IMPLEMENTATION OF THE LONG-TERM ENERGY EFFICIENCY PROGRAM IN HOUSEHOLDS IN LATVIA

Maksims ANTONOVS¹*, Eriks MALINOVSKIS², Kaspars PLOTKA³

¹–³ Riga Technical University, Riga, Latvia

*Corresponding author’s e-mail: maksims.antonovs@edu.rtu.lv

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Abstract. Considering the trend towards climate neutrality and energy efficiency at the global level as well as the problem of high energy poverty at the national level, the issue of housing renovation was inevitable for Latvia in 2023. The main objective of the study is to analyse the situation in Latvia, its problematic aspects and opportunities for the government, as well as to propose possible methods for solving the problem of low rates of housing renovation in Latvia. The main methods used were PESTLE analysis to identify problems and cluster analysis to compare financial opportunities in each country. The main results of the study are the conclusion that the financial aspect of renovation in Latvia is at a satisfactory level and is not the main reason for the unpopularity of renovation, but the main problem is energy poverty. The main conclusion is that renovation in Latvia requires a new approach that can improve the energy efficiency situation in Latvia, and providing such a method in the form of building renovation based on private-public partnership is the possible approach.

Keywords: energy efficiency, energy poverty, households, Latvia, renovation.

INTRODUCTION

The housing stock in Latvia, as in other post-Soviet countries, is in unsatisfactory condition; most of the houses were built in the period 1946–1990, 66 % (OECD, 2020). The energy efficiency of these buildings does not meet the general modern building standards at the time of 2023, as well as the requirements of the European Union and individual countries to achieve climate neutrality (European Commission, 2019b; Kivimaa & Martiskainen, 2017; Pohoryles et al., 2020). The energy efficiency programme for these buildings is the last chance, but renovation in Latvia is relatively slow. Renovation has many goals, but the ones that apply to Latvia include improving energy efficiency, extending the life of Soviet-era buildings, and fighting energy poverty by improving energy efficiency and thereby reducing heating and electricity bills. The government is interested in renovation, but not enough effort is being made. The public does not see the point of renovation due to their lack of awareness and the idea that it is expensive. The overall goal is to create an environment conducive to energy-efficient renovation by addressing the challenges highlighted in the text, such as financial barriers, bureaucratic complexities, lack of awareness, and societal incentives. Integrating
these enhancements can contribute significantly to tackling energy poverty and promoting successful renovation efforts in Latvia. The research presents a comprehensive analysis of the energy-efficient renovation landscape across different European countries, focusing on aspects such as energy poverty rates, renovation rates, financial instruments, and government support mechanisms.

1. LITERATURE REVIEW

Renovation of a residential building is a broad concept that can include both the restoration of a historic building and purely technical improvements. Energy-efficient renovation is a technical improvement. In fact, such renovation is an energy service that brings benefits and advantages through a combination of energy efficiency improvements – the ratio of energy production capacity input to energy output (The European Parliament and the Council, 2023). In the case of building renovation, this means a specific range of works and interventions in the structure and systems of a building that result in increased energy savings – the amount of energy saved compared to pre-renovation values (Bertoldi et al., 2020; Mikulic et al., 2020). The most popular ones are replacement of windows, doors, roof surfaces, insulation of the basement and ground floor or attic and top floor, sealing of panel joints, replacement of pipes, modernisation of heating, lighting and power supply systems, balcony repairs and general facade insulation (Cimbale et al., 2023). Each change brings its own impact on the final energy efficiency of the building. In order to determine and evaluate the result of the work done, it is necessary to measure the performance before and after the renovation. This makes it possible to understand how much the changes have affected the final energy consumption, whether there are still weaknesses, and, in general, what results have been achieved. For this purpose, energy performance certificates are used, which indicate the shortcomings in buildings before renovation and assess the efficiency of the work already done afterwards.

1.1. Energy performance certificates

Energy performance certificates are used to determine the degree of energy efficiency in a more transparent and accurate way (Li et al., 2019). This allows the overall performance of buildings to be assessed, as well as the sources and energy costs. Such certificates are also important at the level of regions, countries and the whole European Union to identify weaknesses and worst performing buildings and to make a sound plan to evaluate investments (European Commission, 2020a). However, the availability of certificates is very low, and the coverage of the housing stock is less than 10 % in some countries. And this can have a serious impact on renovation decisions. The role of having energy performance certificates is high. 43 % of the respondents from 12 different European Union countries and different age groups mentioned the availability of a certificate as a very important factor in renovation decisions, while 29 % considered it somewhat important (Charalambides et al., 2018). However, energy certificates are not only important for residents in deciding on renovation, but they are also a critically important requirement for those who implement the project. Energy efficiency evaluation
through an energy audit is one of the first steps in planning the entire work, as it identifies weaknesses, and the certificate of the building after renovation is a confirmation of the quality of the work that has been done, which has achieved the goal of reducing energy consumption. This indicates that the widespread availability of energy performance certificates can directly impact the renovation rate as it is a significant factor. To increase the prevalence of certificates, it is necessary to increase the number of energy audits and the use of solutions for measuring efficiency during building operation.

1.2. Renovation rate and energy poverty

The energy renovation rate in the European Union is low, about 1 % per year (Sandberg et al., 2016). Efficient renovation with a 60 % or more reduction in energy consumption occurs with only 0.2 % of the building stock per year. According to the renovation wave, the goal by 2030 is at least a doubling of the renovation rate. If all forces and resources are mobilised, this would allow 35 million homes to be renovated, and only at this rate is it possible to achieve the earlier targets of climate neutrality by 2050. An additional investment of 275 billion euros from the European Union is already needed to reach the 2030 targets (European Commission, 2020; Bertoldi et al., 2021; Vasquez et al., 2016).

Energy poverty is the side of the problem that allows us to discuss the huge importance and urgency of renovation. About 34 million Europeans face the fact that they cannot afford to keep their homes warm (Eurostat, 2023). This problem is particularly critical in post-Soviet countries. Due to the large number of non-energy efficient buildings, which were built in times when there were not such high and well thought out energy efficiency requirements, the inhabitants of such buildings are trapped because they cannot make the most important change – renovation – that will solve the problem of energy poverty due to financial difficulties (Streimikiene & Balezentis, 2019). Although the buildings of such households have a high potential for energy efficiency improvements, the barriers to making these changes are also high. The complex decision-making process for multi-family buildings not only hinders residents facing energy poverty, but creates difficulties for all. However, the specificity of energy poverty leads to specialised financial solutions (Economidou, et al., 2023). It is mainly proposed to use grants and subsidies for renovation and to use funds from energy savings. Vulnerable households should have guarantees that rents will not rise in parallel with renovation work from the government and private sectors to build confidence in the renovation, which will help overcome the previously mentioned barrier to collective decision-making.

Three countries have been selected for the analysis. The situation in Latvia is studied due to its low renovation rates. Estonia is located next to Latvia and has a similar area, but the renovation rate is higher, which makes it important to study this country as well. The Netherlands is also similar in area to these two countries, with a better economic situation and an even higher renovation rate. The study of these three countries allows us to conclude about the different approaches to renovation and energy poverty.
1.3. Situation in the Netherlands

The situation for countries with energy poverty is not so straightforward. In the Netherlands, about 7% of the population, or 550,000 households, face problems with both high energy bills and poor energy performance of homes (Mulder et al., 2023). Although the situation with the number of renovated buildings has had a positive trend through the years, by 2018, houses with a minimum acceptable energy performance certificate C level are less than one-third of the buildings, and together with buildings above this level, about half of the total housing stock (Netherlands Enterprise Agency, 2020). To increase the renovation rate and reduce barriers related to energy poverty, the Dutch government offers subsidies and programmes to incentivise energy efficiency investments. The Homeowners Energy Saving Subsidy (SEEH) (relevant until the end of 2022), the Sustainable Energy Investment Subsidy (ISDE), and the National Energy Savings Fund (NEF) are the main schemes (IEA, 2020). These government policies incentivise homeowners through lower loan rates. There is a separate scheme and fund (the Energy Performance Incentive Scheme for the Rental Sector (STEP) and the Energy Savings Fund for the Rental Sector) to support low-interest rate loans for owners who rent out their property to further incentivise them to make such an investment and provide a guarantee to the same residents facing energy poverty. Subsidies are also available for specific works: insulation, energy-efficient elements of heating systems, consultations with experts, and energy efficiency assessments. Loans are also available, the interest on which is usually tax-deductible, which makes such loans more attractive. Considering all available incentives and programmes, the problem of energy poverty is still relevant for low- and middle-income households, for whom investments in energy efficiency are not feasible. Attention to this problem is insufficient at the level of general policies, but there is a positive trend at the national level (Halleck Vega et al., 2021). In general, the system of stimulation and financing assistance is very flexible and detailed, which, in theory, should help the renovation of the housing stock in a variety of ways. Still, there is a lack of funds to fight energy poverty, which affects a noticeable part of the country's population, because these people need maximum support for such an investment.

1.4. Situation in Estonia

Even though the situation within the European Union is very different, there are general levels of progress with renovation. In the Netherlands, this level can be considered good, as when further compared with the Baltic States, the level of energy poverty, the rate of renovation and the incentive and support mechanisms are noticeable changes for the worse. In Estonia, about 10% of the inhabitants have experienced energy poverty to some extent. The problem of interconnection between residents of different income levels is highlighted, as there are cases when one household is ready to make a financial contribution, while a household facing energy poverty, even with the available support measures, cannot afford it and as a result threatens the implementation of the project for the whole house. Some residents are unable to invest in renovation, and not surprisingly, the prices for
renovating an apartment building range from 150 euros per square metre to 620 euros. Speaking about the housing stock’s condition, 4% of buildings built before 2000 with energy efficiency certificate C and above and more than 20% with the lowest class F certificate. In Estonia, the government provides a quite unusual scheme for financing renovation. The KredEx fund is based on attracting private investors as financiers to reduce the burden on the state budget. This financial instrument is based on a balance between grants and loans, making all financial costs as easy as possible for final households. The grant system in Estonia increases the residents’ willingness to decide to renovate (Ministry of Economic Affairs and Communications of the Republic of Estonia, 2020). The involvement of private investors, the attempt to find a balance between grants and loans, which is so important for households facing energy poverty, as well as the understanding that energy poverty directly affects the decision to renovate even for households that can afford such a project, the system of financing assistance, which has already shown positive results in changing the willingness of residents to make decisions – this all shows that the government is interested, analysing the situation and working to increase the pace of renovation, which is still not high enough.

1.5. Situation in Latvia

Analysis of the situation in Latvia showed that its indicators were even worse. The energy poverty rate, which is characterised by poor living conditions, is 33%. This is almost five times higher than in the Netherlands and about three times higher than in Estonia. The European Union average shows that Latvia’s situation is about four times worse than average (European Commission, 2019a). Even considering that the prices for renovation of one square metre are approximately at the Estonian level, between 200 and 400 euros on average, the poverty situation of the population worsens the financial readiness for renovation. To reduce energy poverty in Latvia, social policies are applied. For example, municipalities provide everything to ensure a minimum income level; in exceptional cases, a special housing allowance is provided, which may include electricity and heating costs. Spot financial support is also provided by the government. The electricity supplier Elektrum also provides payment support. Under the Energy Efficiency Obligation Scheme, energy suppliers provide energy efficiency information to residents in order to achieve energy savings (European Commission, 2020b). However, most of the measures aim to fight the consequences of energy poverty in the country, rather than eliminate the cause. Support through assistance to pay energy bills may conversely push households into a greater state of energy poverty, as it discourages any incentives to invest in energy efficiency and may even encourage spending the money saved on other goods (Streimikiene & Balezentis, 2019). This is also evidenced by the pace of completed renovation. When the renovation programme 2022–2026 starts, the number of renovated houses does not exceed 10%. Latvia has a financial instrument ALTUM – a financial institution of state development, which operates with financing from the European Union and repays up to 49% of the renovation loan. The beginning of the use of ALTUM can be considered a positive change because previously renovation was carried out with the help of the Investment and Development Agency of Latvia (LIIA), which distributed grants to households.
after the completion of renovation, i.e., the residents initially took out a loan for the total amount of the project, while in ALTUM the grant is initially allocated and the loan is taken out for the remaining half of the amount (Luce et al., 2021). On the government side, mechanisms are being created to increase guarantees and find financing faster, and ALTUM has also participated in developing ESCO renovation programmes, which specialise in energy efficiency projects. However, the pace of renovation in Latvia is still very low compared to the EU average, especially in neighbouring Estonia. The government should focus more on this issue, create new mechanisms and continue to improve old ones in order to achieve the climate neutrality goals set by the European Union.

The renovation process varies from country to country, in terms of the number of projects already implemented, the level of energy poverty, which directly affects the pace of renovation, and the mechanisms and programmes adopted by governments to achieve the goals. Latvia is lagging behind the European Union’s average pace, so the authors believe that a review of current policies is required based on the experience of other countries that have been more successful in improving the energy efficiency of their housing stock.

2. METHODOLOGY

The article’s authors use cluster and PESTLE analysis as a research method. The PESTLE method (Aguilar, 1967) is a tool for analysing the impact of the external environment and is used to assess the impact of political, economic, social, technological, environmental and legal factors on the subject of analysis (in the case of this paper on renovation in Latvia). PESTLE analysis is usually used for risk management, adaptation to the environment and making the most cost-effective decisions; therefore, it fits the topic of renovation in Latvia (Pan et al., 2019; Dalirazar & Sabzi, 2020; Bitoun et al., 2022). The PESTLE method helps to answer to the research question: what factors prevented the increase of renovation rates in Latvia in the period 2016–2023? For this purpose, the PESTLE analysis is followed by a focus on negative aspects of influence.

Cluster analysis is used to create clusters based on similarities between research subjects. The purpose of cluster analysis is to create groups of data for further categorisation and interpretation (Tryon, 1939). Cluster analysis was initially used in psychology, but now it is used in many other fields, such as economics (Pradana et al., 2020; Satre-Meloy et al., 2020; Lund & Ma, 2021; Van Mechelen et al., 2023). The cluster analysis answers the question of how developed the sources of financial support are in Latvia and whether they can compete with other European countries. The authors first focus on economic indicators related to renovation, financial instruments, and loans separately in Latvia, Estonia, and the Netherlands, and then create clusters based on the data received for further analysis and interpretation.

The chosen methodology consisted of finding problems and strong points using the PESTLE method, then focusing on financial problems and using cluster analysis to draw conclusions about the impact of the financial aspect of renovation. This
methodology helps to find problems and solutions from the government side in the context of improving the energy efficiency of residential buildings in Latvia.

3. RESULTS AND DISCUSSION

3.1. PESTLE analysis

In the PESTLE analysis, the authors surveyed 126 homeowner students receiving master's and PhD degrees from 5 September to 31 November 2023 to find out the main factors influencing renovation in Latvia. There were 30 factors from different categories, but the analysis shows the most popular answers. The table created by the authors about the PESTLE analysis can be seen in Table 1.

Table 1. PESTLE Table (created by the authors)

<table>
<thead>
<tr>
<th>Renovation in Latvia</th>
<th>Influence</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Political</strong></td>
<td></td>
</tr>
<tr>
<td>The population is motivated by tax discount</td>
<td>+</td>
</tr>
<tr>
<td>With the help of financial institutions, the government financially supports the reconstruction of the houses</td>
<td>+</td>
</tr>
<tr>
<td><strong>Economical</strong></td>
<td></td>
</tr>
<tr>
<td>The population has no money for renovation</td>
<td>-</td>
</tr>
<tr>
<td>Reduces the price of electricity and heating</td>
<td>+</td>
</tr>
<tr>
<td>Increase in property value</td>
<td>+</td>
</tr>
<tr>
<td><strong>Social</strong></td>
<td></td>
</tr>
<tr>
<td>Need to gather 50 % plus 1 vote in favor of housing renovation</td>
<td>-</td>
</tr>
<tr>
<td>Someone from the residents should be in charge of the renovation process</td>
<td>-</td>
</tr>
<tr>
<td>Improves the appearance of the building</td>
<td>+</td>
</tr>
<tr>
<td><strong>Technological</strong></td>
<td></td>
</tr>
<tr>
<td>Increases safety in the building by extending its service life</td>
<td>+</td>
</tr>
<tr>
<td>Improves energy efficiency</td>
<td>+</td>
</tr>
<tr>
<td><strong>Legal</strong></td>
<td></td>
</tr>
<tr>
<td>Need to conduct an energy audit</td>
<td>-</td>
</tr>
<tr>
<td>Support the European Green Deal and energy efficiency directive</td>
<td>+</td>
</tr>
<tr>
<td><strong>Environmental</strong></td>
<td></td>
</tr>
<tr>
<td>Reduction of CO₂ emission</td>
<td>+</td>
</tr>
</tbody>
</table>

The political category is represented by two factors. The population is motivated by property tax discount depending on local government laws. For example, in Riga, the capital of Latvia, there are more than 30% of Latvian residents. In Riga, residents can receive a 90% discount on property tax if the building facade of the building in use is insulated and the energy efficiency class of the building is not lower than the C class. The tax discount is valid for 10 years (Latvijas Vestnesis, 2022). Tax discounts are available in almost all municipalities in Latvia, and this may be one of the motivators for some people to start improving the energy efficiency of their homes and strive for the highest EPC class. State institutions financially support the renovation process. ALTUM is the most popular public financial instrument supporting renovation in Latvia: therefore, the authors distinguish it from financial instruments. ALTUM provides financial assistance.
through loans, guarantees and investments in areas the state has identified as important and requiring support. Support programmes are implemented with funding from Latvian funds, European Union funds, and funding from ALTUM itself. ALTUM is under the control of the Ministries of Finance, Economy and Agriculture. ALTUM has the resources to provide financial assistance, evidenced by the fact that in 2022, the institution allocated a total of 766 million euros to support the national economy (ALTUM, 2023a). All the factors in the political category are considered positive by the authors, as they motivate the population to renovate their homes.

In the economic category, there are three factors. The respondents identified one factor as negatively affecting the object under study: the population does not have money for renovation. The average renovation price in 2022 in Latvia was 400 EUR/m², but the average salary in Latvia was 1006 euros (Saulajs, 2023; National Statistical System of Latvia, 2022). From the salary, a person has to spend money on housing, food and other needs, which leaves very little money, which means that it is almost impossible for a resident to save for renovation in Latvia on their own. It is impossible to change these statistics in the short term, so residents need financial assistance for renovation. Reducing electricity and heating prices is one of the primary motivators for renovation, as it helps to fight energy poverty. All buildings are different, and it is difficult to precisely answer how much consumption will drop after renovation. Still studies have estimated a reduction in consumption of about 50%. A residential building with 30 flats was studied, but the approximate percentage of complete renovation in all buildings is approximately stable, so it can be stated that after renovation, energy consumption drops by 50% (Geipele & Kocanova, 2019). The decrease in energy consumption, in turn, brings a decrease in the amount of bills, which makes renovation economically favourable in the long term. The last factor in the economic category is the increase in property value. There is no specific percentage by how much the value of real estate increases, but its increase leaves no doubt, as low electricity and heating prices make real estate more attractive for buying or renting, and the distinctive appearance of the building, which is often different for each building, adds to the value of real estate. The negative factor of the economic category is the most critical of all the factors presented in the PESTLE analysis, but the other positive ones justify the costs of renovation, so people should be motivated by it. The economic category justifies renovation as a long-term investment.

The social category contains various factors related to the individual and society. The category includes two negative factors: the need for a 50% plus one vote in favour of renovation and the fact that residents should entrust the renovation process to someone from the community (ALTUM, 2023a). The problem lies in many aspects, such as the population not being adequately informed about the benefits of energy efficiency improvements in housing, lack of initiative or the existence of unsuccessful examples that demotivate people, lack of enforcement policies that could force potential clients of an energy efficiency programme to start implementing the programme, and the existence of a large number of involved parties (Ministry of Economics of the Republic of Latvia, 2020). The authors expect that all these issues are related to society and its attitude towards renovation, which
in turn can be remedied by introducing to the public the positive aspects of renovation, which are discussed in the PESTLE analysis, and by creating and disseminating renovation advertising. The respondents identified the positive factor of the social category as the fact that the appearance of the building is improved (Hess & Tammaru, 2019; Kertsmik et al., 2023). When designing the project, the residents can choose one of the many building designs that will be created with modern materials, which will make the building stand out among the similar-looking buildings in the neighbourhood. The social category indicates that there is a problem that people lack motivation for renovation, but if everyone is told about the positive aspects of renovation, most likely little will change because the main problem of renovation in Latvia, which was identified earlier, is the financial barrier.

In the technological category, the first factor is to increase safety in the building by extending its service life. 66% of all buildings were built during the Soviet period of Latvia's history (1946–1990), and most of these buildings will reach the end of their service life in 2025–2050, making them unsafe and uninhabitable. Renovation solves this problem by insulating the facade by adding layers of insulation, which also strengthens the walls, and depending on the type of renovation, the heating system and electrical wiring can be improved, which significantly extends the service life (Luce et al., 2021). In the context of Latvia, this is the most relevant advantage of renovation, as the housing stock is becoming obsolete every year. Increasing energy efficiency is the main goal of renovation; therefore, this technological factor is increasing in any renovation process. Technological factors present energy efficiency programmes on the building side, which allows us to conclude that every building needs timely renovation, especially if it is not built with high quality or poor materials, which directly applies to buildings constructed during the Soviet period. Builders had the goal to provide the largest number of people with housing, spending the least amount of money, and no one thought about the long-term perspective of the building, which now directly affects the housing stock of Latvia and its energy efficiency.

The need for energy audits is a factor that the respondents identified as having a negative impact on renovation. The energy audit is necessary to start the renovation and to receive financial assistance from ALTUM (ALTUM, 2023b). The population already considers the preparation of documents for renovation too bureaucratic, and preparing an energy audit complicates the process (Ministry of Economics of the Republic of Latvia, 2020). Latvia is a member of the European Union and supports the European Green Deal and energy efficiency directives, which have a positive impact on renovation. The EU allocates large sums of money to each member state for renovation, which does not fully cover the costs, but makes it much easier to pay for the renovation loan (European Commission, 2020a). The legal category shows that there are bureaucratic barriers that the state has already started to tackle by providing detailed information about the necessary documents and guidelines, and the European Union helps residents to reduce the renovation cost.

The environment category contains one positive factor, but its impact is incommensurable in the long term – reduction of CO₂ emissions. The European
Union has a policy that aims to make the whole union climate-neutral by 2050, which will affect people after that time because climate change is a long-term problem. The European Union aims to do everything to reduce the rate of climate change, and renovation is part of this action (Maduta et al., 2023). The category of environment tells us that renovation in Latvia is important not only for Latvia and its inhabitants but also for the inhabitants of the European Union who strive for climate neutrality.

Summarising all the above mentioned, renovation in Latvia has a lot of positive aspects, which are reflected both in the living standards of the inhabitants and in their financial situation, but there are two problems arising from all the negative influencing factors – lack of motivation and lack of funds. Lack of incentive is indirectly connected with the fact that people do not even think about renovation because it is expensive for them, but the state makes small efforts to make renovation a common topic in society and not impossible to people. The problem of finances is the main problem that the authors highlight, and further work is aimed at finding possible solutions to this problem.

3.2. Cluster analysis

For the cluster analysis, the authors analysed economic indicators in the context of renovation, financial support instruments, and credit offers in 3 countries: Latvia, Estonia, and the Netherlands. Initially, the analyses are carried out independently in each country in order to process the data on the object of research separately.

Financial support in Latvia

The average gross salary in Latvia is 1372 euros for 2022 (National Statistical System of Latvia, 2022). At the same time, the renovation price per square metre is approximately 400 euros (Saulajs, 2023). Since this is a gross salary, mandatory tax deductions range from 22 % to 30 %, which means that, on average, about 1000 euros remain. Given the assumption that the average size of a flat in a house is 52 square metres, the whole project will cost € 20 800 at least, not taking into account all possible associated costs that may appear depending on the condition of the house and the scope of work. This is almost a 21-month salary, taking into account that a person invests absolutely all the money he earns in the renovation of his house. Such income distribution is, of course, impossible. Any unavoidable monthly expenses only increase the payment period for the renovation service. It is also important to mention that the average salary is valid for economically active citizens. At the same time, the houses that need renovation are also inhabited by pensioners, whose income may be times less than working-age citizens’, and for them, the investment in such an expensive project is absolutely unaffordable, since mostly such people are exposed to energy poverty problems and already receive support from the government to pay heating bills. The need for a loan is obvious. At Swedbank, it is possible to take out a loan for improving the energy efficiency of a home with an annual rate of 1.79 % + 6-month Euribor rate (Swedbank, 2023). Over the last 5 years, the Euribor rate became positive for the first time in 2022; after the outbreak of hostilities, it started to rise sharply, increasing to 4 % by 2023 (see Fig. 1).
Consequently, in addition to the bank's interest rate of 1.79 %, the loan payment has now increased by a further 4 %, which is a sharp increase in the amount that will have to be repaid to the bank. The Euribor rate can vary, which can increase or decrease the final rate. The loan is given for an amount from 20 000 euros for a period of up to 30 years. For example, if the loan is taken out for 20 years, the monthly payment with the current Euribor rate is 147 euros (Swedbank, 2023). Compared to the average net salary, this payment is 15 % of earnings. However, if a person earns a minimum salary of 620 euros, such a monthly payment becomes a tangible part of the expenses and it becomes even more difficult to afford renovation. In order to reduce the financial burden on residents in Latvia, the financial institution of state development ALTUM works, which, in case of meeting all the requirements provides a subsidy of up to 49 %, but not more than 200 000 euros for the costs of one project excluding VAT. There is also a 49 % subsidy for the development of technical documentation, but not more than 10 000 euros (ALTUM, 2023c). Consequently, the burden on each individual inhabitant of the building is almost halved. The existence of such a mechanism facilitates the financial side of renovation. The subsidies allocated for the 2022–2026 programme amount to 57.2 million euros. On 1 November 2023, 16 % of the total fund is reserved. 16 % for a quarter of the programme instead of the logical 25 % indicates that the number of new applications is low. The reason for this is energy poverty. In Latvia, it is at a high level of 33 % (European Commission, 2019a). Obviously, a situation where residents have problems paying utility bills is incompatible with additional investments in improving the energy efficiency of buildings, even though such investments may eventually solve the problem of high energy costs and energy poverty in general. As a result, a loop problem is created – there is no money for renovation because of high utility costs, and renovation is needed to lower these costs.
Financial support in Estonia

Before tax deduction, the average Estonian resident in 2022 received 1644.5 euros (Statistics Estonia, 2023). Renovation works cost about 400 euros per square metre and can reach 600 euros per square metre (Ministry of Economic Affairs and Communications of the Republic of Estonia, 2020). About 1300 euros is the salary after deducting taxes, which is about 20 %. To calculate the final renovation price without taking into account the associated costs in the planning process and without focusing on the original condition of the building, the average size of a 52-square metre flat is taken. The final price for an average flat is 20 800 euros. To cover such costs, 16 monthly salaries are needed, taking into account that they are used only for the project. With an average income, it is impossible to afford to finance such a project, especially since one has a spectrum of necessary monthly expenses that leave a negligible amount free compared to the price of the project. A loan is needed to realise the project. In Estonia, the loan for energy efficiency is provided by the KredEx fund, which further distributes the subsidies. The interest rate is a 2 % + 6-month Euribor rate (KredEx, 2023a). The Euribor rate is dynamic, which means possible changes in the monthly payment, especially with the current sharp increase in the rate over the last 5 years – from negative to 4 %. The loan amount ranges from 15 000 euros to 3 million euros, even in the case of renovation of several houses by a single partnership. The loan is granted for up to 30 years. Using the example of the already calculated average project price for one flat with a 20-year loan, the monthly payment will be 149 euros. Translated into a ratio with net salary – the loan burden will take up about 11 % of income. But it should be realised that people may earn less than the average salary, for example, they may receive the minimum wage, which is 720 euros in Estonia (Estonian Tax and Customs Board, 2023). In such a financial situation, the monthly loan payment will be approximately 20 %, and taking into account other unavoidable expenses, it is a significant part. The subsidies distributed by KredEx are intended to ease the financial burden. The size of the subsidy varies from 30 % to 50 % depending on the region, the further away from the big cities, the bigger the subsidy. Such subsidies reduce the burden for each of the residents of the house. The programme, which will last from 2022 to 2027, has a total subsidy fund of 300 million euros from the European Union, allocating a certain part each year. For 2023, 80 million euros has been allocated, which was already distributed by April (KredEx, 2023b). The level of energy poverty in Estonia is about 10 % (Ministry of Economic Affairs and Communications of the Republic of Estonia, 2020). People facing energy poverty have difficulties paying their heating bills, which indicates that they do not have the available funds to renovate, because even with the financial support program available, making a monthly loan payment would critically affect budget allocation and is generally impossible without forgoing some other basic payments and expenses, which literally makes it impossible for them to undertake a renovation that could solve the poverty problem.
Financial support in the Netherlands

The wage situation in the Netherlands does not allow for any objective average to be determined, as wages vary widely from region to region. The situation is the same for renovation prices because there is no dominant type of housing whose energy efficiency projects are similar. The differences between each individual building have also affected the subsidy system. The Sustainability Subsidy Scheme for Owners’ Associations provides separate fixed subsidies for each individual renovation measure, whether it is floor insulation, façade insulation or replacement of doors or windows. The amount of the subsidy also depends on the variety of energy-saving measures; if several measures are implemented at once, the subsidy for each measure is doubled. For 2023, the subsidy is 48.5 million euros (Netherlands Enterprise Agency, 2023). In addition to subsidies, there is a loan for energy-saving investments in the Netherlands. The loan amount ranges from 1000 euros to 71 000 euros, with interest rates from 0 % for annual income less than 60 000 euros and up to 4.40–4.75 % depending on the loan amount (National Heat Fund, 2023). Energy poverty in the Netherlands is at 7 % (Mulder et al., 2022). Renovation can be difficult for this part of the population due to already existing financial difficulties in paying for energy, but the flexible renovation options for individual measures and the zero-interest rate for low-income people partially reduce the financial barrier to renovation that will solve energy poverty.

Analysis

To conduct the cluster analysis, the authors created Table 2, describing renovation credit opportunities.

<table>
<thead>
<tr>
<th>Renovation lending opportunities</th>
<th>Latvia</th>
<th>Estonia</th>
<th>Netherlands</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service provider</td>
<td>Commercial banks</td>
<td>KredEx</td>
<td>The National Heat Fund</td>
</tr>
<tr>
<td>Minimum loan amount</td>
<td>200 00 euros</td>
<td>15 000 euros</td>
<td>1000 euros</td>
</tr>
<tr>
<td>Maximum loan amount</td>
<td>No restrictions</td>
<td>3 million euros (for several houses under one partnership)</td>
<td>71 000 euros</td>
</tr>
<tr>
<td>Interest rate</td>
<td>1.79 % + 6-month Euribor</td>
<td>2 % + 6-month Euribor</td>
<td>Dynamic 0 % to 4.75 %</td>
</tr>
<tr>
<td>Loan term</td>
<td>Up to 30 years</td>
<td>Up to 30 years</td>
<td>From 7 to 20 years</td>
</tr>
</tbody>
</table>

Based on the loan data, the authors concluded that the lending opportunities in Latvia and Estonia are similar, but the interest rate in Latvian banks is lower, which makes them more attractive, as well as the possibility to choose a specific bank, unlike in Estonia, where there is only one option for combining loans with subsidies – KredEx. One of the common disadvantages is the impact of the Euribor rate,
which is currently unstable and tends to rise. The situation in the Netherlands is uniquely different from the Baltic countries. The credit possibilities are flexible; they are divided into separate renovation measures, the interest rate differs depending on the loan amount and term, and there is a zero rate for people with low annual income. The existence of specialised loans for home energy efficiency are a flexible and necessary financial instrument that simplifies the financial barrier.

Table 3 describes state financial support instruments for renovation. Analysing the data on state instruments, the authors concluded that the most flexible is the Netherlands’ program, because of separate subsidies for each specific renovation measure, as well as an inbuilt system of motivation to do more extensive renovation through a two-times increase of subsidies if several measures are implemented at once, is a detailed and flexible solution. Comparing Latvia and Estonia, it is important to note the percentage of financing, as in Estonia it is progressive from 30% to 50% in the advantage of regions, which gives advantages to households that do not live in big cities, while in Latvia it is static for the whole country. The situation with the amount of available funding is controversial, as at first sight Latvia has been allocated about 6 times less funds for the 2022–2026 programme than Estonia, while in KredEx, in the first year of the 2023 programme all the allocated 80 million were used, while in Latvia only 16% of the allocated 57.2 million were used in the same period. The authors concluded that in Latvia, the problem of a small amount of allocated funds compared to Estonia is not the reason for low renovation rates, it is explained by the high level of energy poverty of Latvian residents.

Table 3. State Instruments of Financial Support for Renovation in Latvia, Estonia and the Netherlands (created by the authors)

<table>
<thead>
<tr>
<th>State instruments of financial support for renovation</th>
<th>Latvia</th>
<th>Estonia</th>
<th>Netherlands</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>ALTUM</td>
<td>KredEx</td>
<td>Sustainable Development Subsidy Scheme for Owners’ Associations</td>
</tr>
<tr>
<td>Type of funding</td>
<td>Credit discount</td>
<td>Grant for the loan borrowed from KredEx</td>
<td>Subsidies for each individual renovation measure</td>
</tr>
<tr>
<td>Percentage of funding</td>
<td>49 %</td>
<td>30–50 % (depends on region)</td>
<td>Fixed, depends on the measure of renovation</td>
</tr>
<tr>
<td>Maximum funding</td>
<td>200 000 euros for the project, 10 000 euros for technical documentation</td>
<td>Not specified</td>
<td>Funding is not limited, dependent on renovation measures</td>
</tr>
<tr>
<td>Amount of available financing</td>
<td>57.2 million euros over 4 years</td>
<td>330 million euros for 5 years. In 2023, 80 million euros will be allocated</td>
<td>48.5 million euros for 2023</td>
</tr>
</tbody>
</table>
Based on the data on loans and support instruments, the authors concluded that Latvia, compared to Estonia and the Netherlands, is not behind in terms of the financial opportunities offered. In some aspects, Latvia has better conditions, for example, the most beneficial interest rate, separate financing of the project and its technical documentation. However, in Latvia, there is no dynamic interest rate and flexible motivating subsidy system like in the Netherlands and no dynamic financing percentage to motivate regions like in Estonia. The volume of available financing, which is smaller in Latvia than in other countries, cannot be considered a significant disadvantage because even this amount is not actively used, which indicates the influence of other factors on the pace of renovation.

As a result of the cluster analysis, the authors conclude that financial support for energy efficiency improvement in the form of a loan in Latvia is significant and with a better rate than in Estonia and the Netherlands, but it is linked to the 6-month Euribor exchange rate, which makes the loan less attractive, but commercial banks cannot ignore the Euribor. Speaking about government financial support, the Latvian support instrument ALTUM is a satisfying one with advantages and disadvantages compared to Estonia and the Netherlands. The problem is that the funds allocated to ALTUM are not fully implemented, but the reason is that the population is not ready for renovation, even with the help of ALTUM. The government should either improve the financial instrument or improve the welfare of the population in order to increase the pace of renovation and implement the funds fully.

CONCLUSIONS

The problem of energy efficiency requires a new approach. The situation in Latvia is unique and requires radical action because by 2050, if everything continues at the same pace as it is now, Latvia will not be able to achieve its goals and become climate-neutral. All power is in the hands of the Latvian government, and if the authors’ ideas are implemented, the programme to improve the energy efficiency of residential buildings in Latvia could be successful.

To improve the situation with renovation in Latvia, the government needs to review its financial policy, as the money allocated to help people pay their bills could be used more rationally in the context of renovation, as well as to improve the financial situation in the country, but there is a more important problem. Even if we renovate the houses built in the Soviet period, referring to their service life, it will just extend their service life for a couple of decades, but after a while, they will be outdated again.

The authors see the possibility of a radically different approach to solving the problems of energy poverty and low energy efficiency of residential buildings. The authors believe that rather than renovating a building, many problems can be solved if new, more spacious, durable and energy efficient buildings are built in its place. This is possible in cooperation with the private sector, in this case with a construction company.

The principle of public-private partnership allows the distribution of risks, efficient use of resources and involves specialists in a certain field. The idea is that
residents invest in their property, and then construction takes place in place of the old house. The construction company builds higher houses, with more flats, which will allow it to earn more. At the same time, no resources are spent on finding land for the project elsewhere, and the residents are guaranteed a flat in return for their investment (Pikas et al., 2015; Sakovskis, 2018). The government should act as a mediator and guarantor between all the parties included. Since the residents have given up their flats in favour of a new one that is about to be built, an important factor is where the residents can be housed for the duration of the construction. The government should assist in finding and paying for temporary housing. Analysing the financial side of the issue, the materials of the original house can be used in the construction of the new one, which will make the construction work cheaper, as well as ALTUM can financially support the project by compensating the construction company 49% of the costs, as they are financing the renovation now. The authors realise that a small number of people will be willing to do this, but if the government can guarantee the terms of the construction work and undertakes to take the blame for the failure of the work, people may be willing to do it.

The authors' concept is difficult to implement and is ambitious, but its realisation could fix many problems related to energy poverty. People would get new housing that would not need renovation for a long time, the price of land would go up, heating and electricity prices would initially be much lower and the building would meet the latest energy efficiency standards. In the authors’ opinion, it is impossible to implement all the bureaucratic bases for this project in one moment, but if efforts are made, everything can be done. People who do not want to face temporary difficulties during the construction of a new house will be able to move to another house that has been rebuilt, but those who will be ready for difficulties and such an investment will have new and quality housing without direct investment.

REFERENCES


