



Long-term renovation strategies as key instruments to guide local renovation

Lessons learned from good practices across Europe:
Financing, data collection, and tailored approaches

Supported by:



Federal Ministry
for the Environment, Nature Conservation
and Nuclear Safety



European
Climate Initiative
EUKI

based on a decision of the German Bundestag

Project details and acknowledgements

Project title	Our Buildings
Project name	Accelerating climate action buildings – Strengthening civil society and policymakers in Romania and Bulgaria
Project duration	September 2018 – February 2021
Website	https://www.bpie.eu/renovating-our-buildings-in-bulgaria-and-romania
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Date	February 12, 2021
File name	Long-term renovation strategies as key instruments to guide local renovation – Lessons learned from good practices across Europe
Credits	Layout by the Publishing Bureau

This project is part of the European Climate Initiative (EUKI) of the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU). The EUKI competition for project ideas is implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH. It is the overarching goal of the EUKI to foster climate cooperation within the European Union (EU) in order to mitigate greenhouse gas emissions.

The opinions put forward in this paper are the sole responsibility of the authors and do not necessarily reflect the views of the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU).

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Abbreviations

EC	European Commission
EIB	European Investment Bank
EPBD	Energy Performance of Buildings Directive
EPCs	Energy Performance Certificates
ESCO	Energy service company
ETS	European emission trading system
LTRS	Long term renovation strategy
MEPS	Minimum energy performance standards
MS	Member State
NECP	National energy and climate plans
OSS	One-stop-shops
RRF	Recovery and Resilience Facility



1. Introduction

Long-term renovation strategies (LTRS) can fulfil an essential role for local public authorities aiming to decarbonise the building stock, get access to funding and benefit from opportunities presented by the Renovation Wave. The European Performance of Buildings Directive¹ EPBD (EU) 2018/844 requires Member States (MS) to set up LTSR – policy instruments outlining how European MS aim to transform their existing national buildings into a decarbonised and energy-efficient building stock by 2050 [1]. They serve as roadmaps with measurable milestones, indicators and impact, supplemented by an overview of the national building stock, specific policies to stimulate renovation, innovative financing instruments and an overview of initiatives for smart technologies and skills in the construction sector.

In October 2020 the European Commission published the Renovation Wave strategy COM (2020) 662,² one of the central initiatives of the EU Green Deal, to which national LTSR delivered significant input. The aim of the strategy is to at least double the EU renovation rate from the current 1% to 2% and renovate 35 million building units by 2030, thereby saving energy, improving people's health and well-being, and creating jobs. These efforts will be important in reaching the 55% reduction in GHG emissions the EU is aiming for by 2030, and will support its longer-term ambition to become carbon neutral.³ Key action points and new funding opportunities are introduced to *"make renovation a win-win for climate neutrality and economic recovery"* [2]. The Renovation Wave strategy additionally announces the revision and improvement of the Energy Performance of Buildings Directive (EPBD) in 2021,⁴ which will significantly impact the development of LTSR and building

renovation efforts across Europe. Among other things, the EU Commission plans to expand the requirement for the renovation of public buildings (3% per year) to all governance levels covering buildings owned by local authorities,⁵ to propose a stronger obligation to obtain Energy Performance Certificates (EPCs), and to phase in mandatory minimum energy performance standards (MEPS) for existing buildings which will likely help phase out the worst-performing buildings.

To achieve the goals and expected benefits from the Renovation Wave, collaboration between many actors along the value chain and across governance levels is required. The Renovation Wave explicitly states that the engagement and ownership of cities, regional and local authorities is essential to achieve its objectives, in addition to collaboration with other private stakeholders and national governments. Besides policy measures to increase the building renovation rate, the strategy also mentions the barriers hindering renovation activity that apply to Member States (MS) all over Europe, in particular local, regional and city authorities.

The available strategies⁶ are a rich source of building renovation activity, including innovative examples of how energy efficiency improvements can be triggered. Despite its value, eight EU MS are still to hand in their LTSR more than a year after the original deadline, indicating low prioritisation for building renovation in some MS.⁷ Building renovation activity can also be used to induce a green recovery after the COVID-19 pandemic. Therefore, the European Commission (EC) identified building renovation as one European Flagship initiative under its 2021 Annual Sustainable Growth Strategy, recommending MS to build on the national LTSR in their Recovery

¹ European Commission, Directive (EU) 2018/844 of the European Parliament and of the Council of 30 May 2018 amending Directive 2010/31/EU on the energy performance of buildings and Directive 2012/27/EU on energy efficiency. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv%3AOJ.L_.2018.156.01.0075.01.ENG.

² European Commission, COM(2020) 662 Final Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions – A Renovation Wave for Europe – greening our buildings, creating jobs, improving lives. Available at: https://ec.europa.eu/energy/sites/ener/files/eu_renovation_wave_strategy.pdf

³ At the time of writing, the trilogue was still ongoing. However, all three EU institutions have agreed on the target.

⁴ Next to the EPBD, the Energy Efficiency Directive (EED), the Renewable Energy Directives (RED), and the EU Emission Trading Scheme (ETS) are also being updated.

⁵ Expected revision of the Energy Efficiency Directive (EED) in Q2 2021.

⁶ Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Ireland, Latvia, Luxembourg, Netherlands, Romania, Slovakia, Spain and Sweden have published an LTSR (09/02/2020).

⁷ By the cut-off date of this report only 17 MS had submitted their 2020 LTSR to the European Commission, while 10 governments had delayed for almost a year, with an initial deadline of March 2020.

and Resilience Plans to assure economic recovery funds are well spent in the staff working document SWD (2020) 205.⁸ The EC thereby incentivises national governments to engage in strategic planning, and links EU policy to national building renovation activity.

In a similar way, national governments can integrate bottom-up approaches, local initiatives, and local strategic plans into national planning strategies. By supporting local authorities and integrating local plans in national renovation roadmaps, a coherent framework can be created [3]. LTRS impact increases when these strategies address national and local level simultaneously, for instance by fostering knowledge exchange and providing recognition to those local policymakers that invest in planning, implementing, and monitoring building renovation.

According to the Renovation Wave communication, *“mobilising financing can be difficult, in particular at the local and regional level”*[2]. The availability of public funding is often limited, and even when funding is available regulatory barriers and limited capacity among local authorities might prevent access to and optimal combination of funding sources. Moreover, large-scale building renovation is often slow because the benefits of renovation are not clearly explained nor quantified; and energy performance measurement frameworks, like energy performance certificates (EPC), are not achieving sufficient coverage. The revision of the EPBD in 2021 provides a policy window to mainstream financing efforts, increase capacity and skills along the renovation value chain, and improve the quality and comparability of EPCs.

This report will therefore focus on three overarching challenges faced by public authorities, and summarise best-practice examples that help to overcome them:

How to access sufficient financial means to implement a building renovation strategy at the local level?

Access to funding is essential to implement energy efficiency renovations, and it is therefore featured prominently in European legislation and policy initiatives. Article 2a of the EPBD explicitly describes ways in which public authorities in MS are supposed to facilitate access to finance. Moreover, Article 10 of the EPBD illustrates the importance of appropriate financ-

ing by insisting on the need to provide a clear overview of available financial sources in each MS, and allowing the EC to give support when appropriate. The consultation for the Renovation Wave Communication reaffirms the importance of well-targeted and adequate financing to enable sufficient depth and scale in renovation. Nevertheless, it can be challenging for public authorities, especially at the municipal and city level,⁹ to know where, when and what kind of funding opportunities are available – and how to access them. Leveraging the existing funds is therefore also relevant and remains challenging for certain local authorities. Simultaneously, regional authorities and municipalities across Europe are already developing effective and innovative measures tailored to local circumstances. Rather than reinventing the wheel every time, it can be highly beneficial for local policymakers to understand which policy designs and funding sources are used elsewhere, as inspiration for projects at home. One example is the establishment of one-stop-shops (OSS) that tailor financial services for renovation to local contexts while simplifying procedures, technical advice, and project management for building owners. The establishment of OSS in all MS is considered crucial to achieve the potential benefits and emission reductions possible through building renovation [2][4].

This report will describe new European funding opportunities related to the Renovation Wave, assess in what way national LTRS already include innovative financing schemes targeting the local level, and present good-practice examples illustrating different financial approaches local authorities can consider.

How can building stock data collection and storage be improved?

Reliable building stock data collection remains a challenge for EU policymakers. Energy performance certificates (EPC) are one of the main tools used to collect data, but they vary in design and calculation methodology across MS, and need to be better tailored to user needs [5]. The EPBD established basic requirements for EPCs but coverage remains low, whereas issues related to pricing and quality persist, calling into question its reliability [5]. The Renovation Wave states that accessible and transparent databases with information on energy performance, energy cost and share of renewables are essential for local and regional policymakers to design effective policies and track the progress of reno-

⁸ European Commission, SWD(2020) 205 final PART 1/2, Commission Staff Working Document Guidance To Member States Recovery and Resilience Plans, Brussels, 17/09/2020.

⁹ This is illustrated by the fact that the EU promises active support in project design and support to access all available financial instruments for regional authorities on the [website of the EU Commission](#).

vation activities in their building stock, as is already the case in some frontrunner countries, such as Denmark and Portugal. The broad uptake of EPCs and the improvement of quality is thus important, but needs to be complemented by more comprehensive data repositories, such as digital building logbooks.¹⁰

The report will indicate if national LTRS already include relevant data collection initiatives for local authorities and describe good-practice examples related to data collection, digital storage, and next-generation EPCs.

How can multiple benefits, like reducing energy poverty and tackling the worst performing buildings, be achieved?

The energy renovation of buildings can have a range of benefits for building owners, residents and the whole community. Besides the more obvious benefits of energy savings, renovation can positively impact health and wellbeing, building administration, job creation and the climate-resilience of buildings [6]. The Renovation Wave stresses that key principles like circularity, aesthetics, health, and environmental standards must be integrated into a comprehensive strategy. Additionally, the EPBD prescribes that MS should include an evidence-based assessment of wider benefits like air-quality, safety, and health into the LTRS assessment. This suggests that not all these benefits are currently

being achieved, and that LTRS might include good-practice examples to tackle this challenge.

This report assesses to what extent national LTRS mention integrated planning procedures and approaches tailored to specific building segments, type of residents, or added value besides energy savings. In the section on good practice, examples of integrated planning on local levels will be presented in addition to programmes targeting specific building types – e.g. public buildings, multifamily buildings – or addressing energy poverty.

Overall, LTRS are an opportunity to streamline renovation efforts at the local level; and to inform national policymakers about data on and planned efforts in the municipal building stock, as well as existing gaps for funding or capacity. Municipal renovation strategies contain significant untapped potential for local and national policymakers to improve financing schemes, data collection and the realisation of the multiple benefits of building renovation. Figure 1 provides an overview of the report structure.

The following section provides a combination of good practices derived from the latest updates of national LTRS and additional sources. These might help overcome some of the challenges involved in fostering building renovation, and support achieving the 2050 climate targets and the objectives of the Renovation Wave.

¹⁰ Digital building logbooks are digital files storing several relevant information sources related to particular buildings. For more information consult Volt & Toth (2020). Definition of the Digital Building Logbook – Report 1 of the Study on the Development of a European Union Framework for Buildings' Digital Logbook. Available at: <https://op.europa.eu/en/publication-detail/-/publication/cacf9ee6-06ba-11eb-a511-01aa75ed71a1>.

Figure 1. Report structure



2. Long-term renovation strategies and the Renovation Wave – Momentum for municipalities

With the 2018 Clean energy for all Europeans package,¹¹ the requirement to develop and adopt comprehensive LTRS was moved from the Energy Efficiency Directive (EED) to the revised EPBD, making the strategies part of the EU MS integrated national energy and climate plans (NECP). The updated LTRS submitted to the EC in 2020 include numerous instruments relevant for or targeted to the local level. Moreover, the Recovery and Resilience Facility (RRF) and the revision of the EPBD and other EU directives in 2021 provide new opportunities for local authorities to get access to funding, improve data collection, target specific building segments, or draft integrated renovation plans. Earlier publications in the context of the Our Buildings project have reported on available financial schemes for energy renovation [7], in particular for Romania and Bulgaria, and guidelines for drafting LTRS.¹² Adding to this, the following section analyses the latest LTRS from EU MS regarding their relevance for municipalities, and describes which new funding opportunities arise related to the new Multiannual Financing Framework 2021–2027 (MFF) and the EC's recovery plan.¹³

2.1 Overview of policies relevant for the municipal level in LTRS

The aim of this section is to indicate to what extent MS have included policies specifically dedicated to local authorities in their LTRS.

Transforming the European building stock requires a comprehensive approach covering all governance levels as well as all actors along the renovation value chain. Varying degrees of collaboration between national,

regional and local authorities are necessary to implement ambitious building decarbonisation policies in line with long-term EU and national targets. Due to overlapping jurisdictions, national policies influence and regulate the activities of local authorities to a large extent, such as in the case of an update of the national EPC scheme or when buildings owned by the national government are being renovated in a specific municipality. It is also common for local-level authorities to be made responsible for implementing national measures related to building renovation. Other policies directly address local authorities and their building stock, or are initiated by local or regional policymakers and included in the national plans.

Table 1 shows which LTRS highlight policies dedicated to the local level. Dark green represents an LTRS which includes initiatives begun by local authorities or policies explicitly addressing regional and local authorities, while light green indicates that the LTRS includes policies indirectly affecting local authorities. Definitions for the categories are presented below.¹⁴



¹¹ In 2019 the EU completed a comprehensive update of its energy policy framework to facilitate the transition away from fossil fuels towards clean energy: more information at https://ec.europa.eu/energy/topics/energy-strategy/clean-energy-all-europeans_en

¹² For more information visit: <https://www.bpie.eu/renovating-our-buildings-in-bulgaria-and-romania/>

¹³ See https://ec.europa.eu/info/strategy/recovery-plan-europe_en

¹⁴ The scope of these categories might overlap. For instance, certain financial instruments tailored to the local level were specifically for residential buildings (tailored approach) and included certification schemes to foster data collection. Similarly, tailored approaches like one-stop-shops might focus on public buildings. In practice, effective programmes often tailor financial instruments to a specific section of the building stock and include data collection and monitoring. Rather than being mutually exclusive, these categories serve to highlight relevant features of the good practice in question. Sometimes good practice examples might therefore belong to multiple categories. In the good practice section below such relevant features will be explicitly highlighted for the reader.

Table 1. Overview of policies tailored for municipalities

	Financing instruments	Public buildings	Data collection	Tailored approaches	Integrated planning
Flanders	●	●	●	○	●
Denmark	●	●	○	●	○
France	●	●	○	●	●
Ireland	○	●	○	○	○
Latvia	●	●	○	○	○
Luxembourg	○	●	●	○	○
Netherlands	●	●	○	○	●
Spain	●	●	●	●	●
Sweden	●	●	○	○	●

Initiated by or explicitly tailored to local authorities ●

Indirectly affecting local authorities ○

Financing instruments



Financing instruments are used to renovate buildings, implement energy-efficient installations and other measures to decarbonise the building stock. Examples of innovative financial instruments – ranging from grants and subsidies to fiscal support that helps to overcome the challenge of high upfront investments – are highlighted, including large funds providing loans and innovative financing initiatives like the promotion of energy service company (ESCO) services. To implement financial instruments on the local level collaboration with regional banks and energy agencies is beneficial.

For example, the Flemish ‘Energy Houses’ (*Energiehuizen*) are locally operated organisations linked to the Flemish Climate and Energy Agency that provide zero-interest loans to residential building owners investing in energy efficiency, as well as providing legal, technical and financial advice. In the Netherlands’ Natural-Gas Free Districts Programme (*Programma Aardgasvrije Wijken*), the national government is investing EUR 400 million in subsidies to municipalities to detach complete residential districts from the gas network. French municipalities, on the other hand, are allowed to provide exemptions

from real estate tax for renovations of buildings constructed before 1989.

Many financial instruments tailored specifically to the local level focus on public buildings. This is for example the case with the state and local government energy efficiency fund in Latvia, the green loans from the Kommuninvest bank owned by Swedish municipalities, and the Danish municipal renovation loans. ESCO services are also available to local governments, for instance in Latvia and Ireland, although uptake remains modest because of the impact of such services on balance sheets.

Public buildings



Public authorities own and occupy a significant share of the building stock and can lead by example by renovating their own buildings. The focus is on planning tools, instruments and policies aimed at renovating public buildings. It includes examples of long-term public sector strategies for energy efficiency improvements and provides concrete examples of initiatives that focus on the renovation of public administrative buildings,

schools, and healthcare facilities. Relevant examples from the LTRS are presented below.

The primary objective of Luxembourg's [Maintenance and Renovation Fund](#) is to renovate public buildings, including those of local authorities. The [RenoWatt+](#) one-stop-shop in Wallonia focusses specifically on the renovation of public buildings and facilitates technical, financial and legal advice; as well as supporting project implementation and demand aggregation. The French [Local and Regional Authorities Action for Energy Efficiency](#) programme facilitated by the French national federation of local authorities aims to improve energy efficiency and cut down carbon emissions. The programme facilitates the implementation of LTRS by identifying local priority projects and providing the legal and financial support required to implement them. The Irish [Public Sector Energy Efficiency Strategy](#) provides a framework for renovation action on public buildings, whereby Irish public authorities may retain financial gains from energy efficiency efforts within their [organisational budgets](#).

Data collection and storage



With the revision of the EPBD in Q4 2021, the EC aims to strengthen the obligation to obtain EPC. This might also impact municipalities by increasing the quality of renovation works and improving the monitoring of financial investments. EPC schemes can also be very important tools to gather and store data about the building stock, including the worst-performing building segments. Despite their potential, most EPC schemes are not systematically used as databases for local planning purposes. Because EPC schemes mostly affect local authorities indirectly, the category data collection and storage focusses on improvements of data management systems, databases and IT systems to efficiently store, process and communicate data.

For instance, national governments can provide software and energy management systems to local authorities which allow public building managers to improve energy efficiency based on data collection. Digital building logbooks and building renovation passports, on the other hand, can provide building owners with digital access to relevant building performance information and practical information related to financial, legal and technical aspects of renovation measures, and a roadmap to decarbonisation towards 2050. Relevant examples from the LTRS are presented below.

The Luxembourgian government encourages municipalities to measure their energy consumption with

freely provided [energy management software](#), in the context of its national climate package. The measure aims to improve the analysis capabilities of local authorities to guide and prioritise energy renovation in the existing public building stock.

An example of an innovative data repository with high added value for building owners is the 'House Pass' ([Woningpas](#)) in Flanders. A House Pass combines building data sources from various public bodies related to energy efficiency, EPCs, permits, environment, and renovation planning in one accessible spot for residential building owners. The French Energy Efficiency Passports ([Passeport de l'Efficacité Énergétique - P2E](#)), on the other hand, provide data about the energy efficiency of the building in addition to stepwise recommendations on how building owners can renovate their buildings to comply with the 2050 decarbonisation targets.

Tailored approaches



Tailored approaches focus on instruments or mechanisms targeting a specific segment of the building stock. Also, tailored approaches aim to achieve a specific policy outcome like the reduction of energy poverty or the improvement of health or the environment. In practice, tailored approaches for energy efficiency focus on building segments, e.g. single family buildings or multi-family buildings, but they can also be tailored to (e.g.) public buildings. Other programmes focus on achieving a specified outcome such as reducing the share of households at risk of energy poverty, improving indoor environmental quality (IEQ) or climate resilience. Some relevant examples from the LTRS are provided below.

The Swedish fund 'Offentliga fastigheter' is a collaboration between the Swedish Association of Local Authorities and Regions and has dedicated programmes to finance the energy efficiency of schools. The Irish [Better Energy Communities](#) programme provides funding for residential and non-residential buildings specifically tailored to the local and municipal level. The community-oriented approach of the grant scheme favours vulnerable residents and the insulation of façades and roofs over efficient installations. The Latvian Baltic Energy Facility (LABEEF) and European Bank for Reconstruction and Development (ERBD) signed a contract to collect [funding specifically for the renovation of apartments](#) in multi-family buildings. These buildings have to comply with high energy efficiency standards and provide health, safety and com-

fort guarantees. The [Spanish LTRS](#) includes a measure designed to support small municipalities to renovate buildings. National and regional authorities will work in close collaboration with these small municipalities to find solutions to local challenges.

The French government has also issued packages for energy and eco-efficiency centres specifically tailored to small rural municipalities ([KIT-EE](#)).

Integrated municipal planning



Policies aiming for integrative planning processes at the local level are only found in some of the MS. Such comprehensive, long-term planning can include strategies to simultaneously tackle energy poverty, health and environmental issues. Certain LTRS include national legislation that obliges local authorities to formulate plans, whereas others present examples of plans developed by local authorities in other contexts such as the Covenant of Mayors.

In the Netherlands all municipalities have to develop decarbonisation strategies for all buildings in their jurisdictions in context of the district approach ([Wijkgerichte aanpak](#)). The plan must detail the available sustainable heating sources and a concrete

execution plan to decarbonise all buildings in the longer term.

Swedish municipalities, on the other hand, [report annually](#) on their energy consumption and measures taken to reduce their consumption and change their supply. Since 2018 municipalities have also been obliged to conduct environmental impact assessments for all projects expected to have a significant impact on the environment. The [Spanish LTRS](#) provides an overview of how municipalities varying in size, such as Albacete, Madrid and Alcaladà del Júcar, have drafted regional renovation strategies, and what their strengths and advantages are. In addition to data about the buildings the strategies define priority areas based on a combination of existing societal policy objectives and the need for improved energy efficiency and decarbonisation.

Gaps

Regarding tailored approaches most LTRS mention programmes affecting local authorities indirectly. Programmes tailored for specific building types (e.g. multi-family buildings or tertiary buildings) or programmes to tackle energy poverty are often initiated on a national level. Specific buildings or households with (or at risk of) energy poverty are located in a municipality, but the national government is leading efforts to provide solutions.

Take-aways

- The review of the LTRS has shown that some MS already include plenty of relevant information and good practice from the local level in their LTRS. The Spanish and French LTRS are particularly good examples of this
- Regarding innovative financing instruments and public buildings, most LTRS mention policies initiated by or directly affecting local authorities
- The LTRS of other MS focus primarily on the national level. The relevance of LTRS for local authorities could be increased by integrating more local initiatives and policies. This could also foster the uptake of building renovation strategies in local and NECPs, e.g. in Romania and Bulgaria
- Regarding tailor-made approaches and data collection and storage, LTRS could better describe the effects of such good practices at the local level – and show how regional and local authorities can contribute to their implementation
- The revision of the EPBD in 2021 provides an opportunity to continue improving the value of LTRS for local authorities by including more guidance and requirements regarding the local level in such strategies. A successful transformation of the building stock depends, in the end, on integrated national and local action

2.2 New financial opportunities under the EU Recovery Plan

The publication of the Renovation Wave created momentum and announced key interventions for deep renovation across Europe. The EC has formulated clear targets to double the renovation rate and to increase the share of deep renovations while making accessible and targeted funding available; thus MS should make use of this exceptional opportunity to improve the energy performance and quality of their building stock. Long-term renovation strategies¹⁵ are expected to guide targeted action and support MS to benefit from the unprecedented drive in EU funding fostering investment into building renovation.

Accompanying the Renovation Wave initiative, the EC published the staff working document SWD(2020) 550¹⁶ – Support from the EU budget to unlock investment into building renovation. It summarises the proposed support from the new EU budget to mobilise investment towards building renovation, including high-quality renovations, leveraging private investment, and addressing market barriers.

The Multiannual Financial Framework (MFF) of 2021–2027 is complemented by a comprehensive recovery instrument called NextGenerationEU (NGEU), with a budget of EUR 750 billion to alleviate the economic and social consequences of the COVID-19 pandemic while supporting the much-needed green and digital transition (see Figure 2^{17,18}). NGEU funding will be channelled to EU MS mostly through the established Recovery and Resilience Facility (RRF), which will finance climate-related projects to 37%. The RRF mobilises EUR 672.5 billion in grants and loans which MS can access by submitting individual Recovery and Resilience Plans due in the first quarter of 2021. The EC recommends that MS should build on their NECP and LTRS in their Recovery and Resilience Plans to make sure the budget is allocated in line with decarbonisation plans. In its staff working document, the commission identifies building renovation as a key short-term priority (EU Flagship initiative) *“and strongly encourages Member States to reflect building renovation as a top priority in their national Recovery and Resilience Plans that they will prepare to access*

funding from this Facility [...]”[8]. Governments should strengthen existing programmes or plan for reforms and investments inspired by the examples highlighted in guidance documents by Commission services, such as one-stop-shops, skill building campaigns or home renovation schemes. The LTRS are a key strategic and planning tool to steer funding into building renovation at national and local level and to ensure investments meet priorities.

The REACT-EU initiative will further extend the crisis response under the cohesion funds with an additional EUR 55 billion until 2023 for short-term recovery support and “green, digital and growth-enhancing” investments. MS have the chance to acquire additional financing for regional and local building renovation programmes funded by the European Regional Development Fund (ERDF) or accompanying social initiatives supported by the European Social Fund. In the frame of the 2021–2027 MFF, cohesion policy funds will continue to provide direct investments for building renovation measures and other investments supporting the objectives of the Renovation Wave.

EU budget will also aim at leveraging more private investments into energy- and resource-efficient buildings with the InvestEU instruments announced to follow the successful European Fund for Strategic Investments (EFSI). InvestEU consists of funds from both the MFF and the NGEU. It will provide guarantees to private investments and aims to increase debt and equity financing for building renovation, e.g. by extending the Smart Finance for Smart Buildings initiative. The EC puts a focus on tailored financial instruments for social and affordable housing, public buildings, schools and hospitals, SMEs and support to ESCOs. An EC guide on how to use InvestEU is expected to be published in April 2021.

In sum, the European Union has identified building renovation as a key way of stimulating economic recovery while ensuring green investments, job creation, and stronger social resilience. The EC names LTRS as a central reference for allocating additional funds, thereby demonstrating their importance as strategic planning tools to identify priority measures to transform the European building stock.

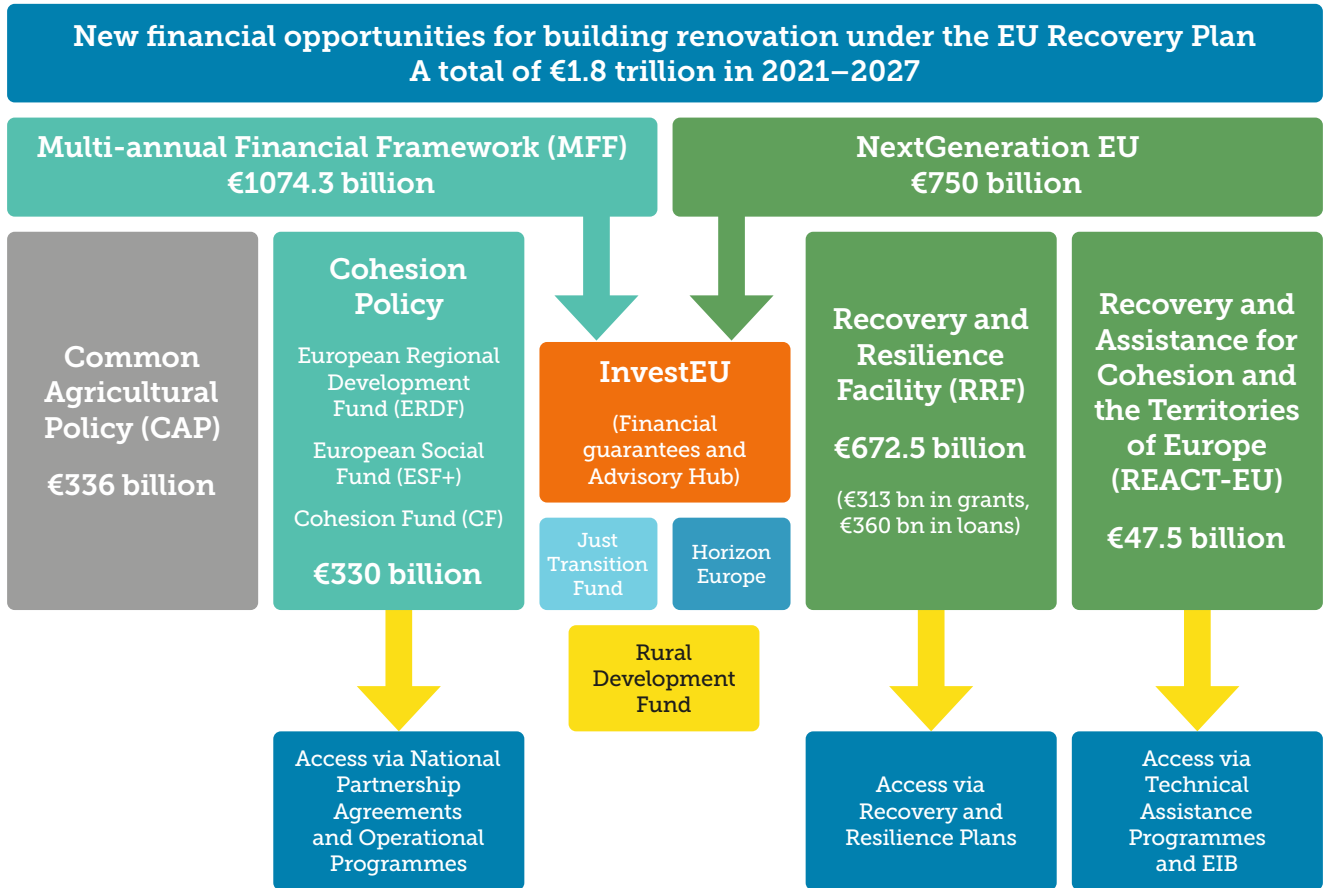
¹⁵ Besides the national climate and energy plans (NECPs), as foreseen in the Renovation Wave strategy.

¹⁶ COMMISSION STAFF WORKING DOCUMENT SWD(2020) 550 final – Support from the EU budget to unlock investment into building renovation under the Renovation Wave accompanying the COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS A Renovation Wave for Europe – greening our buildings, creating jobs, improving lives {COM(2020) 662 final}, <https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1603122391413&uri=CELEX:52020SC0550>

¹⁷ Council of the European Union (2021). Infographic – Multiannual financial framework 2021–2027 and Next Generation EU. Available at: <https://www.consilium.europa.eu/en/infographics/mff2021-2027-ngeu-final/>

¹⁸ European Council. Infographic – Multiannual financial framework 2021–2027 and Next Generation EU <https://www.consilium.europa.eu/en/infographics/mff2021-2027-ngeu-final/>

Figure 2. Overview of the EU Recovery Plan including the MFF 2021–2027 and the NextGeneration EU budget, own illustration based on EU Council infographic



3. Good practice:

Municipal building renovation policies in and beyond the LTRS

This chapter includes good practices initiated by local and regional authorities, but also national programmes and policies that could support local authorities in their efforts to increase the renovation rate. The objective is to introduce local policymakers to different approaches to get access to finance, improve data collection, and ensure the multiple benefits of renovation are achieved through integrative planning and tailored approaches. This section, therefore, presents good practice examples in five categories:

1. Innovative financing instruments
2. Public buildings
3. Tailored approaches for specific stakeholders
4. Data collection and storage
5. Integrated urban planning tools

An overview table with all the selected good practices can be found in Appendix I.

3.1 Innovative financing instruments

New and innovative ways to access and distribute financing for renovation planning and projects are essential to increase the renovation rate and achieve EU renovation targets. Local authorities need to obtain the expertise and capacity to access public and private financing sources and to know how to utilise public funding to leverage private investment in building renovation. The examples below therefore focus on good practice financing instruments.



3.1.1 SEM POSIT'IF – France

Good practice	
Short description	The SEM (Société d'Economie Mixte) Energies Promote, Organise, Support, Imagine the energy Transition in Ile-de-France (POSIT IF) project was implemented between 2013–2016 in Ile-de-France in support of the 38% energy consumption reduction goal set by the region [9]. Among the objectives was the attraction of private market investment through financing instruments like energy service contracts in addition to conventional public grant programmes. To achieve this a semi-public energy service company (ESCO) was established to renovate condominiums and public buildings, thereby attracting external expertise while giving local policymakers influence on the activities of the company.
Mode of implementation	This semi-public ESCO was largely owned by regional and local authorities, with 85% of its shares being owned by the local councils and 15% by a private partner [9]. From 2013–2016 the company provided its services to condominiums and public buildings. Its overall budget was EUR 2 million, of which 75% was contributed by the European Union. The budget was used for hiring a director, technical expert, financial expert and project managers. The staff developed technical, legal and financial plans for each renovated building, attracted third-party financing, provided pre-financing in certain projects, established cooperation with external stakeholders and coordinated companies implementing the renovation measures [12]. Structural partnerships were developed with stakeholders and companies from the energy efficiency and construction sectors during the lifetime of the project. Overall, the project delivered EUR 35.582 million of energy-related investments and savings equal to 17,490 MWh/year [9]. The initiative now continues under the name 'Île-de-France Énergies' [11].

Good practice	
Addressing challenge	SEM POSIT IF addresses the challenge of attracting sufficient funding for building renovation at local level without significantly affecting the public budget balance.
Why good practice/ Key success factors	The POSIT IF project stands out as a good practice because it introduced a highly effective business model for multi-family buildings, boosting the local construction economy, and contributed to capacity-building among public authorities and policymakers [9]. POSIT IF created a service encompassing design, renovation and operation that included energy saving guarantees, tailored financial plans and ambitious energy savings (average 47%) to meet the 'Bâtiment basse consommation' or nZEB standard (<80kWh/m ² /year for existing buildings) [10]. Moreover, regional authorities have strong influence on company decision-making, and a continuous dialogue between regional and national authorities has been established [12].
Take-away for regional and local authorities	Due to the involvement of local authorities as stakeholders in the company, their skills and understanding of building renovation improved. This significantly enhanced capacity-building and allowed local policymakers to have influence on housing renovation policies, financial instruments and the development of local and regional renovation strategies [9].
Sources	<p>[9] Intelligent Energy Europe (n.d.). Promote, Organise, Support, Imagine the energy Transition in Ile-de-France territory (POSIT IF). European Commission. Available at: https://ec.europa.eu/energy/intelligent/projects/en/projects/posit-if</p> <p>[10] EDF ENR (n.d.). BBC: Bâtiments Basse Consommation. Available at: https://www.edfenr.com/lexique/bbc-batiments-basse-consommation/</p> <p>[11] Ile de France Energies (n.d.) Une entreprise régionale innovante pour la transition énergétique! Available at: https://www.iledefranceenergies.fr/qui-sommes-nous/</p> <p>[12] Energy Cities (2014). Financing schemes increasing energy efficiency and renewable energy use in public and private buildings. Infinitesolutions. Available at: https://energy-cities.eu/wp-content/uploads/2019/01/infinite_solutions_comparative_analysis_web.pdf</p>

3.1.2 Réseau Canopée Logement Social – France

Good practice	
Description	The Réseau Canopée Logement Social project was established in 2018 and will renovate 4,300 social housing units in France, as well as constructing 1,200 new ones [13]. The Réseau Canopée is an investment platform specifically focussed on social housing with residents vulnerable to energy poverty, and aims to tackle the spilt incentive dilemma in the rental sector. The platform is to support social housing agencies that face reduced income while being faced with higher costs for renovation and construction [15]. The programme will be carried out by the social housing operators that are part of the Réseau Canopée: Ansom Habitat, Oise Habitat, Opal and Reims Habitat [14]. The platform will pool investment projects of the four relatively small housing agencies that individually would not have been supported by the EIB, and will provide the necessary affordable long-term financing to allow rents to remain low after renovation [15].

Good practice	
Mode of implementation	<p>An investment platform will be created with support from the European Investment Bank (EIB) to attract the necessary investment for the construction and renovation work. The housing operators participate financially and are supported by the EIB with attracting private financiers, technical advice and financial resources [15]. The EIB will help attract financing from the French National Promotion Bank, the Caisse de Depots et Consignation and other public financing sources.</p> <p>The project aims to reduce energy consumption, mitigate climate change and tackle energy poverty. The targeted buildings are among the oldest in France, with an average age of 38 years, and are located in 'priority city districts' with higher shares of low-income residents [15]. Many of these buildings have low energy performance and have a high potential for energy savings, with 75% of the housing units having EPC-ratings between D and G and an equivalent energy consumption of 151 kWh/m²/year [15]. To ensure environmental benefits are achieved, most building renovation projects will be deep renovations (54% average energy savings) [15]. Moreover, the renovation and construction projects will have to comply with the EIB urban plan (i.e. include diversity and combat urban sprawl).</p> <p>The European Investment Bank (EIB) will invest EUR 107 million, roughly one-third of the total estimated costs of EUR 326 million.</p>
Challenge addressed	The Réseau Canopée Logement Social project tackles the challenge of combining building renovation with wider benefits.
Why good practice/ Key success factors	The Réseau Canopée Logement Social project can be considered good practice because it combines deep renovations with tackling energy poverty and upgrading the worst-performing building stock. This shows that synergies are possible and multiple benefits of energy efficiency can be achieved. During an appraisal procedure the implementors of the projects – the social housing agencies – have successfully proved their experience and positive track record with the renovation and public consultation processes. This has been stressed as one reason for the approval of the funding [16].
Take-away for regional and local authorities	Municipalities can collaborate with social housing agencies and facilitate public consultation in areas where renovation projects could be implemented.
Sources	<p>[13] EIB (2018a) Réseau Canopée Logement Social. European Investment Bank. Available at: https://www.eib.org/de/projects/pipelines/all/20180398</p> <p>[14] Canopée (2021). Réseau Canopée – Partager & Progresser. Available at: http://www.reseau-canopee.fr/#</p> <p>[15] EIB (2018b). EFSI Operation Scoreboard – Réseau Canopée Logement Social. European Investment Bank. Available at: https://www.eib.org/attachments/registers/88023681.pdf</p> <p>[16] EIB (2018c). Environmental and Social Data Sheet – Réseau Canopée Logement Social. European Investment Bank. Available at: https://www.eib.org/attachments/registers/85659073.pdf</p>

3.1.3 New Green Savings Programme (NGSP) – Czechia

Good practice	
Description	<p>The New Green Savings Programme provides residential building owners with subsidies for renovation activities like expert advice, fabric insulation, heating source and system replacement, solar thermal electricity generation, ventilation systems with heat recovery, heat recovery from wastewater, and green roofs [17]. It is funded by the State Environmental Fund of the Czech Republic [20]. Targeted building typologies are single-family buildings and apartment buildings in Prague, which are considered a high priority [18].</p>
Mode of implementation	<p>Czechia has built up significant experience over the last decade by re-investing carbon revenues in energy-efficiency programmes [18]. Since 2009, the Czech government has committed revenues from the Kyoto Protocol and EU Emission Trading System for the creation of the New Green Savings Programme.</p> <p>After an initial challenging start, the direct investment of state budget in the New Green Savings Programme helped to bridge the financial gap until structural ETS revenues could be invested, starting in 2012. Ever since, at least half of all ETS auction revenues must be channelled to GHG emission reduction, and 100% of revenues if they are lower than EUR 480 million. The programme was initiated in 2009 [22] and reintroduced during 2014–2020, providing funds continuously [18]. Moreover, it has been extended until 31 December 2021 [20].</p> <p>The sum of the grant depends on the real energy savings achieved by the project, reaching up to 50% of eligible costs for deep renovations [20]. In practice, the 30% grant for partial and 50% grant for deeper renovations ranged between EUR 4,000–10,000 for partial and EUR 12,000–28,000 for deeper renovations [21][18]. Overall, the projected allocation of funds for 2014–2020 was EUR 916 million, of which EUR 350 million was distributed between 2014–2018. In this same period energy savings equalling 3.7 petajoules (PJ) were achieved, which was the largest amount saved by any Czech emission reduction programme [18]. However, to achieve the expected funding allocation, project delivery should have increased significantly.</p> <p>The Ministry of Environment is ultimately responsible for the New Green Savings Programme, which it manages through the State Environment Fund and local offices. The Ministry of Industry and Trade, simultaneously, invests another part of the ETS revenues in energy efficiency and renewable energy for the public and commercial building sectors [19].</p>
Challenge addressed	<p>The New Green Savings Programme tackles the challenge of cost-intensive renovations by earmarking EU ETS revenues for energy-efficiency interventions in the residential sector.</p>
Why good practice/ Key success factors	<p>The New Green Savings Programme is a good practice example because of its long duration, the large volumes of funding made available for measures, the high and positive environmental impact, the positive economic impact, and the expected higher achievement in the years to come. The programme's continuity and stable funding sources contribute to its success. Moreover, impact assessments made by the Czech treasury have indicated that investments in building energy efficiency are completely recovered in public budgets through income tax, insurance and reduced unemployment benefits [18]. Simultaneously, the NGSP contributes to economic growth and was among the most cost-effective programmes.</p> <p>The fact that Czech ETS revenues are expected to rise in the coming years, along with funding allocated by the Modernization Fund, means there is potential for significant additional financing for building renovation in Czechia. Such funding would greatly enhance the capacity of municipalities to implement local building renovation strategies.</p>

Good practice	
Take-away for regional and local authorities	Municipal policymakers should earmark available funding for residential renovation projects to gain multiple benefits such as job creation and health improvements. Apart from EU ETS revenues, mobilised financing from recovery funds, including the Recovery and Resilience Plans, should also be directed to building renovation to ensure a green recovery. For building owners it is important that the grant is available for a longer period of time, so they can plan the renovation when it suits them best.
Sources	<p>[17] Nová Zelená Úsporám (2021). About the New Green Savings Programme. State Environmental Fund of the Czech Republic. Available at: https://www.novazelenausporam.cz/about-the-new-green-savings-programme/</p> <p>[18] Sunderland, Louise (2019). Learnings from the Czech Republic on using EU ETS revenues for residential renovations. Regulatory Assistance Project. https://www.raponline.org/knowledge-center/learning-from-the-czech-republic-on-using-eu-ets-revenues-for-residential-renovations/</p> <p>[19] Sance Pro Budovy (2016). programme EFEKT. Czech Ministry of Industry and Trade. Available at: http://www.renovujdum.cz/cs/programy/efekt</p> <p>[20] State Environmental Fund CZ (2021). New Green Savings Programme. State Environmental Fund of the Czech Republic. Available at: https://www.sfzp.cz/en/administered-programmes/new-green-savings-programme/</p> <p>[21] Sance Pro Budovy (2016). Important information about the renovation of buildings. Available at: http://www.renovujdum.cz/</p> <p>[22] Manteuffel, Bernhard von., Katja Dinges (2018). New Green in Savings Programme (NGiS) in the Czech Republic. Available at: https://www.euki.de/wp-content/uploads/2018/12/Fact-Sheet-Green-Savings-Programme-CZ.pdf</p>

3.1.4 Green bonds for municipalities – Sweden

Good practice	
Description	In the Swedish LTRS, 'green bonds' are mentioned as relatively new and innovative financing tools that have received increasing attention. Stakeholders ranging from municipalities to building owners have shown interest in the bonds, which earmark capital for projects and activities with positive environmental impact [23].
Mode of implementation	<p>By 2020, it had become accepted practice for municipalities and real estate companies to issue their own green bonds, which are more financially attractive in comparison to traditional bank loans. The main difference is that the green bonds must be exclusively invested in projects that meet specific green framework conditions, e.g. minimum energy performance improvement for a building [23].</p> <p>In 2013, for example, Gothenburg became the first city worldwide to issue green bonds[24]. Between 2013–2018 a total of EUR 693 million (SEK 7.06 billion) was raised to foster sustainable investments in the city. This funding could be used for renewable energy, energy efficiency, public transport, waste management and sustainable housing projects. From the total funding disbursed, 71% (EUR 492 million) was used for sustainable building projects. The requirements for such projects were tightened every year, which finally resulted in a local green bond framework [25].</p> <p>In the 'Gothenburg Green Bond Framework', first published in 2018 and updated in 2019, the city prescribes which projects are eligible [25]. For buildings this includes a maximum energy performance of 50kWh/m²/year for commercial and public buildings, and for residential buildings no more than 60kWh/m²/year, equal to EPC-A or B ratings. Major renovations must improve energy performance by at least 30% kWh/m²/year to be eligible. The EC's sustainable finance Taxonomy Regulation will influence the criteria for the issuance of green bonds in the coming years.</p>
Challenge addressed	Green bonds provide an opportunity for municipalities to attract capital earmarked for investments in building renovation. This helps to overcome the lack of financing available for such projects.
Why good practice/ Key success factors	Green bonds can be considered good practice because they enable municipalities and regional authorities to collect the necessary capital to invest in building renovation. Because environmental and energy efficiency criteria are linked to the funding, the renovated buildings contribute to the decarbonisation of the building stock and achieving the EU climate objectives for 2050. Besides Gothenburg, other municipalities like Östersunds have issued their own green bonds, raising EUR 78 million (SEK 800 million) [26]. On a state level the Kommuninvest local authority funding agency issues green bonds to obtain funding for municipalities nationwide [27]. Similarly, the Danish KommunKredit local authority has issued EUR 1.75 billion in green bonds from 2017–2020. From the disbursed green loans, 60% went into district heating and 1% into upgrading the energy efficiency of buildings [28]. This illustrates the potential of green bonds for energy efficiency and decarbonisation measures in the built environment, and shows that municipalities are potential beneficiaries.
Take-away for regional and local authorities	The examples indicate that earmarking funding specifically can help to attract investment required for larger-scale building renovation. The municipalities in these examples demonstrate that certain local authorities can take action autonomously.

Good practice

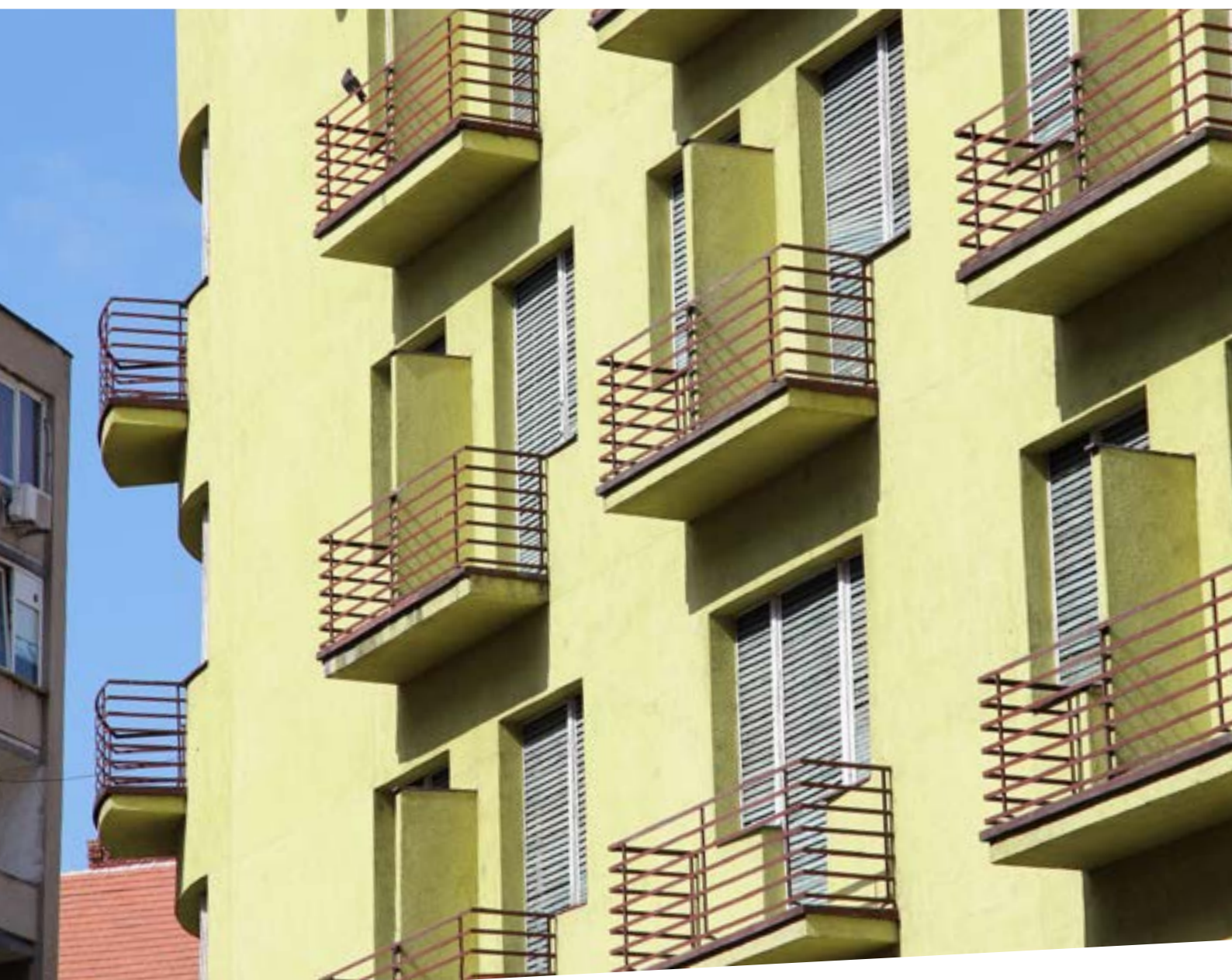
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- [27] Kommuninvest (2021). Green Bonds. Available at: <https://kommuninvest.se/en/funding-and-funding-need-3/greenbonds/>
- [28] KommunKredit (2020). Green Bond Impact Report 2020. Available at: https://www.kommunekredit.dk/wp-content/uploads/filebase/en/stock_exchange_announcements/green_bond_impact_report/KommuneKredit_GBIR_Report_2020_web.pdf

3.1.5 Green Home certification and green mortgage programme in Romania

Good practice	
Description	<p>The Romania Green Building Council has developed a green mortgage product rewarding energy efficiency and environmental responsibility in the building sector, in collaboration with a leading regional bank [29].</p> <p>The green mortgage includes a discounted mortgage pricing for the purchase of ‘Green Home’ certified residential buildings [30].</p>
Mode of implementation	<p>The Green Home certification has been developed to build and operate residential buildings with minimum environmental impact [31]. In order to be eligible for a green mortgage, a residential building must be Green Home certified.</p> <p>During the certification process attention is paid to relevant impact categories such as energy efficiency and green energy, the location, sustainable and healthy materials, indoor air quality, bioclimatic design: lighting and shading, construction site and ongoing property management, and other green design principles [31].</p> <p>To get certification for a building or project, first a preliminary review is conducted. During this low-cost procedure, the certifier will produce an initial indication of whether a project is eligible for Green Home certification, based on a point-by-point assessment of applicable green home criteria [31]. During subsequent negotiations, the certifier and building buyer or investor agree on the minimum score for each impact category that needs to be achieved, after which a pre-certification agreement is signed. During the project design and implementation, an energy auditor and expert from the certifier support the project design team. After completion, an energy auditor and expert from the certifier assess the project, calculate the final Green Home rating, and ensure that new residents know how to efficiently operate installations [31].</p> <p>The green mortgages offered by banks are characterised by discounted interest rates. Banks provide these discounts because the buildings will have significantly lower utility bills, reducing default risks compared to ‘normal’ homes – households can pay off a higher mortgage. Moreover, the property value of Green Homes is higher [31]. The Green Home certification indicates to financial institutions that residential projects qualify for the financial benefits of a green mortgage.</p> <p>Before projects are started, the certifier, the project developer and the partnering bank come together to sign the pre-certification agreement. After completion of the project the certifier notifies the bank if the project meets the criteria for the green mortgage. After completion, the borrowers benefiting from the green mortgage agree to send annual energy and water consumption data to the certifier, and they may also be subject to testing of indoor air and water quality. This data will be shared with the participating banks to compare projected and achieved performance, while the banks in turn share their green mortgage portfolio performance compared to ‘normal’ building stock [31].</p>
Challenge addressed	<p>The green mortgage programme allows prospective buyers of residential buildings to take up a higher mortgage and purchase energy-efficient and environmentally-friendly homes. In its role as certifier, the Romania Green Building Council helps to build trust among banks and project developers. This improves the level of funding flowing into energy-efficient residential buildings.</p>
Why good practice/ Key success factors	<p>Certification by a third-party expert allows banks to provide homeowners with a mortgage with reduced interest payments, while greening their own portfolio.</p> <p>The data collection and monitoring facilitates performance validation after completion of the project.</p> <p>New building owners are getting high-quality, energy-efficient and environmentally-sound homes for an equal or lower total monthly cost of ownership [31].</p>

Good practice	
Take-away for regional and local authorities	Green financing can increase the amount of energy-efficient buildings within a municipal jurisdiction. Municipalities could foster the implementation of green mortgages to improve the overall energy performance of their building stock. When linked to data collection, monitoring and storage, it can also help to improve knowledge about the local building stock.
Sources	<p>[29] Romania Green Building Council (n.d.) Green Mortgages. Available at: http://www.rogbc.org/en/projects/green-mortgage</p> <p>[30] Romanian Green Building Council (2014). Smart Investing for a Green Home. Available at: http://rogbc.org/Downloads/Proiecte/GreenHomes/RoGBC%20-%20Smart%20Investing%20for%20a%20Green%20Home%20-%20ENGLISH.pdf</p> <p>[31] Romanian Green Building Council (2014). Green Homes and Green Mortgage Toolkit for Residential Investors. Horizon 2020 Project. Available at: http://www.rogbc.org/Downloads/</p>



3.1.6 On-bill and on-tax financing – EuroPACE and RenOnBill project

Good practice	
Description	<p>In the US, 'on-bill' energy efficiency financing schemes as well as 'on-tax' financing schemes have been in widespread use for decades. On-bill schemes involve the private sector, mostly utilities, in the energy efficiency market and create new business models for utilities or other financial or third-party institutions [32].</p> <p>There are various models of on-bill financing schemes that differ in the source of financing, the association with the property's meter or the property tax and underwriting methodologies. However, the main concept is that a utility or other investor with whom the building owner/tenant already has a relationship pays for the energy performance investments, and these are then repaid by the building owner/tenant via their monthly utility bill or regular taxes. If the loan is attached to the meter of the property, the final user pays an additional on-bill tariff and can transfer this debt to another user if the building/apartment is sold or there is a change in tenants. In most cases the on-bill programmes aim to ensure 'bill neutrality', which means that the energy savings offset the monthly additional loan or tariff added to the bill [32].</p>
Mode of implementation	<p>On-tax financing is most widespread in the US as property assessed clean energy (PACE), which is currently tested in the EU in the frame of the Horizon 2020-funded EuroPACE project. PACE schemes are linked to a property rather than to a user/building owner, and do not necessarily address the owner/tenant dilemma [33].</p> <p>The PACE mechanism includes upfront investment by a municipality or local administration, which raises the budget by issuing bonds to support clean energy or energy-saving investments. The investment is repaid via a dedicated tax link to the property for a 20-year period, and can be transferred to a new owner in case the building is sold – this also allows older people to implement deep renovation measures, as they do not have to repay the whole investment in a shorter timeframe [33].</p>
Challenge addressed	<p>The long-term repayment period via on-bill or on-tax schemes provides financing options that address the challenge of high upfront costs. Different schemes have different actors providing the upfront capital – either a financial institution, a utility, an ESCO, or a third-party provider.</p>
Why good practice/ Key success factors	<p>The repayment debt is in certain schemes attached to the meter (on-bill scheme) or to the property itself (on-tax scheme), which means the investment can be transferred to another building owner or tenant once the building/apartment is sold or a new tenant moves in. This system may alleviate the owner-tenant dilemma, and provides advantages for an implementation of the financing option in the residential market [32].</p>
Take-away for regional and local authorities	<p>On-bill/on-tax financing schemes provide opportunities to address the owner-tenant dilemma that often hinders large-scale renovation activities in the residential market. Municipalities should implement pilot projects early on and remove regulatory barriers to incentivise utilities or third-party providers to enter the market.</p>
Sources	<p>[32] RenOnBill (2020). Overview of On-Bill Buildings Energy Renovation Schemes. Horizon 2020 project. Available at: https://renonbill.eu/knowledge-sharing/overview-of-on-bill-buildings-energy-renovation-schemes</p> <p>[33] EuroPace2020 (2018). Europace Readiness Assessment – Legal and Fiscal Analysis of the EU 28. Available at: https://www.europace2020.eu/reports</p>

3.2 Public buildings

Municipalities and regional authorities occupy and are often responsible for a significant part of the public building stock in a country. As users and operators of a significant share of public buildings including municipal buildings, educational buildings and healthcare facilities, their policies targeting the renovation of public buildings can have a significant impact. In Article 2g of the EPBD it is explicitly stated that investments must be made to create an energy-efficient public building stock. To support public authorities in accessing fund-



ing, certain reports like the Our Buildings report on financial schemes¹⁹ provide deeper insight into various types of public finance available. Furthermore, in the Renovation Wave Communication the EC writes that public buildings, along with the worst-performing buildings, are a good place to start a renovation market and attract new investment. Public buildings are a focus area that deserves special attention. Therefore, good practice examples of local policies targeting public buildings will be presented.

3.2.1 RenoWatt – Wallonia Belgium

Good practice	
Description	RenoWatt is a platform that functions as a one-stop-shop for public buildings in Wallonia [34]. The pilot phase of the project between 2014–2017 proved its effectiveness in the province of Liège, winning the ‘EU Best Energy Service Project 2017’ prize [35]. Building typologies covered include public administration, schools and healthcare. RenoWatt aims to reduce CO2 emissions with 40% compared to 1990 level, generate 32% renewable energy, and reduce energy consumption with 32% [36].
Mode of implementation	<p>The project was funded by the European Energy Efficiency Fund (EEEF), CITYinvest and the Ministry of Economic Affairs in Wallonia [35]. Three key principles are at the core of the RenoWatt service. First, support with the implementation of energy performance contracts. Second, the aggregation of demand by pooling buildings together to get attractive offers. Third, the participation of RenoWatt in the public procurement of municipalities, taking responsibilities in the legal procedures, assessing technical clauses and specifications, and the helping in the selection of and negotiations with service providers. These principles are translated into six phases of the RenoWatt model [35].</p> <p>Experts support public authorities with the selection of the most suitable buildings based on building data and energy performance. After an energy audit of the selected buildings, a financial analysis is performed to select suitable financing instruments. For each building specific solutions are designed, after which the tender for and implementation of the renovation activities begin [28]. Financing can consist of public funds, available subsidies, or third-party financing.</p>
Challenge addressed	The RenoWatt model shows a way in which (smaller) municipalities can gather sufficient funding to renovate buildings in their jurisdictions.
Why good practice/ Key success factors	RenoWatt is a good-practice example because it shows that energy performance contracting and OSS services tailored to public buildings can raise sufficient funding and achieve multiple benefits. The RenoWatt platform aids public authorities with the aggregation of projects, which allows for better prices and innovative financing in the form of energy performance contracting. The principles applied in RenoWatt can be transferred to other regions. It is recognised as exemplary in Europe, which is illustrated by the fact that the Rhodope one-stop-shop in Bulgaria is based on the RenoWatt model [36].

¹⁹ In particular for Romania and Bulgaria. For more information visit the BPIE website: <https://www.bpie.eu/publication/financing-energy-renovation-in-buildings-guidance-on-financial-schemes-with-a-focus-on-bulgaria-and-romania/>

Good practice	
Take-away for regional and local authorities	Aggregation of projects and energy performance contracting can be feasible tools for municipalities to renovate their buildings; municipal support is required to develop initiatives like RenoWatt.
Sources	<p>[34] RenoWatt+ (n.d.). Reno...What? Wallonian Government. Horizon 2020 project. Available at: https://renowatt.be/fr/historique/</p> <p>[35] Cityinvest (2017). RenoWatt wins at the Best European Energy Service Award. Available at: http://cityinvest.eu/content/renowatt-project-wins-best-european-energy-service-award</p> <p>[36] RenoWatt+ (n.d.). Our Mission. Wallonian Government. Horizon 2020 project. Available at: https://renowatt.be/fr/notre-mission/</p>

3.2.2 Public Sector Energy Efficiency Strategy – Ireland

Good practice	
Description	The Public Sector Energy Efficiency Strategy was published in 2017 and functions as a concrete renovation strategy for public buildings. The strategy contains a plan with concrete actions and objectives to achieve energy-efficiency goals for the public sector. The strategy aims to make public buildings more energy-efficient, and sets energy efficiency targets for 2020 against the benchmark year 2009 (33% more efficient in 2020 and 50% in 2030). Besides improving energy efficiency, the goal is to ensure that structured energy management becomes an integrated part of sustainable resource management across the public sector [37].
Mode of implementation	<p>Building typologies covered are administrative and public buildings owned by the government, and educational buildings. The strategy has four key principles:</p> <ul style="list-style-type: none"> • Use “skills and experience to take a national leadership role in the deploying of energy-efficient projects and initiatives” • Coordinated efforts of the complete government • Action- and result-driven approach to public sector reform and cost-efficient energy management • Contribute to develop a sustainable national energy system and CO2 reductions <p>The annual report of 2019 indicated that 99% of public bodies are using the online national energy monitoring and reporting system established by SEAI and DCCAE, in addition to 73% of schools. This shows how well the government is doing.</p> <p>Moreover, 2018 data showed that 27% energy efficiency improvement had been achieved since 2009 [37].</p>
Challenge addressed	The strategy shows that coordinated efforts can greatly improve data collection and energy efficiency of public buildings, including many on the local level.
Why good practice/ Key success factors	The Public Sector Energy Efficiency Strategy is a good practice example because it facilitates targeted investments in energy efficiency and allows public authorities to lead by example.
Take-away for regional and local authorities	Delegating responsibilities is important to involve all layers of public authorities in efforts to improve energy efficiency. A strategy tailored to the public sector can provide clarity to local authorities over what actions to take and objectives to achieve.
Sources	[37] Government of Ireland (2020). Public Sector Energy Efficiency Strategy. Department of the Environment, Climate and Communications. Available at: https://www.gov.ie/en/publication/7c726-public-sector-energy-efficiency-strategy/

3.2.3 SPL OSER – France

Good practice	
Description	SPL (Société Publique Locale) Oser is a publicly owned company that designs and implements deep energy renovation projects for public buildings like schools and administrative buildings. SPL Oser also gives energy performance guarantees and strives to create jobs [38].
Mode of implementation	<p>SPL Oser was created in 2012 and became operational in 2014 to support regional and local authorities in the Rhône des Alpes region. The company basically functions as a regional ESCO [39]. The company was founded by nine local authorities, the regional authority and the intermunicipal collaboration network in the context of low demand and supply for deep energy retrofits.</p> <p>The activities of SLP Oser include technical energy audits, financial and legal advice, project development, project management, integration of renewable energy sources and provision of long-term energy performance guarantees [38][39]. SPL Oser aims to invest a total budget of EUR 78 million during the project lifetime to increase the energy efficiency of the renovated buildings to the French low energy standard Bâtiment Basse Consommation (BCC) of 80kWh/m²/year.</p> <p>In order to benefit from the services from SPL Oser, local authorities need to become shareholders and contribute to the equity of the SPL Oser fund. Costs are EUR 1 per inhabitant [39]. In addition to advice and project management support, SPL Oser also provides funding for project implementation. For each project, roughly 10% of the costs are covered by the equity payments and the remaining 90% is borrowed by SPL Oser from European, national and regional financial institutions. The operational costs of the project delivery team were met by a EUR 1.1 million grant from the European Energy Efficiency Fund.</p> <p>Since its inception, 10 projects improving energy efficiency by 40–70% worth EUR 31 million have been put in motion. Another seven projects are being assessed for feasibility. In addition to the 9 founding local authorities, two others have joined and two are involved in an intake procedure [39].</p>
Challenge addressed	SPL Oser addresses the challenge of accessing financing to renovate buildings by using a public energy service company.
Why good practice/ Key success factors	SPL Oser is a good practice example because it illustrates the leadership role local authorities can take in promoting building renovation, creating construction jobs, and significantly improving the energy performance of public buildings.
Take-away for regional and local authorities	Collaboration between municipalities and combining efforts can produce sufficient financial, technical and legal expertise to implement ambitious energy efficiency improvements in public buildings.
Sources	<p>[38] SPL OSER (n.d.). SPL OSER Auvergne-Rhône-Alpes – l'efficacité énergétique au service des collectivités locales. Available at: https://spl-oser.fr/</p> <p>[39] Cityinvest (n.d.). Regional Energy Services Operation – OSER. Available at: http://cityinvest.eu/content/regional-energy-services-operator-oser</p>

3.2.4 REHABITARE programme – Castilla y León – Spain

Good practice	
Description	<p>The central objective of the REHABITARE programme is to enlarge the public social housing stock and support population in rural areas. The programme provides grants for the renovation of publicly owned but abandoned properties. This reduces vacancy of buildings, combating depopulation and meeting housing demands of vulnerable societal groups, in particular young people [40].</p>
Mode of implementation	<p>The REHABITARE programme was initiated by the Ministry of Development and Environment of Spain [40].</p> <p>Requirements for municipalities to request a grant are:</p> <ul style="list-style-type: none"> • The building must be in a municipality with fewer than 5,000 inhabitants • The building must be owned by the municipality • The municipality must justify the existence of applicants for protected public housing, referring to a public registry for social housing in Castilla y León with a minimum of 1–4 applicants depending on the size of the municipality • Costs may not exceed EUR 40,000 per project including VAT; additional costs are for the municipality • The architectural quality and cultural heritage value of the building must be maintained <p>Next to countering depopulation, supporting the vulnerable and maintaining cultural heritage, the programme aims to foster local economic development through the involvement of local companies in the renovation work [40].</p> <p>The municipality will sign a contract with the Ministry of Development and must allocate the building to new inhabitants within three months after completion of the project. Moreover, the building must maintain social housing for a minimum period of 10 years. Finally, the municipality must draw up objective requirements to select the new tenants, especially vulnerable groups like young people, victims of gender violence and homeless residents [40].</p> <p>In the five years from 2016 to 2020 262 dwellings have been renovated, of which 242 are owned by public authorities and 20 by the church [41]. Over EUR 12 million has been invested. Forecasts for the 2021–2023 period are for EUR 12.2 million, of which roughly 30% will be invested by provincial councils, to renovate another 82 dwellings [41].</p>
Challenge addressed	<p>The REHABITARE programme addresses access to finance for small municipalities and vulnerable people, as well as ensuring multiple benefits of deep renovation.</p>
Why good practice/ Key success factors	<p>The REHABITARE programme ensures that abandoned and energy-inefficient buildings, often in community centres, are renovated and made accessible for vulnerable groups. Heritage value, depopulation, support for small municipalities and protection of the vulnerable are aspects that are addressed by the REHABITARE programme.</p>
Take-away for local and regional authorities	<p>Collaboration between national, regional and local authorities with suitable programme design can ensure that deep retrofitting of buildings results in several additional benefits for the local environment, economy and population.</p>
Sources	<p>[40] Junta de Castilla y León (2020). Vivienda Y Urbanismo de Castilla y León – Programa Rehabitare. Available at: https://vivienda.jcyl.es/web/es/programa-rehabitare.html</p> <p>[41] Intereconomía (2020). Fomento y Diputación de Palencia destinarán 1,4 millones al programa Rehabitare. Available at: https://intereconomia.com/noticia/fomento-y-diputacion-de-palencia-destinaran-14-millones-al-programa-rehabitare-20201211-1512/</p>

3.3 Tailored renovation schemes

In a diverse building stock with a large variety of buildings and ownership structures, many policymakers tailor building renovation initiatives to specific groups. This could be vulnerable residents, private building owners, condominium associations or others. In the Renovation Wave Communication [2], one of the focus areas is tackling energy poverty of



vulnerable groups, besides renovating the worst-performing buildings. To achieve this, approaches suited to the specific circumstances of these buildings and residents are required. The same applies to condominium associations, which must be acknowledged as a specific building typology, and targeted as such, to realise the EU Green Deal ambitions [42].

3.3.1 PadovaFIT one-stop-shop targeting multi-apartment buildings – Italy, Bulgaria, Romania

Good practice	
Description	<p>PadovaFIT describes a one-stop-shop (OSS) business model targeting multi-apartment buildings and public service facilities, implemented in close collaboration with local authorities. The OSS offers an integrated service to private and public homeowners financed by ESCOs. Standardised contracts and technical procedures to reduce costs and improve the quality of renovation measures were implemented by a consortium led by the municipality of Padova. The OSS aims to aggregate renovation projects to facilitate large-scale energy-saving measures [44].</p> <p>At the end of 2015, renovations of five apartment buildings (97 apartments) had been approved under the OSS approach, while another 44 buildings were in the pipeline.</p> <p>The project initially created and piloted the OSS approach in the Italian city of Padova in 2012 and received funding from Project Development Assistance (MLEI-PDA) under the Intelligent Energy Europe II fund. It is now expanding its home renovation services as a Horizon 2020-funded programme to the Romanian cities of Timisoara and Smolyan as well as Vidin in Bulgaria (2019–2022). Building on experience from PadovaFIT, the business model is being adapted to Romanian and Bulgarian conditions [44].</p>
Mode of implementation	<p>The consortium implementing the programme consists of the municipal authority, a cooperative bank, an ESCO, an engineering company, a non-profit foundation and local private stakeholders. This multi-stakeholder group coordinates and facilitates energy-efficiency improvements with technical support, acting as a marketer, aggregator, facilitator and financial advisor.</p> <p>Additionally, the project implemented information campaigns to raise awareness and trust among homeowners and tenants about existing services and market solutions, and helped the local authority to alleviate regulatory barriers to effective financing options [45].</p> <p>The renovation services covered by PadovaFIT are upgrades of the building envelope; replacement, improvement or insulation of heating equipment, electrical equipment and distribution systems; and installation of renewable energy sources. After an initial free energy audit, the renovation project – including an energy performance contract between the selected ESCO and the building owners – is planned and carried out. The financing is either provided by the ESCO’s own funds or through another financial institution [43].</p>

Good practice	
Challenge addressed	The PadovaFIT OSS offers a tailored renovation service to private apartment buildings and public buildings. The financing model via energy service companies and local financial institutions overcomes the challenge of high upfront costs for renovations and assures energy savings over a long-term period. By aggregating demand of several buildings and implementing standardised procedures, cost reductions and quality improvements are achieved to increase trust among building owners and tenants.
Why good practice/ Key success factors	<p>The early involvement of an ESCO in the planning process and the financing via energy performance contracts are key success factors of the OSS scheme. The multi-stakeholder consortium incorporates the different perspectives of the municipal stakeholders, and can thus address challenges early on.</p> <p>In addition, tailored awareness-raising campaigns for private and public homeowners determine the success of the OSS, as well as involving facilitators to provide information and to act as multipliers in the municipality.</p>
Take-away for regional and local authorities	Decision-makers should involve multiple stakeholders in the planning and initiation process of a renovation scheme – in this case covering the municipal authority, a cooperative bank, an ESCO and local renovation-providers, as well as citizen representatives or NGOs. A multi-stakeholder consortium can speed up implementation by acting as facilitator, aggregator and financial advisor.
Sources	<p>[43] Cityinvest (n.d.) Padova's apartment building retrofit programme PadovaFit!. Available at: http://cityinvest.eu/content/padova%E2%80%99s-apartment-building-retrofit-programme-padovafit</p> <p>[44] BuildUp (2019). PadovaFIT Expanded project. European Commission. Available at: https://www.buildup.eu/en/explore/links/padovafit-expanded-project</p> <p>[45] PadovaFit Expanded (n.d.) PadovaFIT Expanded. Horizon 2020 project. Available at: https://www.padovafit.eu/home.html</p>

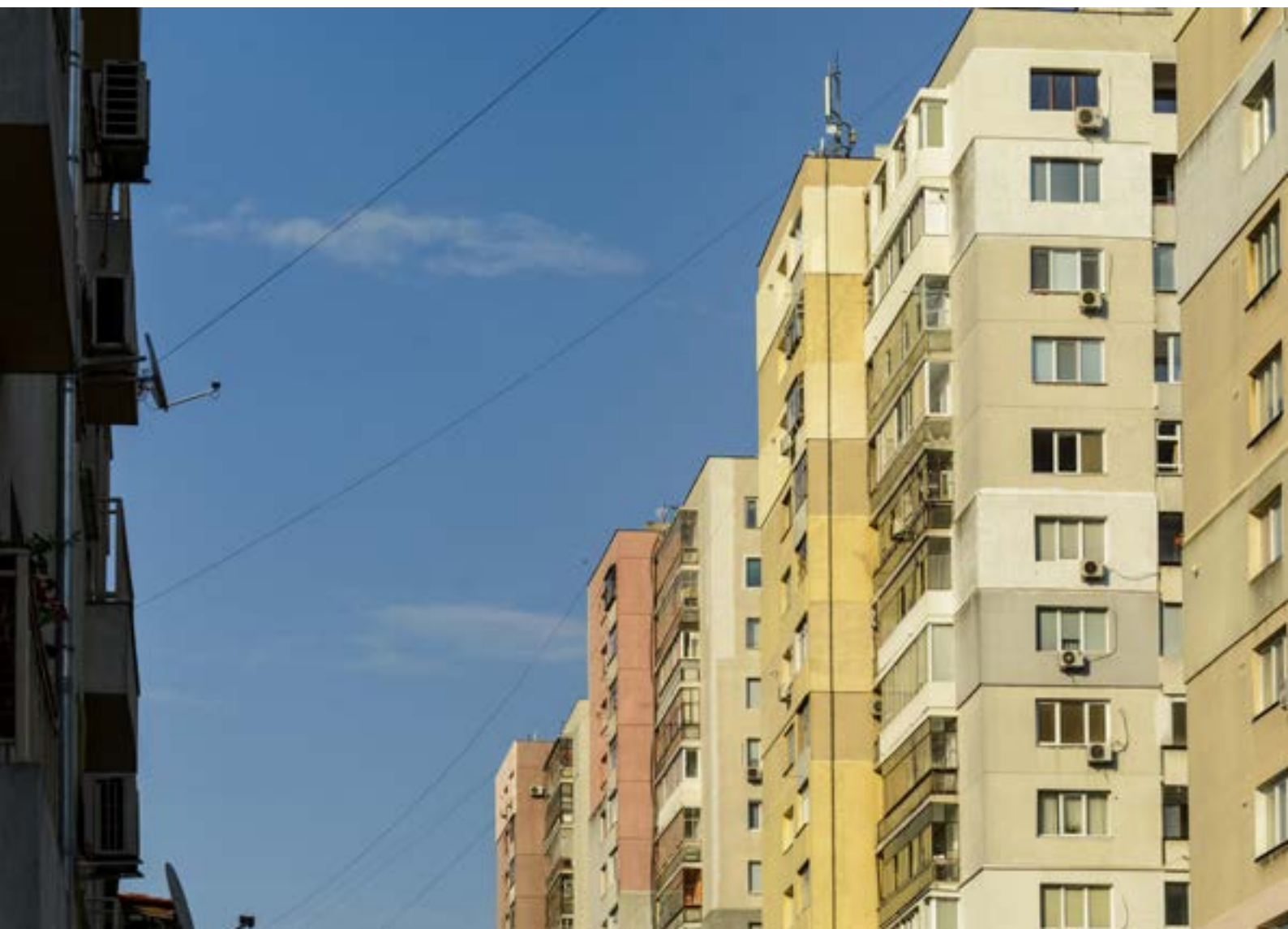
3.3.2 JESSICA II multi-family building modernisation programme – Lithuania

Good practice	
Description	<p>The modernisation programme in Lithuania implements energy efficiency upgrades in multi-apartment buildings financed by a EUR 150 million revolving fund established through the EU's Structural and Investment Funds 2014–2020. The JESSICA II financing scheme is managed by the EIB and funds energy-efficiency projects in residential housing in Lithuania by preferential loans and leveraging private investment, building on the successful first phase of the scheme which ran until 2013.</p> <p>The scheme mostly addresses energy-poor homeowners' associations as the majority of apartment buildings in Lithuania are privately owned, which means a majority vote is needed to initiate the renovation of a building – and homeowners have little incentive to invest. JESSICA I invested EUR 265 million in energy-efficiency projects, covering each Lithuanian municipality. JESSICA II aims to leverage more private financing to increase the total amount invested by establishing a 'pre-financing' instrument of EUR 180 million in resources from commercial banks, a public agency, and other third-party contributors [46].</p>
Mode of implementation	<p>The loan scheme is managed by the European Investment Bank (EIB) in close collaboration with the Lithuanian Ministry of Finance and Ministry of Environment, as well as financial intermediaries, providing resources to overcome the financing gap to invest in local renovation measures in apartment buildings. The scheme initially offered municipal subsidies for low-income households, making it a well-received instrument to alleviate energy poverty [47].</p> <p>Under the JESSICA II phase, the EIB additionally developed a guarantee instrument to attract more private funding and to move away from channelling ERDF and national funds to renovation projects through financial intermediaries. This comes in the form of a financial guarantee to commercial banks who can directly offer preferential loans to homeowners' associations to maximise the number of loans granted [46].</p>
Challenge addressed	<p>The JESSICA II fund tackles the challenge of high upfront costs by providing preferential loans to vulnerable homeowner associations, thereby often addressing the worst-performing buildings.</p>
Why good practice/ Key success factors	<p>The JESSICA I and II funds represent good practice as long-term financing instruments that move from public to private financing sources to ensure sustainable funding cycles. The 'pre-financing' instrument from the EIB supports households and homeowner associations in the tendering and application process to overcome a lack of financial resources.</p>
Take-away for regional and local authorities	<p>Municipalities should aim for long-term funding schemes to ensure planning security for building owners. Especially for larger multi-family buildings, renovation measures can be cost-intensive and require long planning cycles. Financial institutions like the EIB are important partners to secure guarantees, thereby mobilising private finance from commercial banks or third-party institutions.</p>
Sources	<p>[46] Jessica II Fund for Multi-apartment Building Modernisation. Available at https://www.energypoverty.eu/sites/default/files/downloads/observatory-documents/19-06/case_study_-_jessica_ii_without_url.pdf</p> <p>[47] EIB (2019). Lithuania: New financing for energy efficiency loans with Siauliu Bankas. Available at: https://www.eib.org/en/press/all/2019-001-new-financing-for-energy-efficiency-loans-in-lithuania-with-siauliu-bankas</p>

3.3.3 Better Energy Communities grant scheme – Ireland

Good practice	
Description	<p>The <u>Better Energy Communities</u> (BEC) scheme is one of the main grant schemes administered by the Sustainable Energy Authority of Ireland (SEAI), and aims at reducing the fossil fuel usage, energy costs and GHG emissions of the national building stock. The BEC scheme, which started in 2012, supports innovative community-oriented projects from various sectors, including residential housing upgrades and non-residential building works, and accepts applications from commercial and voluntary organizations, the public sector and private homeowners, with a focus on vulnerable groups [48].</p>
Mode of implementation	<p>Since 2011, the Better Energy programme has been the main governmental scheme administered by the Sustainable Energy Agency Ireland (SEAI) to support multiple building renovation measures and renewable energy installations with different grants (e.g. <u>Better Energy Homes</u>, <u>Better Energy Warmer Homes</u>).</p> <p>The Better Energy Communities (BEC) is the second largest scheme according to volume, with a special focus on municipal, community-oriented projects. Projects that apply for funding under the grant scheme are required to demonstrate that energy efficiency improvements (wall insulation, roof insulation, upgrade of windows and doors) are given priority over the installation of renewable heating systems or other smart technologies, thereby operationalising the EU principle of <i>Energy Efficiency First</i> [49].</p> <p>Funding varies between EUR 50,000 and EUR 1,500,000 per project, and the level of subsidies depends on the type of building and occupants. Private non energy-poor or local authority homes can receive up to 35% of the total costs, while energy-poor private homeowners can receive up to 80%.</p> <p>The Fourth National Energy Efficiency Action Plan from 2017 states that the BEC scheme provided over EUR 16 million in grant funding for energy efficiency upgrades in 2016 to more than 2,000 homes and close to 300 community and commercial buildings [49]. An investment of EUR 55 million was leveraged in total, supporting more than 700 direct and indirect jobs across Ireland. In total, more than 15,000 homes and hundreds of communities, private and public buildings have received energy efficiency upgrades.</p>
Challenge addressed	<p>The BEC scheme mainly addresses the challenge of high upfront costs, by providing a subsidy of 35–80% of total costs for energy efficiency improvement of private and public buildings in municipalities [50]. As the scheme is specifically tailored to community-oriented projects and provides a higher support to energy-poor private homeowners, multiple benefits are realised. Supported projects create social cohesion, jobs and increased solidarity in communities.</p>
Why good practice/ Key success factors	<p>One of the main success factors of the Better Energy Communities scheme is its community-oriented approach that puts vulnerable communities and projects at the centre of the funding scheme (the scheme design grants up to 80% of total costs for energy-poor households) [50]. This creates multiple benefits for local stakeholders. The Irish ‘fabric first’ approach that prioritises energy performance interventions on the building envelope over supply-side installation of renewable energies also supports improved comfort and well-being for building occupants.</p> <p>The high amount of long-term funding is another key success factor that ensures planning security for communities.</p>

Good practice	
Take-away for regional and local authorities	This scheme demonstrates the multiple municipal benefits of a community-oriented and <i>Energy Efficiency First</i> approach. As the SEAI requires energy performance certificates after completion of renovation measures, high quality works and energy savings can be ensured.
Sources	<p>[48] Better Energy Communities scheme, SEAI website. Available at: https://www.seai.ie/grants/community-grants/</p> <p>[49] SEAI (2019a). National Energy Projections 2019. Sustainable Energy Authority of Ireland. Available at: https://www.seai.ie/publications/2019-04_SEAI2019ProjectionsReport_Final.pdf</p> <p>[50] SEAI (2019b). Communities Energy Grants Application Guidelines 2020. Sustainable Energy Authority of Ireland. Available at: https://www.seai.ie/grants/community-grants/project-criteria-and-funding/Community-Grant-Guidelines.pdf</p>



3.3.4 Environmental Fund for Schools – Romania

Good practice	
Description	The Romanian Environmental Fund for Schools aims to improve energy efficiency and foster intelligent energy management in public schools [51]. The goals are both reduction of greenhouse gases and the modernisation of school buildings.
Mode of implementation	<p>The programme is implemented by the Ministry of Environment, Water and Forests and financed with revenues from the European emission trading system (ETS) allowances [52].</p> <p>Funding can be used to improve thermal insulation, new heating installations, implementation of energy management systems, energy-efficient lighting, and ventilation systems [52].</p> <p>The effectiveness of the programme is measured in terms of reduced final energy consumption and reduced CO₂ emissions.</p> <p>The fund's total budget is EUR 78 million, of which EUR 39 million is for municipalities with up to 5,000 inhabitants and EUR 39 million is for municipalities with more than 5,000 inhabitants [51]. Per application round, small municipalities can request up to EUR 300,000 while larger municipalities can apply for double that amount [52].</p> <p>Eligibility of applicants is determined by factors including:</p> <ul style="list-style-type: none"> • The energy audit performed must indicate that a reduction of at least 10% in final energy consumption can be achieved • The building must be a public property • The building must not have received public funding in the last five years • The owner institution must show a 'strategic document', which may be a sustainable energy action plan, a strategy for CO₂ reduction, a local strategy in the field of energy, or a nationally approved energy efficiency action plan [52]
Challenge addressed	Through this scheme, access to funding is assured and linked to incentives to improve data collection.
Why good practice/ Key success factors	The fact that funding is earmarked for the renovation of public buildings and directly linked to data collection makes this a good practice example. The funding can be used to improve energy management systems, but the requirement for an energy audit result with expected return on investment along with the requirement to submit an accompanying strategic document incentivises local authorities to improve their data collection.
Take-away for regional and local authorities	The development of strategic documents can give policymakers more insights into the building stock and provide focus and efficient spending of public funds. The Romanian Environmental Fund for Schools proves it can also help to get access to funding, as such documents might be required for eligibility and access to public funding.
Sources	<p>[51] Administratia Dondului Pentru Mediu (2020). Energy Efficiency in Schools. Environmental Fund Administration. Available at: https://www.afm.ro/eficienta_energetica_scoli_legislatie.php</p> <p>[52] Administratia Dondului Pentru Mediu (2020). Financing Guide of 16 November 2020. Environmental Fund Administration. Available at: https://www.afm.ro/eficienta_energetica_scoli_ghid_finantare.php</p>

3.4 Data collection and storage

Building stock data collection is a key challenge for many local authorities. What data to collect, where to store the collected data and how to compare and validate various types of data are recurring issues encountered by local policymakers. To aid local authorities, the OurBuilding report on LTRS provides a structured planning approach to start collecting regional and local data about the building stock.²⁰ In addition, initiatives and programmes related to energy management systems, smart meter technology and EPC schemes can help authorities improve their understanding of the build-



ing stock in their jurisdiction. EPCs are often linked to financing schemes; they can have an influence on the valuation of buildings and provide information to investors. However, significant differences still exist between MS in terms of EPC coverage and quality [53]. Moreover, EPC systems are often national programmes that have an indirect impact on the local level. The following section will therefore not focus on EPCs but include good examples of existing data collection, databases and storage systems, and digital instruments that provide added value to building owners while fostering data collection.

3.4.1 Woningpas Flanders

Good practice	
Description	Woningpas (Housing Pass) is a digital building passport for residential buildings in Flanders that was launched in late 2018 [54]. The Woningpas functions as a unique digital file linking multiple data sets about a particular building, to which building owners and their appointed representatives have access.
Mode of implementation	The aim of the Woningpas is to be a user-friendly 'digital safe' for building-related information to foster high-quality and sustainable renovation. It includes information on installations and insulation, renewables, quality of the house, licensed renovations and soil information. The storage function is combined with a long-term plan for how energy performance and quality can be improved in the future. Data in the Woningpas is generated automatically through links with various existing government databases containing building, spatial and environmental data. Building owners can get access to the Woningpas by logging in with their electronic IDs [46]. Furthermore, building owners can grant others access to their Woningpas, and they can update the file after renovation measures [55].
Challenge addressed	The Woningpas shows how data collection and storage related to buildings can be improved and made accessible to building owners and policymakers.
Why good practice/ Key success factors	The Woningpas is a good practice example because it provides building owners and professionals with a user-friendly and comprehensive building-related database. Instead of having to contact various agencies and authorities, all data is stored in a single file, which can be updated and shared by the building owner. This supports building owners and local authorities in tackling the challenge of limited data access and availability. Its dynamic nature will allow for further integration of data related to the building like burglary protection, material performance, heritage, accessibility and fire safety; or data beyond the building like mobility, low-carbon energy options, environmental planning and heat networks [54]. As such it enables links with existing government databases and fosters collaboration between (local) authorities, while providing user-oriented services. The design principles of Woningpas can also be applied outside Flanders [54]. Total costs for the development and implementation of the Woningpas are EUR 3.2 million for 2018–2022 [56].

²⁰ Visit the BPIE website for more information: <https://www.bpie.eu/publication/our-buildings-templates/>

Good practice	
Take-away for regional and local authorities	Key take-aways for local authorities are that synergies can be created between data collection, user-oriented digital services and information tools, to foster building renovation.
Sources	<p>[54] JoinUp (n.d.). About Building Passport Flanders (Woningpas). European Commission. Available at: https://joinup.ec.europa.eu/collection/egovernment/solution/building-passport-flanders-woningpas/about</p> <p>[55] Overheid van Vlaanderen (2020). Over Woningpas. Flemish Government. Available at: https://woningpas.vlaanderen.be/web/guest/over-woningpas/</p> <p>[56] Vlaams Energieagentschap (2016). Draft Designnota Woningpas. Flemish Energy Agency. Available at: https://www.energiesparen.be/sites/default/files/atoms/files/RP_fase2_draftdesignnotawoningpas_versiejuni2016.pdf</p>

3.4.2 EFEKT programme: Energy management systems for municipalities – Czechia

Good practice	
Description	The grant for energy management systems in Czechia is part of the larger EFEKT programme and aims to reduce primary energy consumption through intelligent energy management in public authority buildings [57][58]. This measure is mentioned as one of the strategies to improve data collection in public buildings [59].
Mode of implementation	<p>The EFEKT programme in Czechia consists of two sub-programmes, of which the first focuses on investment and the second on non-investment activities [57]. The energy management grant from the EFEKT programme is part of the non-investment activities, and has the reduction of primary energy consumption as its main objective. The sub-programme it is part of aims to provide data to develop energy-efficiency strategies [58].</p> <p>The systems implemented must comply with the EN 50001 standard or the environmental management and audit system. The applicant is obliged to send a report on the sustainability and impact of the project one month after implementation and every five years thereafter [58].</p> <p>The subsidy is implemented by the Ministry of Industry and Trade [57]. For 2021 the total budget of the energy management grant is EUR 5.7 million. The grant for energy management systems can be requested by regions, companies, (associations of) municipalities, and city districts with more than 5,000 inhabitants. The maximum amount of support available per applicant is EUR 20,000 and cannot exceed more than 70% of the total costs [57].</p>
Challenge addressed	The programme addresses data collection at a local level and improves insight into the energy performance of the public building stock.
Why good practice/ Key success factors	The grant can be considered a good practice because it specifically supports local authorities in reducing their final energy consumption while simultaneously improving data collection. This allows local authorities to tailor their renovation policies and renovate the buildings with the worst energy performance.

²¹ For example, the LTRS of Flanders, Luxembourg and Ireland mention similar initiatives.

Good practice	
Take-away for regional and local authorities	Support mechanisms such as the EFEKT subsidy for energy management systems are becoming more widespread, as are those specifically tailored to public buildings on a local level. ²¹ There may be funding sources available that can help to improve data collection while reducing final energy consumption.
Sources	<p>[57] Ministerstvo Prumyslu a Obchodu (2021a). Programme EFEKT. Czech Ministry of Industry and Trade. Available at: https://www.mpo-efekt.cz/cz/programy-podpory/efekt</p> <p>[58] Ministerstvo Prumyslu a Obchodu (2021b). Call nr. 6/2021 to submit application for subsidies under the State programme for the Support of Energy Savings for the period 2017–2021. Czech Ministry of Industry and Trade. Available at: https://www.mpo-efekt.cz/upload/6cd6d069e64a28ff10122424d61b29ea/21_efekt_vyzva_06_2d_energeticky-management.pdf</p> <p>[59] Czechia LTRS (2020). Long term renovation strategy to support the renovation of the national stock of both public and private residential and non-residential buildings. Czech Ministry of Industry and Trade. Available at: https://ec.europa.eu/energy/sites/default/files/documents/cz_2020_ltrs_official_translation_en.pdf</p>



3.4.3 Passeport Efficacité Énergétique (P2E) – France

Good practice	
Description	The Energy Efficiency Passport (P2E) in France is an experimental tool that provides an energy audit and tailored building renovation roadmap to individual residential buildings [60]. The roadmap indicates the renovation phases, the level of performance that can be achieved, and an estimation of renovation costs. The objective is to foster the decarbonisation of the building stock.
Mode of implementation	<p>The P2E is developed based on the understanding that energy efficiency alone is not sufficient to trigger deep renovations; and that deep renovations will be implemented in stages, rather than performed at once [61].</p> <p>The digital application has various features aimed at auditing, suggesting renovation packages to reach the Bâtiment Basse Consommation standard, a carbon estimator indicating whether renovations are in line with national targets, suggested renovation measures, risks and safety issues, and finally a suggested roadmap to decarbonisation [62].</p> <p>P2E has a board of directors which includes (among others) the founding members of The Shift Project, industrial energy and renovation specialists, and professional associations in the building sector. In addition, representatives of the local jurisdictions involved (Région Centre-Val de Loire, Région Grand Est, and regional agencies) are also part of the board [60][61].</p>
Challenge addressed	Data collection and information provision within participating regions of France has been improved, providing building owners with a relevant roadmap to achieve a staged renovation.
Why good practice/ Key success factors	This pilot project was first initiated in 2012 and has evolved to encompass various features which have been implemented and tested at the local level. The P2E provides valuable information to building owners and provides regional and local public authorities with information about the state of the building stock.
Take-away for regional and local authorities	Local authorities can fulfil an important role in the development and testing of digital applications, which in turn can provide valuable information about the state of the building stock. This can allow public authorities to tailor their support mechanisms and policy objectives to those areas most in need.
Sources	<p>[60] The Shift Project (2021). Passeport Efficacité Énergétique (P2E). The Shift Project. Available at: https://theshiftproject.org/experience-p2e/</p> <p>[61] Zsolt Toth, Maarten de Groote, Sofie De Regel, Giulia Carbonari, Marco Calderoni (2020). Building Logbook State of Play. European Union. Available at: https://op.europa.eu/en/publication-detail/-/publication/58580f81-06b7-11eb-a511-01aa75ed71a1/language-en/format-PDF/source-search</p> <p>[62] Expérience P2E (n.d.) Mettre en oeuvre un démarche de rénovation énergétique qui s'appuie sur un Passeport Efficacité Energétique. Engagé pour Faire. Available at: https://www.experience-p2e.org/le-p2e/application/</p>

3.4.4 Klimatdeklaration – Sweden

Good practice	
Description	The aim of Klimatdeklarations ('Climate Declarations') is to reduce the climate impact of newly constructed buildings [63]. The upstream emissions in the lifetime of buildings are not sufficiently accounted for. The climate declaration will include all embodied emissions for the construction materials and the construction process of a new building.
Mode of implementation	<p>The Ministry of Finance has submitted a proposal that will require climate declarations for buildings starting in 2022 [63].</p> <p>The Swedish government wants to foster the application of life-cycle assessment methodologies in the built environment by the introduction of Klimatdeklarations. The aim is to provide decision-makers with information about emissions during the construction process, and stimulate the construction sector to develop carbon-neutral products and processes [63].</p> <p>The Swedish Housing Agency Boverkets has been assigned the task of developing an open database with environmental and life-cycle data relevant for the construction sector. It will also develop a climate declaration register to store climate declarations once the law enters into force [64].</p> <p>To support the building sector and homeowners, information and guidance documents will be published. The agency will also develop a plan for continued development and expansion of the climate declaration [64].</p> <p>In a report detailing potential further development, the Swedish Housing Agency recommends that the impact of other life-cycle stages of buildings should be included in the declaration, such as maintenance, renovation, and operational energy use [65]. Moreover, the deconstruction, demolition, transport, waste processing and disposal stages after the end of life should be included. For a complete picture, environmental information about biogenic carbon storage and the energy balance of locally produced electricity could be added. To stimulate the implementation of climate-neutral measures the Housing Agency suggests that environmental maximum values are introduced after 2027, to be gradually tightened over time towards 2050 [65].</p>
Challenge addressed	Klimatdeklarations facilitate data collection about the construction process and embodied emissions of buildings.
Why good practice/ Key success factors	This is a good practice not only because it helps to collect data about carbon emissions that are often overlooked in conventional impact assessments. The inclusion of life-cycle-impact data and whole-life carbon is expected to be introduced on a wider scale. The declaration is designed in a way that allows the Swedish Housing Agency to expand its scope in future, to include areas including renovation measures in addition to new buildings. The tool is embedded in a broader policy landscape and, besides providing information to building owners and professionals in the construction industry, can stimulate innovative climate-neutral construction practices.
Take-away for regional and local authorities	The take-away for regional and local authorities is that data collection will keep developing in the years to come. Assessing whole-life carbon emissions of buildings and building renovations requires a variety of data sources, including but not limited to operational energy. To anticipate this trend authorities could start investing in data collection mechanisms, databases and digital tools to support decision-makers.

Good practice	
Sources	<p>[63] Regeringskansliet (2020). Regeringen vill införa klimatdeklaration för byggnader. Swedish Ministry of Finance. Available at: https://www.regeringen.se/pressmeddelanden/2020/02/regeringen-vill-infora-klimatdeklaration-for-byggnader/</p> <p>[64] Boverket (2020a). Climate declaration for construction of a building. Swedish National Board of Housing, Building and Planning. Available at: https://www.boverket.se/sv/byggande/uppdrag/klimatdeklaration/</p> <p>[65] Boverket (2020b). Regulation on climate declarations for buildings – proposal for a roadmap and limit values. Swedish National Board of Housing, Building and Planning. Available at: https://www.boverket.se/globalassets/publikationer/dokument/2020/regulation-on-climate-declarations-for-buildings.pdf</p>

3.5.4 EPISCOPE – Northside Dublin Pilot

Good practice	
Description	<p>The goal of Ireland's EPISCOPE project is to track progress in energy renovation of the housing stock, in particular thermal insulation and heat supply, in the context of energy savings and climate protection [66]. EPC databases combined with other building information are visualised on an interactive website [67].</p>
Mode of implementation	<p>EPISCOPE's objective has been to assess and monitor the renovation rate in the Northside of Dublin. To achieve the objective the energy performance of the building stock at the start of the project in 2015 was estimated (using EPCs), as were renovations performed until implementation of the projects, and the annual renovation rate was estimated. Based on that data scenarios were developed for 2020, 2030 and 2050 [66].</p> <p>To facilitate the monitoring, an EPC mapping tool was developed, which could be a valuable resource in planning and accelerating the renovation of the building stock [66]. Based on various data sources the project aimed to develop scenarios and to estimate potential energy and carbon emission reductions for the future.</p> <p>Data was collected from sources including the national EPC database, existing building renovation programmes (e.g. Better Home, Warmer Home, Better Energy Communities, and local agency and retrofit programmes), a pilot action survey, and small-scale energy consumption pilots [66].</p> <p>At the time of the study in 2015, 30% of the buildings in the project area had an EPC. Roughly 12.5% of the housing stock was in public hands [66].</p> <p>EPC data and other building-related information are visualised in an interactive map for site visitors [67]. The interface allows users to select parameters like insulation levels, heating installations, EPC level or building age. In that way it is possible to identify city districts or neighbourhoods in which a specific aspect of the building stock is in need of upgrade or renovation.</p> <p>The outcomes of the study indicate that the national EPC database, combined with the pilot action survey, provide relevant insights about the energy efficiency of the building stock. In the case of the Northside of Dublin the outcomes suggested that 75% of the housing stock still needed to undergo deep renovation in 2016, and that the grid needed to be decarbonised by another 60% to achieve the 2050 emission reduction targets [68]. The recommendations of the study suggest that such analyses of the building stock should continue, and that the methodology should be further refined. It stresses the value of EPC databases as an essential part of future energy trend modelling [66].</p>

Good practice	
Challenge addressed	The pilot study shows a practical applicability of EPC databases on a local scale. The data could be used by policymakers to identify priority districts in need of renovation.
Why good practice/ Key success factors	The EPISCOPE pilot in the Northside of Dublin can be considered a good practice because it established a building performance monitoring tool based on EPCs and demonstrated the practical applicability of EPC databases. The interactive GIS-based map allows visitors and policymakers to identify which parts of the Northside of Dublin are priority areas, which could aid policymakers to tailor their policies to those areas.
Take-away for regional and local authorities	Data collection at the local level provides valuable insights into which city districts are in most need of renovation, in particular when visual interfaces are used.
Sources	<p>[66] Episcopes (2016). National Report of the Irish EPISCOPE Pilot Action – Deliverable 3.1. Energy Europe Programme of the EU. Available at: https://episcopes.eu/fileadmin/episcopes/public/docs/pilot_actions/IE_EPISCOPE_LocalCaseStudy_EnergyAction.pdf</p> <p>[67] OpenStreetMap contributors (2016). Map Data. Available at: http://energyaction-static.s3-website-eu-west-1.amazonaws.com/index.html</p> <p>[68] Episcopes (2016). Episcopes Northside of Dublin Pilot Action Results – May 2016. Available at: https://energyaction.ie/ea/episcopes/</p>

3.5 Integrated municipal planning

Building renovation takes place in the broader context of urban planning. In the Renovation Wave this is illustrated by the fact that besides energy efficiency and decarbonisation of energy sources, key principles like life-cycle thinking and circularity, public health and environmental standards, digitalisation, and aesthetics and architectural quality



must be integrated. Holistic urban planning is necessary to combine these different aspects. Moreover, the retrofitting of buildings should coincide with the decarbonisation of the heating and cooling supply. In the Renovation Wave the EC will foster this through the support of district approaches, besides revising the Renewable Energy and Energy Efficiency Directive.

3.5.1 District approach – The Netherlands

Good practice	
Description	The Dutch government and nationwide transition partners agreed upon the ‘district approach’ (Wijkgerichte aanpak) in the national Climate Agreement in 2019 [69]. Within this planning approach to decarbonise the Dutch building stock, regional and local authorities play a prominent role.
Mode of implementation	<p>The district approach aims to decarbonise residential and non-residential buildings, and uses a plan-based strategy. Within the district approach, municipalities are leading efforts to create ‘Transition vision heating’ documents, which are strategies describing how each district within municipal boundaries will be decarbonised towards 2050. Due to the diversity of the building stock, varied ownership and availability of heating sources, the decision has been made to plan at district level. The municipalities are also responsible for engaging in participatory processes to draft these plans, in which the input of residents, building owners and other stakeholders is considered essential [69].</p> <p>To support the municipalities with these responsibilities, various parallel measures have been announced. These include the establishment of a national expertise centre advising municipalities [70]; a knowledge and learning programme called ‘Natural gas-free districts’ in which municipalities receive subsidies to start decarbonising districts and share lessons to scale up efforts nationwide [71]; and a legislative trajectory to adjust the heating market, building-related financing and participation in spatial planning [69]. Moreover, the district approach should be aligned to regional energy strategies that cover the availability and distribution of renewable heating and cooling sources in ‘energy regions’ covering multiple municipalities [72]. The district approach, as part of a broader set of measures, allows integrative planning and decisions tailored to the local context.</p>
Challenge addressed	The district approach improves access to finance by providing clarity for investors from the private market, and creates opportunities to attain multiple benefits through building renovation tailored to local circumstances.
Why good practice/ Key success factors	The district approach in the Netherlands is a good practice example because it presents an integrated process towards decarbonisation of the building stock. The combination of national measures and local leadership is expected to result in effective decarbonisation and renovation strategies. Key strengths of the Dutch approach are its participatory aspects and the collaboration between various levels of government. However, recent reports of the National Audit Chamber indicate that progress is lagging behind expectations [73], and some ‘pilot’ districts face legislative or technical challenges which are slowing down progress [74] [75]. Focus on the wishes of residents, suitable technical heating solutions, and reduction of disturbances during the project implementation are considered essential for its success.

Good practice	
Take-away for regional and local authorities	The Dutch government initiated the district approach to allow local authorities to tailor the transition to a decarbonised building stock to local circumstances. This can allow local authorities to integrate other priorities like public health, environmental quality and combating energy poverty with the decarbonisation objective. Moreover, the government is convinced that clear strategies will improve the confidence of investors and financial institutions and provide an incentive to invest in energy-efficient and carbon-neutral processes, construction products and buildings.
Sources	<p>[69] Klimaatakkoord (2019). Klimaatakkoord. Government of the Netherlands. Available at: https://www.klimaatakkoord.nl/documenten/publicaties/2019/06/28/klimaatakkoord</p> <p>[70] ECW (2021). Expertise Centrum Warmte. Available at: https://www.expertisecentrumwarmte.nl/default.aspx</p> <p>[71] PAW (2021). Programma Aardgasvrije Wijken. Government of the Netherlands. Available at: https://www.aardgasvrijewijken.nl/default.aspx</p> <p>[72] RES (2021). Nationaal Programma Regionale Energiestrategie. Government of the Netherlands. Available at: https://www.regionale-energiestrategie.nl/default.aspx</p> <p>[73] Algemene Rekenkamer (2020). Aardgasvrije wijken: te hoge verwachtingen gewekt. National Audit Chamber. Available at: https://www.rekenkamer.nl/actueel/nieuws/2020/05/20/aardgasvrije-wijken-te-hoge-verwachtingen-gewekt</p> <p>[74] De Voogt, Sam (2020). Ineens was er een brief: voorlopig gaat uw wijk toch niet van het Gas. NRC. Available at: https://www.nrc.nl/nieuws/2020/10/15/ineens-was-er-een-brief-voorlopig-gaat-uw-wijk-toch-niet-van-het-gas-af-a4016235</p> <p>[75] Van Santen, Hester (2020). Tegenslag in Terheijden: de rechter blokkeert het zonnepark van de bewoners. NRC. Available at: https://www.nrc.nl/nieuws/2020/11/02/tegenslag-in-terheijden-de-rechter-blokkeert-het-zonnepark-van-de-bewoners</p>

3.5.2 e5 scheme for municipalities – Austria

Good practice	
<p>Description (objective, main design features)</p>	<p>The e5 scheme for energy-efficient municipalities was initiated in Austria in 1998 by the federal states of Salzburg, Tirol and Vorarlberg in order to support the long-term integrative planning of municipal climate protection and energy efficiency efforts. The scheme supports municipalities in implementing long-term measures and evaluates their effectiveness in a comprehensive and consistent approach across Austria, currently in eight of nine states (Burgenland, Carinthia, Lower Austria, Salzburg, Steiermark, Tyrol, Styria and Vorarlberg) [77].</p> <p>The e5 tools and support improve processes, identify potential for improvement and facilitate the participation of a range of stakeholders in energy policy decisions and activities. Regarding building renovation, the e5 scheme supports [68]:</p> <ul style="list-style-type: none"> • Mobilisation of the municipalities as information hubs for members of the public (first point of contact, advice from the municipality, either directly or via facilitation of existing advisory services) • Training courses for municipal employees (energy consultant training etc.) • Provision of a point of contact for political representatives and municipality employees with regard to municipalities' options for taking action • Evaluation of the energy consumption of public buildings based on target and limit values (benchmarks for electricity/heat/water), building thermographic images • The creation of renovation plans for public buildings • Cooperation and communication with various target groups (associations, business and commerce, schools, public authorities etc.) • Public relations (all media and target groups) [76]
<p>Mode of implementation (responsible authorities, compliance, enabling measures, budget, transferability)</p>	<p>The e5 scheme for municipalities is administered by the Austrian national energy agency (Österreichische Energieagentur) and implemented by the regional authorities who put an e5 commission into practice. In addition, e5 consultants and auditors are responsible for guiding the activities and leading the certification process in the municipalities respectively [76].</p> <p>In Styria, for example, the e5 scheme provides 78 measures for municipalities in six areas of action that can be implemented, and these are evaluated by means of periodic internal and external audits [78]. For the specific area of cost-effective deep renovation there are numerous auditable measures which can be undertaken for municipal buildings and facilities, such as 'stock-take and analysis', 'creation of a refurbishment plan' and 'role model refurbishment'. The regional authority provides a free online energy accounting tool for buildings supporting the assessment of energy consumption in municipalities [78].</p>
<p>Challenge addressed</p>	<p>The approach of the e5 scheme supports municipalities in planning climate protection activities, including building renovation measures, in a comprehensive way, thus ensuring benefits such as job opportunities and empowered citizens.</p>
<p>Why good practice/ Key success factors</p>	<p>The comprehensive scheme supports awareness-raising, planning and monitoring of climate mitigation efforts in the fields of regional planning, public buildings, energy and waste management, mobility, internal processes and communication/outreach. An auditing process every three years evaluates the energy performance of the municipality and certifies its progress.</p>

Good practice	
Take-away for regional and local authorities	The e5 scheme supports Austrian municipalities in planning their long-term climate mitigation efforts, including energy-efficiency improvements, by providing tools (e.g. online energy auditing tools) and standardised monitoring and certification processes. The latter is important to track progress and streamline the measures between the participating municipalities. Local authorities should assign responsible roles within the municipality setting up auditing and review processes to ensure the measures are aligned with long-term targets at the regional and national level.
Sources	<p>[76] Austria LTRS (2020). Document on the long-term renovation strategy pursuant to Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings in the consolidated version of 30 May 2018. Institute of Construction Engineering (OIB). Available at: https://ec.europa.eu/energy/sites/default/files/documents/at_2020_ltrs_en.pdf</p> <p>[77] e5 scheme national website (n.d.) Dae e-5=Programm für energieeffiziente Gemeinden. Programme for energy efficient municipalities. Available at https://www.e5-gemeinden.at/e5-programm/das-e5-programm-fuer-energieeffiziente-gemeinden</p> <p>[78] e5 scheme website of Styria (n.d.) e5 – Das Rezept für kommunale Energiepolitik. Energie Agentur Steiermark GmbH. Available at https://www.e5-steiermark.at/%C3%BCber-e5/</p>

3.5.3 Regional and local long-term renovation strategies – Spain

Good practice	
Description (objective, main design features)	Innovation in planning, management and municipal renovation finance in the form of local renovation strategies is elaborately described in the Spanish LTRS [79]. Essential elements in such strategies are the identification of spatial priority areas and subsequently timelines, financial support schemes and urban management tools to implement the strategies [79]. Various concrete good-practice examples are provided from small, medium-sized and large municipalities.
Mode of implementation (responsible authorities, compliance, enabling measures, budget, transferability)	<p>The Spanish LTRS mentions that the Spanish Housing Plan from 2013–2016 was the first to require strategic planning documents from local authorities to get access to funding [79]. Ever since, various regional authorities have developed and implemented plans independently, including Castillo y León, Catalonia, Valencia, Andalusia, the Basque Country, Navarra, Aragon, Network of the Valencian Community, and Galicia. The LTRS describes the focus points and objectives of each strategy.</p> <p>In section 4.4.6 of the LTRS, innovation in planning, management and finance is discussed. The section of the LTRS stresses the importance of planning at the local level for the decarbonisation of the building stock. Exemplary strategies are provided from Albacete (medium-sized), Alcaladà del Júcar (small), and Madrid (large), focussing. The LTRS highlights the successful aspects of these individual strategies.</p> <p>The exemplary renovation strategy of Albacete, which was published in 2018, identifies specific districts like Milagrosa, Santa Terea and Hermanos Falcó Zone as priority areas, based on parameters previously defined by the municipal council. The plan also links these priority areas to other existing initiatives such as the integrated strategy for sustainable urban development (EDUSI), the General Urban Planning Strategy (PGOUA) and the Municipal Conservation and Inspection Ordinance (OMCIP)[80].</p> <p>The plan is intended to lay the foundation for building renovation in the municipality and identify areas for short-term interventions and action. A second objective is to provide the municipal council with the detailed analysis of the building stock it requires in order to request support from regional and national housing programmes [80].</p>
Challenge addressed	These local renovation strategies allow policymakers to collect data about their building stock, then use this knowledge to prioritise short-term actions and request support from regional and local authorities, e.g. related to finance.
Why good practice/ Key success factors	This is a good practice example because the local integrated plans are presented as an essential part of the national LTRS. This is beneficial because highlighting successful aspects of existing local strategies facilitates knowledge exchange between local authorities. The strategies allow local decision-makers to align renovation activities with other existing policy priorities. Finally, it puts municipalities who have invested in such strategies in the spotlight, and allows them to share what they have learned while linking local action to national climate objectives.

Good practice	
Take-away for regional and local authorities	Drafting local renovation strategies has benefits besides data collection. In the example of Albacete, the strategy serves to identify priority areas, as well as providing data to support requests for aid on regional and national levels.
Sources	<p>[79] Spain LTRS (2020). ERESEE 2020 Actualización de la Estrategia a Largo Plazo Para La Rehabilitación Energética en el Sector de la Edificación en España. Ministry of Transport, Mobility and Urban Planning. Available at: https://ec.europa.eu/energy/sites/default/files/documents/es_ltrs_2020.pdf</p> <p>[80] Gerencia Municipal De Urbanismo Albacete (2018). Plan Director de Rehabilitación y Regeneración Urbana Albacete. Municipality of Albacete. Available at: http://www.albacete.es/es/por-temas/urbanismo-y-obras/documentos/plan-director-rr.2018.1.1</p>



4. Conclusion and policy recommendations

The long-term renovation strategies that have been published so far have proved to be a rich source of information on the European building stock. They include relevant good practice examples for renovation action at the local level, although strategic consideration of a multi-governance approach and collaboration is often missing.

LTRS should pay more attention to local needs in the future

The relevance of LTRS for local authorities should be increased by explicitly stating how national tailored approaches and data collection and storage efforts are relevant at the local level, and how local authorities can contribute to the implementation of such initiatives. The widespread application of EPCs and other data collection initiatives helps to improve national LTRS by feeding municipal data into the building stock repository. A detailed overview of the national building stock is crucial to identify priority actions and design effective renovation policies.

The submitted LTRS contain many promising policies, plans and ideas for initiatives that require further elaboration. For instance, in the Spanish LTRS a 'sustainable municipality' label is mentioned which would be provided to local authorities that drafted local renovation strategies, linking these to the national policy context and dedicated funding for building renovation [79]. However, not enough data could be found to assess the effects or details of this policy. The systematic establishment of local LTRS would help to close the gap, and would feed into the development of national LTRS.

Finally, the set-up of interactive and trustworthy public consultation processes is important to ensure a detailed and collaborative LTRS process in which municipal concerns and priorities are heard and taken up by national authorities.

New financial instruments can increase investment into deep renovation

The LTRS is a promising policy instrument to guide the implementation of measures to decarbonise the building stock and allocate priority investments. The EU Recovery Plan requires MS to hand in their national Recovery and Resilience Plans to access the mobilised stimulus budget. MS should identify renovation schemes and reforms building on robust and comprehensive LTRS to allocate the money to leverage green investments and social resilience.

There is a range of new financial instruments making energy renovation attractive for multiple stakeholders and financial institutions. The Property Assessed Clean Energy (PACE) scheme in the US, as well as European on-bill pilot projects, such as RenOnBill, demonstrate opportunities to alleviate the owner/tenant dilemma by connecting the debt for renovation activities to the whole property or to the meter of the building respectively. Depending on the programme design, implementing PACE would also allow flexibility and long pay-off times linked to the meter of the building, rather than to a private individual: this would enable the transfer of repayment obligations between individuals, and could further increase the reach of ESCO schemes that are already well known in Europe. If available, the revenues from Emissions Trading System emission rights could provide the necessary capital to set up building renovation initiatives, as is illustrated by the New Green Savings programme in Czechia.

Financial instruments²² for building renovation can also achieve multiple other policy objectives when they are designed to be integrated into LTRS. Policymakers should identify opportunities for linking financial instruments to data collection and storage, like in the case of the Green Home certification scheme and green mortgages in Romania. Alternatively, financial instru-

²² Examples of such instruments can also be found in the Financial Guidance for municipalities report in the context of the OurBuilding project. For more information visit: <https://www.bpie.eu/wp-content/uploads/2019/11/EUKI-Financing-energy-renovation-in-buildings-Nov2019.pdf>

ments can be designed to be beneficial on a social level by improving the health and well-being of vulnerable groups living in (public) social housing agencies, as is illustrated by the Réseau Canopée Logement Social programmes in France. SEM POSIT'IF and SPL Oser show that local authorities' participation in semi-public ESCOs can increase access to capital while improving the administrative capacity to implement renovation projects. The capacity to attract investment, coordinate initiatives and manage renovation projects remains an important threshold for local authorities to stimulate renovation, in addition to the availability of financing, and requires attention.

Accelerate renovation of public buildings through local collaboration, data collection and aggregation of demand

Collaboration between local authorities is important. The SPL Oser programme shows that collaboration between local authorities can provide positive results in terms of renovating administrative buildings and schools and attracting sufficient financial and technical expertise. Open initiatives such as SPL OSER, in which other stakeholders can join in a later phase, can increase involvement and momentum. In addition, deep retrofits of the public building stock – especially publicly owned social housing like in the REHABITARE programme in Spain – can have significant positive effects for the wellbeing of vulnerable residents. Taking such considerations into account when planning the renovation of public buildings can thus result in additional benefits.

The Irish public sector energy efficiency strategy shows that a comprehensive planning strategy for public buildings with clear monitoring and tracking processes can potentially result in significant efficiency improvements,

energy savings and improvement of data collection. This is another argument in favour of dedicating resources and expertise to drafting sector-specific and local renovation strategies.

Finally, the success of RenoWatt indicates that the public sector can reduce costs and facilitate renovation processes through the aggregation of demand. Such collaboration also makes it possible for smaller municipalities and authorities with lower financial capacities to get attractive offers and access to the expertise required to implement complex renovation measures.

Many good practices are tailored to specific target groups

Effective renovation policies are tailored to specific building segments or policy objectives. Tailored programmes always target a demarcated section of the building stock based on characteristics like tenure (public, private) or size (single or multi-family), or they aim to achieve multiple renovation benefits. The latter point is illustrated by the Better Energy Communities programme, which shows how energy efficiency and combating energy poverty can go hand in hand. The renovation of multi-family buildings in Lithuania is an example of a tailored approach that can also be seen in other eastern European MS with large stocks of multi-family buildings, like Latvia and Romania.

Data collection and storage is key to achieving long-term renovation objectives

Data collection is important for local authorities and national authorities alike, as the information allows for better and more tailored policy-making, along with easier access to financing. Moreover, it can help authorities to manage their own energy efficiency and carbon emis-



sions, make forecasts of future performance, and check compliance with existing policies. The data management systems supported by the EFEKT grant in Czechia illustrate how to directly cut down on final energy consumption while improving insights into the energy performance of the building stock. The Northside of Dublin pilot study within the EPISCOPE project illustrates the important role of EPCs for data collection and in modelling future energy trends.

Innovative approaches involving digital building logbooks and online interfaces, such as the P2E in France and the Woningpas in Flanders, have a double advantage. They provide local authorities with better information which facilitates prioritisation and cost-effective renovation. The P2E case illustrates that regional and local authorities can play important facilitating roles in the development of such initiatives. What is more, such databases can often integrate and store multiple data sources, which might prove useful in the future when new data sources – such as the life-cycle data envisioned by the Swedish Climate Declarations – become more widely available in Europe.

Complex transformations need integrated planning

Strategic documents help local authorities to get insights into their building stock but can also be a requirement to get access to further public funding. This means there is a double incentive to develop strategic documents like LTRS, on both national and local levels. Moreover, integrated planning on a local level has the potential to deliver multiple benefits for local authorities – this is the aim of such strategies in the Netherlands, Austria and Spain. The e5 scheme in Austria also shows that monitoring tools and standardised procedures can help to validate the effectiveness of these long-term policies while improving energy efficiency on a local level. The Spanish LTRS considers local strategies to be an essential part of the national LTRS. The way in which qualitatively strong local planning strategies feature in the LTRS facilitates learning among local authorities and reflects a national effort to engage local policymakers to achieve national efficiency and climate targets.

Policy recommendations

Link financial instruments to data collection and storage

Linking financial instruments to data collection and storage can create positive feedback loops and enhance building renovation rates. When financing instruments are linked to monitoring tools and data storage, this allows policymakers to make cost-effective decisions and prioritise specific building segments. Good data collection, energy audits and certification programmes make it easier for public authorities to get access to finance. Local LTRS are key instruments for local policymakers to start collecting data and assure a structured strategic approach for building renovation. MS should actively support and facilitate the systematic implementation of local LTRS.

Collaboration among local authorities can accelerate renovation of public buildings

The aggregation of demand can help local authorities to access the necessary capital and expertise. The green bonds for municipalities in Sweden and Denmark illustrate how access to capital to invest in building renovation programmes can be achieved, whereas OSS like RenoWatt+ show that costs for renovation and expertise for individual municipalities can be reduced by the aggregation of demand. Local LTRS could foster collaboration between local authorities and enhance knowledge exchange.

Designing new policy instruments: Combining effective features to create synergies between policy objectives and ensure multiple benefits

When designing new initiatives and policies, local authorities should aim at integrating various features effectively. For instance, they could integrate financial instruments with data collection by linking innovative ESCO services, data monitoring and certification schemes. In this way the building stock can be decarbonised while simultaneously improving data collection, reducing the costs for local authorities and improving the wellbeing of vulnerable residents. Local LTRS help to find synergies between policy objectives and facilitate knowledge-sharing about good practice on a local level.



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Appendix I:

Overview table good practice examples

Category	Good practice
Innovative finance	SEM ENERGIES POSIT IF – France
	Réseau Canopée Logement Social – France
	New Green Savings Programme – Czechia
	Green bonds for municipalities – Sweden-Denmark
	Green Home certification and green mortgage programme – Romania
	EuroPACE
Public buildings	RenoWatt+ – Wallonia
	Public Sector Energy Efficiency Strategy – Ireland
	SPL OSER OSS – France
	Public social housing renovation REHABITARE programme in Castilla de Leon (Spain)
Tailored approaches	Padovafit – Romania and Bulgaria
	Multi-family building programme (JESSICA II) – Lithuania
	Better energy communities scheme – Ireland
	Environmental Fund for Schools – Romania
EPC/data collection	Woningpas – Flanders
	EFEKT – Czechia – energy management systems municipalities
	Passeport Efficacité Énergétique (P2E) – France
	Klimatdeklaration – Sweden
	Episcope – Pilot monitoring energy performance combining EPC databases and interactive GIS interface
Integrated urban planning	District approach – Netherlands
	E5 scheme for municipalities – Austria
	Local and regional renovation strategies – Spain

Contributors:



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Federal Ministry
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