31/10/2025

Rural Energy Efficiency Renovation Roadmap for Vulnerable Groups (REER)

Renovation Roadmap for Kaagvere keskuse 8 building, Estonia.

Co-funded by the European Union under project ID 101077272. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.

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Published in 2025 by RENOVERTY.

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1. INTRODUCTION

Every house ages and eventually requires repairs or more thorough reconstruction as the exterior elements, structures, and technical systems deteriorate. The building's safety and usability may fall below the owners' expectations or fail to meet basic requirements. Meanwhile, builders' and designers' skills are advancing, and new, more sophisticated technologies are entering the market to improve our lhomes.

Apartment owners and associations often do not know where to start or how to ensure that their home becomes comfortable, safe, and energy-efficient. This roadmap has been prepared to support the renovation process of an apartment building located in a rural area.

This guide has been prepared for the reconstruction of the apartment building at **Kaagvere keskuse 8, Kaagvere village, Kastre rural municipality**.

The guide is intended for the complete renovation of an apartment building using the national renovation grant from the Estonian Business and Innovation Agency (EIS). The roadmap also includes an alternative phased approach.

This technical roadmap is addressed to families in Estonia who would like to increase the energy efficiency of their homes, reduce energy bills, or improve comfort through renovation. The guide has been created by the **RENOVERTY** project [1] to promote the renovation of vulnerable rural districts and to lay the foundations for increasing energy efficiency in an accessible and socially just way.

2. ENERGY RENOVATION OF APARTMENT BUILDINGS

Before you begin, it helps to understand what energy renovation involves. Energy renovation means improving a home to make it more energy-efficient, comfortable, and environmentally friendly. Typical measures include better insulation, upgraded windows, energy-saving heating systems, and adding renewables such as solar PV. These changes can lower energy bills, reduce carbon emissions, and provide a more comfortable indoor environment year-round.

While the benefits are significant, there are challenges. Upfront costs can be high, and savings accrue over time, so a long-term view is needed. Finding reliable professionals and navigating grants or subsidies can also be complex. The good news: financial support and expert advice are available to make the process smoother and more affordable.

Renovation methods and options

Energy renovation can generally be carried out in two ways: comprehensive renovation or step-by-step renovation.

Comprehensive (deep, full) renovation

This is a complete upgrade of the building, significantly improving its condition and energy performance, often aiming for optimal energy consumption. It typically covers all major elements: insulation; windows; heating, cooling, and ventilation systems; and water and sewage systems. The goals are to ensure a healthy indoor climate and safety while reducing energy use and greenhouse gas emissions. Comprehensive renovation requires more extensive preparation and implementation than a step-by-step approach.

Step-by-step renovation

This gradual, multi-stage approach divides the renovation into individual, manageable measures implemented over time. It allows you to address specific elements in stages and better align with limited financial and time resources. Because of the higher immediate cost of comprehensive renovation, a step-by-step approach is often most suitable for energy-poor households, where an energy audit helps prioritise the most impactful energy efficiency measures first.

When renovating apartment buildings in Estonia, owners and apartment associations generally choose between **comprehensive renovation (all activities at once)** and a **step-by-step approach (gradual renovation over 15–20 years).** Both methods have advantages depending on financial resources, project complexity, and long-term goals. **Table 1** provides a comparison of full versus step-by-step renovation.

Table 1. Comparison of Renovation Options

Factor	Full Renovation (All at Once)	Step-by-Step Renovation
Energy Savings	Immediate and high (50-70%)	Gradual, spread over years
Financing & subsidies	Typically higher government/EU support	Some subsidies available, usually lower
Property value	Significant increase in the short term	Gradual increase over time
Disruption to residents	High, but only once	Lower per stage, repeated over years
Cost control	Costs fixed at today's prices	Flexible but exposed to inflation

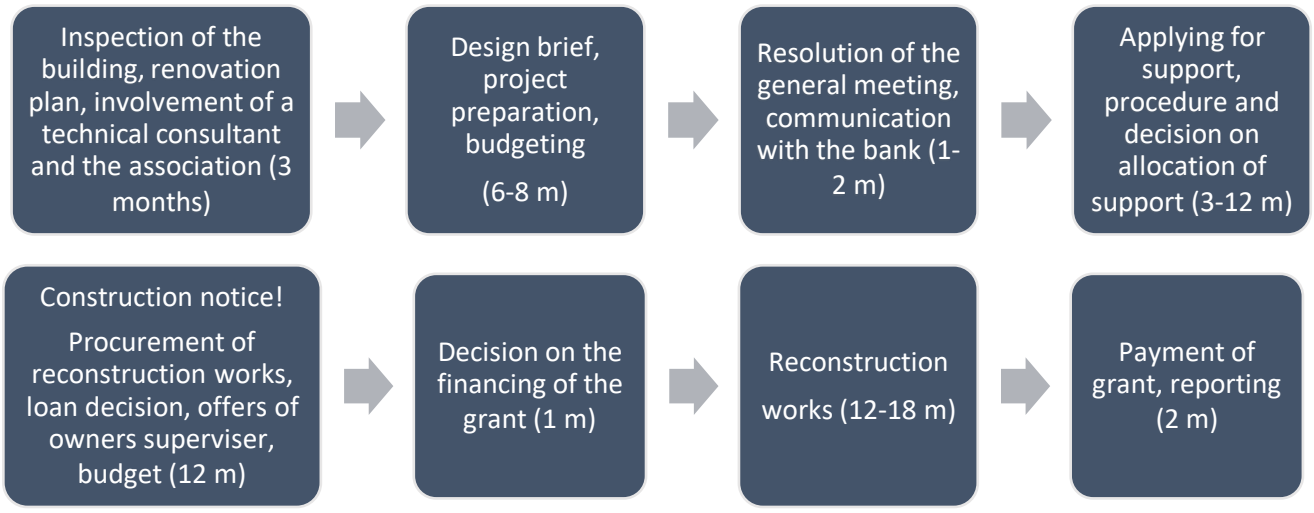
Efficiency of renovation	All systems are optimized together	Risk of mismatches between old andnew
Long-Term cost savings	No need for repeated work	Possible extra costs from redoing some parts

Comprehensive renovation is suitable when sufficient funding (including grants) is available. Final feasibility depends on grant requirements, support rates, and maximum amounts.

In Estonia, a renovation grant for apartment buildings is available, and therefore this roadmap describes the renovation process using the EIS grant. The grant covers 30–50% of renovation costs, depending on the location. A higher support rate applies to areas with lower economic development.

Illustration 1, presents the general process for renovating your home with an EIS grant, along with a preliminary timeline. The grant-application schedule is unpredictable because there are no fixed call dates. Many steps are complex and require expert input. If you feel uncertain, don't worry, this guide outlines the steps for citizens and the potential complexities to help you address issues early. Let's begin with the first step: contacting experts and seeking advice.

Illustration 1: Infographic summary of the energy renovation process



Source: Kredex

3. STEPS TO FOLLOW TO RENOVATE YOUR HOME

3.1. Step 1 – Seek advice and look for professionals

Apartment owners and associations play a key role in planning a renovation. The quality of the result depends on managing the design and construction processes and i**nvolving competent specialists**. A simple rule applies: the better informed the client, the better the outcome.

Start by getting information and advice.

I At the beginning, you can contact the Estonian Business and Innovation Agency (EIS), County Development Agencies, or your local municipality for guidance. They can explain how to start, what grants and loans are available, and how to apply. County Development Centres across Estonia offer free consultations on EIS services aimed at apartment associations.

Assess the building's current state

Start by assessing the technical condition of the building. If you lack the necessary technical knowledge, involve experts in building systems and construction. It is advisable for the apartment association to hire a technical consultant when planning the work. For comprehensive renovation with EIS subsidies, engaging a technical consultant is mandatory.

Professionals who operate in the renovation market and support owners on the renovation journey are listed in Table 2.

Table 2: Entities and organisations of professionals operating in Estonia

Entity	Link
Estonian Business and Innovation Agency (EIS)	https://kredex.ee/et
List of renovation technical consultants	https://kredex.ee/et/kodudkorda
Union of technical consultants for renovation	https://tkliit.ee/

County Develpment Centers	https://eis.ee/noustamine-maakondlikes-arenduskeskustes/
Tartu Regional Energy Agency	http://www.trea.ee
Estonian Qualifications Authority (energy auditors)	https://kutsekoda.ee/en/
Estonian Association of Architectural and Consulting Engineering Companies (EAACEC)	https://ekel.ee/en/contact

Source: Tabel prepared by TREA

3.2. Step 2 – Inspection of the building.

Evaluate the technical condition of the building and involve a technical consultant. Begin by assessing the building's technical condition. If needed, involve experts in building systems and construction. It is advisable for the apartment association to hire a technical consultant when planning the work. When applying for subsidies, involving a technical consultant is mandatory.

Energy audit of Kaagvere keskuse 8

An energy audit is a comprehensive analysis of a building's energy use. Its main goal is to identify how energy is consumed and to define opportunities for savings.

During the audit, the building's energy balance is prepared, showing how supplied energy (mainly electricity and thermal energy) is used over a period: how much is lost through external elements (walls, roof, floor, doors, windows), how much leaves with sewage water, how much is exhausted via ventilation, etc. The audit also assesses the equipment that produces, distributes, and uses energy (boiler/heating unit, heating system, electrical system, water system, ventilation), evaluates their efficiency, and identifies possible saving measures.

The building was constructed in 1985 and contains 20 apartments: three are three-room apartments, fifteen are two-room apartments, and two are non-residential. Approximately 80% of the windows are double-glazed with plastic frames, while the remaining 20% are single-glazed with wooden frames. The heated area of the building is 1,016 m². According to the building's

Energy Performance Certificate (EPC), the weighted energy use is 321 kWh/m², which corresponds to energy class "G."

Owners of buildings (including those with an energy performance certificate of "C" or better or environmental/energy-efficiency certifications) often have specific expectations and advantages when considering energy renovation. These typically focus on cost savings, environmental impact, and comfort improvements. Table 3 outlines general renovation objectives and suggested actions for owners.

Table 3. Renovation objectives (in general)

Objectives of Energy Renovation	
Reduced Energy Consumption:	• Minimise the energy required for heating, cooling and lighting. • Replace or optimise heating, ventilation, and air-conditioning (HVAC) systems.
Reduction of CO_2 emissions:	• Lower environmental impact through i efficiency improvements and integration of renewable energy sources.
Improved living comfort:	• Achieve optimal indoor temperatures, enhanced air quality, and better sound insulation. • Reduce heat loss for a more stable indoor climate . • Improve health and well-being by reducing presence of damp and mould.
Increased share of renewable energy:	• Incorporate solar panels, photovoltaic systems, or geothermal systems to decrease reliance on traditional, non-renewable energy sources.
Economic enhancement of buildings:	• Raise the energy class of buildings (e.g., A, B, C) and increase the property value for the owners. • Reduce long-term energy management costs. • Enable households to become prosumers.
Cost savings for users:	• Lower energy expenses through targeted efficiency improvements. • Opportunity for households to reduce exposure to poverty/energy poverty.
Compliance with energy regulations:	• Adhere to European, national, and local energy efficiency directives, such as the Energy Performance of Buildings Directive (EPBD).

3.3. Step 3 - Make a plan: initial task, design and costs

A renovation plan means having a well-prepared construction project, including design, financing, and execution. It begins with an accurate initial task (terms of reference). A comprehensive, balanced, and well-formulated initial task is essential to achieving a high-quality result. As the client, you must clearly define - for yourself and for everyone involved in the co-creation process - the following:

- the need for renovation, its purpose and its expected to value for the residents ;
- the legal requirements arising from local and national regulations;
- the technical requirements set by the funding provider (in this case, EIS);
- the resources available for implementing the project;
- the broader impact of the renovation on the surrounding area.

The preparation of the initial task for Kaagvere keskuse 8 was led by TREA (testing the One-Stop-Shop model and acting as a technical consultant in cooperation with Kredex). Residents, the local government, the village association, a local development organisation, the district heating operator, and structural and energy engineers participated in the co-creation process. Later, a designer joined the process to prepare the construction project based on the agreed initial task.

The renovation measures identified for the building were:

- insulating the entire building envelope(foundation, walls, roof);
- installing new energy-efficient windows (preferably triple-glazed) and doors;
- renovating the heating system and switching to an air-to-water heat pump ; enabling temperature control in each apartment;
- installing heat recovery ventilation with a specified energy efficiency index;
- renovating the water supply and sewage systems and installing a PV station on the roof;
- renovating staircases and the basement.

DREEM model

The most relevant energy efficiency measures for Kaagvere keskuse 8 in the framework of the RENOVERTY project were using the DREEM (Dynamic high-Resolution dE-mand-sidE Management) model. This software simulates different consumption scenarios and proposes optimized energy efficiency interventions based on potential savings and technical-economic feasibility. The measures assessed were:

- EEM_1 - Exterior wall insulation: Insulation of the exterior walls of a building.
- EEM_2 - Double-glazed windows: Replacment of single-glazed windows with energy-efficient windows (double-glazed IZO windows) to reduce heat loss.
- EEM_3 – Thermal insulation of the roof:Thermal insulation installed between and under the roof rafters to lower theheat transfer coefficient by adding materials with low thermal conductivity.
- EEM_4 - Energy Efficient Heating System (Boiler Upgrade - Gas): Replacement of the existing heating system with a more efficient gas boiler. Although analysed for financial feasibility, gas is not recommended due to its environmental impact; renewable-based systems such as heat pumps or biomass boilers are preferred.
- EEM_5 - Energy Efficient Heating System (Boiler Upgrade - Biomass): Replacement of the existing heating system with a more efficient biomass boiler.
- EEM_6 - Energy Efficient Heating System (Heat Pump): Replacement of the outdated heating system with a heat pump, providing higher operational efficiency.
- EEM_7 – LED lighting: Replacement of fluorescent and incandescent bulbs with high-efficiency LED lamps.

Tabel 4. Energy efficiency measures (EEM) and annual energy savings (in kWh) Tartu, Estonia

Annual energy savings (kWh) (MFH, Tartu, Estonia)		
	Energy savings (kWh)	**Reduction (%)**
EEM_1: Exterior wall insulation	5,522.1	28.1
EEM_2: Double-glazed windows	1,959.7	10.0
EEM_4: Boiler upgrade - gas	3,602.1	18.4
EEM_5: Boiler upgrade - biomass	728.4	3.7
EEM_6: Heat pump	10,837.2	55.2
EEM_7: Energy efficient light bulbs	85.4	0.4

Based on financial feasibility, EEM1, EEM6 and EEM7 are considered the most cost-effective, while EEM1 delivers the highest energy savings alongside **EEM6** and **EEM7**. Therefore, for the Kaagvere keskuse 8 building, measures **EEM1, EEM6, and EEM7** will be implemented to achieve a deep renovation.

Cost allocation

Renovation costs vary with building size and scope of work and typically range from €450 to €1,000 per m² of net internal floor area. In this case, construction costs are expected to be approximately €650–700 per m². The final cost will be confirmed after procurement, based on the best offer from a qualified construction company.

Renovation grants cover a substantial share of costs. In rural areas, the grant typically covers 50% of eligible costs, including the technical consultant's fee, design costs, mandatory building inspections, construction works, and any necessary surveys conducted before or during the design phase to establish the state of the building.

EIS Renovation Cost Estimator : https://eis.ee/rekonstrueerimise-kulude-kalkulaator-korteruhistutele/

EIS Calculated Energy-Performance Class Estimator:

https://eis.ee/arvutusliku-energiamargise-kalkulaator-projekteerijale/

3.4. Step 4 - How to finance energy renovations

In Estonia, apartment associations generally have three financing options for renovation: own funds, bank loan, and EIS support/grant. In most renovation projects, a combined financing model is used, meaning that the bank loan is complemented with the national renovation grant.

For comprehensive renovation of apartment buildings, national support is available. For the 2022–2027 period, the state has allocated €330 million from the European Union Structural Funds for apartment building renovation grants.

The most recent renovation grant call took place in September–October 2025, and new calls are expected.

Main conditions:

- The grant can be applied for apartment buildings built before the year 2000 and managed by an apartment association.
- The grant may be used only for reconstruction works included in the approved main construction project. That project must be prepared in accordance with § 13(3) of the Building Code, the EVS 932 standard (or equivalent), and all applicable regulations. The

architect must be an authorised architect with at least professional level 7. The project must also be approved by the Apartment Association Board.

- The applicant must sign a contract with a technical consultant, or with the company through which the consultant provides the service, unless no bids were received despite the applicant's efforts. This contract must be concluded no later than at the moment of submitting the grant application.
- The The cost of preparing the construction project (including the construction survey and building audit on which the project is based) as well as the cost of the technical consultant's services, is eligible for reimbursement before the application is submitted to the implementing agency. If the technical consultant also performs owner supervision, those supervision costs are not eligible before the official start date of project activities, as stated in the grant approval decision.

Grant rate and maximum grant support amount (some main points, whole document available here) depend on the location of the building:

- In Tallinn and Tartu: 30%, or 50% when prefabricated elements are used for reconstruction.
- In settlements adjacent to Tallinn and Tartu where the real-estate market value in the year preceding the application exceeds 500 €/m² (per the Land Board transaction database), and in Ilmatsalu, Märja, Haapsalu, Keila, Kohila, Kuressaare, Maardu, Otepää, Paikuse, Pärnu, Rakvere, Rapla, Sauga, Uuemõisa, and Viljandi: 40%, or 50% when prefabricated elements are used for reconstruction.
- In the rest of Estonia: 50%, or 55% when prefabricated elements are used for reconstruction.
- In other regions(excluding Tallinn and Tartu) the grant rate may be 10% lower if all specified conditions are not met (e.g., if heat-recovery ventilation is not installed or if window thermal-bridging requirements are not fulfilled).

Technical requirements for renovation and information on eligible measures, as well as additional details about the grant, can be found on the renovation grant webpage.

3.5. Step 5 - Possible complexities you may encounter

Subtitle step 5. Addressing complexities in the retrofitting process

Starting an energy renovation project can involve various complexities such as financial and technical challenges, regulatory compliance, administrative burden, and resistance to change. The **One-Stop Shop (OSS)** and hired **technical consultants (TC)** are your main points of reference: they inform, guide, advise, and accompany you throughout the retrofit, helping to resolve difficulties and remove obstacles at each stage.

Table 5 outlines common risks that may emerge during an energy renovation project and practical responses:

Table 5: Analysis of possible risks associated with energy renovation (from the co-creation process)

	RISK	SOLUTION	WHO	HOW
ADMINISTRATIVE COMPLEXITY	Gathering and submitting the necessary permits and documentation can discourage homeowners from undertaking renovations.	Consulting with OSS (tested within RENOVERTY by TREA) or a technical consultant (TC); they can guide you or prepare the correct documentation. You can also consult theonline "Renovation guide" and participate in online or in-person trainings.	Professional staff from the OSS and technical consultants (TC) provide guidance or full service. The Renovation (construction) guide (in Estonian) is also available.	OSS and TCcan assist by providing guidance or other services. TREA also offers training sessions for apartment associations using the RENOVERTY tested platform model.Trainings are available both online and in person. The link tothe Renovation Guide is provided in Chapter 4

ADMINISTRATIVE COMPLEXITY	Application processes for existing programs are often unclear and inaccessible for people experiencing energy poverty.	Consulting with EIS (for application requirements), OSS or atechnical consultant (TC); they can help or prepare the required documentation.	Professional staff from EIS, the OSS, and TC.	OSS and TC can assist by providing guidance or by providing a service. Links to the EIS grant information are provided in the previous section.
SOCIAL CHALLENGES	Homeowners experiencing energy poverty often lack information about renovation options, subsidies or incentives, even when these are available.	First check the online "Renovation guide", then consult the Local authority (LA), the OSS, or a technical consultant (TC); they can guide you or prepare the required documentation. Participate in trainings as needed.	LA, OSS, TC, and the Renovation guide (link in chapter 4)	OSS,TREA will guide you on how to start the renovation journey. TREA also provides trainings for apartment associations using the platform model tested in RENOVERTY. Trainings are available both online and in person.
ECONOMIC	High initial costs, as homeowners often lack the financial resources to finance the renovation.	Revise therenovation plan and initial task, and consult with OSS and TC. The online renovation guide also helps to prioritize the measures.	Professionals form the OSS or TC	Renovation guide (link in chapter 4)
TECHNICAL	Older homes may require	Participate in trainings and	OSS, TC	Professionals from the OSS and TC can

	significant structural improvements before energy-efficient renovations can be carried out, which increases the complexity and cost of the project.	information-sharing events to receive guidance from experts such as the OSS or TC. Afterwards, consult with them directly, and they will assist in developing the renovation plan.		advise on how to proceed. TREA provides trainings for apartment associations using the platform model tested in RENOVERTY. Trainings are available online and in person.
	Developing the initial task for reconstruction is challenging for owners because there are different requirements and expectations.	Consult the OSS or a technical consultant (TC); they will help develop the initial task and involve the necessary experts. You can also take a training on the co-creation process of renovation.	Professional staff from the OSS, TC,and other necessary experts.	In cooperation with professional staff managed by the OSS or TC, the initial task can be developed. The link to the online co-creation training is available in Chapter 4.

Source: TREA

Some effects during renovation

Managing the impacts of the energy-renovation phase is critical to a project's success. While situations will vary, careful planning and clear communication are always essential starting points. Have a clear work plan, define the scope and work areas, set the expected duration and working hours, and hold regular meetings with experts to review progress and resolve questions.

Renovation can have both negative and positive effects. On the negative side, residents may feel stressed or resentful when works extend into apartments (for example, when replacing pipes, installing or replacing radiators, changing windows, or installing ventilation systems). On the positive side, we have observed that the renovation process can bring residents closer together, as they share the experience and interact more throughout the project.

3.6. Summary

Congratulations, you have reached the end of this guide. Before undertaking an energy renovation, assess your household's financial capacity, factoring in applicable grants and subsidies. Although the subsidies described here are typically paid in full at the end of the process, the financing methods outlined earlier can help advance funds and make the renovation more feasible. In parallel, contact qualified professionals who can prepare a comprehensive renovation offer (including the energy audit, feasibility advice, solution options, cost optimisation, project design, and construction management) and engage construction companies to carry out the works. The works require permits that must be obtained from your municipality, along with payment of the related fees. Finally, review the common complexities and potential drawbacks so you can apply mitigation measures and ensure a smooth, satisfying renovation experience.

Don't forget! As outlined throughout this guide, **the One Stop Shop (OSS) and technical consultants (TC) can advise** households like yours throughout the process and help you address the complexities that may arise at different stages of an energy renovation**.**

Now, it is your turn to start planning your renovation!

1. Seek advice	Decide when you will visit or contact the TREA office.	Add the relevant contact details.
2. Look for professionals and request budgets	How many professionalswill you contact, and when? Will the professionals apply for grants on your behalf, or will you do it through the Regional Housing Office of Osona?	Check section 3.1
3. Select the most appropriate measures	Which renovation measures are most suitable for your building? Which options offer the best balance between energy savings and financial feasibility?	Check sections 3.2 and section 3.3
4. Check the possible complexities	What challenges or inconveniences might appear during the process?	Check section 3.5 and be prepared!

4. REFERENCES AND LINKS

Online Renovation Guide (in Estonian): https://livekluster.ehr.ee/ui/ehr/v1/abi/ehitusgiid

Concept of single family building renovation roadmap: https://www.bpie.eu/wp-content/uploads/2018/03/iBRoad-The-Concept-of-the-Individual-Building-Renovation-Roadmap.pdf

Public Procurement Register. https://riigihanked.riik.ee/rhr-web/#/

Calculator for Apartment associations for renovation costs: https://eis.ee/rekonstrueerimise-kulude-kalkulaator-korteruhistutele/

National renovation strategy: https://kliimaministeerium.ee/sites/default/files/documents/2023-06/Hoonete%20rekonstrueerimise%20pikaajaline%20strateegia.pdf

Kredex (EIS renovation webpage): https://kredex.ee/en

Last renovation call regulations (into Estonian): https://www.riigiteataja.ee/akt/124092024008?leiaKehtiv=

Co-creation online training : https://renoverty.aisforacademy.eu/?lang=en

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Co-funded by the European Union under project ID 101077033. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.