change adaptation.
- **Funding program for the energy efficient renovation** [98] - increases the rate and quality of renovations in buildings, including through the further development of housing subsidies and building regulations, as well as the development of renovation concepts. Gradually making zero-emission buildings the standard.
- **Phase-out of fossil fuels in space heating from 2020** [99] - end for all oil and coal heating systems by 2035, no new gas boilers / connections in new buildings from 2025; heat strategy for the complete decarbonization of the heat market.
- Development of a **Renewable Expansion Act** [100] and further development of the Energy Efficiency Act for appropriate framework conditions for the environmentally friendly expansion of renewable energies including the €1 million Roofs Photovoltaic Program.
- Implementation of a **national circular economy strategy** [100] in line with the Circular economy plan of the EC and promoting the circular economy in the construction sector.
- **Austria's Bioeconomy Strategy** [101] aims to replace fossil resources with renewable raw materials across various industrial and economic sectors. It includes a step-by-step approach to substitute fossil-fuel based heating systems with more climate-friendly alternatives.
- The **RENEW SCHOOL program in Austria** [102] focuses on quick, affordable, green and healthy school renovations.
- **Austria's 2030 Mobility Master Plan** [103] identifies ways to shift towards more sustainable modes of transportation, with the goal of establishing a carbon-neutral transport system by 2040.
- **Austria's Recovery and Resilience Plan** [104] includes significant investments in sustainable mobility, energy efficiency in buildings, and the phase-out of oil and gas heating systems and supports companies' investments in low-emission buildings and vehicles.
- **The Green Finance Agenda** [105] is a comprehensive strategy presented by the Federal Ministry for Climate Action (BMK) and the Federal Ministry of Finance (BMF). It sets out how the areas of action are to be implemented, when this is planned, and which institutions are responsible for this. Topics: mobilizing capital, make Austria sustainable, managing climate-relevant risks, promoting transparency with an effective impact in the capital market.
- **Subsidies and Incentives for Sustainable Construction and Renovation** [106] are provided for substantial construction and renovation. The government is also promoting timber construction due to its lower carbon footprint.
- **Reforms to Tenancy Law** [107] are considered crucial to maximize investment in ecological construction and renovation, as the current provisions restrict the rentability and pricing of subsidized properties.

- **Smart Specialisation** - the federal government encourages its science and research institutions to realise their role as regional Lead Institutions. The RTI Strategy sets out the strategic direction for the next ten years in the form of overarching objectives to e.g. focus on knowledge, talent and skills on construction and renovation.

6.1.2 Legislation on construction and renovation

MAIN BUILDING LEGISLATION

The main building legislation in Austria encompasses a range of regulations and requirements that govern construction and renovation activities in the country. These regulations aim to ensure that construction and renovation activities adhere to legal requirements and quality standards in Austria.

Planning Permission and Building Regulations

Individuals must apply for planning permission to build or renovate a property, following a specific procedure that involves obtaining a project from an architect or engineer and submitting it to the local building authority for approval. Listed buildings, conservation areas, and preservation orders have additional rules and regulations that must be followed, including obtaining approval from the Federal Monuments Office for alterations or renovations to listed properties. Based on the federal competencies established in the constitution, there are 9 building regulations.

To harmonize technical building regulations for the entire federal state according to the **Energy Performance of Buildings Directive** [6] the Austrian Institute of Construction Engineering (OIB) has so far issued guidelines in different fields. However, the OIB guidelines do not have the force of law. Nevertheless, the nine federal states largely commit to implementing the guidelines in their respective building codes.

The **OIB Guideline 6 on "Energy Efficiency and Thermal Protection** [108] defines the following requirements for the thermal-energetic quality of new buildings and major renovations:

- thermal quality of building components, such as maximum U-values (a measure of heat transfer) for individual components,
- usable energy demand or shares thereof for heating energy demand (HED) or cooling demand (CD) and final energy demand,
- primary energy demand, which is calculated from the final energy demand per energy carrier and the respective conversion factor for primary energy. Conversion factors are indicators for all heating systems, providing information on primary energy demand, renewable energy share, and CO_2 emissions per unit of heated energy.

With the issuance of OIB Guideline 6 in 2019, beside the mandatory energy performance certificate (EPC) for buildings an additional **renovation certificate** (renovation passport) was introduced for existing buildings. For individual measures or when recommending renovation measures, it must be ensured that the requirements for major renovation can always be met. For every newly created energy certificate for existing buildings, a renovation passport with corresponding recommendations for a renovation concept must be issued simultaneously.

Permits and Licenses

A building permit for new construction or major renovations, **an occupancy permit** before occupying the property, **an electrical permit** for electrical work, and **a plumbing permit** for plumbing work are required.

The building permit process for new construction or major renovations involves thorough planning, submission to the local building authority, obtaining necessary approvals, and ensuring compliance with environmental and conservation regulations. This process is essential to ensure that construction activities adhere to legal requirements and quality standards in Austria.

Laws and Regulations

- **Spatial Planning Act** (Raumordnungsgesetz ROG) focuses on spatial planning, land use, and development control, ensuring sustainable development and efficient land use.
- **Energy Efficiency Act** (EEffG) aims to promote energy efficiency in buildings, setting standards for energy performance and requirements for energy-efficient renovations.
- Tenancy law (Mietrechtsgesetz MRG) governs the legal relationship between landlords and tenants, covering issues such as rent control, lease agreements, and tenant rights.
- **The Renewable Expansion Law** (Erneuerbare-Energien-Gesetz EAG) was recently passed to support the goal of 100% renewable electricity supply by 2030.
- Austria has also introduced **a CO_2 price (CO_2 tax) of €30 per ton** of CO_2, which increases the cost of fossil fuels and incentivizes the use of renewable energy in buildings.
- The **Renewable Heat Supply in New Buildings Act (Energiewirtschaftsgesetz EWG)** prohibits the installation of fossil fuel-based heating systems in new buildings, promoting the use of renewable heating alternatives.

Chamber of Commerce (WKO) is known as the Austrian Federal Economic Chamber and serves as the federal parent organization for the nine State Chambers and 110 trade associations representing various industries within Austria's economic system. **Membership in the WKO is compulsory by Austrian federal law** and includes all active businesses in Austria.

LEGISLATION ON FINANCING RENOVATION OF BUILDINGS

The Limited-Profit Housing Act (LPHA) is a federal state responsibility and follows the idea to build up a long-term social housing stock at below-market cost-rents for large sections of the population. Limited-Profit Housing Associations (LPHA) have limited business activities and follow a cost coverage principle. Shareholders profit is limited by 3.5% of the original capital invested, other profit must be reinvested in housing-related assets, such as refurbishments, by the Associations. LPHA manage a housing stock from 1 million units, which represent 24% of the total housing stock in Austria and almost 40% of all multi-apartment dwellings (data from 2022). The LPHA sector is known for its low energy and passive house standards.

Austria's main legislation governing financing of building renovations includes the residential building subsidies, **the Renovation Bonus, and the THEWOSAN program**. These provide financial incentives and support to encourage energy-efficient renovations of residential buildings in Austria.

Subsidies are conditional on meeting minimum energy and environmental standards, demonstrated through energy audits and performance certificates. They are **managed by the nine Austrian provinces**. and have developed into a **quality assurance system** regarding thermal and ecological standards, planning quality, and social integration. For this reason, we are faced with the peculiar situation that subsidized housing has on average, higher quality standards than most private market products. The efficiency of the housing subsidy system is enhanced by its close interaction with the LPH system and additional capital market financing instruments. Different financing tools (soft loans, annuity grans, grants, guarantees) are used by regional governments to provide object- and subject - related subsidies. The total budget of housing subsidy schemes remained stable €2.5-3 billion per year

in the last decades, almost 30% of the budget is used for refurbishment. In addition, with other subsidies form the federal government (€460 million in 2022) roundabout €1 billion are spent on housing renovation subsidies in 2022.

The federal states subsidise refurbishment measures with a bundle of different measures. A clearly recognisable trend in the 2010s was a decline in subsidies for individual building component renovations with a simultaneous increase in the cash value of subsidies for comprehensive thermal-energy renovations. The subsidy figures nevertheless fell. However, the promotion of individual measures, particularly the replacement of heating systems with regenerative systems, has now become much more important. Non-repayable annuity subsidies for bank or building society loans are the most important instrument in terms of volume and are used in most of the federal states. Some federal states also offer one-off grants with a lower cash value (lost grants).

Subsidy models for low-energy households, the "**Sauber Heizen für Alle" funding programme** was launched in 2022 - but only for the private home sector. The term "alle" is intended to ensure that poorer sections of the population are also able to take advantage of this funding, which is aimed at decarbonising space heating.

Incentives are provided for using renewable energy sources, efficient building services, and climate-friendly construction materials. E.g. the Renovation Bonus (Sanierungsbonus) provides funding for the thermal renovation of multi-story residential buildings with at least three units and terraced housing complexes older than 15 years on national level. Eligible measures include insulation of exterior walls, ceilings, roofs, floors, and replacement of windows and doors.

Funding is awarded as a one-time, non-repayable investment subsidy of up to 30% of eligible costs, with higher amounts for using renewable insulation materials or green roofs, by national government.

TAX REGULATIONS CONCERNING FINANCING RENOVATION OF BUILDINGS

Property Tax: Austria levies property tax on the assessed unit value of developed and undeveloped real estate, with rates depending on the property's intended use and calculated using a special multiplier between 0.1% and 0.2% annually.

Tax deduction for renovation measures: (production and maintenance expenses) allows property owners to deduct a portion of their renovation expenses from their taxable income each year for a period of 15 years, thereby reducing their tax burden. Furthermore, certain renovations aimed at improving energy efficiency or utilizing renewable energy sources may qualify for additional tax-free subsidies.

Real Estate Transfer Tax: is levied at 3.5% of the acquisition price or property value when buying or selling a property. Transfers to close family members are taxed at a 2% rate based on three times the assessed value, while gifts or inheritances are taxed based on the property's value with rates ranging from 0.5% to 3.5%.

Stamp Duty to specific transactions like lease agreements, certificates of bonds, bill of exchange, and assignment of receivables, with rates ranging from 0.13 % to 1%. Real estate transactions with a tax base of €1100 or below are exempt from stamp duty in Austria.

Value Added Tax (VAT): Property owners who rent out or are entrepreneurs according to Austrian tax law qualify for deduction of the value added tax (VAT) on renovation materials and services, further lowering the overall cost of the project. **Condominium associations (WEG)** are considered entrepreneurs under the Value Added Tax Act. They provide services for the administration and

maintenance of common property. WEG is entitled to input tax deduction provided that proper invoices are available.

Capital Gains Tax Exemptions: When selling a property in Austria, you can reduce the amount of capital gains tax by providing information regarding additional expenses related to the development, which increased its cost. Exemptions to the capital gains tax, such as for properties used as a primary residence for at least 2 years, properties inherited or gifted, and properties sold due to divorce or bankruptcy.

Eco special deduction lump sum for individuals: As part of the Eco-Social Tax Reform 2022, it became possible for individuals to deduct energy-efficient renovation measures from their income tax over a period of 5 to 10 years. The basic requirements for this tax deductibility are government support for energy-efficient renovations (e.g. Sanierungsbonus), private use of living unit (family home, apartment) and certain minimum expenses (e.g. €4 000 for thermal-energy-efficient measures).

Documentation of renovation expenses and compliance with energy efficiency standards are typically required to claim deductions or subsidies.

OTHER LEGISLATION CONCERNING FINANCING RENOVATION OF BUILDINGS

The **Kreditinstitute-Immobilienfinanzierungsmaßnahmen-Verordnung (KIM-VO)**, issued by the Austrian **Financial Market Authority (FMA)**, aims to limit systemic risks associated with debt-based financing of residential real estate by credit institutions. While its primary focus is on new private residential real estate financing, it also has implications for renovations and building improvements.

In accordance with the recommendations of the **Financial Market Stability Act (FMSG)** and based on an expert opinion by the Österreichische Nationalbank (OeNB), the FMA has therefore issued limits for the granting of residential property loans. In connection with **energy contracting projects**, there is a specific regulation that is anchored in the Austrian Environmental Assistance Act. [109]

Liability for energy contracting projects: From 2020, the Federal Minister of Finance may, in agreement with the Federal Minister for Climate Action, Environment, Energy, Mobility, Innovation and Technology, assume liability for energy contracting projects within the framework of subsidies for thermal-energy renovation measures and for switching to climate-friendly heating systems (domestic environmental subsidies) up to a maximum cash value of €50 million. The federal guarantee makes it possible to financially secure projects in the field of energy contracting.

6.1.3 Targets for renovation of the building stock

Targets for renovation of the building stock is to raise the building renovation rate in Austria from the current 1.5% to 3% of the total building stock to renovate all the thermally insufficient housing stock in Austria until 2040. Overall, the targets for building renovation in Austria focus on enhancing energy efficiency, reducing carbon emissions, and promoting sustainable innovation in the building sector.

The National Energy and Climate Plan (NECP) – Austria's 2030 target is to reduce non-ETS greenhouse gas emissions by 36% compared to 2005, in line with the EU's Effort Sharing Regulation. Its renewable energy contribution is estimated at 46-50% of gross final energy consumption in 2030, which is considered adequate. For energy efficiency, Austria's contribution remains of low ambition, with a range of 28.7-30.8 Mtoe for primary energy and 24.0-25.6 Mtoe for final energy consumption. The country faces challenges in developing concrete policies and measures to achieve its energy efficiency and emission reduction goals.

Renewable Energy Expansion Act (EAG) provides the legal framework for establishing and operating renewable energy communities. The aim is to promote the use of renewable energy at local and regional level. According to EAG, which regulates the legal basis for renewable energy communities (EEG) in Austria EEGs are allowed to generate, store, consume and distribute energy (electricity, heat or renewable gas) from RES. Only renewable energy may be used, Members of an EEG pay reduced grid usage fees of 57% in the local area and 28-64% in the regional area. Smart meters are required for billing.

Energy efficiency targets in EEffG – The different EU Energy Efficiency Directives has mainly been implemented in the Federal Energy Efficiency Act (EEffG). The nine Austrian federal states are involved in the implementation as important public authorities, as they have many legal competencies in relation to energy efficiency policy.

The **Austrian Energy Agency** was appointed as the national energy efficiency monitoring authority to monitor and evaluate Austria's progress in implementing the EED. The implementation of energy audits or the establishment of recognized management systems must be documented by means of standardized summary reports at least every four years.

The mandatory EE targets set out in the regulation to reduce final energy consumption and realize savings are as follows:

- The indicative target for final energy consumption for a control energy year has been set at 920 petajoules (PJ) for 2030, instead of 1,050 PJ.
- The targets for cumulative final energy saving measures amount to 650 PJ by the end of 2030, of which 250 PJ are to be financed with federal funds and 400 PJ are to come from strategic measures.
- The measures to achieve the targets will be evaluated by E-Control as the new monitoring authority.

Long Term Renovation Strategy (LTRS) – Austrian LTRS supports the renovation of its national building stock into a highly EE and decarbonized building stock by 2050:

- LTRS provides an overview of the national building stock, including statistical sampling and the expected share of renovated buildings by 2020. It identifies cost-effective approaches to renovation relevant to building types and climatic zones, considering potential trigger points in the life cycle of buildings.
- It outlines policies and actions to stimulate cost-effective deep renovation of buildings, including staged deep renovation. It sets indicative milestones for 2030, 2040 and 2050, and provides an estimate of expected energy savings and wider benefits.
- It also ncludes an overview of national initiatives, to promote skills and education in the construction and EE sectors. It also provides an overview of existing and planned financing measures to support the implementation of renovation strategies.
  LTRS also establishes mechanisms for monitoring and verification of the progress made with the implementation of the strategy. It includes an evidence-based estimate of expected energy savings and wider benefits, such as those related to health, safety, and air quality.

6.1.4 Research and development

OwnYourSECAP project [110] – Municipalities and cities across the EU are working together with energy and climate protection experts to develop and implement the SECAPs (Sustainable Energy and Climate Action Plans) and tackle the issue of energy poverty.

IncorporatEE [111] – EU-funded project builds on the experience in the cities of Salzburg and Villach. By promoting investment in major renovations, improving building technology and installing renewable energy sources in local public buildings, the project aims to achieve energy savings of 55% and CO_2 savings of 65%.

RenoBooster [112] in Vienna aimed to boost renovations in private residential buildings by establishing a One-Stop-Shop called "Hauskunft." The Horizon 2020 project analyzed the renovation market to identify gaps, existing services, new ones, etc. Hauskunft exists after end of the project.

RENEWNow [113] focuses on sustainable building practices and EE initiatives. The focus is on implementing innovative strategies to support sustainable development and reduce environmental impact through advanced building renovation and construction techniques.

RENOVATE2RECOVER [114] is an initiative focusing on leveraging the National Recovery and Resilience Plans (NRRPs) to accelerate deep renovation activities across the EU, including Austria.

RENVELOPE - Energy Adaptive Shell [115] developed a cost-efficient, circular, complete solution for modernizing existing buildings by conditioning buildings from an outer shell (façade, roof boxes), which is a shift from the traditional approach of housing the heating, ventilation and air conditioning systems inside the building.

MEIDLINGER "L" [116] develops a basis for a transformation and a demo project for new vertical and horizontal green spaces at house fronts in the street space. The project takes an integral and inter-disciplinary approach to climate change adaptation in existing buildings at the interface of public and private space.

MESTRI-CE [117] aims to develop a methodology to support the implementation of new EU requirements, including implementing uniform building standards, adequate data management systems, technical and economic assessments, potential savings predictions, and verification and reporting. It establishes a new investment model to finance more climate-friendly buildings that guarantee sustainability.

KNOwNEBs [118] deals with integration of non-energy benefits into energy audit practices to accelerate the uptake of recommended measures.

NOVICE [119]’s main goal was to develop and demonstrate an innovative business model for Energy Service Companies (ESCOs) that would provide energy savings to buildings and Demand Response (DR) services to the grid after renovating buildings or blocks of buildings.

DECLEAR [120] is reducing the energy demand of households by building measures as preventing energy poverty. For the study, statistical data were processed into a matrix that maps characteristic cases of energy poverty weighted.

TIMEPAC [121] will improve the existing certification process across countries through Transversal Deployment Scenarios. Each TDS encompasses various stages of the EnPC workflow (generation, storage, analysis, and exploitation), involving multiple stakeholders (research groups, energy agencies, ESCOS, etc.) and resources (data, tools, methods).

The Austrian Federal Environment Agency, in a comprehensive "**potential analysis" for the Austrian Federal Economic Chamber's Division for Banking and Insurance**, has calculated that achieving climate neutrality by 2040 would require additional investment totalling around €145 billion in the sectors of energy, industry, buildings, and transportation by 2030. In the building sector, approximately €26 billion in additional investments are needed, particularly for thermal renovation of buildings and switching heating systems to RES. To drive climate transformation in the building sector, realistic data on buildings (such as energy certificates indicating thermal building quality, heating types, and building technology) and plans (such as renovation schedules) are crucial. High-quality and nationally standardized availability of digital energy certificates is essential to ensure effective monitoring and decision-making processes regarding EE measures and renovations.

KlimaCent [122] analysed the framework conditions for financing the so called “Wärmewende” in Austria up to 2040. Existing and foreseeable new financing instruments for building renovation at home and abroad were examined for their effectiveness and the financing needs up to 2040 were estimated. Finally, a newly developed non-budgetary financial instrument is presented to fill the identified funding gap. A particular focus is on the political-legal feasibility of the proposals.

Renovation and decarbonisation of 1990s residential buildings in Lower Austria. From pilot to scaling. This project investigates easy-to-implement renovation measures to decarbonise buildings erected in the 1990s. The aim is to identify and finance measures that work with minimally invasive interventions in inhabited dwellings. The project supports the redevelopment process with a particular focus on economic feasibility and social and environmental sustainability.

Methods to accelerate renovations of single and double housing since the refurbishment of single and double housing has steadily declined in recent years this action develops a set of measures to speed up comprehensive private redevelopments again (establishment of redevelopment coaches, reduction of complexity, coordination of support systems at federal and state level, easily accessible energy and redevelopment consultancy services).

The **Report on Housing subsidies 2023** [123] is the 14th update of a comprehensive report on Austrian housing subsidies, conducted annually since 2010 on behalf of the City of Vienna. This study is the most comprehensive data collection and analysis available on the Austrian housing subsidy schemes by the nine Austrian federal states and their context concerning EU trends, housing in Austria in general, demographics, the building sector, and climate policy.

The **Berichtsstandard Wohnbauförderung 2023** [124] builds on the last available data sources concerning housing policy expenses by the regions, data collected by the Environment Agency Austria (UBA) on subsidized refurbishments, housing statistics, population trends, construction activity and climate policy expenses. It also incorporates specific survey data collected from housing practitioners in the respective regional administrations.

Austria supports energy renovations in buildings through various awareness activities, partnerships, and educational programs. Here are some key initiatives:

Citizen Hubs for Energy Renovation – Austria uses Citizen Hubs as platforms to engage citizens, provide information, and raise awareness about energy efficiency in buildings. These hubs serve as **one-stop-shops** (OSS) to promote and support energy renovations at the community level. As they are important to raise awareness about EE renovations among citizens they are installed in each federal state:

- The Energieberatung **Burgenland** offer free advice on refurbishment, energy saving and current subsidies. The Burgenland provincial government provides information on its website.

- In **Carinthia** – Energy advice for Carinthian households: thermal insulation, window replacement, optimization/renewal of the heating system, use of solar energy (especially photovoltaics), summer overheating and tips for power saving.
- In **Lower Austria** – Energie- und Umweltagentur des Landes Niederösterreich (eNu) advises citizens and municipalities on the efficient use of energy, in new construction and renovation projects. The eNu also provides information about energy subsidies in Lower Austria.
- In **Upper Austria** – OÖ Energiesparverband is an institution of the Province of Upper Austria and the central contact point for product-independent energy information. It offers free energy advice for households and energy consulting for municipalities and companies.
- In **Land Salzburg** – provides independent, product-neutral and free advice on energy renovation projects.
- In **province of Styria** – offers subsidized energy advice for single-family home, and provides on its website a list of officially recognized energy advisory centres in Styria.
- In **Tirol** – Energy Agency Tirol is the independent advice center of the province of Tyrol and a competent contact for all energy issues. It supports builders, tenants, institutions and municipalities in identifying their energy-saving potential and implementing appropriate measures and provides information about current energy subsidies in Tyrol and Austria.
- In **Vorarlberg** – Energy Institute Vorarlberg answers questions about energy and ecology in new buildings and renovations. It also holds an overview for private individuals about the housing and energy subsidies.
- In **Vienna** – the Hauskunft offers free, individual and practical advice. As a service of the City of Vienna, Climate and Innovation Agency offers step by step in the transition to renewable energy systems.

Renovation Initiative by the Austrian Federal Government

Klimaaktiv, Austria's climate protection initiative, aligns with building renovation efforts in several keyways and promotes energy-efficient and sustainable building practices:

- Offers advice, information, and qualification initiatives to stakeholders, shape market trends towards more energy-efficient buildings.
- Setting transparent standards and quality assurance measures: klimaaktiv standards.
- Measures the success of its building renovation program through several key indicators and metrics, number of klimaaktiv certified buildings, Energy efficiency and greenhouse gas emissions savings, market share of ecological buildings and establishment of the klimaaktiv building standard as a benchmark.
- Activating and integrating relevant players and stakeholders and building partnerships with stakeholders from the building sector, measures level of engagement and cooperation.
- provides consultations and training sessions to support the implementation of its standards and criteria and measures its success by tracking the satisfaction of its clients.
- awards prizes for outstanding projects that demonstrate excellence in sustainability, energy efficiency, and ecological building.

The "Sanierungstoolbox" by klimaaktiv is a resource aimed at supporting building renovation and heating system replacement in Austria. This toolbox provides valuable information, guidelines, and tools to facilitate energy-efficient renovations and promote sustainable building practices.

Initiatives e.g. "Österreich ist nicht ganz dicht" is the slogan for a new campaign launched by Austria's Ministry of Climate Action to promote the Sanierungsbonus (renovation bonus) program, that provides

financial incentives to encourage building owners to undertake thermal renovations and improve the energy efficiency of their properties.

Energy Audits and Advice for Households: Austria offers energy advice to households through the energy advice bodies of the federal states. These audits and advice services help homeowners understand the benefits of energy renovations and guide them through the process. Energy advices to households are provided by trained and independent auditors. They help households understand their energy consumption, identify efficiency improvement opportunities, and guide them through the process of implementing energy-saving measures. [125]

Partnerships and Networks: Austria collaborates with various stakeholders, including the construction industry, to promote energy renovations.

- **Austrian Institute of Construction Engineering (OIB)** develops guidelines and strategies to support thermal energy renovations and the use of renewable energy sources in buildings.
- **Climate Hub**, specifically, Climate Lab in Vienna, is a unique initiative that brings together diverse stakeholders to drive climate action and achieve climate neutrality goals.
- **The Innovation Labs part funded by Austrian Ministry of Climate Action and Energy (BMK)** are initiatives that focus on driving change and innovation within the ministry and the wider insurance industry.
- **National Cluster** are networks or groups of interconnected companies, suppliers, service providers, and associated institutions in a particular industry or sector. These clusters aim to promote innovation, collaboration, and competitiveness within their respective fields. They play a significant role in the Austrian economy by fostering cooperation and knowledge sharing among businesses and research institutions.

Educational Programs: Austria invests in educational programs to build capacity in the construction and energy efficiency sectors. This helps to ensure that skilled professionals are available to carry out high-quality energy renovations.

Austrian Development Agency (ADA) Projects supports projects in domestic development-education work that advance development education, cultural activities, and public relations in Austria.

Global Citizenship Education and Education for Sustainable Development: Austria is dedicated to implementing the Sustainable Development Goals (SDGs) and Agenda 2030 through Global Citizenship Education and Education for Sustainable Development. The **Austrian Youth Strategy** focuses on encouraging the active involvement of young individuals in political processes, with an emphasis on participation and initiative.

National Reform Program 2023: includes reforms focusing on green and digital transitions. The program aims to ensure the stability and professionalism of public administration, with a specific focus on tertiary education and the newly created university education programs.

Vienna International School (VIS) - Education for Sustainable Development: integrates the Eco School Program and the Sustainable Development Goals into its curriculum to educate students on global issues and sustainability.

TU Wien - MEng Sustainable Construction: offers the MEng Sustainable Construction program, focusing on sustainable construction practices.

Green Building Solutions (GBS) Summer University: organized by OeAD student housing is an academic program that focuses on green building solutions. It is designed for international students and professionals in architecture, planning, and engineering.

Energy agencies in the states provide training and education for energy consulting, known as "Energieberatungen Ausbildung". They are essential for professionals looking to provide expertise in EE, RES, and sustainable building practices.

6.2 Market capacities relevant for financing sustainable renovation

6.2.1 Building stock features

TECHNICAL CAPACITIES OF BUILDING STOCK

Austria has a diverse building stock with a mix of residential and non-residential buildings. The 2021 register census identified 2,374,777 buildings. Of these, 2,097,996 are residential buildings and the remaining 276,781 buildings are used for other purposes such as commerce, offices or industry [126].

Around 13% of buildings in Austria date from before 1919. Every 15th building was constructed between 1919 and 1944. The other construction periods, except for the construction years 1945 to 1960 and the years after 2000. The years 1971 to 1990 account for the largest share (26.8% in total), while the period between 1990 and 2010 accounted for more than a fifth of the buildings, roughly the same number as between 1945 and 1970.

Residential buildings make up a significant portion of the stock, with both single-family houses and multi-family/terraced houses. Residential buildings are single-family houses (SFH), multi-family/terraced houses (MFH) and apartment buildings. The building stock is relatively old, with over half of residential buildings constructed before 1970 when the first thermal regulations were introduced. The average U-values for walls range from 0.2-1.8 W/(m²K) depending on construction period, indicating varying levels of insulation. Heating demand varies widely from 10 to 380 kWh/(m²a) for residential buildings depending on age and insulation levels. Older buildings tend to have much higher heating demands.

The degree of **urbanization differs across Austria**. On average, 42% of residential buildings are located in high-density urban centres, 30% in intermediate urban areas, and 28% in rural areas.

- Vienna, as the capital and largest city, has a unique building stock characterized by its historic center and the “Gründerzeit” period redevelopment in the 19th century. The city's buildings showcase a range of architectural styles from the Middle Ages to the present.
- Rural areas have a mix of historic farmhouses, villages, and more modern residential and agricultural buildings. Traditional building materials like wood and stone are common.
- Historic buildings are Baroque palaces and churches, especially in Vienna and Salzburg, built by Italian architects in the 17th-18th century, medieval castles and fortresses like Hohenzollern Fortress in Salzburg and Historic city centres like Vienna's Inner Stadt.
- Modern architecture are iconic 20th century buildings like the Kunsthaus in Bregenz by Peter Zumthor, Ski jumps and Olympic venues like Zaha Hadid's Bergisel Ski Jump in Innsbruck and Contemporary social housing projects like the Lohbach Residences in Innsbruck.

Non-residential buildings make up a smaller but significant portion of the stock. Offices, wholesale, and education facilities account for about 75% of the service sector floor area. Other on-residential buildings are retail buildings, hospitals and healthcare facilities, hotels and restaurants.

The technical condition of the building stock varies with a range of construction types and ages. The residential building stock is relatively well-documented, with data available on building characteristics, construction periods, and energy performance. However, there is a lack of comprehensive data on the non-residential building stock since there is no transparent existing database. **Typical construction elements** in Austrian buildings include tilted roofs, wooden or concrete ceilings, and brick or concrete walls. The thermal performance of these elements varies widely depending on the construction period. Older buildings often have heating systems from the 1990s or earlier, which are less efficient than modern condensing boiler systems.

Energy performance certificate data shows that around **15% of the building stock has the worst energy efficiency**, belonging to the lowest energy classes. The **average rate of renovation between 2000 and 2010 was reportedly 1% per year**, with some differences at the regional level and based on building ownership. Buildings owned by non-profit organizations or local authorities showed renovation rates above 1%, so they did not reach the target of 3% per year. **Around 83% of the overall dwelling stock in Austria was built before 1990 and will therefore be subject to thermal renovation in the upcoming years.** The proposed EU Directive on the Energy Performance of Buildings aims to mandate the renovation of the 15% of the Austrian building stock with the lowest energy efficiency, between 2025 and 2033. The providing funding alone is insufficient to stimulate retrofits, and more support is needed such as one-stop-shops offering independent advice.

Lack of Comprehensive Data – There is a severe lack of data regarding the technical condition and energy performance of non-residential buildings in Austria. The available data is predominantly focused on the residential sector, making difficult to assess the full scope of the retrofit challenge across the entire building stock.

Challenges for Financially Disadvantaged Households – Mandatory renovation of the 15% least efficient buildings will predominantly impact single-family homes owned by elderly people with a short future life horizon, and financially disadvantaged households that cannot afford the upgrades.

Capacity Constraints in the Construction Industry – The construction industry and its connected trades will need to significantly ramp up capacity to handle the increased renovation workload. More transparency and consumer rights enforcement will also be important to ensure a socially acceptable energy transition.

FINANCIAL VOLUME FOR RENOVATION OF BUILDING STOCK

To achieve the Austrian climate targets by 2040, 85,000 apartments and 15,000 apartment equivalents in service buildings must be decarbonized every year. **Since the heating system of 100,000 homes needs to be replaced every year due to their age**, the challenge is not in the number to be achieved, but in the implementation of technology changes to renewable heating systems.

To achieve the decarbonization of residential and service buildings by 2040, annual investments of €1.7 billion are required. The costs over and above the heating system replacements and self-initiated conversions that are due anyway account for 30-40% of this, i.e. € 500-700 million per year. If the necessary thermal refurbishment measures are included, this results in a total investment requirement of around €80 billion by 2040, of which only €20 billion will go beyond the extent of refurbishment required anyway. **The funding requirement for these necessary refurbishment measures amounts to**

around €900 million per year, whereby the amount depends on the instruments used. Compared to the current subsidy volume of around €500 million, this means that a doubling is necessary [127]. Other calculations arrive at a higher annual investment requirement on energy efficiency measures of €2.5 billion in the baseline scenario and €2.9 billion in the efficient scenario [128].

The cost of retrofitting buildings for decarbonized heat includes expenses related to various low carbon heating options such as air-source heat pumps, hybrid heat pumps, green hydrogen boilers, biomass boilers, and low carbon district heat networks. These costs are influenced by factors like predicted electricity costs, green hydrogen costs, and the specific heating system deployed.

While EE measures may not always be cost-effective at an individual building level, the installation of these measures can lead to cost savings for the entire energy system. The savings are estimated to be at least €0.4 billion per year, with the potential for even greater savings depending on the type of renewable heating system implemented.

The Austrian government has introduced incentives and subsidies to support green retrofit initiatives, such as providing a subsidy of up to 50% of eligible renovation costs, with higher rates available for low-income households. These incentives aim to encourage homeowners to enhance the energy efficiency of existing buildings [129].

"Kostenoptimalität": The cost-optimal building renovation arrangement in Austria involves identifying the most efficient and cost-effective strategies for improving the heating energy performance of buildings. This process is based on typical building characteristics, construction types, and climatic conditions with the aim to achieve optimal EE improvements while considering the building type, climatic zone, and life-cycle costs. The guidelines provided by the OIB outline recommendations for renovations steps to enhance the energy performance of buildings in a cost-effective manner.

6.2.2 Renovation technologies and intervention

TYPES OF TECHNOLOGIES FOR RENOVATION OF BUILDINGS

The most used technologies for energy-efficient building renovations in Austria focus on improving the building envelope, upgrading heating and ventilation systems, integrating renewable energy sources, and implementing smart building controls to optimize energy performance. Upgrading the insulation of building envelopes, such as walls, roofs, and floors, is a key measure to reduce heat loss and improve EE. This often involves adding external insulation to existing walls or replacing windows with more efficient models.

Ecological materials are an important aspect in the renovation of buildings, as they not only protect the environment but can also improve the health of the occupants. The following material are used:

- **Soft fibre boards** are made from wood waste. They are free of harmful substances, open to diffusion and suitable for the interior insulation of old buildings.
- **Silicate lightweight foam** is a mineral insulation material, made from expanded glass. It is non-combustible and suitable for core insulation in double-shell masonry.
- **Lime insulating plaster** is purely mineral plaster that offers improved thermal insulation and a healthy indoor climate. It is particularly suitable for cellar renovation.
- **Blown-in insulation** consists of biological materials such as cork, wood fibre, seaweed or cellulose and offers comparable insulation performance to conventional insulation materials.
- **Ecological building materials** should not contain respirable fibres and fine dust to protect the health of residents and should be produced sustainably and from renewable raw materials.

Reputable eco-labels such as **IBO Certificate** [130] or **NaturePlus** [131] set high test criteria and guarantee the quality of ecological building materials. A specific web portal and database **Baubook** [132] simplifies ecological and healthy building by providing validated building material data for the calculation of energy and ecological performance indicators. It contains around 3,700 validated building products from a wide range of manufacturers. The data basis is used to calculate life cycle assessments and energy performance certificates. It facilitates verification in the context of ecological tenders, building certifications, and subsidy systems. Baubook offers useful online optimisation tools such as the **baubook calculator** for building components, **eco2soft** for life cycle assessments, and **AWR amortisation and profitability calculator**.

Replacing old, inefficient heating systems with modern, high-efficiency alternatives is another important aspect of building renovations in Austria. This includes technologies like condensing boilers, heat pumps, and biomass boilers that use RES.

Integrating renewable energy technologies, such as solar photovoltaic systems and solar thermal collectors, into renovated buildings helps reduce their reliance on fossil fuels and further improves their energy performance. For example, the plus-energy office high-rise building in Vienna has a large photovoltaic system to generate clean electricity on-site.

Upgrading ventilation systems, often in combination with heat recovery, helps maintain good indoor air quality while minimizing heat losses. This is particularly important in well-insulated buildings to ensure adequate air exchange and prevent moisture buildup.

Implementing building automation and control systems allows for the optimization of a building's energy use by automatically adjusting heating, cooling, ventilation, and lighting based on occupancy and external conditions. This helps ensure efficient operation and maximizes energy savings.

Implement **plus-energy buildings** include significant energy cost savings, environmental benefits, occupant comfort, community integration, and technological innovation, making them a desirable and sustainable choice. Austria is leveraging various renewable energy sources for buildings, such as Hydropower, which accounts the highest amount of total electricity generation. Bioenergy makes up 59% of Austria's renewable energy production, primarily from solid biofuels like wood chips and fuelwood. The use of solar energy is growing, though it currently supplies about 6.3% of renewable energy. Wind power accounts for 13% of the power sector, with plans to increase this to 26% by 2030.

Producing precast elements specializes in prefabricated cellars and precast concrete or timber elements. Examples include sandwich walls, solid walls, and facade elements. Modular houses are a popular trend in prefabricated timber building construction in Austria.

TYPES OF INTERVENTIONS FOR RENOVATION OF BUILDINGS

The most often used intervention /processes for EE renovation are:

- replacing old, inefficient windows with more energy-efficient models,
- upgrading heating systems and replacing old, inefficient heating systems with modern, high-efficiency alternatives like condensing boilers,
- Installing renewable heating technologies such as heat pumps and biomass boilers and optimizing heating system controls and dimensioning,
- enhancing the airtightness of the building envelope,
- upgrading thermal insulation of walls, roofs, and floors to reduce heat loss and improve EE.

Austria has set a goal to overcome its dependence on oil, gas, and coal in heating by 2040. The "Raus aus Gas" (Exit Gas) initiative in Vienna is a key part of this effort. This initiative focuses on expanding district heating, which currently supplies around 40% of Vienna's heating and hot water needs.

For private homeowners, the "Raus aus Öl und Gas" (Exit Oil and Gas) funding program provides incentives to replace fossil fuel heating systems with more efficient and climate-friendly alternatives like heat pumps, biomass boilers, or connection to district heating. But it does not push **deep renovation** which involves comprehensive measures to significantly improve the EE of buildings. It goes beyond standard renovation practices to achieve substantial energy savings, typically ranging from 60% to 90%.

The **step-by-step renovation** is a structured approach to the renovation of buildings, focusing on incremental improvements to achieve significant EE gains. It is intended to be cost-effective and efficient while ensuring that the building is restored to a sustainable and EE state.

6.2.3 Funding

DIRECT FUNDING FROM EU SOURCES

European Structural and Investment Funds (ESI Funds): Most of the EU funding in Austria is provided via the **ESI Funds**, which are administered by national and regional authorities. These include the **European Social Fund (ESF), the European Regional Development Fund (ERDF) and the European Agricultural Fund for Rural Development (EAFRD).** The ESI Funds target a range of stakeholders, including businesses, especially SMEs, to enhance their competitiveness and innovation Individuals, and to improve employment and education opportunities, and combat poverty and social exclusion. Regional and local authorities support integrated urban and rural development.

European Investment Bank (EIB) Group: The EIB works with partner banks to facilitate access to finance. It offers loans and guarantees of up to €7.5 million for SMEs in the areas of innovation, research and development. In addition, the EIB provides equity and venture capital through local and national intermediaries, focusing primarily on the life sciences sector. It has also provided financing for renewable energy projects, including wind farms, that contribute to the decarbonization of the energy sector. In 2023, the EIB Group committed €1.26 billion in new financing for projects in Austria.

The EIB Group's financing in Austria targets a wide range of stakeholders, including businesses, especially SMEs, to enhance their competitiveness, innovation, and access to finance regional and local authorities, to support sustainable urban and rural development, individuals, to improve access to affordable housing and social infrastructure.

FINANCIAL MECHANISMS OF STATE SUBSIDY PROGRAMMES

Austria offers various financing models for energy efficiency (EE) projects, including **own funding, loan financing, ESCO model, public-private partnership (PPP), and grant schemes.** The suitability of each model depends on factors such as the type of project, expected payback period, and the capabilities of public bodies to implement the model. Grants are often combined with own financing, and the blending of EU grants with other financing models is becoming more popular.

European Regional Development Fund (ERDF): With a funding of approximately €536 million for the 2014-2020 period the focus lies in research and innovation, shift to a low-carbon economy, and competitiveness. For **c**limate protection at least 20% of ERDF funding (around €110 million) is

earmarked for projects related to climate protection. It is managed by 16 federal and regional funding agencies, which provide information on eligible measures and funding conditions.

European Social Fund (ESF): Approximately €875 million for the 2014-2020 period was available for employment, education, and combating poverty, with a focus on social integration and economic and social cohesion. ESF funding is allocated through operational programs, which define the main focuses and goals of the measures.

Co-financing - National financing sources supplement European funding: These financial mechanisms demonstrate the diverse range of state subsidy programs in Austria, addressing various sectors and goals, from innovation and EE to regional development and social cohesion.

Subsidy Program for Siding and Intermodal Terminals: This program, managed by the Federal Ministry for Climate Action, provides grants or annuities of up to 50% for the construction and expansion of terminal facilities to improve access to rail and inland waterway systems.

Bilateral Climate Finance Program: This program, managed by the Austrian Ministry for Climate Action, provides grants of up to 100% of eligible project costs for initiatives related to climate change mitigation and adaptation.

MECHANISMS TO ATTRACT COMMERCIAL FINANCING PRODUCTS

Loan Guarantee Programs: Austria has enlarged its regular loan guarantee programs e.g. in 2020 to include COVID-19 response measures, such as bridge-financing loans with specific terms like 100% guarantee rates, zero-interest rates, and eligibility for companies in difficulties. Secure liquidity and facilitate the financing of working capital loans for companies affected by the COVID-19 crisis. Applications are forwarded to specialized agencies like **Austrian Federal Promotional Bank (AWS) for SMEs or Österreichische Kontrollbank for large companies.**

Risk Capital Initiatives: the objective Is to stimulate the development of a well-functioning market for risk capital to enhance access to finance for young, innovative SMEs. Public-financed Venture Capital Funds, Fund-of-Fund programs, and legislative initiatives like the Law on Crowdfunding. Carried also out by subsidiaries of the **AWS** to eliminate any state aid component. The AWS generally assumes 80% of the credit risk, while the financing institution bears at least 20%. The costs for the guarantee are made up of a processing fee and a rating-dependent guarantee fee.

Direct Market Plus on Vienna Stock Exchange: The objective is to provide an easy access to the capital market for small and medium enterprises. Low stock exchange fees and less strict listing requirements compared to the main market.

European Structural and Investment (ESI) Funds: The ESF is funding around €442 million for 2014-2020, focused on employment, education, and combating poverty. This is managed by 16 federal and regional funding agencies in Austria.

Private equity and venture capital: Private equity funds and venture capital investors provide equity capital for companies to finance growth and development. Although Austria has played a rather minor role in the private equity market to date, companies are becoming increasingly open to this form of financing, especially for growth investments and succession planning.

Investment promotion and guarantees: AWS offers guarantees that facilitate access to credit for companies and reduce the risk for private investors. These guarantees are aimed at companies of all sizes and can be used for both investments and working capital.

Tax incentives: Austria is currently discussing a new corporate investment law to reduce tax hurdles for private and foreign investors. Special vehicles such as the “Private PRIVAK” in Belgium offer tax incentives to encourage investment in venture capital.

Investment control and safeguards: Consideration is being given to adding public welfare risks to existing investment screening to prevent unwanted takeovers by for-profit investors. In sensitive areas such as care or housing, measures are being discussed to keep financial investors out and to strengthen public welfare-oriented players.

Public investment offensive: The public sector could itself act more strongly as an investor to advance the renewal and further development of critical infrastructures. This would curb the risky expansion strategies of profit-oriented investors.

MECHANISMS TO ATTRACT DIRECT PRIVATE INVESTMENTS

Austria employs a multi-faceted approach, combining financial incentives, risk-sharing mechanisms, legal reforms, and strategic public investments to create an attractive environment for direct private investments, particularly in innovative, sustainable, and community-oriented projects tax incentives, and other incentives to invest own equity, crowd funding, ESCO etc.

Venture Capital (VE) and Private Equity (PE): players are e.g. Speedinvest, Xista science ventures, and the AWS Gründerfonds providing financing and support for startups and innovative companies.

Loan Guarantee Programs: Austria Wirtschaftsservice (AWS) offers loan guarantee programs that reduce the risk for private investors by providing guarantees for up to 80% of the credit amount. These guarantees are available for companies of all sizes, covering both investments and working capital needs.

Tax Incentives: Austria is considering introducing new tax benefits and incentives, such as the possibility to create a "flexible corporation" (FlexCo) with reduced minimum share capital, to further attract private investments in startups and innovative companies.

Investment Screening and Protection Measures: There are discussions about expanding Austria's investment screening mechanisms to protect against unwanted takeovers by profit-oriented investors, particularly in sensitive sectors like healthcare and housing. This aims to ensure that private investments align with the public interest and support sustainable, community-oriented development.

Public Investment Initiatives: The public sector in Austria could take a more active role as an investor to drive the renewal and development of critical infrastructure, thereby crowding in private capital and limiting the influence of profit-driven investors.

Funding Agencies and Programs: Austria has specialized funding agencies like the Austrian Research Promotion Agency (FFG) and Austria Wirtschaftsservice (AWS) that provide a range of subsidies, grants, and other financial support to attract private investments, especially in research, innovation, and sustainability.

Stable Economy: Austria is known for its stable economy. This stability attracts foreign investors who seek secure environments for their investments.

Favorable Foreign Investment Legislation: Austria does not discriminate between local and foreign investors. The Commercial Code provides the same requirements for both types of entrepreneurs. This favorable legislation makes Austria an attractive place for foreign investments.

High Living Standards and Infrastructure: Austria offers high living standards and well-developed infrastructure, which are attractive to foreign investors. The country is one of the largest exporters in Europe and is known for its strong protection of intellectual property rights.

Financial Centre: Austria aims to strengthen its position as a financial centre. The initiative includes measures to improve the long-term financing of the economy and ensure financial stability. This includes increasing the demand for capital market products and improving risk capital and equity financing.

6.3 Analysis of the area “financing building renovation”

The analysis was prepared based on a dialog in the RENOWAVE.AT network, and a summary was presented to the technical working groups and checked for plausibility.

6.3.1 Main findings on financing the renovation of private buildings

In Austria in particular, the Limited-Profit Housing Act (LPHA), a federal state responsibility follows the idea to **build up a long-term social housing stock at below-market cost-rents for large sections of the population.** There are established programs for subsidizing the renovation of residential buildings, e.g. Subsidy models for low-energy households and the "Sauber Heizen für Alle“ funding program. Reputable eco-labels such as IBO Certificate set high test criteria and guarantee the quality of ecological building materials - they are funded. home savings schemes are not attractive, tax models are missing. But Austria has no climate protection law and the costs of achieving zero-emission standards are expensive, specially saving the last few kilowatt-hours per square meter per year. Pre-financing is not possible by private, which offers various financing mechanisms, including subsidies, loans, and public-private partnerships, the complexity of navigating these different options can be a barrier for some private building owners.

The mandatory renovation of the 15% least efficient buildings will predominantly impact single-family homes owned by elderly people with a short future life horizon, and financially disadvantaged households that cannot afford the upgrades. This is especially true particularly for smaller projects. The access to financing options is limited. The “WEG” Condominium Act is one of the greatest barriers, since there is a lack of coordination and communication between different stakeholders. There is also a lack of databases with appropriate technical data on energy consumption, investment cost benchmarks.

Table 1: SWOT analysis in financing building renovation of private buildings in Austria.

STRENGTHS	WEAKNESSES
• **Well-established subsidy programs for residential building renovations, e.g. Subsidy models for low-energy households: The "Sauber Heizen für Alle".** • Incentives for Renewable Energy and Energy Efficiency in line with achievement of high energy efficiency standards, such as the passive house standard -> helps drive deeper energy renovations. • Legislation governing financing of building renovations includes the residential building subsidies, the Renovation Bonus, and the THEWOSAN program.	• The building permit process is in long and in 9 federal states different. • **Austria has NO climate protection law.** • High Costs of Achieving Zero-Emission Standards (expensive costs), saving the last few kilowatt-hours per square meter per year causes disproportionately high costs. • The current renovation rate in Austria is around 1.5%, which is below the target of 3% needed to achieve significant energy efficiency improvements and meet climate targets.

• Limited-Profit Housing Act (LPHA), a federal state responsibility and follows the idea to build up a long-term social housing stock at below-market cost-rents for large sections of the population. • Citizen Hubs as platforms to engage citizens, provide information, and raise awareness about energy efficiency in buildings. • **Reputable eco-labels such as IBO Certificate, NaturePlus set high test criteria and guarantee the quality of ecological building materials and are funded.** • No discriminate between local and foreign investors. The Commercial Code provides the same requirements for both types of entrepreneurs. • Leveraging a combination of funding sources, such as blending EU grants (e.g., ESIF) with other financing mechanisms like loans or ESCO/PPP models. • Regulatory Framework: implemented regulations and guidelines. • **Capacity Building: initiatives like AEA, cluster, OSS... that support the dissemination of energy efficiency and renewable energy activities.** • **Tax Incentives: for investments, stimulate the provision of risk capital and contribute to the growth of the financial sector, supporting building renovations.** • **Stable Economy and Favourable Investment Climate**: an attractive destination for foreign direct investments, which can support building renovation activities.	• Offers various financing mechanisms, including subsidies, loans, and public-private partnerships, the complexity of navigating these different options can be a barrier for some private building owners. • Available funding may not be sufficient to support the scale of renovations needed to meet national and EU energy efficiency targets. More comprehensive and effective funding mechanisms are required. • Raising public awareness about the benefits of energy renovations and providing education on the necessary steps can be a challenge. • Ensure its renovation strategies and financing mechanisms are fully aligned with EU policies and goals, such as the Renovation Wave and 2050 climate targets. Stronger integration with EU-level initiatives could be beneficial. • Ensuring the cost-effectiveness of renovation projects through life-cycle assessments and other measures remains an area that requires further development and attention. • Integrating digital technologies and innovative solutions into the renovation process to enhance efficiency and sustainability is an area where more progress is needed. • Some federal states – more privately owned residential building stock. • **OSSs are not responsible for multistore residential building.** • **Home savings schemes are not attractive.** • **Lack of fully transparent database for EPC data of existing properties.**
OPPORTUNITIES/POSSIBILITIES	**THREATS/BARRIERS**
• **Tax deduction for renovation measures (production- and maintenance expenses) could be more,** Tax incentives to encourage energy-efficient renovations. • Innovative Methods for Energy Performance Assessment and Certification of Buildings (renovation pass already implemented). • Around 83% of the overall dwelling stock in Austria was built before 1990 -- subject to thermal renovation in the upcoming years. • Leverage EU funding streams such as the European Structural and Investment Funds (ESIF), the European Fund for Strategic Investments (EFSI), Horizon 2020, and the ELENA facility to support building renovations. • Innovative financing models such as on-bill finance, property assessed clean energy (PACE) financing, energy-efficient mortgages, energy efficiency feed-in tariffs, incremental property taxation, one-stop shops, and crowdfunding. • Public-private partnerships (PPPs), leveraging private sector expertise and funding to support public sector projects. • Blend different funding sources, EU grants with other financing mechanisms like loans or ESCO models	• **Mandatory renovation of the 15% least efficient buildings will predominantly impact single-family homes owned by elderly people with a short future life horizon, and financially disadvantaged. households that cannot afford the upgrades. Special support will be needed for these vulnerable groups.** • Insufficient capacity in the construction industry to handle the increased demand for energy renovations can lead to delays and higher costs. The construction industry and its connected trades will need to significantly ramp up! capacity to handle the increased renovation workload. • More transparency and consumer rights enforcement will also be important to ensure a socially acceptable energy transition. • Available funding for energy renovations might not be sufficient to support the scale of renovations needed to meet national and EU energy efficiency targets. • Complexity of financing mechanisms, such as blending different funding sources. • **Upfront costs of energy renovations can be a significant barrier for private building owners.** • Limited awareness and education about the benefits of energy renovations.

• Energy efficiency obligations to ensure that energy-intensive buildings Energy Service Agreements: by providing a guaranteed energy savings performance contract. • Revolving funds by providing a pool of funds that are replenished as energy savings are achieved (see WBIB). • Crowdfunding by leveraging social media platforms to raise funds from many individuals. • Increase the use of energy efficiency feed-in tariffs by providing incentives for energy-efficient upgrades that generate energy savings. • Increase the use of on-bill finance by providing incentives for energy-efficient upgrades that are financed through energy savings. • Increase the use of energy efficiency mortgages by providing incentives for energy-efficient upgrades that are financed through mortgages. • Support staged renovations, i.e.. longs lasting and predictable, see EPBD. • Energy communities combined with other innovative solutions.	• Complex planning procedures and lack of clear guidelines can slow down the implementation of energy renovations. • Need for specialized expertise and equipment in small municipalities), can increase the costs and complexity. • Risk of non-compliance with EU and national regulations can deter private building owners from investing in energy renovations. • Limited access to financing options, particularly for smaller projects. • High transaction costs associated with energy renovations, such as consulting fees and administrative expenses. • **Resistance to change and lack of public awareness.** • Lack of coordination and communication between different stakeholders and WEG, lack of contact between building owners and energy professionals, and lack of coordination between institutions. • **Limited economic benefits, since energy ha low costs.** • Environmental barriers – EU renaturations Law. • Lack of clear policies and regulations, no climate protection law. • **Lack of databases** with appropriate technical data on energy consumption, investment cost benchmarks.

6.3.2 Main findings on financing the renovation of public buildings

Several attractive programs exist in Austria: klimaaktiv, Austria's climate protection initiative, aligns with building renovation efforts, Mission 100 cities, Pioniercities and comprehensive subsidy programs for energy renovations in public buildings as well as leverage EU funding streams such as the European Structural and Investment Funds (ESIF), the European Fund for Strategic Investments (EFSI) is taken. There exist energy service agreements to finance energy renovations in public buildings and One-stop shops OSS to streamline the process of energy renovations in public buildings and national funding, so that they are to less using EU money – special ELENA projects by European Investment Bank (EIB) – rather using bank credit. Municipalities find it difficult to take out loans and to set up a multi-year budget planning (which is required for loans or ESCOs) due to the political situation. The lack of data regarding the technical condition and energy performance of non-residential buildings in Austria is a big issue and municipalities usually lack the staff and appropriate expertise, human resources and financial resources, which us required for the technical, legal and financial preparation and management of complex renovation projects. The EU taxonomy pushes the renovation market and the ecological building materials.

Table 2: SWOT analysis in financing building renovation of public buildings in Austria.

STRENGTHS	WEAKNESSES
• Attractive programs (klimaaktiv, Austria's climate protection initiative, aligns with building renovation efforts, Mission 100 cities, Pioniercities). • Comprehensive subsidy programs for energy renovations in public buildings. • Leverage EU funding streams such as the European Structural and Investment Funds (ESIF), the European Fund for Strategic Investments (EFSI). • Energy efficiency obligations.	• Because of a dispute within the Austrian government the draft **National Energy and Climate Plan (NECP).** update has not been submitted to the European commission yet • **Nine Austrian federal states** are involved in the implementation of the Energy efficiency targets in EEfG: as important public authorities, as they have many legal competencies in relation to energy efficiency policy.

• Energy service agreements to finance energy renovations in public buildings. • **One-stop shops to streamline the process of energy renovations in public buildings.**	• Experiences in Eu funding, but since enough national funding, we are **to less using EU money – special ELENA projects by European Investment Bank (EIB) – rather using bank credit.** • Municipalities find it difficult to take out **loans.** • **- multi-year budget planning** (which is required for loans or ESCOs) is limited for municipalities due to the political situation. • The public sector in Austria could take a more active role as an investor to drive the renewal and development of critical infrastructure, thereby crowding in private capital and limiting the influence of profit-driven investors. • There is a severe **lack of data regarding the technical condition and energy performance of non-residential buildings in Austria.** • Municipalities usually lack the staff and appropriate expertise, human resources and financial resources required for the technical, legal and financial preparation and management of such complex projects.
OPPORTUNITIES/POSSIBILITIES	**THREATS/BARRIERS**
• The construction industry in Austria needs to increase its production volume by around two-thirds to meet the demand for deep renovations. This requires addressing capacity constraints and ensuring sufficient skilled labour. • **EU taxonomie** pushes Ecological building materials – they are an important aspect in the refurbishment of buildings. • Producing **precast elements specializes in prefabricated** cellars and precast concrete or timber elements, **industrialized renovation.** • Increase private sector participation in energy renovations in public buildings. • Confederation assumes liability for ESCO models. • Launch energy communities. • Pooling projects for participation in ELENA, Smart Cities programs. • Increase demonstration projects through FFG funding programs. • Enhance public awareness about the benefits of energy renovations and the available financing options by providing more information and education on energy-efficient upgrades. • Increase the use of renewable energy sources in public buildings. • Long-term planning of financing and phased financing. • Motivating the population to help.	• Available funding for energy renovations in public buildings might not be sufficient. • Construction industry in Austria may face capacity constraints. • Complex planning procedures and **lack of clear guidelines.** • Need for **specialized expertise in municipalities.** • Lack of knowledge and training of various energy actors, including policymakers, renovation solution suppliers, energy solution suppliers, clients and beneficiaries, financing intermediaries and other intermediaries. • Lack of liability from the federal government regarding business models for ESCO. • Public procurement system regarding low bidder principle and not best bidder principle prevails. • Risk of non-compliance with EU and national regulations. • Lack of synchronization between national and local governments, lack of financial and human resources, lack of ambition of municipalities, and difficulty in dealing with home-owner associations and heterogenous districts with significant variations in the standard and age of the buildings. • Obligations to comply with a lot of building construction norms also for other aspects than those related to energy when buildings are renovated or regulations protecting the cultural heritage. • Lack of financial incentives, complex rules to achieve funding for renovation work. • Municipalities may not be sufficient money to support the scale of renovations. • Construction industry in Austria may face capacity constraints in handling the increased demand for energy renovations in public buildings.

7 HUNGARY

7.1 Policy context relevant for financing sustainable renovation

7.1.1 Policies and strategies

The aim of the **National Energy Strategy 2030, looking ahead to 2040** [133] is to transform the stock of private residential buildings into a highly energy-efficient and decarbonised building stock by 2050. The objective is to cost-effectively convert existing buildings into near-zero energy buildings.

According to the **National Clean Development Strategy 2020-2050** [134], the government is ready to intervene to achieve climate neutrality and is choosing the path of early action, even if it costs approximately 24.709 billion Hungarian forint (approximately €62 million) more than a more relaxed timeline.

According to the Hungarian **Long-Term Renovation Strategy** [135] renovation targets are achieving the renovation rate of 3% per year for the total residential stock by 2030. This means total energy use in residential buildings and CO_2 emissions can decrease approximately by 20%. Furthermore, during the same period, the aim is to increase the annual renovation rate of the public buildings stock to 5%. If this is achieved gradually, the overall energy consumption of public buildings, as well as CO_2 emissions, can decrease by 18% [86]. *For technical, financial details see chapter 7.2.1.*

For detailed targets for renovation of the building stock see in chapter 7.1.3.

7.1.2 Legislation on construction and renovation

MAIN BUILDING LEGISLATION

Act C of 2023 on Hungarian Architecture [136] The new regulatory framework, by merging several laws, represents the interests of municipalities, local communities and the architectural profession, in addition to the fundamental need to protect quality of life and value, protect green spaces and our existing built heritage, promote energy-efficient economic transformation, and encourage quality and sustainable architecture, landscape architecture and environmental design. The intention of the legislator is to make the architecture law more transparent and modern, simpler and more uniform, while reflecting the importance of the architecture profession.

Act LXIX of 2023 on the Regulation of Public Construction Investments [137] The aim of the new Investment Law is to establish a new basis and unify the system of public construction investments, to increase the efficiency of public construction investments with the priority of energy efficiency, to provide adequate legal, professional and budgetary guarantees for the actors of investments in order to ensure the predictability of these legal relations, to strengthen and unify the system of public organisations involved in the implementation of public construction investments.

The scope of the Act primarily covers construction projects reaching the national public procurement thresholds under Act CXLIII of 2015 on Public Procurement, for the implementation of which the budgetary or indirect EU funds used, individually or collectively, exceed 50% of the estimated value.

Domestic legislation on energy performance of buildings

The first Energy Performance of Buildings Directive (EPBD) entered into force on January 4, 2003. The amended EPBD, namely the EPBD "recast" Directive 2010/31/EU, was transposed into domestic

legislation, by the Hungarian Ministry Without Portfolio Decree (TNM) 7/2006 and the Government Decree 176/2008. These domestic regulations are currently in force.

TNM Decree 7/2006 (V.24.) on the regulation of the energy performance of buildings [138] In particular, this decree covers the first three of the five main areas contained in the directive: elaborated a national methodology for calculating the integrated energy efficiency of buildings; established minimum requirements for the energy efficiency of new buildings with a surface area of over 1000 m^2; established minimum requirements for large existing buildings (with a surface area of more than 1000 m^2) regarding their energy performance in case they are subject to major renovation. The same requirements apply to new buildings and buildings undergoing major renovation, which is defined based on the building value: the cost of the renovation of the building envelope and/or mechanical systems must exceed 25% of the buildings value.

Government Decree 176/2008 (VI.30.) on the certification of the energy performance of buildings [136] According to the decree, an EPC must be issued for the building from 1 January 2009, when the new building is put into use, until it is authorized for use. In the case of an existing building, certification was voluntary until 31 December 2011. An important element of the certification process is the proposal what changes and upgrades should be made for the building, what their expected results are, and what new energy category the building can advance to.

Government Decree 264/2008 (XI.6.) on the energy audit of heat generating equipment and air conditioning systems [139] According to this Decree an energy audit must be carried out every 4 years for installations using non-renewable liquid and non-renewable solid fuels with an effective rated output of 20 to 100 kW, for gas-fired heat generating installations with an eff. rated thermal input greater than 100 kW and for air-conditioning systems with an effective rated thermal input between 12 kW and 150 kW. An energy audit shall be carried out every 2 years for heat generating installations using non-renewable liquid and non-renewable solid fuels with an effective rated thermal input greater than 100 kW and for air conditioning systems with an effective cooling capacity greater than 150 kW.

Decree 9/2023 (25.V.) on the determination of the energy performance of buildings [12] One of its most important features is that the requirement for a near-zero energy demand for new buildings has been replaced by a mandatory cap on specific CO_2 emissions, replacing the mandatory renewable energy share. This approach, by setting carbon weighting factors, equates district heating and cooling from waste heat or cogeneration (efficient) with renewable energy. The new legislation abolishes the requirement in the TNM Regulation that in the case of major renovation or major extension, the whole building must comply with the technical building standards. The equivalence of electricity produced in renewable energy communities is also reflected in the new provisions.

Government Decree on the detailed rules for the design and installation of construction products in buildings and the verification of performance in the process 275/2013 (VII. 16.) [140] says that the installation of a construction product is subject to the existence of a generally lawful declaration of performance. The declaration of performance may be based on a harmonised EU product standard or ETA in the harmonised area, or on a national technical assessment in the non-harmonised area.

LEGISLATION ON FINANCING RENOVATION OF BUILDINGS

Decree 24/2023 (XII. 29.) [141] regulates in detail the financing of the renovation of buildings in the public sector.

Government Decree 138/2020 (21.IV.) [142] is subject to the State Property Act and provides for the management of state property under the original legislative powers. Although it does not deal with renovation of buildings, the management of public property can be an important aspect of financing.

Government Decree 44/2019 (III. 12.) [143] on Maternity Allowance (a pre-natal funding to young married couples), reformed in 2024, is of particular importance as it continues to play an important role in providing new business volumes of loans as follows.

Government Decree 303/2023 (11.VII.) [144] on the subsidies for the creation of housing in small settlements also known as the 'Village CSOK' (Family Housing Allowance Program) [145] Amendment Decree, contains the detailed rules of the new Village CSOK, and the annex, in which all the settlements where the Village CSOK can be applied for from 2024.

The amount of CSOK available in small settlements for the construction or purchase of a new dwelling will not be increased (maximum of HUF 10 million will remain), so the increases will only affect the village CSOK available for second-hand dwellings (maximum of HUF 15 million).

The rules for the 'rural CSOK' are an effective contribution to the realisation of families' housing plans". For the purchase and simultaneous extension or modernisation of second-hand residential property, the amount of the village CSOK will be: the current HUF 600 000 for 1 child will be reduced to HUF 1 million, for 2 children from 2.6 million to 4 million, from HUF 10 million to HUF 15 million for 3 or more children. For modernisation or extension of existing housing, the amount of the subsidy will be increased from HUF 300 000 to HUF 500 000 for one child, for two children from 1.3 million to 2 million, and from HUF 5 million to HUF 7.5 million for three or more children.

The CSOK subsidy has no EE criteria, even though as part of the renovation measures EE measures are also eligible for the subsidy.

TAX REGULATIONS CONCERNING FINANCING RENOVATION OF BUILDINGS

The tax reliefs that are currently available in the personal income tax system to support the modernization of properties do not require meeting any criteria related to energy savings. These are: family allowance for mothers with 4 or more children, and for mothers under 30 and young people under 25 years of age [146] and first married couples' allowance tax relief [146]. The amount varies according to the number of children: HUF 600 000 for one child, HUF 2 million for two children and HUF 7.5 million for three or more children [147].

Energy Efficiency Tax Credit for companies subject to **corporate tax credit** can be claimed if an EE investment or renovation reduces final energy consumption. It goes for the tax year following the year in which the investment is put into service or, at the option of the taxpayer, in the tax year in which the investment is put into service and in the five tax years thereafter. The limit is up to 70% of the calculated corporate tax for the year in question. The aid intensity varies from region to region, ranging from 30-45% for large, 40-55% for medium-sized and up to 50-65% for small companies. The maximum amount of tax relief per investment is €15 million. This EE tax credit scheme raises several substantive issues of interpretation, such as the appropriate benchmarking of energy savings and the interpretation of eligible costs.

General tax benefits

In addition to tax incentives related to investments for EE purposes, other general tax incentives are also available to support the activities of companies. These can be development tax credits, grants for asset-based or technology-intensive investments granted by an individual government decision (EKD), tax base reductions for R&D projects or training grants [148].

OTHER LEGISLATION CONCERNING FINANCING RENOVATION OF BUILDINGS

In Hungary the basic legislation about the financial activities is the **Law No. CCXXXVII of 2013** [149] about credit institutions and financial companies [149]. This law regulates the operation of the credit institutions and other financial companies that can carry out lending and deposit collecting activities.

The Central Bank of Hungary (MNB) acts as the regulatory body for the whole financial sector, the operation of all credit institutions, financial companies, investment funds and companies, insurance companies and other institutions as pension funds are supervised by the MNB. In its regulatory capacity MNB publishes regulations [150] which must be obeyed by all market participants. For more detailed information on the financial prevailing mechanisms see chapter 7.2.3.

7.1.3 Targets for renovation of the building stock

Greenhouse gas emissions target in Hungary are in line with the EU's Climate and Energy Policy Framework adopted by the European Council in October 2014. Hungary aims to reduce its greenhouse gas emissions by at least **40% by 2030 compared to 1990**. This translates to a target where gross emissions in 2030 should not exceed 56.19 million tonnes of CO_2 eq. Hungary aims to achieve a RES target of at least **21%** in gross final energy consumption by 2030. Specifically, in the heating and cooling sector, the share of RES could approach **30%** in 2030.

Hungary is encouraging the installation of PV panels to partially replace electricity consumption. The aim is to have at least **200,000 households** with an average of **4 kW** of roof-mounted PV by 2030.

Energy efficiency targets for the final energy consumption in 2030 should not exceed the 2005 level, i.e. **785 PJ**. If the final energy consumption increases above 2005 levels, the increase can only come from carbon neutral energy sources.

Objectives related to buildings: About 40% of primary energy use in Hungary takes places in buildings, with residential buildings accounting for the largest share of nearly 60%. With the modernisation of the residential building stock to improve EE, and the increasing use of alternative heating methods, it is estimated that up to a quarter of natural gas imports (~2 billion m^3 of natural gas per year) could be replaced. The reduction in residential final energy consumption will be most significant for natural gas consumption, with planned measures expected to **reduce residential natural gas consumption by around 50% between 2016 and 2030** (nearly 2 billion m^3, around 1500 kToe).

Deep renovation of 3% of the central government building stock's the floor space per year is a strategic goal. The aim is to achieve **energy savings of around 15-30%** in public buildings. [151]

Operational objectives and targets:

- A 20% savings in the energy use of the domestic housing stock by 2030,
- A 60% reduction in CO_2 emissions related to the energy use of buildings by 2040 from the average level in 2018-2020,
- By 2050, the percentage of nearly zero-energy buildings should reach 90%.

Renovation targets:

- Renovation rate of **3% per year** for the total residential stock by 2030 that shall decrease total energy use in residential buildings and CO_2 emissions by approximately 20%.
- **5% of annual** renovation rate of the public buildings stock; if achieved gradually, the overall energy consumption of public buildings, as well as CO_2 emissions, can decrease by 18%. [152]

- Transformation of the stock of private residential buildings into a highly energy-efficient and decarbonised building stock by 2050.

Measures planned for energy-conscious and modern Hungarian homes:

- Installation of 1 million smart meters in the electricity sector.
- Continuation of smart cost-sharing schemes in district-heated homes.
- Installation of PV systems to partially substitute own electricity consumption
- Installation of heat pumps to meet the heating and cooling needs of modern buildings and the combustion of biomass in efficient individual heating systems.
- Support the development of Energy Communities [133].

7.1.4 Research and development

National Smart Specialisation Strategy (S3), 2021-2027 [153] objectives are research and dissemination of solutions for residential EE through the widespread use of existing and new methods and strengthen climate awareness in society through social innovations (e.g. skills development and smart solutions). The strategy aims to develop and strengthen the smart specialisation of higher education institutions. It highlights the importance of research and development in the field of smart technologies and aims to increase the focus of higher education institutions on digitalisation and innovation with the emphasis on cooperation with companies and other organizations, as well as the strengthening of international links through joint research projects and programs. The strategy aims to promote efficient and effective knowledge transfer, building on the mutual benefits of higher education and business, and to ensure high quality, practice-oriented training.

The Central Bank of Hungary ´s initiative on the Green Preferential Capital Requirement Programme qualifies as real innovation in motivating the commercial banking sector to offer green financing products, like green mortgages and green corporate loans. This initiative is still unique and very innovative among central banks in Europe [154]. MNB has set itself the objective to ensure that the Hungarian financial intermediary system makes a significantly greater contribution to ecologically sustainable convergence and to the reduction of risks arising from climate change. The banking sector can best support this objective by its lending activities and re-channelling funding sources [154]. *More information: chapter 7.2.3*

The National Bank of Hungary and the Budapest University of Technology set up a **Green Finance, Green Economy workshop** in the framework of a research partnership. The workshop delivered 3 strategic projects in the academic year 2020/2021: Rebound effect, Relationship between rents and energy efficiency, Estimation and forecasting of demand for green retail financial products, identification of drivers [155].

Own Your SECAP [110] is joining the municipalities through the Covenant of Mayors and obligate them to prepare a SECAP reviewed every 2 years to reduce greenhouse gas emissions by 55% by 2030 and to adapt to the impacts of climate change in line with a shared vision.

7.1.5 Empowerment activities

As there is a growing demand for experts with knowledge in green finance the **Central Bank of Hungary** promotes education and research in green finance. It has agreements with five universities to help with education programmes and organizes a **conference on green financing** each year with is a prominent event for the members of the financial society.

The success of 2019 **Green Programme** aiming to provide a favourable regulatory environment for financial institutions to promote sustainable operations and introduce green products, initiated the new **Family Green Finance Informational Programme** in 2023. The aim of the programme was to provide individuals and families with useful and practical assistance in recognising that conscious financial management can also serve the environment.

Sustainable Energy Investment Forums (SEIF) were organised two times, in 2020 with the active cooperation of the Central Bank of Hungary focusing on green transition at the forefront of economic recovery with the need to make EE attractive for the financial sector and the need to establish integrated home renovation services to assist homeowners throughout the whole project journey [156]. Second SEIF one year later made a step forward in three topics, such as putting the Energy Efficiency Obligation Scheme (EEOS) into motion in the business sector, revitalising the market for energy service companies (ESCOs) in the public sector, and integrating home renovation services [157].

RetrofitHUB project activities included a deep analysis of the present status of the apartment house renovations based on studying the projects under way, the professional literature, online surveys and deep interviews. Several training programmes have been developed and delivered focused on the key findings. A series of workshops have been delivered where case studies on selected apartment houses have also been worked out with the involvement of the key stakeholders. An “Apartment building retrofit handbook” [158] has been prepared and published by HuGBC.

Support for residential solar systems and electrification of heating systems in combination with solar systems" RRF-6.2.1 call for proposals mainly for detached houses, terraced houses and low-density houses which have outdated heating, particularly for low-income households. This subsidy program offers owner-occupiers with incomes below the national average the opportunity to receive non-repayable support to install RES or undertake EE upgrades in their dwellings.

CapaCITIES [159] project delivered a national platform to help the municipalities at EE renovation to reach the climate neutral targets. The main objective is increasing awareness and interest, organizing workshops, and deciding on joint actions to advance the Cities Mission at national level. It works at local level to inspire stakeholders, to emphasize on the benefits and to create efficient communication between different levels due to political and language barriers.

NetZeroCities [160] supports European cities – Budapest, Miskolc and Pécs being among them – to drastically cut down greenhouse gas emissions through climate action to achieve climate neutrality by 2030.bTwenty-six cities from across the EU and in associated countries of Horizon Europe will become ‘Pilot Cities’, acting as innovation hubs as they test solutions for rapid decarbonisation. Miskolc and Pécs are part of the **Pilot Cities Programme** which is one element of NetZeroCities. The pilot activity of Pécs and Miskolc is Modelling energy transition pathways [160]**.**

ConstrucSkills4LIFE project has identified a critical shortage of skilled workers—both blue-collar and white-collar—needed to achieve the 2030 targets for sustainable building renovation. As a result a Roadmap has been developed to support the enhancement of skills and competencies among building professionals, addressing the challenges of how to attract more students to pursue careers in construction, how to upskill the existing workforce to ensure they possess up-to-date knowledge regarding sustainable renovation practices.

7.2 Market capacities relevant for financing sustainable renovation

7.2.1 Building stock features

TECHNICAL CAPACITIES OF BUILDING STOCK

There are currently more than 3.7 million **residential dwellings** in Hungary, with a total floor area of almost 274 million m² [135]. The total number of **public buildings** with a floor area of more than 250 m² is[3] around 24 000. The total heated floor area of public buildings is therefore 50 million m².

Final energy consumption in residential buildings is on average between 205 and 225 kWh/(m²a), and public buildings approximately 214 kWh/(m²a). There are very large differences based on the year of construction and the type of renovation. The most widespread fuel is natural gas, which supplies 76% of the population of residential buildings and 80% of the public building stock. The total final energy consumption of residential buildings in 2018 was 205 000 TJ, while that of public buildings was approximately 39 000 TJ [135]. According to the data from the 2022 census, 97% of occupied homes are owned by private individuals.

Building typology of residential buildings is based on the survey of the housing stock conducted in 2015, in which the Hungarian housing stock was classified into 23 building types by age, size (single family houses - SFHs, small and large multi-family buildings - MFHs) and construction technology (adobe, brick, prefabricated) [161]. As a result of it a typology of the housing stock and a building database, suitable for modelling energy use in dwellings and for analysing the impact of different energy saving measures, were prepared [162]. General condition as regard to renovation capability of the buildings is presented in Figure 4.

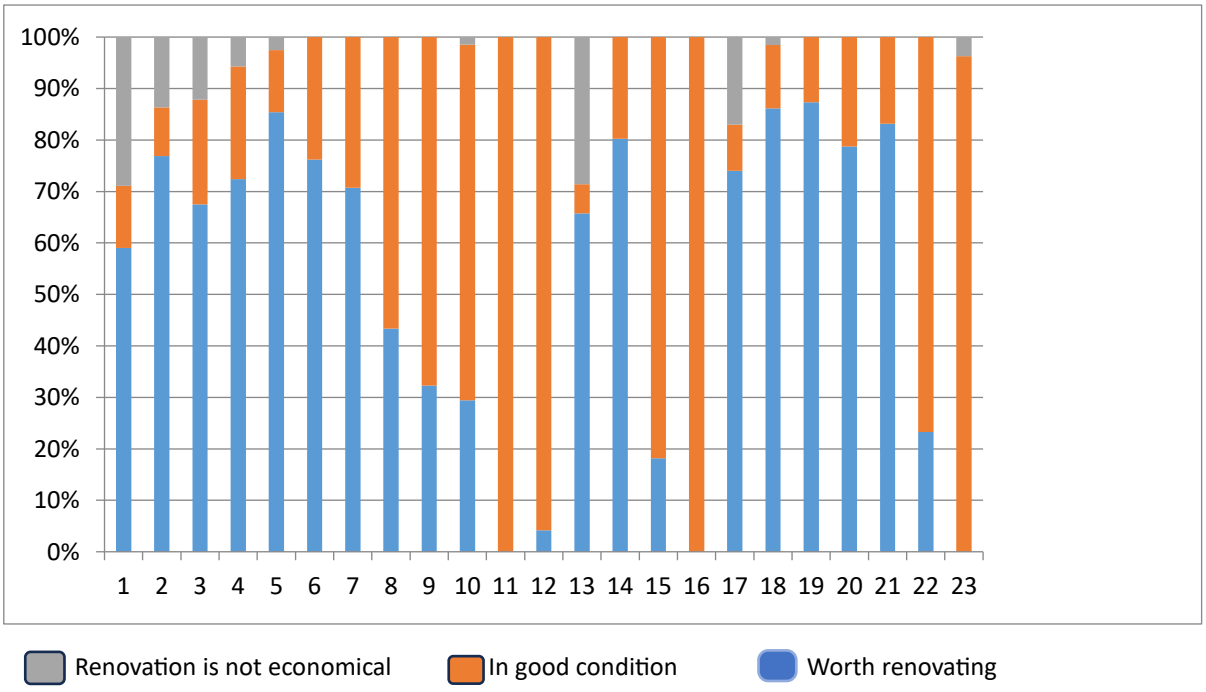

Figure 4: Condition of residential buildings from Hungarian data base [161].

[3] Buildings of less than 250m² are excluded from the analysis as the register of smaller buildings is incomplete and, according to municipal building statistics, 90 % of the useful floor area is made up of over 250 m²buildings.

The graph shows that the proportion of buildings that cannot be economically renovated is negligible compared to the total stock, while the majority of the housing stock has been found to be worth renovating.

Energy statistics of the residential building stock - buildings account for 40% of total energy consumption in Europe. The largest share of energy consumption in residential buildings is used for space heating (EU: 64%, Hungary: 71%), followed by lighting and electrical equipment (EU: 15%, Hungary: 11%), heating (EU: 14%, Hungary: 13%), cooking (EU: 6.4%, Hungary: 5.0%) and cooling (EU: 0.4%, Hungary: 0.2%). Heating as a share of energy consumption is more significant in Hungary than the EU average, which may be explained by climatic reasons and/or the inferior energy performance of its buildings. The energy demand for space cooling is steadily increasing, tripling between 1990 and 2019. The largest energy use is related to natural gas (EU: 33%, Hungary: 49%), followed by electricity (EU: 25%, Hungary: 18%), firewood (EU: 18%, Hungary: 22%), oil (EU: 12%, Hungary: 1%) and district heating (EU: 9%, Hungary: 8%). The role of gas use in Hungary is dominant, one of the most significant in Europe. The use of firewood is also significant, as it is a typical fuel-source in underdeveloped regions that do not have any form of gas network and instead rely on outdated stove heating systems. [162]

The average energy performance of homes in the country, based on energy certificates, falls into the "FF" category (almost 40% of single-family houses are in category “HH”). This means that, on average, buildings consume at least twice as much energy as a modern, energy-efficient building. The energy condition of apartments in multi-unit buildings is average, while about 62% of single-family homes fall into the three worst energy categories [163].

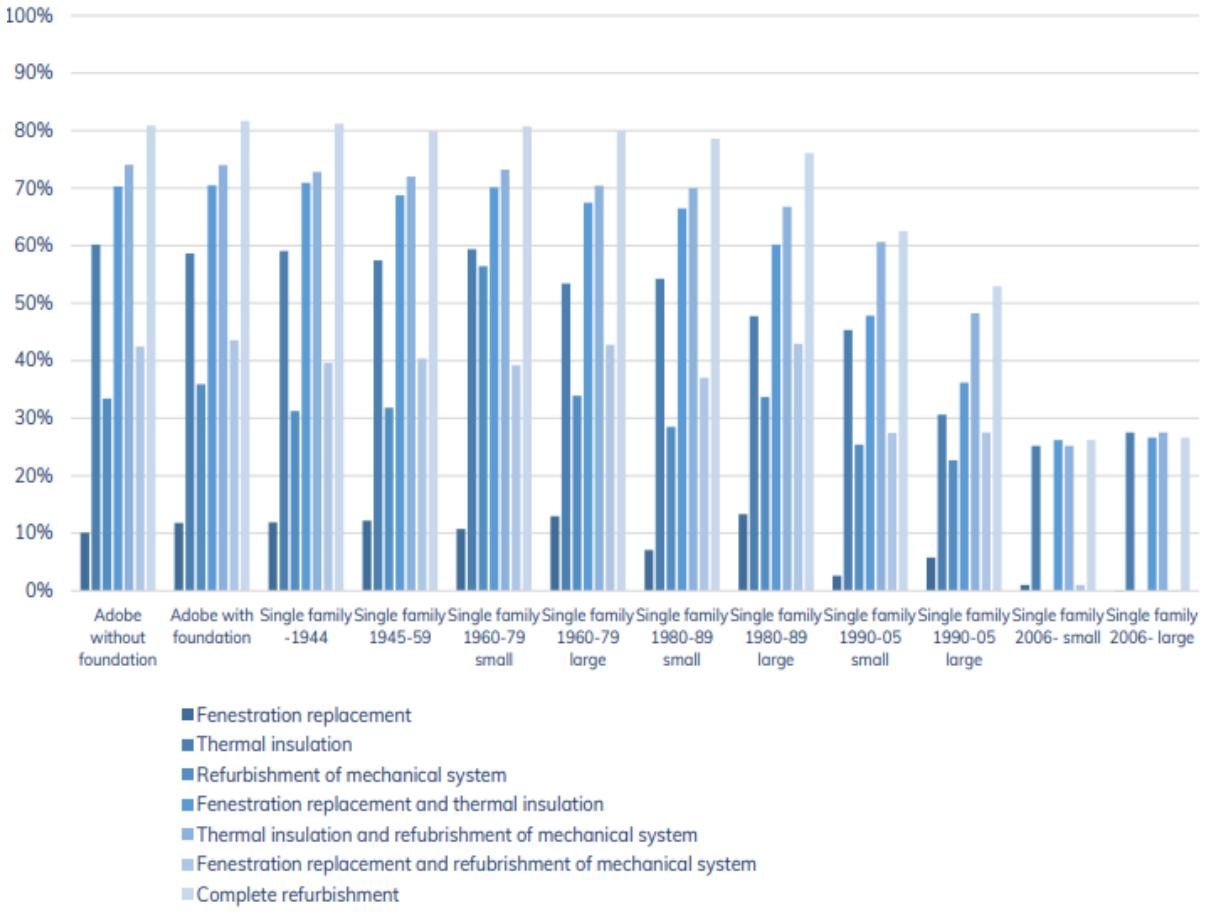

Figure 5: Primary energy savings in residential buildings due to energy measures [164].

Renovation progress - the most significant problem for the Hungarian residential building stock is the low level of the thermal insulation of the envelope. The data of building renovation shows that 35% of buildings nationwide are considered fully thermally insulated. For attic floor slab thermal insulation, the number rises to 45%. With regards to windows and doors 52.5% of dwelling units have thermally insulated windows, of which 10% are triple glazed. Old windows are nearly all double glazed. The figures vary by type of the building, as shown in Figure 5, and the older the building the worse the situation.

The figures show that there is a huge gap in the renovation of the building envelope. They also show that the most important step towards decarbonisation would be to improve it, as installing electric heating in buildings with high heat demand is not recommended, even in case of heat pump system.

Due to public and EU funding the installation of solar panels has been incredibly widespread in recent years, often for heating purposes in combination with electric heating panels. But the solar heating cannot cover heating needs and should therefore be designed to cover electrical needs outside of the heating season instead [162].

Public buildings - The current number of public buildings is 26 000 (state and municipal building stock). They account for 11% of the energy consumption of domestic buildings. This is 34 PJ per year (14 PJ natural gas, 6.5 PJ district heating, 6 PJ electricity, 7.5 PJ non-wired energy). In 2023, public buildings in Hungary will spend nearly HUF 405 billion on overheads, of which about 96.5% will be energy costs.

Renovating public buildings could reduce Hungary's primary energy import exposure by around 74%.[4] The rate of renovation of public buildings can be estimated based on renovation projects financed by EU funds. In the period between 2015 and the first quarter of 2020, according to publicly available data, the number of relevant projects financed by the grant was 1,721. [135]

The typological model of public buildings - when analysing the public building stock, the purpose and the year of construction of buildings were the main classification criteria, while building types were identified based on energy consumption and prevalence. The survey is based on the data of the Hungarian Central Statistical Office and ÉMI on public buildings owned and occupied by the municipalities and the State, respectively.

Based on the available data, buildings were categorised according to their purpose in health and social care facilities, office buildings, commercial buildings, cultural facilities and educational buildings. Buildings were grouped into subcategories according to their year of construction in constructed before 1900, between 1901 and 1945, between 1946 and 1979, between 1980 and 1989 and finally constructed after 1990. Model buildings sub-types were further defined according to their purpose, the structural characteristic of the period of construction and the number of storeys. These were then used as a standard for EE analyses. A total of 42 public building sub-types are identified. [165]

The energy performance profile of public buildings - in order to examine the energy performance of model buildings, the structure as well as heating, hot water supply, cooling, ventilation and lighting systems were identified for each building type.

Five of the ten highest ranking primary energy consumers of the model buildings are health care facilities with values between 300 and 350 kWh/(m^2a). Moving down the list, office, commercial and educational buildings or health and social care facilities have roughly the same primary energy consumption of between 260 and 300 kWh/(m^2a). There is no significant difference in the primary

[4] Sourced from Ministry of Energy, Hungary.

energy consumption of educational buildings, which is in the range of 232–251 kWh/(m^2a). The primary energy consumption of the most EE buildings is between 130 and 230 kWh/(m^2a) [165].

According to the Hungarian Long-Term Renovation Strategy [135] annually about 3% of the 3.7 million residential buildings, i.e. 111 thousand units need to be renovated. Each about €18 thousand on average (ÉMI expert estimate) amounting annually up to about €2 billion of financing need. The same strategy for the public buildings set a target of annually 5% renovation, i.e. about 2.5 million m^2 of the 50 334 765 m^2 represented by 23 819 units. There is no expert cost estimate of the cost of public building renovation financing needs.

7.2.2 Renovation technologies and intervention

Experts and studies show that in Hungary, homeowners undertake a lot of maintenance and modernization work on their homes. Although the number of renovation activities is high, the depth of these renovations is often shallow, resulting in little to no reduction in energy consumption. Recent data indicate that while the average home renovation rate has been relatively high, it primarily consists of light, partial renovations (3-30% improvement). Medium renovations (30-60% improvement) account for less than 1%, and deep renovations (over 60% improvement) are negligible.

A recent survey by the Hungarian Energy Efficiency Institute shows that 75% of people have made EE upgrades to their homes in the past 5 years, a big increase from the 41% who did so 4 years ago. However, most of these upgrades were single improvements, like adding insulation or replacing windows. Only about one-quarter of the renovations included a combination of measures, such as pairing thermal insulation with new windows or upgrading both the heating system and the thermal insulation [166].

In building renovations, EE is increasingly prioritized, yet the primary drivers remain the replacement of damaged or poorly maintained components and equipment. Many renovations are essential for safety reasons, such as replacing tiles, water pipes, gas pipes, or electrical systems, and may not yield significant energy savings. EE is most apparent in thermal insulation upgrades. Renovation efforts are typically guided by financial constraints, addressing the most critical technical issues first.

TYPES OF TECHNOLOGIES FOR RENOVATION OF BUILDINGS

In Hungary, various technologies are commonly used in building renovations to improve EE and incorporate RES into buildings. A recent study [158] indicates that in condominiums, the most frequent renovation activities include replacing the lighting system and modernizing the heating system. This is followed by thermal insulation upgrades and window replacements. Most used technologies and their significance is described below.

Retrofitting the Solid Parts of the Building Envelope: Upgrading solid parts such as roofs, outer walls, and ground floors is essential for improving a building's thermal resistance. Adding thermal insulation to these areas helps reduce heat loss in winter and heat gain in summer. Exterior wall insulation using EPS (expanded polystyrene) and XPS (extruded polystyrene) materials is prevalent. This stabilization of indoor temperatures lowers overall energy consumption, makes buildings more EE and comfortable. According to a 2020 report by the Hungarian Central Statistical Office (HCSO), around 45% of renovated buildings included improved thermal insulation. Green roofs and facade greening techniques are also employed to enhance urban sustainability and create pleasant public spaces.

Retrofitting Openings in the Building Envelope: Replacing windows, doors, rooflights, and skylights with low-emission, multi-layer glazing is essential for EE. The installation of triple-glazed windows with

low-emissivity coatings is common, as these windows provide superior thermal insulation compared to double-glazed units. This approach also helps to minimize thermal bridges. HCSO data indicates that 35% of residential buildings underwent window and door replacements between 2018 and 2021.

Establishing a Controlled Heat Recovery Ventilation System: Installing a controlled mechanical ventilation system with heat recovery is often neglected due to limited resources for renovation. However, it is vital to reduce heat losses through natural ventilation. Mechanical ventilation system can recover heat from the outgoing air and use it to warm the incoming fresh air, thus maintaining indoor air quality while minimizing energy losses. It ensures that homes remain comfortable without excessive energy expenditure.

Replacing heating and domestic hot water systems with modern, EE alternatives is crucial for building renovations. Upgrading to high-efficiency boilers or district heating systems can significantly cut energy use and emissions. In Hungary, this modernization is a priority, with many buildings adopting very efficient options. Initiatives like the Smart Cost Sharing program and the Radiator Replacement Program support this shift. The Radiator Replacement Program specifically upgrades old radiators to newer models for improved heat distribution and control.

Insulating Heating, Cooling, and Domestic Hot Water Pipes: Proper insulation of pipes for heating, cooling, and domestic hot water is important for reducing energy waste. By insulating these pipes, heat is retained within the system, and energy is used more efficiently. Additionally, better control of these systems further enhances energy savings and operational efficiency. This is especially relevant in Hungary, where the adoption of pipe insulation in both residential and municipal buildings has contributed to notable reductions in energy consumption and operational costs.

Upgrading to LED Lighting and Smart Lighting Controls: Switching to LED lighting and implementing smart lighting controls can significantly cut energy consumption. LEDs are more EE and have a longer lifespan compared to traditional bulbs. Smart lighting systems adjust based on occupancy and natural light levels, optimizing energy use and reducing unnecessary lighting. In recent years, LED lighting has become increasingly popular in Hungary, with a significant proportion of residential and municipal buildings making the switch to more EE lighting solutions.

Photovoltaic (PV) systems are one of the fastest-growing RES, converting sunlight into electricity to lower energy bills and reduce reliance on non-renewable sources. As of November 2023, Hungary has over 255,000 household-sized PV systems, a fourfold increase from the previous decade. The Solar Plus Programme provides financial support for small-scale solar installations, making renewable energy more accessible, improving efficiency, and reducing costs.

Heat pumps are becoming a popular alternative to traditional gas heaters due to their efficiency. They transfer heat from the air or ground into buildings, providing both heating and cooling with minimal energy consumption. According to the latest census results from KSH, nearly 28% of households in Hungary had air conditioning and heat pumps (air-to-air, air-to-water) in 2022. Over the past two years, the proportion of households with air conditioning has doubled.

Biomass, such as wood, is widely used in residential and community heating systems. It provides a renewable and efficient heating solution, supporting local energy production and reducing fossil fuel reliance. Biomass integration into renovations contributes to a more sustainable energy landscape. In 2022, solid biomass continued to play a dominant role (61.4%) in total RES, with residential solid biomass (firewood) representing the largest share within total renewable energy consumption (44.5%) [167].

Incineration plants convert waste into energy, aiding in decarbonizing district heating systems. They help reduce landfill use and CO_2 emissions, supporting sustainable waste management and cleaner district heating solutions. **Co-generation systems** simultaneously produce electricity and useful heat, reducing carbon emissions. They provide reliable low-carbon energy, especially when other renewables are unavailable, ensuring efficient energy use and reducing fossil fuel dependence. **Geothermal systems** utilize the Earth's natural heat for heating and domestic hot water. In Hungary, these systems are particularly effective for district heating applications especially in municipal buildings. Incorporating geothermal technology achieves substantial energy savings and reduces reliance on non-renewable sources.

DIRECT FUNDING FROM EU SOURCES

Direct EU Funding is available under the European Union´s dedicated programmes. About €300 billion to fund the REPowerEU Plan to phase out Russian fossil fuel imports [168] and mobilise about €150 billion of new investment by 2027 connected EU [169] and EIB [170] programmes. Key cross-border EU energy infrastructure projects worth of €850 million. [171]

Direct funding to be received from EU Cohesion Policy funding programmes of almost €22 billion for the period 2021-2027 will be distributed to Hungarian companies, municipalities and different organisations via the government´s operative programmes to help the country implement joint EU priorities such as a balanced territorial development and **a fair climate and digital transition**, whilst supporting an **innovative and inclusive social market economy**.

The **Hungarian National Recovery Plan** as approved by the European Commission in November 2023 and accepted by the European Council in December 2023 has been extended with the RePowerEU section. Most actions under this section aim at green transition: total available budget of the programme is €10.4 billion. 67% of this amount is planned for the purpose of green transition. The main groups of actions include the modernisation of the grid, boosting the use of RES, increasing EE, decarbonisation of industry, green transition in public transport, development of green skills.

As to EE, a large portion of the budget is foreseen for actions related to deep renovation of public, commercial and residential buildings with the strict aim of delivering energy savings. Actions related to building retrofits and deep renovations financed from EU sources have to reach a minimum 30% reduction in energy consumption. The EE related programmes are planned to be organized for **three main target groups.**

- The first group concerns the **public buildings**, where the budget foresees 1.8 million m^2 of public building area to be retrofitted, based on a 100% state subsidy financing. The RePowerEU section alone foresees a budget of 62.8 billion HUF (€161.8 million) for this purpose (other programmes will also be available).
- The second one targets the **SMEs and mid-cap companies** with the aim of a 30% reduction in their unit-based energy consumption and a total savings of 81.87 GWh. The budget foreseen in this section of the programme is 155 billion HUF (€405.7 million), which will be transferred to the SMEs via the Hungarian Development Bank (MFB) in the form of preferential loans (the EU funds will be used to subsidize, therefore reduce interest rates payable by the SMEs).
- The third programme targets the retrofit of **residential buildings**. The aim of this programme is to reach a 30% reduction in the energy consumption of the households. The budget foreseen for this section is 197 billion HUF (€518.6 million), the funds will also be transferred by MFB in the form of a combination of in interest-free loan and direct subsidy. The ratio of the preferential loan to the subsidy will be determined by two factors: the final beneficiaries´

income level and the savings in primary energy consumption of the final beneficiary. At least 10% of this amount should be given to energy poor households. With the help of this amount a total of 20 thousand apartments are expected to be retrofitted.

In addition to that the Partnership Agreement with Hungary foresees that a total of €6.7 billion under the European Regional Development Fund (ERDF) will be invested to improve the EE of public and private buildings and increase energy generation from RES. It will also promote the circular economy, water and wastewater management, and sustainable transport. It will help improve air quality and protecting ecosystems and biodiversity.

The Environmental and Energy Efficiency Operative Programme Plus, the continuation of the previous EEEOP [172] under the new framework for the period 2021-2027 earmarks €1.936 billion for financing EE and RES programmes [173].

Other direct funding possibilities are related to technical assistance. Facilities, like the EIB´s ELENA facility as well as the Project Development Assistance under certain LIFE programmes are available to finance technical assistance (technical, legal, financial preparatory work related to project development, preparation of projects in relation to energy efficiency and/or deep renovation of municipal, public buildings and/or condominiums/apartment houses).

INDIRECT FUNDING

All the programmes listed above are based on direct funding mechanisms. At this stage indirect funding mechanisms are not known.

FINANCIAL MECHANISMS OF STATE SUBSIDY PROGRAMMES

State subsidy programmes for public buildings - retrofits and deep renovation of public buildings in Hungary were financed typically by grants and subsidies only. During the past seven-year EU budgeting period, between 2014 and 2020 the retrofits of public buildings were financed under the so-called KEHOP and TOP programmes. These were based mainly on EU funding; a total of 2,200 building renovation projects were implemented under these programmes.

From 2024 a new programme is foreseen for the public buildings under the National Recovery Plan, where the budget foresees 1.8 million m^2 of public building area to be retrofitted, based again on a 100% state subsidy financing. The RePowerEU section alone foresees a budget of 62.8 billion HUF (€161.8 million) for this purpose (other programmes will also be available, of course one project can receive grant from one programme only).

State subsidy programmes for commercial/industrial buildings - During the past EU budgeting period there were several programmes targeted to SMEs in order to facilitate investment in EE and RES. The programmes were either based on grants whereby 50-70% of the investment amount were disbursed as grants, tied to specific criteria to be achieved, the other remaining part of the investment had to be borne by the SMEs themselves; or they were based on preferential loans where the subsidy was given in the form of reducing the interest rates paid by the SMEs. The programmes were aimed at different purposes, some of them could be used for EE or RES generation.

Another form of state subsidy is the EE tax credit (see the details in 3.1.2.3.) which is an incentive to SMEs and to large companies to implement investment in EE and/or RES with the aim of reducing their primary energy consumption. This allowance is continuously available.

From 2024 the other window of the National Recovery Plan will target the SMEs and mid-cap companies with the aim of a 30% reduction in their unit based primary energy consumption with a total foreseen savings of 81.87 GWh. The budget foreseen in this window is 155 billion HUF (€405.7 million), which will be transferred to the SMEs via the Hungarian Development Bank (MFB) in the form of preferential loans (the EU funds will be used to reduce interest rates payable by the SMEs).

State subsidy programmes for residential homes - Although a number of state subsidy programmes (like the so-called "CSOK" -family home programmes) are available for the acquisition of residential homes in Hungary, some of them can also be used for home renovation purposes. The important fact is that these facilities/programmes support families with children (tied to family status) in acquiring new homes or larger homes and while it is possible to buy second-hand apartments/houses and renovate them within the given facility. There is no condition related to the reduction of energy consumption in these facilities.

Most of the programmes however are no longer available, they were closed at the end of 2023. In the following section we give a short overview of the facilities that were directed towards renovation/energy efficiency/renewables, and what is expected for 2024.

"Village CSOK" **-** of the abovementioned state subsidized programs the so-called "Village CSOK" (family home program for rural areas) has been extended and is still available during 2024. This is a non-repayable grant [174] given to families where the amount of the available grant depends on the number of (existing or to be borne) children and the family status. The grant can be given for the purpose of buying newly built or second-hand houses, for the extension and/or deep renovation of existing houses but only in small villages and settlements determined by the relevant government decree [175]. The grant can be combined with other facilities and market-based loans. See further details in 7.1.2.2.

Facilities run by the Hungarian Development Bank (MFB) - The most important loan product that was available in the retail segment was a non-market-based, loan-like product, the Residential Energy Efficiency Loan Programme, which existed in the form of a refundable EU-grant (the funding of the facility is an EU grant), managed by the Hungarian Development Bank (MFB). In this program with a total available budget of HUF 115 billion (approx. €320 million), individuals, condominiums and housing cooperatives could take advantage of a preferential 0% fixed rate loan for purposes, among others, as upgrading of heating systems, thermal insulation, replacing doors and installation of solar panels. The facility had two windows, one for the central part of Hungary („VEKOP") and one for the other regions of the country („GINOP").

In the VEKOP, the total loan amount disbursed to homeowners was 14.2 billion HUF (€40 million), while the amount in the second one, GINOP, was 76 billion HUF (€213.8 million), thus altogether more than 90 billion HUF (€253.8 million) worth of loans were disbursed to more than 20 thousand homeowners to renovate their residential buildings between 2020-2021. 75% of the total loans disbursed, i.e. 67.5 billion HUF (€189.9 million) was used to finance household size solar panel investments, while 25% of the total loans disbursed was used to finance deep home renovations. The average loan disbursed to each homeowner was around 3 million HUF, while the amount was more than 60 million HUF in the case of condominiums.

Based on the above summary, MFB´s loan facility was a successful programme as it offered a loan with 0% interest rate, long maturity (up to 20 years) and with a loan amount under 5 million HUF homeowners did not have to give any collateral. This facility ran out in 2021 and is no longer available.

Family Home Program - The Hungarian Government subsidized a programme for the renovation of residential buildings between January 2021 until the beginning of 2022. The core element of the programme that was available via most of the commercial banks was that each family, who had at least one child under the age of 25 years was eligible to receive a grant from the state amounting to 50% of the total amount paid for a home renovation, where the maximum grant was 3 million HUF/family. This means that home renovations up to 6 million HUF/family could be subsidized. If a family could not finance its own part of the renovation, they could take a preferential loan from the participating commercial banks. It included measures related to the deep renovation, like thermal insulating, change of windows and doors, change of heating systems, etc, however other renovation measures could also be financed under the programme. Although the facility targeted home renovation and deep renovation, the grant element was not bound to achieving improvement in EE, decrease in energy consumption or the improvement in the family home´s EE performance certificate. The facility is no longer available.

Central Bank of Hungary ´s (MNB) Green Home Programme - within the so-called Credit Facility for Growth (NHP) a Green Home Programme was launched in October 2021. The facility amounted to 200 billion HUF, was extended by another 100 million HUF, and like the other elements of NHP, it was a refinancing facility offered by the MNB to the participating commercial banks at an interest rate of 0%. The money could be lent to private homeowners at a fixed interest rate of 2.5% in the whole duration of the loan. The loan could be used to finance the building or the acquisition of newly built apartments or family houses with high EE. The maximum loan amount per residential home was 70 million HUF (€184 thousand), the maximum duration of the loan was 25 years. This facility is no longer available either and it only financed the acquisition of high EE new homes, not the deep renovation.

Housing savings scheme - from the beginning of 2000 until 2018 housing savings schemes with a state subsidy element were available and very popular. The facility in general required an 8 year´s savings period with a fixed monthly amount to be saved by the client and 30% of the amount saved was granted to the client´s savings account by the state. The collected amounts could be used to buy newly built or second-hand apartments, houses and/or to extend and renovate the apartments. Many families and single young people saved for housing purposes via this product until it was terminated by the government in late 2018 by phasing out the grant element. The termination of the state subsidy in 2018 has led to a major decrease and backfall of retrofits. However, there is a still existing portfolio of the housing savings accounts initiated before 2018 which can be used for the same purpose. And since 2022 three commercial banks have started to offer housing savings products on market basis.

New Home Renovation Program - from July 2024 a new home renovation program is available for energy modernization of family houses built before 1990. With a co-payment of one million HUF from own resource, a maximum subsidy of HUF 6 million (€15 thousand), can be used, half of which is an interest-free loan, and the other half is a non-refundable grant. The interest-free loan must be repaid within eight years. The ratio of the preferential loan to the subsidy will be determined by two factors: the final beneficiaries´ income level and the savings in primary energy consumption of the final beneficiary. The higher the savings are the higher the grant element will be, and the lower income level can also result in higher grant element, however the grant can be maximum 3.5 million HUF out of the 6 million HUF. The program can be used for the replacement of doors and windows, the modernization of the hot water system, the thermal insulation of buildings and the replacement of gas boilers. The program that has an important requirement of a 30% reduction in energy consumption of buildings achieved as a result of these investments, started on 1st July, 2024 and made available via a consortium of commercial banks. The program is financed from the REPowerEU program and the Recovery and Resilience Facility.

Support for a residential solar system or electrification of a heating system in combination with a solar system - the government has introduced financial support under the Recovery and Resilience Plan's "Energy F (Green Transition)" program (RRF-6.2.1.-2021) to assist homeowners with incomes below the national average. This initiative offers non-repayable grants for installing RES, such as solar panels, and for upgrading EE in residential properties. Applications for this support were open from December 6, 2021, to February 6, 2022, with a project completion deadline of June 30, 2026. A total of 34,985 applications have been approved under this program.

Solar Plus Programme - provides support for installing household-sized solar power systems. Applications for this program were due by July 9, 2024. Eligible projects include solar power systems with an inverter capacity ranging from 4 to 5 kW and a battery storage capacity between 7.5 to 10 kWh. The capacity of the solar panels can be up to 120% of the inverter capacity.

MECHANISMS TO ATTRACT COMMERCIAL FINANCING PRODUCTS

Central Bank of Hungary (MNB) took the initiative in green financing when its Green Program was launched in early 2019 to mitigate the risks associated with climate change and other environmental problems, to expand green financial services, to widen the related knowledge base in Hungary and abroad, and to reduce financial market participants' and its own ecological footprint. Until today, these initiatives can be considered as the **main drivers for the financial sector and indirectly also for other types of investors** to attract private investment. In 2019 MNB joined the Energy Efficient Mortgage Initiative´s advisory board with the intention to launch a domestic platform among Hungarian banks.

In December, 2019 MNB introduced first the **Green Preferential Capital Requirement Programme,** for credit institutions to support the growth of green financial products and to improve the EE of the Hungarian building stock. The preferential regulatory treatment is available for green housing loans granted as of 1 January 2020, and the Central Bank decided to extend the programme, for loan contracts to be concluded until December 31, 2025. The conditions of the programme were modified as of 20 December 2023 [176]. Under a second window**,** the green preferential capital requirement programme was launched for facilitating the green financing of companies and municipalities [177].

Under the **Green Preferential Capital Requirement Programme** [178], which took effect from January, 2020, credit institutions can receive a capital requirement deduction (Discount) on loans serving EE home purposes and consumers may receive an interest rate of fee subsidy. Credit institutions established in Hungary (Beneficiaries) are eligible for the Discount. The Discount base is the gross exposure (on and off balance sheet) of the below defined Energy efficient mortgages and personal loans disbursed to private persons for the purpose of the purchase, construction or modernisation of residential buildings, or to condominiums or housing associations for the purpose of the modernisation of residential buildings (jointly referred to as Loan Objective), calculated on the basis of the volume of performing loans registered at the end of each calendar year within the duration.

From the aspect of being eligible for the Discount, those loans shall be regarded energy efficient, which are aimed at the purchase or construction of residential buildings with energy performance rating A+ or higher and with yearly energy consumption not exceeding 68 KW/m^2, or which are aimed at the implementation of EE renovations, meeting one of the following conditions:

- the property reaches at least A rating, and its yearly energy consumption does not exceed 76 KW/m^2;
- the property reaches savings in prime energy demand of at least 30%;

- one or more of the building renovation measures on residential buildings included in the conditions of the programme are implemented.

The level of the Discount is 5% for A+ energy performance rating and 7% for AA energy performance rating in the case of purchase or construction, and uniformly 5% for building renovation measures. The maximum level of the Discount per segment (residential mortgages, home equity loans, personal loans) is the sum of the SREP [179] capital requirement for the transactions affected by the Discount, determined during the ICAAP review. The total amount of the Discount may not exceed 1% of the credit institution's total risk exposure amount (TREA).

According to the Central502 Bank´s latest Green Financial Report [180] a total credit exposure of 879 billion HUF (€2.254 million) was subject to the preferential capital requirement in the Hungarian banking system in 2023, which means that commercial banks have lent this amount to green purposes (renewable generation, investment in high energy efficient buildings, energy efficient investments of companies, electromobility and other green purposes).

Green bonds and green corporate loans - green corporate loans disbursed have increased by 75% whereas the corporate lending in total grew by only 4% in 2023 in Hungary, which shows the strength of the demand for the green lending products. Majority of the green corporate loans was still financing the production of renewable energies, however other loan purposes, like energy efficient investments of companies or sustainable commercial real estate have also been present.

MNB´s report underlines that it has been the empirical experience of the commercial banks that the risks attached to green loans are lower than that of the general loans as companies with green loans have a lower rate of non-performance. The share of green bonds issued shows a continuously increasing trend in Hungary, at the end of 2023 the total green bond portfolio has reached 860 billion HUF (€2.2 billion), which corresponds to 86% of the total bond issuance in 2023. This amount of green bonds represented 24% of the total bond portfolio at the end of 2023. Green bonds and green corporate loans are well exploited by the commercial real estate developers and some industrial companies, they are the most popular financing means for the leading real estate development companies.

Green covered bonds also show a growing share within the total portfolio of covered bonds: there were five successful green covered bond floatings in 2023 amounting to HUF 50 billion (€128 million). Investment funds investing in ESG products or green bonds produced an 80% growth in 2023, however their share of the total investment fund market is still around 2%.

Green mortgage loans - based on MNB´s Green Preferential Capital Requirement Programme the number of commercial banks started to offer green mortgage loans on market basis (these products are available in 2024 as well). These mortgage products are offered with market-based interest rates, can be used for buying newly built EE apartments/houses or for the EE deep renovation of houses/apartments. The conditions of the green mortgage loans are similar to that of the market-based mortgages offered by the commercial banks in general. However, the benefit is that the banks offer an interest rate reduction (benefit) of 0.1-0.5% compared to the market-based mortgage loans. As the interest rates of market-based mortgages ranged between 6.64-6.89% (as of March 2024) a reduction of 0.1-0.5% in the interest rate does not seem a considerable benefit.

Condominium loans - Some of the commercial banks offer specific loan products to condominiums/apartment houses for the renovation of common areas or for EE investments. The leading Hungarian commercial bank, OTP, offers a loan for condominiums [181] with preferential interest rates based on state subsidy (70% reduction in the interest rate in the first 5 years of the loan,

and further 35% reduction in the interest rate in the second 5 years), with a maximum maturity of 15 years. OTP Bank has an own programme for giving support to condominiums: condominiums are invited to submit their own ideas for investments to cut their energy consumption, the best ideas will be selected, and OTP donates the investments by a total of 30 million HUF (€77 thousand), an idea can be given 1-3 million HUF (€2.5-7.5 thousand). This donation programme has been going on for 15 years now, there have been more than 12 thousand ideas submitted out of which 195 have won the donation given by the bank. [182]

Housing savings products - in recent years three commercial banks (OTP, Erste and Fundamenta, the latter acquired by MBH Bank) started to offer "Bausparkasse-like" housing savings products on market-based interest rates. The products are based on a regular savings plan by the client (usually 4-8 years), at a fixed deposit interest rate, to which the bank adds a surplus intertest, if the conditions are met. A further advantage of the product is that mortgage loans or green mortgage loans can be taken out by the client by more advantageous conditions if he/she has a housing savings account.

MECHANISMS TO ATTRACT DIRECT PRIVATE INVESTMENTS

In the case of **public buildings**, especially those public buildings owned by the municipalities there are possibilities of financing EE deep renovation or retrofits, such as loans combined with grant elements e.g. EBRD´s GEFF [183] models, loans backed with guarantee schemes, ESCO/EnPC models, etc. Market based financing and/or private investment is part of all these financing models. The GEFF models are based on a combination of loan and some kind of a grant element, they have not been available in Hungary in recent years, although there was one operating facility, the MFFEE (Municipal Finance Facility Energy Efficiency) between 2009 and 2014.

The Hungarian ESCO market has gone through significant fluctuations in the past decades, the market showed an upswing tendency after 2000, then after experiencing a very steady decline from 2010, the market was expected to find a new growth route again for the last few years. According to a JRC study [184] from 2017 the ESCO market is not competitive, the small number of ESCOs have to promote the model themselves. Recently ESCOs working with the industrial sector have become more successful as the demand for EE and cutting the energy related costs has become more and more important.

But there is still a great potential in ESCOs/EnPCs model for the public buildings. These models have a number of advantages for municipalities, among others like the off-balance sheet character of this financing. Nevertheless, municipalities face several issues hindering the use of the ESCO/EnPC model in financing the EE renovations. Since 2011 because of the so-called "status law of municipalities" the possibility of taking out loans by the municipalities has become very limited, taking a loan would require a guarantee by the state; therefore, municipalities are not encouraged to seek market based/private financing, they usually wait for the grant programs. On the other hand, municipalities have very limited own resources, at least far from the volume necessary for the retrofits needed.

Other factors that hinder the development of the ESCO market are: the lack of appropriate legal definitions, contract templates, well-defined business models. There is also lack of experience on how to procure ESCO/EnPC type services (municipalities are subject to public procurement). On top of that most municipalities lack the appropriate expertise, human resources and financial sources necessary for the technical, legal and financial preparation and management of deep renovation projects.

7.3 Analysis of the area "financing building renovation"

Based on a literature review, expert opinions from national thematic working group members, and outcomes from Hungarian roundtable discussions, findings on the renovation of private and public buildings were synthesized into a SWOT analysis. In this analysis, strengths represent internal advantages, weaknesses are internal disadvantages, opportunities are external factors that could be leveraged, and threats are external challenges. External influences encompass macroeconomics, technological advancements, legislative shifts, societal changes, and market dynamics.

7.3.1 Main findings on financing the renovation of private buildings

The landscape of EE renovation initiatives in Hungary presents both strengths and significant challenges. On one hand, there is regulatory support in place for green mortgages and EE home improvement loans under the Central Bank's Green Preferential Capital Requirement Programme. There is also a high demand in specialized loans due to lower financing needs compared to new home purchases. However, the market is predominantly fragmented with a large share of privately owned residential buildings, hindering cohesive project bundling efforts. Previous subsidies were often conditional and did not prioritize EE until recently, compounded by setbacks such as the termination of grant elements in home savings schemes. High VAT rates for renovations and unpredictable subsidy programs further complicate efforts to promote widespread EE investments. Despite opportunities like revitalizing housing savings schemes and developing combined grant and loan schemes linked to energy savings, barriers such as utility price regulation, lack of technical databases, shortages in skilled workforce and need for specialized loan products continue to pose challenges to achieving sustainable renovation goals in Hungary.

Table 3: SWOT analysis in financing building renovation of private buildings in Hungary.

STRENGTHS	WEAKNESSES
• Energy efficient home improvement loans are eligible for MNB´s Green Preferential Capital Requirement Programme. • Strong regulatory support for green mortgages by the Central Bank of Hungary. • Home improvements require lower amounts to finance than buying/building a new home, therefore the demand for specialised loans may be potentially high, however the return on investment varies depending on the location of the residential homes. • Organizational competences exist about green mortgages and green mortgage products available at almost all Hungarian banks.	• **Predominately privately owned residential building stock, fragmented market of 4.2 million households with more than 80% of single-family buildings** – no stakeholders engaged in bundling of projects. • Previously, most of the subsidies were conditional on family status therefore not open to everyone. • Main target/criteria of most subsidy programs were not energy efficiency related up to mid 2024. • Grant element of the home savings schemes was terminated causing a major backfall in condominium and residential renovation. • Very high (27%) VAT, condominiums cannot reclaim VAT, preferential VAT is only available for new homes. • Subsidy programs are unpredictable and short, there are no long lasting, predictable programs/schemes to support investments in energy efficiency, staged renovations. • The current renovation rate in Hungary is below 1 %, which is far below the target of 3% needed to achieve significant energy efficiency improvements and meet climate targets. • People in general are not encouraged to invest in EE, empowerment and educational programmes are missing. • Accessing EPC data of existing properties large scale is still challenging for the financing banks.

OPPORTUNITIES/POSSIBILITIES	THREATS/BARRIERS
• **Housing savings scheme 2.0 – revitalization of the housing savings scheme with grant element**, as it would create a predictable volume for financing retrofits • **Housing savings schemes (Bausparkasse) could help motivate home owners in planning their own retrofit schemes and could raise awareness as well.** • Blend different funding sources, EU grants with other financing mechanisms like loans, guarantees or EPC models • **Elaboration of blended grant/loan/guarantee financing facilities, with criteria linked to energy savings/investments in energy efficiency, schemes should be available for everyone.** • **Staged renovation can be a solution to the high upfront costs of deep renovation.** • Elaboration of financing facilities **to support staged renovations, these financing facilities should be long lasting and predictable** (a full system should be working at least for a period 10-15 years) • **Creating revolving funds** – grants or blended with loan facilities – **by providing a pool of funds that are replenished as energy savings are achieved** • Another way of support could be **giving tax incentives/benefits to persons implementing investments in energy efficiency** (for example VAT related to retrofit investment achieving certain level of energy savings could be reclaimed). • Condominiums/multi-apartment houses should be able to reclaim VAT. • Elaboration of tailor-made financing schemes for condominiums/multi-apartment houses, taking into consideration energy performance contracting and other models. • Educating residential homeowners/multi-apartment house managers/financing banks. • Encourage (motivate) the universal utility companies to use energy efficiency obligations to create energy savings programs for their clients • Encourage on bill type of financing for EE retrofit programs. • Improve communication between stakeholders (utilities, authorities, home owners). • Energy communities combined with other innovative solutions like building-integrated renewables for larger condominiums. • **Emphasising to clients that EE has multiple benefits beyond financial savings, such as indoor air quality, adaptation to heatwaves and other climate related stress, contribution to climate change mitigation…**	• **Utility price regulation keeping household energy bills artificially low** has a negative effect on return on investments therefore people are not encouraged to make EE retrofits, it **is one of the main barriers**. • **Upfront investment costs of a deep renovation are still very high, unaffordable for most private home owners, it is another significant barrier for home owners.** • Upfront investment costs are the same for home owners in good market locations as well as for home owners in less frequented locations, thus people will be more reluctant to invest in homes in less frequented locations. • Lots of administrative burdens to comply with if someone takes part in a subsidized program and high transactions costs for private home owners (energy performance audit, other consultants) • Lack of publicly available databases with appropriate technical data on energy consumption, investment cost benchmarks. • Energy poverty has not been dealt with, there are no specific programs targeted to energy poor homes. • Renovation of the least efficient buildings will probably impact single-family homes owned by elderly people with a short future life horizon, and/or financially disadvantaged households that cannot afford the upgrades. Special support will be needed for these vulnerable groups. • Construction industry capacities are insufficient regarding the necessary volume of deep renovations which may further delay renovations and increase prices. • Construction industry upswings and seasonality can further increase investment costs, just like high inflation. • Available funding for energy renovations might not be sufficient to support the scale of renovations needed to meet national and EU energy efficiency targets. • Lack of specialised loan products and blended products for energy efficiency renovations and staged renovations. • Complexity of financing mechanisms, such as blending different funding sources. • Shortage of qualified/certified building contractors. • Shortage of available skilled workforce to implement renovations. • **Lack of coordination and communication between different stakeholders**: home owners, municipalities, government institutions, authorities, energy professionals and the financing community.

7.3.2 Main findings on financing the renovation of public buildings

The SWOT analysis of municipal buildings in Hungary reveals several key findings. Municipally managed projects have benefitted from significant funding under the KEHOP and TOP programs. However, weaknesses include a historical reliance on grant funding alone for building retrofits and limited capacity for municipalities to secure loans due to stringent budgetary laws. Municipalities also face challenges such as a shortage of expertise, human resources, and financial capabilities required for complex project management. Opportunities lie in exploring market-based financing models that combine loans with grant or guarantee elements, potentially facilitated by clearer rules under budget laws to enable borrowing and innovative funding approaches. Additionally, adopting ESCO/EnPC models and engaging in energy communities could enhance efficiency efforts. Nevertheless, threats include legal and procedural barriers to implementing ESCO/EnPC contracts and insufficient legislation supporting innovative business models.

Table 4: SWOT analysis in financing building renovation of public buildings in Hungary.

STRENGTHS	WEAKNESSES
• 2200 projects implemented under the KEHOP, TOP programs, between 2014-2020. • Municipal sustainable real estate financing (loans or bonds) is also eligible for MNB's Green Preferential Capital Requirement Programme. • Lots of preparatory work have already been done under various EU and non EU-funded programs and can be used to design programs.	• Retrofits of municipal buildings were financed typically by grants only. • Municipalities are not encouraged to finance their energy efficiency projects on market basis or via combined methods. • **Municipalities have limited borrowing capacity** under the Law on Stability and State Budget**.** • **Multi-annual budgeting (required for loans or ESCO) is limited for municipalities**. • **Municipalities usually lack appropriate expertise, human resources and financial sources necessary for the technical, legal and financial preparation and management of such complex projects.**
OPPORTUNITIES/POSSIBILITIES	**THREATS/BARRIERS**
• Introduce and encourage market based financing – loans blended with grant/guarantee elements. • **A well-defined rule on the financing of energy efficient retrofits as an exception under the Law on Stability and State Budget could extend the room for municipalities for taking out loans. This would be a basic condition for the municipalities enabling them to adopt innovative financing schemes.** • **ESCO/EnPC based models and solutions**, based on energy performance contracts and savings models. • Increase private sector participation in energy renovations in public buildings. • Pooling projects for participation in ELENA, Smart Cities programs. • Energy communities and other innovative business models. • Energy Efficiency Obligation Schemes (EKR). • EBRD GEFF programmes. • **Emphasising the multiple benefits of EE beyond financial savings (climate change mitigation, adaptation, cleaner air, hedging against energy price fluctuations etc.).**	• **Available funding for energy renovations in public buildings may not be sufficient.** • Construction industry in Hungary may face capacity constraints regarding the volume of renovations. • Complex planning procedures and lack of clear guidelines for public buildings. • Lack of appropriate legal definitions, business models for ESCOs and EnPCs in Hungary. • **Public procurement,** lack of experience on how to procure ESCO/EnPC type services. • Public procurement system regarding low bidder principle and not best bidder principle prevails • Lack of appropriate legislation to enable innovative business models like energy communities. • Obligations to comply with a lot of building construction norms also for other aspects than those related to energy when buildings are renovated or regulations protecting the cultural heritage. • Lack of knowledge and training of various energy actors, including authorities, government institutions, renovation solution suppliers, financing intermediaries and other intermediaries. • Lack of an encouraging environment. • Shortage of available skilled workforce to implement renovations.

8 SLOVENIA

8.1 Policy context relevant for financing sustainable renovation

8.1.1 Policies and strategies

Long-term strategy for energy renovation of buildings until 2050 (DSEPS 2050) [16] *outlines a comprehensive plan for building renovation. By 2050, it aims to achieve net-zero emissions by extensively renovating buildings with low-carbon materials and renewable energy technologies. The strategy also prioritizes new construction and renovations to minimize emissions throughout buildings' lifecycles, while ensuring safety, health, and productivity. LTRS 2050 also addresses seismic considerations in broader building renovation. The strategy identifies public legal entities within both the central government and broader public sectors to drive energy renovation efforts. This involves assessing building areas they own and use, with a focus on renovating a proportion of the total floor area in the central government sector. The strategy conducts a thorough review of the national building stock through statistical sampling, providing insights into the country's building conditions. It prioritizes the development of cost-effective renovation approaches tailored to diverse building types, considering factors like category, location, and climate.*

*Aligned with the **National Energy and Climate Plan**, the overarching decarbonization goals of the LTRS 2050 in the building sector by 2030 include a reduction of greenhouse gas (GHG) emissions in buildings by at least 70 percent compared to 2005 levels, and renewable energy sources (RES) to represent at least 2/3 of energy consumption in buildings. Until 2030, the focus will be on comprehensive energy renovations, considering the general construction-technical and functional condition of the building, reducing energy poverty, and implementing cost-effective solutions.*[5]

The goals till 2050 are: energy renovation has to be finished on 74% of detached buildings and on 91% of apartment buildings. The energy consumption should be decreased by 45% and CO_2 emissions should be lower for 75% compared to data from 2005.

Already existing funding are non-refundable funds from the Energy Efficiency Contribution, the Eco Fund, European Cohesion Policy - Multiannual Financial Framework, the Recovery and Resilience Facility (RRF), and the zero500 program. Refundable funds are available through the Eco Fund and in the form of loans through commercial banks. To a lesser extent, programs are also available through energy suppliers and energy service companies (ESCOs). Until 2030, there will be a gradual reduction in the amount of non-repayable funds and an increase in the amount of repayable funds.

Planned financing schemes: Guarantee fund for residential buildings, covering initial losses, establishing a systemic source for financing renovations of buildings in the narrower public sector, on-bill financing schemes, and a scheme for the purchase of claims from energy service providers.

***National Energy and Climate Plan (NECP)** of Slovenia is a comprehensive policy document guiding energy and climate strategies across all sectors until 2030. Structured around five dimensions—greenhouse gas reduction, EE, energy security, internal energy market, and research, innovation and competitiveness — it encompasses goals and measures pertaining to buildings. NECP measures for financing building renovation and construction include:*

- *Renovation of cultural heritage and special buildings*

[5] Text in italics was written by a parallel project SMAFIN Expanded.

- *Energy Performance Contracting (EnPC)*
- *Support schemes for EE in households, particularly for vulnerable groups*
- *Financial incentives for EE and RES adoption in residential buildings*
- *Financial instruments for buildings with multiple owners*
- *Rebate schemes for household EE: Eco Fund soft loans and incentives from other green loan providers*
- *Incentive allocation between owners and tenants in multi-apartment buildings*
- *Establishment of a guarantee scheme*
- *Rebate schemes for EE in the public sector*
- *Non-repayable investment incentives for public building energy renovation, prioritizing EnPC projects*
- *Development of a financing plan for sustainable building renovation.*

***Recovery and Resilience Plan** (RRP) outlines measures for sustainable building renovation and construction, including:*

- *Establishing a framework for promoting and financing sustainable renovations, considering seismic and fire safety, radon issues, and removal of hazardous materials.*
- *Allocate a permanent and dedicated financial source for energy renovation of central government buildings within the national budget.*
- *Investing in sustainable renovations of publicly-owned buildings, and based on a list approved by the Government of the Republic of Slovenia, aiming for a 30% reduction in energy consumption compared to pre-renovation levels. The total estimated investment cost within the Recovery and Resilience Plan amounts to €86.05 million.*

This includes thermal insulation, EE building elements, heating, cooling, ventilation, lighting, and monitoring systems. Seismic retrofitting, fire safety improvements, and hazardous material replacement will be addressed alongside energy renovation. Cultural heritage preservation requirements will also be considered.

***European Cohesion Policy Program for the period 2021-2027 in Slovenia** prioritizes building renovation with focus on:*

- *Promoting EE and reducing greenhouse gas emissions.*
- *Planning investments for energy renovation of buildings, including public ones, emphasizing sustainability, aesthetics, and inclusivity in line with the New European Bauhaus initiative. Projects will be financed through various financial instruments, including public-private partnerships (PPP), with support from the RRF to streamline documentation and promote additional energy renovation measures.*
- *Financing for public, private sector, and multi-apartment buildings.*
- *Incentives to reduce energy poverty and support small and medium Energy Service Companies (ESCOs).*
- *Access to education services through infrastructure development.*
- *Promoting comprehensive social, economic, and environmental development, including culture, natural heritage, sustainable tourism, and urban safety.*
  - *Priority for projects supporting economic and social revitalization of urban areas, including renovation of empty or underutilized buildings, cultural heritage sites, and creation of new public spaces.*[6]

[6] Text in italics was written by a parallel project SMAFIN Expanded.

8.1.2 Legislation on construction and renovation

MAIN BUILDING LEGISLATION

Building Act [185] provides the legal foundation for building codes, establishing minimum requirements for building energy performance, technical building systems, and calculation methodologies.

Environmental Protection Act [186] addresses the regular inspection of boilers heating buildings.

Energy Act [187] obligates state authorities and local community authorities, when adopting policies, strategies, programs, plans, general and specific legal acts, and when implementing measures based on this law, they must strive to achieve the lowest possible negative impacts on the environment, whereby take environmental burdens into account the whole life cycle.

Act on the Efficient Use of Energy (ZURE) [5] *aims to achieve several objectives in the realm of EE and efficient energy utilization, including reducing energy consumption, enhancing EE, ensuring energy security, promoting efficient energy conversion, and transitioning towards a climate-neutral society with low-carbon energy technologies. It also focuses on providing energy services, maintaining quality internal environments in buildings, and raising awareness among end-users about the benefits of EE. Additionally, the Act emphasizes increasing EE across all stakeholders, particularly in the public sector, and ensuring social cohesion. To meet energy-saving targets, the Act advocates for various energy services and efficiency measures, including utilizing RES for heat or electricity production in households, industry, public, and service sectors, implementing EE measures in buildings, promoting EE measures in transportation, enhancing the efficiency of district heating systems and implementing energy audit programs to assess and improve energy usage. The provisions for the energy performance certificates (EPC) were given in the Energy Act for new and existing buildings as well as for public buildings and transposed to the Energy Efficiency Act.*[7]

ZURE [5] prescribes that an energy-related product may be placed on the market, put into use or can be available on the market when (among others) it meets the prescribed technical requirements regarding the environmentally friendly design of the products. However, by-laws in this area are lacking.

Regulation on energy-related products [188] provides requirement relating to a product or the design of a product aimed at improving its environmental performance, or a requirement to provide information on the environmental aspects of a product. But, this only applies to energy-related (energy-consuming) products, e.g.: refrigerator, dishwasher, etc., not to construction products.

Act on the Promotion of the Use of Renewable Energy Sources (ZSROVE) [13] *regulates the implementation of the state and municipal policies in the field of RES, establishes binding targets for the share of energy from RES in gross final consumption in the Republic of Slovenia, as well as measures to achieve this target and ways of financing them. It also regulates certificates of origin for energy, self-sufficiency in electricity from RES, the use of energy from RES and surplus heat in the heating and cooling sector and the transport sector, as well as the information and training of installers.*[8]

The share of energy from RES in the gross final consumption of energy in the Republic of Slovenia must not be less than the starting share of 25%. Beneficiaries of financial incentives for the use of RES are persons and legal entities, including public sector persons, with the exception of direct users of the

[7] Text in italics was written by a parallel project SMAFIN Expanded.
[8] Text in italics was written by a parallel project SMAFIN Expanded.

state budget. End customers have the right to establish a community, which is a legal entity, for the production of energy from RES; RES community has the right to produce, consume, store and sell energy from RES, also on the basis of contracts for the purchase of electricity from renewable sources; it has equal access to all relevant energy markets both directly and through aggregation; for the purposes of this Act, the RES community is considered a producer of electricity and may obtain support.

Act on the introduction of devices for the production of electricity from RES [189] regulates the priority areas for the installation of devices that produce electricity from RES (photovoltaics and wind turbines), which include the roofs of buildings, and the installation of PV devices in the case of reconstruction of buildings in which interventions are carried out in the load-bearing structure of the roof if roof **floor area is 1000 m^2 or more**. The act obligates the necessity of checking the feasibility and economy of various variants, as well as the evaluation of cost and investment indicators and proposals for the best variant. This study is called **feasibility study** from which it may be concluded that the installation of a PV plant is economically or technically (un)feasible. If an existing building has a roof with roof floor area of **1700 m^2 or more** it is obligatory to instal the PV devices. This act also regulates the research and exploitation of geothermal energy as a renewable natural energy source. The consent of the co-owners who have more than three-quarters of the ideal shares, or the consent of the condominium owners who have more than three-quarters of the co-ownership shares in the common parts of the building is sufficient for the installation of PV on a co-owned property or on common parts of a building.

Regulation on green public procurement [190] is aimed to reduce the negative impact on the environment by public procurement of goods, services and constructions with less burden on the environment, to improve the environmental characteristics of the existing offer and to encourage the development of environmental innovations and the circular economy, and to set an example for the private sector and consumers. Consideration of environmental aspects in public procurement procedures is mandatory for buildings, electricity, air conditioners, heating devices, sanitary fittings, toilet and urinals flushers... The following environmental aspects must be taken into account: EE and the use of renewable or other alternative energy sources, efficient use and re-use of water, efficient use of resources, prevention of risks for users health or for the environment, reuse of secondary raw materials and products and the prevention and reduction of waste generation, promotion of use of products that can be used repeatedly instead of disposable ones, promotion of repairs, preparation and processing of end-of-life products and waste for reuse and recycling.

The **share of wood** (or wood products) in buildings must be **at least 30%** of the volume of built-in materials (excluding funrniture, ground floor slabs and underlying structures). The share of wood may be a one third less , if at least 10% of construction products that have a type I or III environmental mark are installed. Also, the share of wood or wood products in windows must amount to at least 80% of the volume of built-in materials (excluding glass). Or, one of the recognized construction systems and certification of sustainable construction, such as e.g. DGNB, BREEAM, LEED, is used.

Rules on the efficient use of energy in buildings [191] *outline technical requirements for constructing almost zero energy buildings to enhance EE. It covers aspects such as thermal envelope properties, technical building systems, heating, cooling, ventilation, hot water preparation, lighting, automation, control, and RES. Key points include specifying technical requirements, along with methodologies for calculating energy performance and specific transmission heat losses. It also mandates maximum*

annual energy usage for heating and cooling. It is in place with ***Technical Guidelines on efficient energy use*** [192] *issued by the Ministry of Environment and Spatial Planning.*[9]

Rules on the ventilation and air-conditioning of buildings [193] specify the technical requirements for ventilation and air conditioning of buildings and, in the framework of this consideration, determines the lowest, still acceptable quality of the indoor environment. It states that the air in each room must be fresh and pleasant, without odors and must not endanger the health of the people using the room. When designing and constructing buildings, it should be considered that the source of indoor air pollution is the building as a whole: building materials, furniture, ventilation system, equipment. Ventilation must ensure that the concentrations of indoor air pollutants in the premises of the building do not exceed the values for the maximum concentrations of indoor air pollutants, such as: **formaldehyde**, **TVOC**, **ammonia** and **amines**.

LEGISLATION ON FINANCING RENOVATION OF BUILDINGS

There is no specific legislation pertaining to the ***financing of building renovations****. Important decision-making process for significant investments in multi-apartment buildings is regulated by the Property Code, the Housing Act, and the Rules on Multi-Apartment Building Management.*

The legal framework, aligned with the ***Resolution on the national housing program 2015-2025****, guides investment decisions, including those related to EE in multi-apartment buildings. For multi-apartment buildings with more than eight individual units and more than two owners, the legislator has prescribed the establishment of a reserve fund for maintenance purposes. These buildings are also required to appoint a manager. Owners must achieve a 75% consensus for non-maintenance improvements, not requiring a construction permit. This includes EE measures like building envelope thermal insulation, early-stage boiler room renovation, installation of air-conditioning or solar panels. Funds from the reserve fund can also be used to take out a loan burdening the building's reserve fund, as stipulated in the Property Code and Housing Act. According to the legislation, obtaining one hundred percent consent of apartment owners is required for taking out a loan burdening the reserve fund.*[10]

For private households and tertiary sector, maintenance is required according to contemporary rules. Financing in the tertiary sector in general is subject to accounting rules (amortisation). Legislation on efficiency provides basis for financing the building renovation.

TAX REGULATIONS CONCERNING FINANCING RENOVATION OF BUILDINGS

In Slovenia, fiscal instruments are relatively underutilized for incentivizing EE and renewable energy measures in buildings. Currently, the fiscal landscape includes two main instruments:

- *reduced Value-Added Tax (VAT) and*
- *green and digital transition tax deduction.*

A reduced VAT rate of 9.5% instead of the general 22% rate applies to construction, renovation, and repair activities for buildings within social policy, as well as for restoration and repair services related to private residential buildings meeting specific criteria. The digital transition tax deduction, implemented under the ***Corporate Income Tax Act****, aims to facilitate investments in digital and green transitions. Relevant legislation governing this area includes* ***Public Finance Act****,* ***Fiscal Rule Act****,* ***Excise***

[9] Text in italics was written by a parallel project SMAFIN Expanded.
[10] Text in italics was written by a parallel project SMAFIN Expanded.

Duty Act *and* ***Rules on the application of tax incentives for investments in the digital and green transition****.*[11]

Tax Act (ZDDV-1) [194] prescribes a special feature for the construction industry, which states that the place of taxation is where the real estate is located. All taxpayers who provide services related to real estate must verify their obligations in the country where the real estate is located.

For **VAT in construction**, a reduced rate of 9.5% is used in some cases, and in others the general rate of 22%. The reduced rate of VAT in the construction industry is used for the construction and repair of residential buildings, while the general rate is used for commercial buildings or those used for business purposes. VAT in the construction industry at a reduced rate, 9.5 percent is charged on the basis of 11. and 11a. points of Annex I, ZDDV-1.

Rules on the implementation of ZDDV-1 prescribe a reduced rate of VAT in the construction industry only for taxpayers who perform an activity that falls under code F/Construction of the standard classification of activities. The purchase of a new building can also be taxed at a reduced rate, if the size of the apartment does not exceed 120 m^2 or the apartment house does not exceed 250 m^2 of usable area (social policy).

Rules on tax relief for investments in the digital and green transition [195] The document defines (with criteria and standards) what is considered as **investing in EE of buildings** (refers to windows, doors, external walls, roofs, thermal insulation products, appliances, lamps, heating and DHW systems, cooling and ventilation, etc.) and defines that this also applies in the case of wooden construction, if the wood has a certificate in accordance with the FSC standard. The main disadvantage is that it only applies in case of wooden supporting structure.

OTHER LEGISLATION CONCERNING FINANCING RENOVATION OF BUILDINGS

The financing sector, in addition to existing financing services legislation, supervises renovation financing in accordance with EU taxonomy, relevant national regulations, and the Green Bond Principles. These measures aim to guide the financial sector towards increased investment in achieving climate neutrality. The issuance of government green bonds is subject to the ***Public Finance Act*** *and governed by the Slovenian Sustainability Bond Framework 2023* [196] - under this Framework, the Republic of Slovenia may issue three types of bonds: **Green Bonds**, **Social Bonds** and **Sustainability bonds**. *The utilization of the International Capital Market Association's Harmonized Framework for Impact Reporting has been acknowledged within the corporate green bonds market.*[12]

8.1.3 Targets for renovation of building stock

National Energy and Climate Plan of the Republic of Slovenia (NECP) is a strategic document defining the goals, policies and measures for the energy union for the period up to 2030 (while looking ahead to 2040). Currently, the NECP from 2020 is still valid in Slovenia. The draft of the new document was under public consideration and is about to be adopted (probably by the end of 2024). Some general targets of NECP from 2020 are:

- **Greenhouse gas emissions** - net greenhouse gas emissions should be reduced by 36% compared to year 2005 and greenhouse gas emissions from buildings should be reduced by 70% compared to year 2005.

[11] Text in italics was written by a parallel project SMAFIN Expanded.
[12] Text in italics was written by a parallel project SMAFIN Expanded.

- **Renewable energy sources** – to achieve 27% of final energy consumption from RES, while achieving at least 2/3 use of RES in buildings. There is a ban on the sale and installation of new heating oil boilers since 2023.
- **Final energy consumption** - final energy consumption in buildings should be decreased by 20% compared to year 2005.

The new **National Energy and Climate Plan of the Republic of Slovenia from 2024 (NECP 2024)** foresees:

- **Greenhouse gas emissions** - net greenhouse gas emissions should be reduced by 55% before year 2033 compared to year 2005 and greenhouse gas emissions from buildings should be reduced by 70% compared to year 2005.

Long-Term Strategy for Energy Renovation of Buildings by 2050 (DSEPS 2050) defines approaches and policies for decarbonizing the national building stock by 2050 and identifies measures that support the overarching goals in the building sector outlined in NECP.

DSEPS is an outdated document from 2021, yet still valid. A **new DSEPS** is in the process of being written, and it is expected that a draft document will be prepared this fall. Targets from old DSEPS 2050 (2021) are:

- Energy renovation should be done on 74% of detached buildings and on 91% of apartment buildings.
- The long-term goal of buildings in the public sector is the energy renovation of 3% of the total floor area yearly, meeting the minimum requirements for EE in accordance with national legislation.
- In multi-family buildings, the building passport instrument is to be introduced by no later than 2024. It defines the energy, fire, and seismic aspects of renovation and provides guidelines for recommended and required measures for a gradually broader renovation.

DSEPS 2050 (2021) also provides sectoral targets for 2030 relative to the year 2020 for different types of buildings:

- **Households** - final energy consumption is reduced by 25%, and CO_2 emissions are reduced by 45%. A total of 16 062 million m² of single-family and 7.271 million m² of multi-family buildings will be energy-renovated. Energy consumption will be reduced by 6.05 PJ or 26%, with 36% coming as a result of nZEB.
- **Public buildings** - final energy consumption is reduced by 7%, and CO_2 emissions are reduced by 57%. 2.3 million m² of public buildings will be energy-renovated. Energy consumption will be reduced by 0.7 PJ or 20%, with 26% coming as a result of nZEB.
- **Private service sector buildings** - final energy consumption is increased by 1%, while CO_2 emissions are reduced by 51%. 4.1 million m² of buildings in the private service sector will be energy-renovated. Energy consumption will be reduced by 3.7 PJ or 16%, with 24% coming as a result of nZEB.

DSEPS 2050 (2021) also provides an overview of target achievement up to 2020. The analysis is done for year 2018.

- For energy-renovated area of public buildings all indicators show the achievement of the target in 2018 and good prospects for achieving 2020 goals.
- In terms of financial leverage of incentives in the public sector, intensity of CO_2 in commercial and institutional sector, improvement of energy efficiency in the residential sector – saving of

final energy and specific GHG emissions in residential sector the annual targets were met, but some indicators suggest that achieving the target in 2020 could be at risk.

- Failure to meet the annual target and several indicators significantly or one indicator very significantly suggesting that achieving the target in 2020 and in the future will be highly jeopardized was found for: reduction of GHG emissions through measures in the public sector, reduction of final energy consumption through measures in the public sector, improvement of EE in the residential sector – reduction of GHG emissions and share of RES in fuel consumption in general use.

According to DSEPS 2050 (2021) the following targets are set up to 2050 for residential buildings and public buildings separately:

- **Residential buildings** - finally energy use should be reduced by 25% by 2030, 37% by 2040 and 40% by 2050. CO_2 emissions should be reduced by 45% by 2030, 64% by 2040 and 70% by 2050. For detached buildings the goals are to create cumulative savings of energy consumption of 26% by 2030, 41% by 2040 and 45% by 2050. Similar goals in cumulative savings of energy consumption are set for multi-apartment buildings: 26% by 2030, 44% by 2040 and 48% by 2050.
- **Public buildings** - should have a reduction of final energy use of 7% by 2030, 6% by 2040 and 0% by 2050 and reduced CO_2 emissions of 57% by 2030, 83% by 2040 and 92% by 2050. The percentage of complete renovations of public administrative buildings should be 95.2% by 2050. The cumulative savings of energy consumption for public buildings should be 20% by 2030, 29% by 2040 and 26% by 2050.

8.1.4 Research and development

Research activities within the targeted Research Programs are conducted in the public interest through research projects aimed at achieving the goals of national development. These projects are thematically oriented based on proposals from ministries and other proposers responsible for specific areas of public interest. For instance, in 2023, a project focusing on energy management within the public sector received support from both the Ministry of Environment, Climate, and Energy, as well as Slovenian Research and Innovation Agency.

*One of the programs addressing topics related to RENOINVEST is the **Modelling and Assessment of Interventions in the Environment and Energy**, funded by the Slovenian Research and Innovation Agency. This program focuses on developing energy system modelling, designing energy strategies, creating energy use models, analysing environmental impacts of energy systems, assessing environmental impacts from energy system operation and transportation, and optimizing energy systems.*[13]

Another, called **LIFE IP CARE4CLIMATE** [197] is an eight-year-long integrated project that, through awareness-raising, education, and training of key stakeholders, encourages the implementation of measures to help Slovenia meet its greenhouse gas emission reduction targets by 2020 and 2030. The content of the project is divided into six areas and connects sustainable mobility, energy efficiency of buildings, sustainable land use and practices for the transition to a low-carbon economy. Among others it develops the sustainable indicators based on EU framework Level(s).

[13] Text in italics was written by a parallel project SMAFIN Expanded.

POCITYF [198] is H2020 project (involving Celje) that helps encourage the historical cities to become greener, smarter and more livable while respecting their cultural heritage through several energy and finance measures to acchieve positive energy districts.

Action Plan for Nearly Zero-Energy Buildings for the Period Until 2020 [199] - *this strategy for renovating existing buildings to Nearly Zero-Energy Buildings (nZEB) levels is outlined in the Action Plan for Nearly Zero-Energy Buildings for the Period Until 2020 (2015). The LTRS 2050 (2021) establishes the nZEB renovation rates to be achieved by the year 2030 and 2050. The Eco Fund provides incentives for households to build new nZEB single-family houses and to purchase apartments in new multi-family nZEBs, as well as for the deep renovation of houses and the purchase of apartments in deeply renovated multi-family buildings that meet nZEB standards.*

Resolution on Slovenia's Long-Term Climate Strategy until 2050 [9]*is based on the principles of reducing greenhouse gas emissions, efficient energy use, reducing energy consumption, climate justice, a fair transition, and scientific knowledge. It is a strategic document; however, it does not contain specific measures. The implementation of the climate strategy until 2030 is determined by the NECP. By setting the climate goal, the strategy presents a challenge and an opportunity for sectors such as transport, energy, industry, agriculture, buildings (including fuel use in households and the service sector), waste, land use, land-use change, and forestry to achieve net-zero emissions by 2050. Additionally, it also sets strategic sectoral objectives for 2050 (and 2040), which individual sectors must consistently consider and incorporate into their sectoral documents and plans.*[14]

8.1.5 Empowerment activities

Goverment of Slovenia provided dedicated page for **program C1K2 – Sustainable renovation of buildings** [200] with the goal to promote holistic renovation of buildings with an emphasis on the national building stock. As the most important action the reform of planning the and financing the energy renovation of buildings in public sector is predcted. It includes a new Long-term Building Energy Renovation Strategy (DSEPS) 2050, new Rules on the Efficient Use of Energy in Buildings, preparation of the legal basis for the establishment of a stable and sufficient systemic financial source for the energy renovation of buildings in public sector, and the list of buildings suitable for energy renovation. With the reform, an action plan for the energy renovation of public buildings is expected to be prepared by December 31, 2025.

Platform Energetika [201] established as a part of Ministry for environment, Climate and Energy webpage, is providing information on efficient use of energy in buildings, renewable energy sources, electricity generation, etc. Part of information is also a **list of energy service providers** that offer energy contracting services according to the EnPC model is included [202].

Hub for sustainable renovation and construction of buildings (Stičišče TPGS) deals with all aspects of sustainable renovation and construction of buildings with an emphasis on gathering different experiences, identifying new needs, and finding expertly based solutions. The TPGS hub creates conditions for communication between various actors and decision-makers with the aim of supporting new concepts in the renovation and construction of buildings and improving their implementation. The purpose of the TPGS is also to establish a systemic competition in the communication and decision-making process, which enables feedback to decision-makers regarding the implementation process of sustainable building renovation and construction. It connects various actors: professional associations and chambers, research institutes, faculties, ministries, energy agencies, housing fund, banks, industry,

[14] Text in italics was written by a parallel project SMAFIN Expanded.

individuals, managers, non-governmental and civil society organizations, etc., with the aim of contributing to the reduction of GHG emissions.

ZERO500 [203] was a measure identified by DSEPS 2050 targeted at reduction of energy poverty. The program included 500 households with low incomes in single-family homes or apartments in two-family homes, which received 100 percent non-refundable funds for investments in measures for EE use (such as replacing facades, windows, roof insulation, installing ventilation, and others) from Eco Fund.

Strategic Research-Innovation Partnership Smart Buildings with Wooden Chain (SRIP PSiDL) [204] encompasses the areas of the smart and sustainable home of the future with established net zero-emission construction and renovation, with integrated functions of intelligent management of all building segments, ensuring high comfort and a healthy living and working environment through joint product development, cooperation between partners, digitization and internationalization of operations, and by establishing successful business models.

Campaign: In March 2024 the Ministry of Environment, Climate and Energy in Slovenia started a three-month campaign on the importance of renewable energy sources, under the slogan *"The power of wind, sun, water and wood. For all of us. Let's choose renewable energy sources"*. The goal is to bring renewable energy sources closer to people and highlight their role in the decarbonization of the energy sector.

8.2 Market capacities relevant for financing sustainable renovation

8.2.1 Building stock features

TECHNICAL CAPACITIES OF BUILDING STOCK [16]

The **Slovenian building stock** comprises of 87.3 million m^2 of floor space, of which 76% belongs to buildings that were built before 1990. The buildings are divided into residential and service sector buildings, relying on a uniform classification types of buildings. The housing sector comprises a 73% share of the entire building stock and is divided into one- and multi-apartment buildings; the total floor area is 63.7 million m^2. The buildings of the service sector cover 23.4 million m^2 and are divided, according to the purpose of use and ownership, to public buildings and to private service sector buildings. Public buildings represent a 41% share of all in the service sector and include buildings for special social groups, public administration, culture and entertainment, museums and libraries, education and scientific research work, health care and sports. Public buildings consist of narrow and wide public buildings as well as municipal or local communities buildings. Private service sector buildings are hotels, catering buildings, other administrative and office buildings and shops.

The **technical potential in the housing sector** for thorough energy renovation refers to the buildings where at least two elements of the building's thermal envelope (walls, windows, roof) have already reached their target life of the element (30 years) and must therefore be replaced. This means that during the period we observe the age of the building and the structural elements of the building's thermal envelope. The technical potential for energy renovation is model-estimated based on the baseline situation of the building from an energy point of view, which means whether any element based on the age of the building's thermal envelope has already been energy-renovated (facade, roof) or replaced (windows). An energy-unrenovated building in the starting year meets the condition for small, medium and thorough or almost zero-energy renovation. The initial state is taken from the

Registry of real estate (REN), where for individual elements of the building's envelope it is indicated if and when the element was renovated. This potential is increasing in the observed period until 2050, since with each year new buildings, in need of comprehensive energy renovations are added to the cumulative potential. On the other hand, depending on the planned course of renovations, the cumulative share of buildings that meet the conditions for comprehensive energy renovation reduces with annual renovations. In the past therefore, the overall technical potential has been increasing due to relatively few completed renovations. Cumulative technical potential for energy renovation in single-family buildings is 44.6 million m^2, and in multi-apartment buildings 16.4 million m^2.

Public buildings consist of narrow and wider public sector buildings. Total area of public buildings covers 9.7 million m^2, of which 0.9 million m^2 are in the narrow public sector and 8.8 million m^2 are in the wider public sector. The technical potential for energy renovation is model-estimated based on the baseline situation buildings from an energy point of view, depending on the age of the building and the elements of the building's thermal envelope. The default state is taken from REN, where for individual elements of the building's envelope it is indicated if and when the element was renovated. Two possible scopes of renovations were foreseen – partial and comprehensive energy renovation. Buildings that have not yet been the subject of energy renovation have the potential for comprehensive energy renovation. Thus, the technical potential for comprehensive energy renovation of public buildings amounts to approx 8.08 million m^2, while for partial energy renovation it amounts to 5.7 million m^2. That potential is taken into account in the projection of energy renovations of the existing fund, where it presents the initial state for analyses of scope of renovations in accordance with the forecast from National energy and climate plan (NECP). The starting scope of renovations for public buildings in the period 2020-2050 amounts to 3.0 – 3.4%. A special place in the context of energy renovation is occupied by buildings owned and used by the local community of the public sector, for which the energy renovation of three percent of the buildings per year is planned.

In the **private service sector** the technical potential for energy renovation is model-estimated based on the baseline situation of the building from an energy point of view, depending on the age of the building and the elements of its thermal envelope, the same as in public buildings. Also here the default state is taken from REN, where for individual elements of the building's envelope it is indicated if and when the element was renovated. By default there were two possible scopes of renovation - partial and comprehensive energy renovation. Technical potential for comprehensive energy renovation of buildings in the private service sector is 8.08 million m^2, and 5.7 million m^2 for partial energy renovation. That potential is taken into account when predicting energy renovations of the existing fund, where it is the default for analyses of the scope of renovations in accordance with the forecasts from NECP. The starting scope of renovations for private service sector buildings in the period 2020-2050 amounts to 3.1 - 3.3%.

FINANCIAL VOLUME FOR RENOVATION OF BUILDING STOCK [16]

In the **housing sector**, in order to achieve the goals from the NECP, in the period 2021-2030 investments in amount of €7.264 million (including VAT) are needed. The main source for promoting energy renovations in the housing sector are funds from contribution for efficient use of energy, which are awarded in the form of grants through the Eco Fund. In order to achieve the goals within the NECP, renovations in almost zero-energy buildings and comprehensive renovations will be encouraged, since their spontaneous implementation is less likely due to lower economic eligibility, high special costs and the integrity of the implementation. Therefore it is estimated that in the period 2021-2030 €725.6 million of non-returnable subsidies will have to be provided in order to achieve the goals from the NECP in the housing sector. In order to ensure sufficient grants, a phased increase of the contribution

for efficient use of energy is planned from 0.08 €c/kWh to 0.27 €c/kWh in 2030. For energy renovation of buildings in the residential sector €565.7 million are thus planned from the efficient use of energy contribution until 2030.

Through the Eco Fund, grants from the Climate Change Fund are also available for replacement of old heating devices with new devices based on wood biomass or thermal pumps. For energy renovation of buildings in the residential sector €135 million will be provided from the Climate Change Fund until 2030.

Despite the expected increase in the contribution to the EE, additional grants from the European Cohesion Policy within the multi-annual financial framework for the period 2021-2027 in the amount of €8.2 million (including Slovenian part) are also needed for the planned scope of energy renovations. In addition another €5 million are planned as non-refundable resources from the Recovery and Resilience Fund (RRF).

Taking into account the leverages, the total grant is of €725.6 million in the studied period is expected to stimulate €2.399 million of investments. Consumption of grants in individual years may deviate from the planned, so it is important that unspent grants are purposefully carried over to subsequent years exclusively for energy renovation of buildings, as this is the only way sufficient grants will be guaranteed throughout the period. On the other hand, households invest in the energy renovation of apartments even without non-refundable funds. In the past, a larger share of households carried out energy renovations without subsidies from the Eco Fund. Based on the Report on energy and fuel consumption in households in Slovenia for 2019 [205] it is estimated that spontaneous renovations on an annual level amount to roughly €510 million. The report also shows that spontaneous renovations in the past were mostly for partial energy renovations. DSEPS also predicts that the majority of investments in the energy sector renovation until 2030 will be carried out with spontaneous renovations, namely €4864.9 million or an average of €486.5 million annually. Spontaneous renovations will be carried out on a slightly smaller scale compared to previous years, as energy renovations stimulated by grants will be focused on comprehensive renovations and renovations to almost zero-energy buildings. Refundable funds and loans from commercial banks are also available to support investments in the energy renovation of residential buildings. On a smaller scale there are also programs by energy suppliers and energy service companies (ESCOs) available.

In the **public sector**, in order to achieve the goals from the NECP, it is necessary to invest €825 million (excluding VAT) in the period 2021-2030. In addition, due to the failure to achieve the target of 3% energy renovations of buildings in the narrower public sector in the past, additional €23.4 million (without VAT) will have to be invested. The main non-refundable source of financing energy renovations of buildings in the public sector are funds of the European Cohesion Policy.

From 2024, European Cohesion Funds from the new multiannual financial framework in the amount of €59.8 million are also planned for comprehensive energy renovation of buildings in the public sector. In this context, it is planned to continue the financial scheme from the previous periods. This way the share of funding from EU grants, including own participation of Slovenia, will amount to 40% of investments (EU share 85%, Slovenia's share 15%), while the remaining 60% of investments will be financed from private funds and own resources.

During the entire period, €258.7 million of European Cohesion funds are planned, which together with Slovenian participation (€45.7 million) will stimulate €621.1 million (without VAT) of investments in comprehensive energy renovation of buildings in the public sector. In addition another €38 million are planned from the Recovery and Resilience Fund (RRF) as non-refundable funds.

For the energy renovation of buildings in the public sector within the Eco Fund grants in the planned amount of €11.1 million are available from the efficient use of energy contribution. There are additional grants available from the Climate Change Fund in the amount of €11 million. Funds from Climate Change Fund are mainly intended for energy renovations of public buildings that are not feasible within the framework of cohesion policy, public private partnerships and alike. There are also refundable funds available for financing of energy renovations in the public sector from the Eco Fund as well as from SID Bank and commercial banks. There are also some smaller programs of energy suppliers available.

In the **private service sector**, in order for the goals from the NECP to be achieved in the period 2021-2030 investments of €1081 million (excluding VAT) are needed. Buildings in the private sector are an integral part of the companies' assets with which they carry out their activity, which means that companies will invest their own funds in fields with a higher return and a shorter payback period. Grants for energy renovation of buildings thus improve the economy of investments.

The main source of grants for the energy renovation of buildings in the private sector is the efficient use of energy contribution in the amount of €44.39 million. In the framework of the OP ECP, in 2021 and 2022, funds in the estimated amount of €7.49 million are also available to support micro, small and medium-sized enterprises in the field of tourism to increase material and energy efficiency. Together €51.9 million is planned for the entire period, which will stimulate investments in the amount 231.7 million. Planned investments in energy renovation can only be implemented if companies are provided with adequate funds or financial resources in the amount of €1029 million. Companies can finance energy renovations of buildings from their own funds, credits from the Eco Fund as well as with loans from SID Bank and other commercial banks. On the other hand, they can also finance energy building renovations using partnerships with ESCO companies or participate in programs of energy suppliers.

8.2.2 Renovation technologies and intervention

TYPES OF TECHNOLOGIES FOR RENOVATION OF BUILDINGS

Most often used measure when speaking about EE renovation of buildings in Slovenia in general is improvement of **energy source**. According to the statistical data of the Eco Fund, the largest number of measures in the renovation of buildings relate to the replacement of the energy source. In the past, according to their data, heat pumps (of various types, mostly water/air) were most often installed. The measure of energy renovation, which refers to the installation of a **heat pump** as an energy source, is represented in their database in 36%.

This measure of energy renovation of the buildings is followed in equal proportion by the **energy renovation of the facade** with a thermal insulation system, furthermore the installation of **PV panels** for generating electricity and the installation of **mechanical ventilation** with heat recovery. All three mentioned measures are represented in 13% of the renovations from the Eco Fund statistics. The installation of a thin-layer contact facade with thermal insulation according to the ETICS system prevails in case of the energy renovation of facades in Slovenia, where polystyrene is most often used for thermal insulation.

The third place is shared by the measures of replacing **windows** with more EE ones and replacing fossil fuels with biomass. According to the statistics of Eco Fund, each of the listed measures covers approximatelly 10% of all renovations. Due to the conditions of the Eco Fund tender, all these windows are practically 100% made of wooden products, which certainly contributes to the sustainable aspect

of the buildings. However, the reality based on on a simple visual evaluation shows that most of the replaced windows are PVC, as they are significantly cheaper than wooden ones. This information is also supported by the fact that the production of **PVC windows** dominates in Slovenia.

Comprehensive renovations are the absolute fewest in number, according to Eco Fund figures, they do not even reach **0.1%** of all renovations. The comprehensive renovation includes several measures that are not only technically demanding, but also financially extensive.

Due to the accessibility of the system itself, the network and the availability of space for installation, **district heating** is limited to more or less dense urban areas. It is covering larger cities such as: Ljubljana, Celje, Maribor, Nova Gorica, Koper, Novo mesto, and smaller cities such as Kranj, Velenje, Murska Sobota, Ptuj, Slovenj Gradec, Bled, Bohinj, Bovec, Črna na Koroškem, Črnomelj, Dravograd, Gornji Grad, Grosuplje, Hoče, Hrastnik, Hrpelje Kozina, Idrija.

Generation of heat and electricity, also known as **cogeneration**, has been on the rise in Slovenia since 2010. Since Slovenia is an extremely forested country (forests cover as much as 58.4% of the surface), wood biomass represents one of the key renewable natural resources for this technology as well. There are many examples of good cogeneration practice - it is implemented in schools, student dormitories, restaurants, hotels, shopping centres, multi-apartment buildings, medical centres, hospitals, spas, swimming pools... The service is supported by the state with guaranteed purchase and operational support.

Geothermal energy is used to a somewhat lesser extent in Slovenia. Most geothermal sources are in northeastern Slovenia (65%), followed by the Krško-Brežiška basin (25%) and the Ljubljana basin (5%). The most favourable conditions are in northeastern part of Slovenia, where there is a low-temperature borehole for district heating of buildings, Termal I, and only one high-temperature geothermal power plant with a capacity of 45 MW, Termal II. In addition, a pilot geothermal power plant with several hundred-megawatt hours of electricity is being experimentally built on abandoned gas wells, which in practice means the production for a settlement of 40 residential units. According to the data from the 2009 study [206], several power plants with a total capacity of 70 MW and an estimated investment value of €140 million could be built on the area of Termal II [207].

TYPES OF INTERVENTIONS FOR RENOVATION OF BUILDINGS

There are practically no planned step-by-step EE renovations of buildings as the current financing systems do not support them – except in the case of independent self-financing, for which there is no official data. Mainly, a single renovation measure (or two) is applied for subsidies or credits, which in majority of cases means the **installation of a heat pump** – the most common measure, or the installation of PV panels for generating electricity, or the replacement of windows. Deep renovations are extremely rare, their number is small, especially in larger buildings, in fact renovations of existing buildings hardly reach the standard of new constructions. Again, in independent self-financing no official data exists.

Regarding the implementation of energy measures in building renovations, **cultural heritage buildings** are particularly sensitive - due to the protection they face many restrictions. In addition, there are technical restrictions on historic buildings in old city centres. In order to preserve the appearance of the historic relief facades of these buildings, the shape and slopes of the roofs, the design of the windows, etc., renovations are more technically difficult or/and more financially demanding.

In the case of step-by-step energy renovation of buildings, it is necessary to properly coordinate the order of measures before their implementation, otherwise undesirable consequences such as the

appearance of condensation and mould may occur in the building. The first measure must be the renovation of the building façade (actually the whole envelope) by adding thermal insulation. If possible, the windows should be replaced at the same time, otherwise, only after the renovation of the facade (which is not logical from a technical-implementation point of view). This should be followed by the renovation of the heating system and the energy source, as the building's energy needs for heating are reduced by several tens of percent. When planning building renovations, the financial aspect is most often in the foreground, the sustainability of the solutions is rarely considered. However, when it is considered, the choice is made on the basis of general knowledge and experience, since there is no relevant data. Most renovations focus on the calculation of money savings due to savings in energy use, but due to low energy prices, the payback period of renovations is relatively long [208].

8.2.3 Funding

DIRECT FUNDING FROM EU SOURCES

*The **Operational Program for the Implementation of the EU Cohesion Policy 2014-2020** (OP ECP) focused on several key initiatives aimed at enhancing EE and reducing carbon emissions. One significant aspect was the deep energy renovation of buildings across municipalities, the wider public sector, and those owned by the central government. This endeavour aimed to modernize infrastructure and promote sustainability in urban and public spaces.*

To facilitate these renovations, grant co-financing was provided for deep renovation projects. These projects were primarily implemented through EnPC models and public-private partnerships (PPP), with alternative avenues available through public procurement. This financial support enabled the renovation of 1.1 million square meters of building floor area, totalling €114.4 million in grants by second quarter of year 2024.[15]

European Cohesion Policy Program for the period 2021-2027 in Slovenia - to achieve the cohesion policy program specific goal RSO 2.1, which focuses on promoting EE and reducing GHG emissions, the following measures and allocated funds (Implementation Plan of the EU Cohesion Policy 2021-2027) are in place:

- Energy renovation of public buildings (€51.5 million)
- Energy renovation of buildings in the private service sector (€15 million)
- Energy renovation of private multi-apartment buildings (€13.2 million)
- Grants and awareness-raising initiatives for low-income households (€15 million)
- Preparation of projects for the energy renovation of public buildings - co-financing of documentation (€8 million)

The Government of the Republic of Slovenia has utilized the Recovery and Resilience Facility (RRF) to develop and fund its **Recovery and Resilience Plan (RRP)**. The initial plan consisted of 34 reforms and 52 investments across four pillars: green transition, digital transformation, smart sustainable and inclusive growth, and healthcare and social security. The allocated funds totalled €1.78 billion in grants and €705 million in loans. In October 2023, Slovenia's RRP underwent amendments. The revised plan, now incorporating the REPowerEU chapter, is valued at €1.61 billion in grants and €1.07 billion in loans. The total amount of European funds earmarked for the implementation of the RRP stands at €2.68 billion.

[15] Text in italics was written by a parallel project SMAFIN Expanded.

Within the Green Transition pillar, which is one of the four pillars of the Plan, Component C1.K2 focuses on the sustainable renovation of buildings to enhance EE through two measures:

- *C1.K2.IG: Investments in increasing EE in industry (€0.2 million)*
- *C1.K2.IB: Sustainable renovation of buildings (€66.1 million)*

MOPE: The Ministry of the Environment, Climate and Energy regularly plans and publishes public calls (NOO, EKP 21-27) in the areas of: energy renovation of buildings of exceptional administrative or social importance, for co-financing the upgrade of technical building systems, for co-financing the energy renovation of multi-apartment buildings in public ownership, for co-financing the comprehensive energy renovation of buildings owned and used by municipalities, for raising awareness of socially vulnerable groups and enabling access to grants and reducing energy poverty, for energy renovation of buildings in the narrow and wider public sector and the construction of new devices for the production of electricity from solar energy, for comprehensive energy renovation of buildings in the private service sector, for comprehensive energy renovation of private multi-apartment buildings (including demo sNES, earthquake, poverty, etc.) [209].

SPIRIT: Public Agency of the Republic of Slovenia for the Promotion of Investment, Entrepreneurship and Internationalization publishes public tenders for SMEs in the strategic sustainable and circular transformation of business, including the transformation of production according to the principles of the circular economy [210].

INDIRECT EU FUNDING

The Fund of Funds *(FoF) was established in 2017 in cooperation with the Ministry of Economic Development and Technology to facilitate the utilization of European Cohesion funds. Through the FoF, SID bank provides loans, guarantees, and equity financing to companies and the public sector via other financial intermediaries such as commercial banks, savings banks, and public funds. Long-term loans for energy renovation of public buildings are available to the public sector and Energy Service Companies (ESCOs). Additionally, the public sector can acquire loans for urban development projects.*

European Local Energy Assistance *(ELENA) provides technical assistance for EE and RES investments targeting buildings and innovative urban transport for numerous projects in Slovenia. Below is the list of completed ELENA projects related to renovations and implemented via European Investment Bank (EIB) and European Bank for Reconstruction and Development (EBRD):*

- *EOL - Energy retrofit programme of public buildings in Ljubljana (EIB)*
- *PM4PM - Preparation and Mobilisation of Financing for Sustainable Energy Investments in Primorska Region Municipalities (EIB)*
- *Energy renovation of public buildings - City of Novo mesto, City of Celje and City of Kranj (EBRD)*
- *GovDER - Government Deep Energy Renovation (EIB)*
- *The on-going ELENA (EIB) project: Sustainable Energy – East Slovenia (SE-ES)*

FINANCIAL MECHANISMS OF STATE SUBSIDY PROGRAMMES

Eco Fund *finances the measures to boost EE, promote RES, and develop Nearly Zero-Energy Buildings (nZEB), with grants mainly sourced from the Energy Efficiency Contribution and the Climate Change Fund (CCF). In 2022, a total of €73.6 million of non-refundable funds were disbursed, specifically €43.5 million based on the Energy Efficiency Act regulation and €30.1 based on the CCF program funds.*

However, these grants were allocated to various EE and RES measures, not solely to building renovations. Additionally, Eco Fund supports low-income households through:

- *Incentives covering 100% of eligible costs for energy renovations of multi-apartment buildings and replacing old solid fuel heating equipment.*
- *The ZERO project, providing energy consultations and implementing free or low-cost EE measures.*
- *The ZERO 500 project using Cohesion funds for EE and RES measures in single- or two-dwelling buildings.*

***Climate Change Fund** (CCF) is overseen by the Ministry of Environment, Climate, and Energy. It is funded through the sale of GHG emission allowances and is utilized to co-finance measures aimed at both mitigating and adapting to the impacts of climate change. In the CCF plan for 2023-2026, resources are allocated for the following purposes:*

- *EE renovation of public buildings, including both narrow and wider public sector buildings, as well as buildings of significant importance (€79.5 million).*
- *EE renovation of residential buildings (€15.5 million).*

Funding for EE or RES measures targeted at alleviating energy poverty (€22.5 million).[16]

Housing Fund of the Republic of Slovenia (SSRS) is a public fund and central state institution for the financing or implementation of the national housing program or the promotion of housing construction, renovation and maintenance of apartments and residential buildings. Among other tasks SSRS implements financial programs (e.g. financial incentives in the form of favorable loans) with an emphasis also on promoting the comprehensive renovation of the existing housing stock.

MECHANISMS TO ATTRACT COMMERCIAL FINANCING PRODUCTS

*Slovenia offers two distinct types of **green bonds**:*

- *corporate bonds issued by private and public corporations (including commercial banks and SID bank), and*
- *government bonds issued by the Republic of Slovenia.*

It is important to note two key disclaimers. Firstly, the green bond issued by SID bank is not commercial but fully owned by the Republic of Slovenia. Secondly, while the government bond is labelled as 'sustainable,' it is not explicitly 'green.' It is exclusively earmarked for financing projects that adhere to stringent green and social project eligibility criteria.

SID Bank: As national promotional, development and export bank it promotes the competitiveness of the Slovenian economy and sustainable development through banking and insurance services. By issuing **green bonds** for large companies and SMEs, SID Bank offers financing for "green projects", i.e. new or existing ecologically sustainable projects. These include RES projects, energy efficiency of buildings, pollution prevention and control, sustainable management of natural resources, adaptation to climate change, and development of ecologically efficient products, technologies and processes [211]. SID Bank also offers **favourable loans** for companies, other legal entities under private law, legal entities under public law, sole proprietors and other people who perform a certain activity as a profession, etc. Compared to commercial banks, this program offers a more favourable interest rate, a credit period of 1 to 15 years with the possibility of a moratorium, an unlimited loan value, financing

[16] Text in italics was written by a parallel project SMAFIN Expanded.

of up to 85% of (eligible) project costs, combining funds with EU funds or other funds from commercial banks. In terms of content, they refer to projects that are, among other things, related to renewable sources and efficient use of energy. From the perspective of the circular economy, they refer to waste management, reducing air pollution, environmentally friendly production and products, etc. [212] .

Public-Private Partnership Act (ZJZP) [213]: By adopting it the state has regulated the legislative and legal framework for public-private partnerships in the implementation of energy renovations. The Act regulates the purpose and principles of private investment in public projects and/or public co-financing of private projects that are in the public interest. It also regulates the methods of promoting public-private partnerships and the institutions responsible for their promotion and development, as well as the conditions, procedure for their formation and forms and the method of implementation of public-private partnerships, etc.

MECHANISMS TO ATTRACT DIRECT PRIVATE INVESTMENTS

In Slovenia, there are actually not many good and diverse opportunities that attract direct private investments. The most well-known and effective are the state-supported mechanisms established by the ECO FUND.

ECO FUND (Eko Sklad): The Slovenian Environmental Public Fund is a specialized public financial institution for promoting environmental protection in Slovenia. The Fund issues and grants **favorable loans** for environmental investments and **non-refundable financial incentives (grants)** for various measures of efficient use and renewable energy sources to individuals, legal entities and municipalities.

ECO FUND grants: the Eco Fund allocates grants for EE and RES measures in buildings, for sustainable mobility, and for energy audits and investments in EE by companies, based on ZURE and the SPS program. Among others, the grants are intended for replacing old heating devices with new ones running on biomass or with heat pumps (particularly for socially vulnerable citizens), for the construction of nearly zero-energy buildings, for the construction of nearly zero-energy buildings of general social importance, for companies for investments in EE use and RES, for devices for self-supply of electricity. The data show that in 2023, the largest amount of grants was paid for investments in heat pumps, namely EUR 28.95 million, of which the largest amount came from SPS funds. Furthermore, for the replacement of old heating devices with heat pumps for central heating of residential buildings (EUR 25.74 million) [214].

ECO FUND loans: the Eco Fund also provides loans for environmental investment projects, such as efficient waste management to legal entities. Furthermore, the fund is offering loans for citizens for comprehensive renovations of residential buildings, for individual EE measures, for ventilation systems with heat recovery, for implementation of green roof, for installation of electrical or thermal energy storage devices, for biomass heating system, for solar, wind and hydroelectric power plants, etc., all with a fixed interest rate of 1.8% and a repayment period of 10-20 years [215].

ECO FUND reducing energy poverty: the fund implements measures for socially vulnerable citizens. Within energy renovation of multi-apartment buildings, these citizens are entitled to a subsidy for their share of the investment. In addition to individual calls, the fund has also been implementing the ZERO project (Reducing Citizens' Energy Poverty) since 2014. It then implemented the ZERO500 program (within the framework of the Operational Program of the European Cohesion Policy for the period 2014-2020), which ended at the end of 2023. The funds were intended for 500 households with low

incomes to invest in EE measures in one- or two-apartment buildings. In 2023, the fund published a new call for non-refundable financial incentives for reducing energy poverty (ZER) in the amount of EUR 5 million (later increased to EUR 10 million). The call was intended for investments in measures to increase the EE of buildings and the use of RES in one- or two-apartment buildings or apartments in multi-apartment buildings. Under this scheme, a non-refundable financial incentive is granted to an energy-poor household in the amount of up to EUR 18,000, or in the case of exclusively replacing an old heating device together with the installation of a hot water system, in the amount of up to EUR 12,000 [216].

ECO FUND energy consulting: Through professionally trained energy consultants, the Eco Fund also provides free, individual and independent energy consulting directly to citizens, companies and the public sector. In addition, it also carries out educational and promotional activities such as thematic lectures, professional articles, radio and TV shows.

The Eco Fund continues its work and regularly offers financial mechanisms for various users. In accordance with financial possibilities and needs, it develops new products. Part of the fund's services (related to RES and mobility) was transferred by the state to the company Borzen d.o.o.

Borzen: Borzen d.o.o. is a public service that operates the electricity market and provides support services. From 2024 it also issues public calls and distributes **grants** to promote the production of electricity and heat from renewable sources and for the storage of electricity and heat to legal entities. It also issues public calls and distributes subsidies to citizens to subsidize solar power plants for self-sufficiency and combinations of solar power plants with a storage tank. In 2024, Borzen launched a public call for investment aid for the purchase and installation of battery storage systems for electricity in an existing energy self-supply system in total value of EUR 8,000,000.00. The amount of investment aid was EUR 275.00/kWh, depending on the storage capacity of the battery storage system, but not more than 40% of the eligible investment costs [217].

Other types *of EE services that attract direct private investments are available in Slovenia, including **Energy Performance Contracting (EnPC)**. EnPC means a contractual obligation to take advantage of the available economic potential for energy saving, including the financing of the necessary EE measures for the building. The service providers receive support through national policies such as NECP and LTRS 2050. From 2017 to 2023, investments totalling over €140 million were made based on the EnPC business model.*[17] Ministry for environment, climate and energy is providing a list of Energy Performance Contracting providers at the portal Energetika, which names all of the companies mentioned above.

Public-private partnership EnPC: Companies with the widest portfolio of EnPC renovations in the area of public-private partnership, are PETROL d.d. and RESALTA d.o.o., with Domplan d.d. and Interenergo d.o.o. also collaborating in notable EE renovations across Slovenia. The majority of EnPC projects began in the period between 2017 and 2024, with some of the earliest adopters being in between 2010 and 2014. The contractual obligations for energy “pay-off” usually spans from seven to fifteen years, in some cases even up to twenty, while the private partners generally covered around 50% (between 44% and 57%) of the investment. These projects targeted municipal and governmental buildings, like administrative offices, schools and other complexes.

Private-private partnership EnPC: In terms of private investments in collaboration with ESCOs, the most visible projects were EE renovations of multi-owner apartment buildings. From 2017 up until 2024, four renovations like this can be mentioned, two concerning EE renovations (specifically of boiler

[17] Text in italics was written by a parallel project SMAFIN Expanded.

rooms) and two the installation of PV panels. These projects were highly dependent on the will and collaboration of all owners and building managers, so in case of environment awareness is high, different actors manage to come together to produce these kinds of successful projects. This type of renovations also signed a collaboration for the period of seven to fifteen years, where the private funding made up a 100% of investment. Prominent ESCOs here were Domplan d.d., GEN-I d.o.o. and Interenergo d.o.o.

Commercial banks: Most commercial banks in Slovenia offer their clients "**green loans**", intended for investments in improving the EE of buildings. The interest rates of these loans are lower than regular commercial loans but at the same time much higher than those offered by the Eco Fund. Now, the Eco Fund interest rate is 1.8% while, for example, the largest Slovenian bank offers a "green" loan for similar purposes at an interest rate of 2.8%. However, Slovenian banks also offer certain other benefits to encourage clients to make EE investments, such as **additional financial contributions** or subsidies that reduce the total costs of renovation in cooperation with state programs (e.g. SPSP - Scheme of Support Funds for Building Renovation), **a moratorium on repayment**, **a longer repayment periods**, **professional advice** (of EE experts who can advise free of charge), **simpler approval procedures**, **a combination with other subsidies** (banks can enable a combination of a loan with other subsidies or donations, which further reduces the financial burden).

Slovenian Enterprise Fund (SPS): The SPS regularly launches public tenders and issues vouchers to legal entities for the co-financing of services to improve business competencies and products, including, for example, Life cycle assessment (LCA) analysis of products, research, development and design in wood processing companies, etc. Vouchers are particularly intended for SMEs and allow for 60% co-financing of eligible costs, or a maximum of EUR 9,999.99 in grants per voucher. Next call for LCA analysis voucher is planned for September 2025 [218].

Reserve fund of multi-apartment and commercial buildings: in multi-apartment and commercial buildings with several private condominium owners, a significant simplification of the financing of EE investments is represented by a reserve fund, which, in accordance with the provisions of the Property Code and the Housing Act, is mandatory for all buildings with more than 8 individual parts and more than 2 condominium owners. The reserve fund is intended for both regular maintenance investments of the building as well as for larger investments, including those for improving the EE of the building. Usually, the reserve fund does not collect enough money to finance extensive renovations. In such cases, condominium owners are left with the option of taking out a loan against the reserve fund, for which, according to current legislation, the consent of all condominium owners is required. This, however, represents a significant obstacle to the implementation of larger investments.

Insurance companies: The Slovenian insurance market is relatively underdeveloped, which is why even in the construction area, insurance companies do not offer any support for improvement of EE of buildings, e.g. in the form of lower insurance premiums, which is already common practice in most of the EU.

Crowdfunding and crowdlending: The regulatory environment for crowdfunding in Slovenia is largely influenced by EU Regulation 2020/1503 on European Crowdfunding Service Providers (ECSP), which harmonizes crowdfunding rules across the EU and facilitates cross-border investments. At the national level, crowdfunding is subject to the Slovenian Financial Instruments Market Act (ZTFI-1) and supervision by the Securities Market Agency (ATVP). While donation-based crowdfunding remains largely unregulated, lending-based and equity crowdfunding platforms must comply with financial regulations, including transparency requirements and investor protection mechanisms.

In the construction sector, there have been individual attempts to use these financial mechanisms in Slovenia, but without success. However, the GREET CE project has demonstrated that crowdlending can be used to finance solar photovoltaic projects, providing both financial returns for investors and sustainable energy solutions for building owners. Similar models could be adopted in Slovenia to support rooftop solar installations on residential and commercial buildings.

8.3 Analysis of the area "financing building renovation"

The current research, which included a review of policies, legislation and the general situation in the Slovenian construction sector as well as conversations with various stakeholders, experts, members of TWGs, was primarily intended to shed light on the area of "financing building renovation". Its goal was to identify the most important characteristics of this area, which is best demonstrated through a SWOT analysis. The results and conclusions that emerge from the SWOT analysis are intended as a starting point for discussion in the further process of project implementation.

8.3.1 Main findings on financing the renovation of private buildings

Currently the financing in renovation of private buildings in Slovenia in general has quite a lot of barriers which prevent successful implementation and inhibit the achievement of binding climate goals. One of the most important threats is the high investment price at the still relatively low price of energy. The latter results in an absolutely negative impact on the return on investment. This fact deters many individuals or households from deciding on energy renovations. In addition, there are other negative influences: lack of confidence in the quality of implementation (or technologies), lack of knowledge about the additional benefits of improvements, a relatively large intervention in the building itself (during the stay), the search for a good contractor, etc.

The most important advantage of the existing financial mechanisms of the public Eco Fund is the offer of incentives to households to reduce energy poverty. However, practice has shown that the most financially sensitive households are the least responsive to tender, as they do not want to expose themselves, or lack information or knowledge.

Table 5: SWOT analysis in financing building renovation of private buildings in Slovenia.

STRENGTHS	WEAKNESSES
• Public Fund is open to everyone (companies, households) with different financial mechanisms (non-refundable, refundable). • **Public Fund open to energy-poor households with non-refundable financial incentives which to certain amount cover 100% of investment.** • Existing financing models and incentives help to improve EE of existing building stock, increase the value of real estate and raise the quality of life. • Banks and other financial institutions are prepared for changes and are willing to listen and learn, adapt and develop financial models.	• Existing bank credits for sustainable renovations are not competitive with credits from the public fund. • The subsidy programs are targeting energy efficiency renovations only (not sustainable renovations). • **Subsidy program is unpredictable and available only for a short period; usually there is a shortage of subsidy money.** • Only those who are well informed, have a know-how, are financially strong and do not need financial support, apply. • There is a general lack of funding in people empowerment and education programmes. • Fragmentation of decision-makers decreases the efficiency of the whole process.

	• Poor transfer of knowledge to banks and not enough linkage between technical and financial experts. • The selection of measures is mostly on users/investors side, and they are mostly influenced by strong tradition. • Not enough promotion of effective sustainable technologies. • Insufficient promotion of comprehensive renovations. • Complex financial incentives make more sense for large projects and do not encourage investments in smaller and more remote buildings. • Not enough trust in financial models such as ESCO or Energy Performance Contracting (EnPC). • No adequate long-term policy signals to develop favourable financial models for both parties. • Lack of common monitoring methodology to enable the evaluation of efficiency performance of buildings. • Inadequate methodology of evaluating the profitability of sustainable/energy renovation: usual cost-benefit analysis is not useful in evaluating side benefits, such as improved health and well-being, better living and working conditions, general more favourable environmental effects, etc.
OPPORTUNITIES/POSSIBILITIES	**THREATS/BARRIERS**
• Development of sustainable financing models that would be able to support step-by-step renovations to reduce the high upfront costs of deep renovation. • Implementation of tax incentives/benefits to persons investing in energy efficiency or sustainable renovation. • VAT reclaiming for multi-apartment houses. • Inform and educate residential homeowners/ on different investment options. • Digitalisation in construction and financing processes that can simplify, speed up and facilitate the sustainable renovations process. • Production of sustainable construction materials and products that can enable financing the sustainable renovations. • Provision of data for sustainable products that can enable the financing the sustainable renovations and final evaluation of sustainability of buildings. • Promotion of financing sustainable renovation will/can support the activities (inform investors, industry, market…).	• **Low price of energy and high investment costs in comprehensive sustainable renovations have a negative effect on return on investment and act as an inhibitor for decision-making.** • Slow adaptation of legislation to new technologies and market needs. • Lack of databases with appropriate technical data. • External factors such as wars, pandemics, longer and more expensive transport routes, etc affect the prices of construction products and raise the cost of renovations. • Very high labor shortage in the construction sector (competition between construction companies) and low level of knowledge of the workforce. • **Poor communication between key stakeholders: especially financial institutions and investors.** • Lack of interest of banks to develop sustainable financing models. • Very complex and time-consuming administrative processes and preparation of documentation.

• Provision of tools for simulation of financial mechanisms to ease the selection of best option. • Ensuring the continuous implementation of the ZERO500 program, which is aimed at reducing energy poverty among socially weak citizens by providing financial resources. • Preparation of a financial plan for the promotion of measures in households, including the determination of funding sources, incentive mechanisms and measures for the removal of key obstacles and the organization of promotion and provision of assistance according to the one-stop-shop principle. • Increasing the financial leverage for comprehensive, not only energy, but also sustainable renovations and renovations in nZEB. • Creation of new financial instruments for the housing sector. • **Reforms of the legislation defining the amount of consent required for multi-apartment buildings to be charged to the reserve fund.** • Examining the possibility of creating a special fund that will enable and encourage the implementation of comprehensive energy or renovation projects in nZEB. • Strengthening of professional support for multiapartment building owners in the planning of energy/sustainable renovations of multi-apartment buildings. • Education of independent energy consultants to help with advice and preparation of relevant content. • Strengthening the operation of the existing ENSVET network and geographical and substantive expansion of the network (one-stop-shop). • Creation of new financial instruments that would cover first expenses, especially for green loan providers • Preparation of a legal obligation for multi-apartment buildings, which would include, in addition to the analysis of the building's energy efficiency, an analysis of fire safety and earthquake risk. • Development of the scheme of financial incentives for the renovation of multi-apartment buildings, which would cover sustainable renovation, including earthquake and fire renovation of buildings. • Establishment of a portal of energy/sustainability properties of buildings based on all available data, which will enable a comprehensive spatial insight into the condition of buildings and their emissions and enable high-quality planning of measures.	• Large income difference of apartment owners in multi-apartment buildings. • Lack of competences of owners of multi-apartment buildings to make or confirm technical decisions - in technical decisions, they often rely on contractors instead of experts, or make decisions based on the principle of the lowest bid price. • Unsubstantiated and unprofessional promotion and mass implementation of certain measures, which can be counter-effective sustainability-wise and can take up large chunk of available funds (e.g. embodied CO_2, problems with excessive peak electricity, heat pumps for buildings with very poor building envelope).

• Finalization of a system of sustainable building indicators with benchmarking. • Establishing capacity building programs for EE in local communities aimed at renovating public and private buildings. • Addressing the problem of large empty homes, especially outside urban areas, as part of fiscal, social and equitable development policies.	

8.3.2 Main findings on financing the renovation of public buildings

The barriers and weaknesses on financing in renovation of public buildings also prevent successful implementation and inhibit the achievement of binding climate goals. The most important one beside high investment price is the public procurement procedure which is complicated and often results in more expensive investments. Additionally, there is lack of appropriate criteria for balanced and sustainable / green public procurement (GPP).

The strength that could be the most important one is the introduction of new mechanism in Eco Fund which is non-refundable financial incentives for organisation to carry out an energy audit or to introduce an energy management system. The strength is also in PPP as it enables the sharing of resources, risks and benefits between partners. It reduces the risk of development, lowers the need for public investments, mobilizes excess or insufficiently used financial resources, increases efficiency and the time determinant of implementation. And what is just as important, the public sector usually does not have adequate personnel capacity to carry out individual phases in the implementation of project financing.

Table 6: SWOT analysis in financing building renovation of public buildings in Slovenia.

STRENGTHS	WEAKNESSES
• State financial schemes by Eco Fund cover also the public buildings. • **Introduction of new Eco Fund mechanism with non-refundable financial incentives for organisation to carry out an energy audit or to introduce an energy management system.** • Possibility of private investment in renovation of public buildings, PPP • Existing financing models and incentives help to improve the energy efficiency of existing building stock, increase the value of real estate and raise the quality of life. • Banks and other financial institutions are prepared for changes and are willing to listen and learn, adapt and develop financial models. • Due to the presence of the ELENA model a large number of energy consultants, corporations and municipalities are familiar with a public mechanism created specifically for financing documentation preparation.	• Existing bank credits for sustainable renovations are not competitive with credits from the public fund. • The subsidy programs are targeting energy efficiency renovations only (not sustainable renovations) • **Subsidy program is unpredictable and available only for a short period; usually there is a shortage of subsidy money.** • Only those who are well informed, have a know-how, are financially strong and do not need financial support, apply. • There is a general lack of funding in people empowerment and education programmes. • **Fragmentation of decision-makers decreases the efficiency of the whole process.** • Poor transfer of knowledge to banks and not enough linkage between technical and financial experts. • The selection of measures is mostly on users/investors side, and they are mostly influenced by strong tradition.

	• Not enough promotion of effective sustainable technologies. • Insufficient promotion of comprehensive renovations ▪ Not enough trust in financial models such as Energy performance contracting (EnPC). • No adequate long-term policy signals to develop favourable financial model for both parties. • No adequate long-term policy signals to industry to prioritise sustainable products. ▪ Lack of common monitoring methodology to enable the evaluation of efficiency performance of buildings. • Inadequate methodology of evaluating the profitability of sustainable/energy renovation: usual cost-benefit analysis is not useful in evaluating side benefits, such as improved health and well-being, better living and working conditions, general more favorable environmental effects, etc. •
OPPORTUNITIES/POSSIBILITIES	**THREATS/BARRIERS**
• **Development of sustainable financing models that would be able to support step-by-step renovations to reduce the high upfront costs of deep renovation.** • VAT reclaiming for multi-apartment houses. • Inform and educate residential. homeowners/multi-apartment house managers, or managers of public buildings on different investment options. • Digitalisation in construction and financing processes that can simplify, speed up and facilitate the sustainable renovations process. • Production of sustainable construction materials and products that can enable financing the sustainable renovations. • Provision of data for sustainable products that can enable the financing the sustainable renovations and final evaluation of sustainability of buildings. • Provision of system for evaluation of sustainability of buildings will push financial mechanisms. • Promotion of financing sustainable renovation that can support the activities (inform investors, industry, market…). • Provision of tools for simulation of financial mechanisms to ease the selection of best option. • Development of criteria for determining eligible costs for sustainable energy renovation of public buildings. • Development of appropriate financial products for EnPC service providers. • Development of EnPC support with appropriate support measures: training, additional	• Low price of energy that has a negative effect on return on investment. • Complicated public procurement procedures, which often result in more expensive investments. • Lack of appropriate criteria for balanced and sustainable public procurement. • High investment costs for renovations, especially in sustainable renovations and renovations of cultural heritage buildings. • Slow adaptation of legislation to new technologies and market needs. • Lack of databases with appropriate technical data. • External factors such as wars, pandemics, longer and more expensive transport routes, etc affect the prices of construction products and raise the cost of renovations. • Very high labor shortage in the construction sector (unhealthy competition between construction companies is created) • Very low level of knowledge of the workforce in the construction sector. • Administrative processes and the preparation of documentation are very complex and time-consuming. • Small engagement of key stakeholders, such as banks. • Poor communication between key stakeholders: financial institutions and investors. • Lack of interest of banks to develop sustainable financing models. • Hidden costs of sustainable investments • Lack of competences and professionally trained own staff for planning and organizing.

professional and technical assistance in project preparation, tools. • Establishment of the mechanisms to encourage the creation of companies for energy services, with special attention to SMEs. • Update the Guidelines for energy renovation of cultural heritage buildings with innovations and changes in legislation and strategic documents, upgrading of technical content, creation of recommended phases of the project. • Definition of target groups and introduction of quality control for energy audit providers. • Establishing capacity building programs for energy efficiency in local communities aimed at renovating public and private buildings. • Introduction of control systems, monitoring of energy use (energy bookkeeping, monitoring) and actual achievement of planned savings, as well as connection to other national databases.	comprehensive energy renovation operations from a technical point of view and from the point of view of the implementation of public procurement procedures. • **Mistrust of co-financing mechanisms, for example energy contracting or public-private partnership; lack of competence and professionally trained own staff to carry out such operations.** • The limited scope and consequently smaller effects of the renovation of buildings of cultural heritage, historical or cultural buildings or buildings with a special aesthetic appearance make owners doubt energy/sustainable renovations. Renovation costs can be higher due to the use of special ("non-standard", "historic") materials or techniques that bring them as close to the original as possible.

9 Comparison between participating countries and EU

The comparison of Austria (AT), Hungary (HU), and Slovenia (SL) as regard to building renovation initiatives is crucial for several reasons. Firstly, it provides a benchmark against EU standards and policies, helping to assess each country's progress and alignment with European goals. By identifying strengths and weaknesses across technical capacities, financial resources, and utilization of EU funding, policymakers can pinpoint areas needing improvement to accelerate building stock renovations.

Moreover, comparing these countries allows for the exchange of best practices and lessons learned. Austria and Slovenia, for instance, demonstrate strong capacities in renovation technologies and national funding, which could serve as models for Hungary to enhance its strategies. Understanding these disparities also aids in fostering regional cooperation and harmonization of policies, essential for achieving collective EU climate and energy targets.

Additionally, such comparisons support the resource allocation and policy formulation. They show where investments are most effective and where additional support, whether technical, financial, or legislative is required. The alignment of the three countries is strategic as it enhances the efficiency of building renovation efforts, promotes sustainability, and contributes to broader economic and environmental goals across Europe. Thus, through comprehensive comparisons, all three countries could refine their approaches and contribute more effectively to the EU's sustainable development agenda.

Table 7: Assessment to what extent the action in participating countries is addressed.

Actions	AT	HU	SL
Policies and Strategies*	◎ ◎ ◎ ◎	◎ ◎ ◎	◎ ◎
Legislation harmonized*	◎ ◎ ◎	◎ ◎ ◎	◎ ◎ ◎
Targets set*	◎ ◎ ◎	◎ ◎ ◎	◎ ◎ ◎
Technical capacities for renovation of building stock	◎ ◎ ◎	◎ ◎ ◎	◎ ◎ ◎ ◎
Financial volume for renovation of building stock	◎ ◎ ◎ ◎	◎	◎ ◎ ◎
Renovation technologies	◎ ◎ ◎ ◎	◎ ◎ ◎	◎ ◎ ◎ ◎
Renovation interventions	◎ ◎ ◎ ◎ ◎	◎	◎ ◎
Direct funding from EU	◎ ◎ ◎ ◎	◎ ◎	◎ ◎ ◎
Indirect funding from EU	◎ ◎ ◎ ◎	◎	◎ ◎ ◎ ◎
National funding	◎ ◎ ◎ ◎	◎	◎ ◎ ◎

**compared to EU*

LEGEND:

◎	The action is addressed - **almost non**
◎ ◎	The action is addressed - **very little**
◎ ◎ ◎	The action is addressed - **partially**
◎ ◎ ◎ ◎	The action is addressed - **mostly**
◎ ◎ ◎ ◎ ◎	The action is addressed - **completely**

Based on the comparison in Table 7 assessing building renovation initiatives in Austria (AT), Hungary (HU), and Slovenia (SL), several insights emerge. All three countries demonstrate significant association with EU policies, legislation harmonization, and the establishment of renovation targets. However, there are notable differences in other critical areas:

- Austria and Slovenia exhibit robust financial commitments to building renovation, whereas Hungary appears more limited in this regard.
- Renovation technologies are well-adopted across all three countries, indicating a high level of technological readiness.
- Austria stands out for its comprehensive renovation interventions across various building types, whereas Slovenia and Hungary show less extensive actions.
- Overall, while Austria and Slovenia align more closely with EU standards in building renovation, Hungary shows gaps, particularly in financial resources, utilization of indirect EU funding, and national funding availability. These insights highlight opportunities for Hungary and Slovenia to enhance their renovation strategies through targeted interventions, bringing them closer to EU benchmarks and fostering sustainable development across the region.

Austria is a country that has a large number of financial incentives and programmes that support EE renovations. However, its biggest obstacle is that it does not have a **Climate protection act** in place yet and different regulations in nine federal states can complicate and obstruct nation-wide projects and models. Subsidy programs for the renovation of residential buildings and tax relief are well established for private buildings. What is missing are solutions that can provide private individuals with financing in advance, before renovation. The upcoming mandatory renovation of 15% of the least efficient buildings will primarily affect single-family homes owned by the elderly and financially vulnerable households. It will be important to provide them with special financial support and higher tax reliefs for renovation measures.

The main advantage for public buildings is the **One-Stop-Shop** EE consulting model, with opportunities for prefabricated elements. However, clear guidelines and specialized expertise are lacking, particularly in municipalities.

Hungary's highlighted strength is significant improvement in **competences of banks** at renovations of private buildings. Contributing factor for renovations is also the fact that it is easier to finance renovations than buying new homes. This also brings forth a weakness, which is Hungary predominantly has mostly **private building/apartment ownership**, with no stakeholders in bundling projects. Another one goes for **subsidy programs that are short and unpredictable**. Nevertheless, there is an opportunity for long-lasting and predictable financing programs and tax benefits. **The barriers** in renovations are a highly centralized system, with artificially low energy costs, and the high up-front costs of the investment which is not affordable by the majority of home owners.

Hungary's renovation in public sector is at risk since it is financed **by grants only**, while municipalities have serious limitation in taking out loans and are not encouraged to assure the finances with their annual budget system. A large number of preparatory works for documentation is needed, especially under EU and non-EU programmes.

In Slovenia the most positive aspect of the renovation of private buildings is the program with non-refundable financial incentives of the Eco Fund, intended for **energy-poor households**. But in general, it should be emphasized that the **administrative procedures** for applying to the financial mechanism are very complex and time-consuming. A big obstacle is also the fact that in multi-apartment / multi-owner's buildings, the consent of all owners is required for EE renovation. There is a poor

communication between key stakeholders and a slow return of investment, due to combination of low price of energy and high investment costs in sustainable renovations.

Regarding public buildings**,** Slovenia faces a lack of long term and predictable financing mechanisms. The decision-making process is also very slow and fragmented, which highly decreases the efficiency of the processes. However, the Eco Fund financial scheme covers also public buildings. The main opportunity can be seen in the development of sustainable financing models that would be able to support step-by-step renovations to reduce the high upfront costs of deep renovation.

A complete review of the area of building renovation with a focus on financing options, together with a lot of mutual exchange of opinions and discussions with experts, showed that there are many shortcomings and gaps in all three countries. Their evaluation summarized in the table of weaknesses and gaps (Table 8) indicates similarities, but also significant differences between countries:

- All three countries assessed that the gap, which is not addressed at all, is **the price of energy** - the prices are too low, which makes the payback periods of investments relatively long. The issue of **fragmentation among decision-makers in the construction sector** stands out, which hampers coordinated efforts, leading to inefficiencies and delays in implementing effective renovation strategies. Furthermore, value chains are long, many stakeholders are involved, which affect the transparency of the process. No action was observed regarding the gap **tradition among users**, which, according to partners opinion, is strong in all three countries. It is interesting that in all three countries the gaps **not enough awareness among population (about the consequences)** and **no interest in sustainable solution of technology and service suppliers** are also assessed equally, except that the first is assessed as "in process of addressing", while the second is “addressed to a large extent”.
- The **adaptation of legislation to accommodate new technologies** is a slow process in all three countries. However, Austria and Hungary have made some strides in this area, unlike Slovenia, where legislative adaptation remains largely stagnant. The proactive legislative approaches in Austria and Hungary could provide valuable insights for Slovenia, emphasizing the importance of a supportive legal framework to foster innovation and modernization in building renovation.
- What stands out most is the comparison of the countries regarding gaps of **fire safety** and **seismic safety**, where Austria and Hungary estimate that there are no gaps, while in Slovenia the gaps are recognized. There is a similarly large contrast in the assessment of the **promotion of effective technologies**, except that here the assessment of gap is the same for Slovenia and Hungary.
- Less strong, but still relatively large, are the differences in the assessment of the gaps: **slow transfer of knowledge to key stakeholders** and **high investment costs for innovative sustainable technologies.** They are rated "already addressed to large extent" for Austria, and "no action is noticed so far" for Slovenia and Hungary.
- Slovenia and Hungary have practically the same **total number of gaps** that are addressed and gaps where no actions have been detected. Together, they account for almost half of all identified gaps in both countries. **Austria** appears to be more advanced here, as it estimates that almost **half of the gaps are addressed to a large extent**. However, no country was assessed to have a gap that would be completely eliminated.
- In summary, while there are some efforts to address specific challenges in Austria, Hungary, and Slovenia, significant gaps remain, particularly in **decision-making**, **knowledge transfer**, and **legislative adaptation**. A more concerted and cohesive approach is required across all three countries to overcome these barriers and achieve effective and sustainable building renovation outcomes.

Table 8: Comparison of issues related to smart investments between participating countries.

Gaps and weaknesses	AT	HU	SL
Fragmentation of decision-makers (in construction sector)			
Poor communication between key stakeholders			
Slow transfer of knowledge to key stakeholders			
Strong tradition among users			
Slow adaptation of legislation to new technologies and market needs			
Not enough promotion of effective technologies			
Not enough awareness among population (about the consequences)			
Lack of interest of banks for sustainable financing			
Lack of interesting financial models			
Not enough trust in financial models			
Lack of tax incentives			
Lack of focused educational programmes			
Lack of well-trained workers			
Lack of digitalisation in planning			
Lack of digitalisation in construction process			
Lack of monitoring the consumption of energy			
Lack of sustainable industrial solutions			
Lack of data for sustainable design			
No existing evaluation of sustainable design (and investments)			
Low and distorted energy prices			
No long-term policy signals for industry to prioritise investments in sust.			
No interest in sustainable solution of technology and service suppliers			
High investment costs for innovative sustainable technologies			
Hidden costs of sustainable investments			
Lack of common monitoring methodology for evaluation of EE			
Lack of legislation on environmental characteristics of products			
Lack of promotion in sustainable investment			
Lack of renovations of public buildings that serve as an example			
No demonstration of innovative financing in technologies and solutions			
Poor fire safety of buildings			
Poor seismic safety of buildings			
Reforms of tenant law (WEG, MRG)			
Reforms of residential property law			

LEGEND:

	No gaps at all
	Yes, gaps existed and were successfully eliminated
	Yes, gaps exist and are already addressed to large extent
	Yes, gaps exist and are in process of addressing
	Yes, gaps exist, but no action is noticed so far

10 Concluding remarks

This study examines the policies, legislation, and market capacities for sustainable building renovations in three neighboring countries: Austria, Hungary, and Slovenia. Through comprehensive review and analysis, it highlights various positive developments, as well as numerous gaps and weaknesses that require urgent attention in the field of building renovation.

Analysis showed that **Austria's** main drawback in public renovations are the lack of Climate protection law and different regulations in 9 federal states. The most needed solutions for the private sector are those that could secure financial resources before the renovation. The main overall issue for **Hungary** is the lack of long term and predictable funding in private and public renovations and the consent of owners in multi-apartment buildings in case of renovation. Additionally, the development of sustainable financing step-by-step renovations models is highly desirable. Sustainable renovation of buildings in **Slovenia** is suffering due to poor communication between key stakeholders, slow return of investment and the fact that renovation in multi-apartment buildings requires the consent of all owners. The main strength to highlight however lies in the Eco Fund financial schemes that cover both public and private buildings, particularly in non-refundable financial incentives for energy-poor households.

It can be concluded that the three countries involved, Austria, Hungary and Slovenia can learn significantly from each other by exchanging knowledge through international platform events and other activities. These events will provide opportunities for national financial experts and stakeholders in the construction sector to meet and share insights. Such knowledge exchange is crucial for developing effective strategies and solutions that can be implemented across borders.

The issues presented in this study will be further discussed at national thematic working group events and on national platforms. They will also be addressed during the development of national action plans aimed at overcoming the challenges hindering the upscaling of sustainable investment practices in building renovation. The collaborative efforts and the shared learning experiences from these events will be summarised in three national policy papers, that will present the results and cross-border recommendations, serving as a guide for future initiatives.

By addressing the gaps and leveraging international cooperation, the RENOINVEST consortium aims to foster sustainable investment practices and enhance building renovation efforts in the participating countries.

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