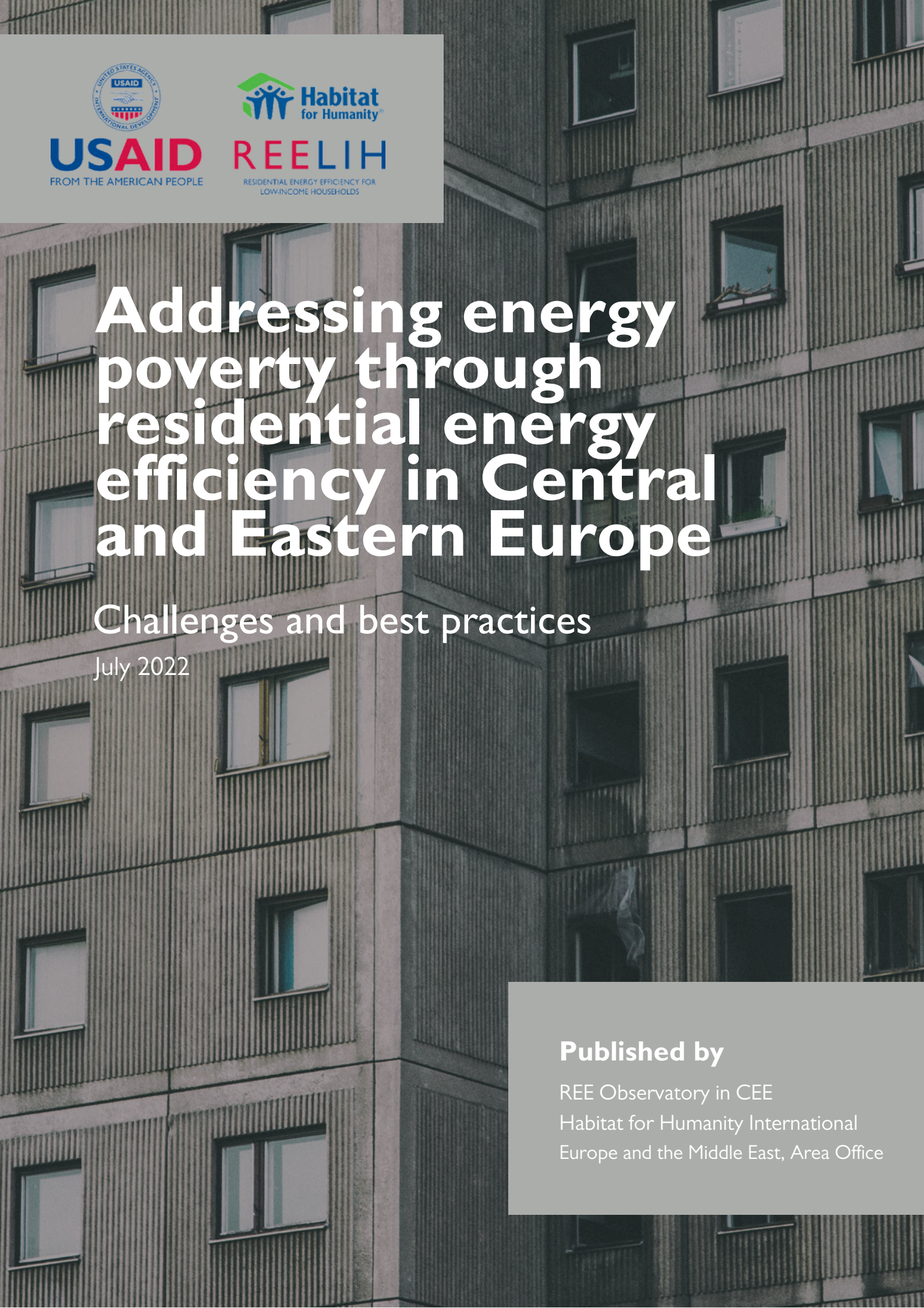

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REELIH
RESIDENTIAL ENERGY EFFICIENCY FOR LOW-INCOME HOUSEHOLDS

Addressing energy poverty through residential energy efficiency in Central and Eastern Europe

Challenges and best practices

July 2022

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REE Observatory in CEE
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Ľudmila Peruňská, REELIH Advocacy Assistant, HFHI EME
György Sümeghy, Associate Director, Policy & Advocacy, HFHI EME

Contributors:

Anna Zsófia Bajomi
ComAct project
Mariangiola Fabbri
Nóra Feldmár
Éva Gerőházy
Elena Milanovska
Besim Nebiu
Astghine Pasoyan
Mirzet Ribić
Anu Sarnet
Hanna Szemző
and other contributing authors

Residential Energy Efficiency Observatory in Central and Eastern Europe
July 2022

Foreword

This publication is the first product of a new initiative of Habitat for Humanity International, Europe and the Middle East, Area Office (HFHI EME), the Residential Energy Efficiency (REE) Observatory in Central and Eastern Europe (CEE).

Since HFHI EME started working on scaling up financing for owner-occupied multi-apartment buildings in the Western Balkans and in Armenia more than a decade ago, we have been always very keen on reflecting and evaluating on what we did in the field, capturing the key learnings, and publishing research to support market development and policy advocacy work. During this decade-long journey, we established partnerships with several organizations like USAID, Metropolitan Research Institute, Buildings Performance Institute Europe, UN-ECE, ENOVA, HFH Armenia, HFH Macedonia, IWO-Housing Initiative for Eastern Europe, etc. With the support of these organizations, it has become our standard practice to design and implement research in the field of residential energy efficiency and energy poverty and especially, to gather evidence on how retrofitting multi-apartment buildings leads to energy poverty alleviation.

By recently establishing the Observatory we wanted to enhance our capacity in a strategic way and raise our efforts to a new level. The Observatory will provide further evidence for our REE work in CEE, it will provide the space for exchanging best practices and fostering policy dialogue. And it is our hope that we will be able to publish a collection of academic articles on a regular basis from now on.

This publication is the first collection of such articles, and it includes mostly the summaries of previously published longer studies. We believe that by disseminating good knowledge and evidence we contribute to the discussion in CEE about how to scale up the retrofitting of multi-apartment buildings and how to decrease energy poverty in a moment where heating in the winter has become one of the biggest political and social challenges in our region.

Zita Kakalejčíková
Manager of Residential Energy Programs
HFHI EME

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Residential Energy Efficiency Observatory in Central and Eastern Europe
July 2022

How energy efficiency retrofits contribute to energy poverty alleviation.

Theory, best practice in the European Union and case studies from the REELIH project in Armenia, Bosnia and Herzegovina and North Macedonia

AUTHORS

Éva Gerőházi, Metropolitan Research Institute
Hanna Szemző, Metropolitan Research Institute
Mariangiola Fabbri, Buildings Performance Institute Europe
Anna Zsófia Bajomi, Habitat for Humanity Hungary
and other contributing authors

ABSTRACT

The Metropolitan Research Institute and Buildings Performance Institute Europe (Gerőházi et al. 2019) evaluated the implementation of the REELIH project funded by the United States Agency for International Development (USAID) and led by Habitat for Humanity International (HFHI) in three countries. The aim of the evaluation was to find out how the project countries (Armenia, Bosnia and Herzegovina, and North Macedonia) contributed to the fight against energy poverty by encouraging energy efficient renovation of multi-family apartment buildings (MABs). The results show that given the general condition of dwellings and heating patterns, the REELIH project definitely eased the situation of many households: apartments are better heated and comfort levels have increased. Furthermore, important maintenance issues, such as leaking roofs, were fixed. In particular, institutional and financial frameworks of energy efficient retrofits have been enhanced towards the upscale of retrofit, including buildings in the most difficult situation.

Keywords: impact of REELIH project, energy poverty, residential energy efficiency, institutional and financial frameworks, Western Balkans and Armenia

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I. INTRODUCTION

This article is based on the research carried out by Metropolitan Research Institute and Buildings Performance Institute Europe (Gerőházi et al. 2019) aiming to highlight the interrelation between energy-efficient retrofits and energy poverty alleviation. The research focused on how energy efficiency retrofits in MABs can contribute to alleviating energy poverty.

Energy efficient retrofits can be potentially effective to fight energy poverty, as they increase the energy performance of the housing stock, thus can potentially lift out households from energy poverty by decreasing the energy need of their apartment. Energy efficient retrofits, however, face special financial (e.g., high up-front costs, relatively long turn-back periods) and technical (e.g., complex interventions, involvement of various stakeholders) challenges. Because of these challenges, they should be carefully designed to exploit retrofits' potential of energy poverty reduction.

II. METHODOLOGY

ii.i. Defining energy poverty

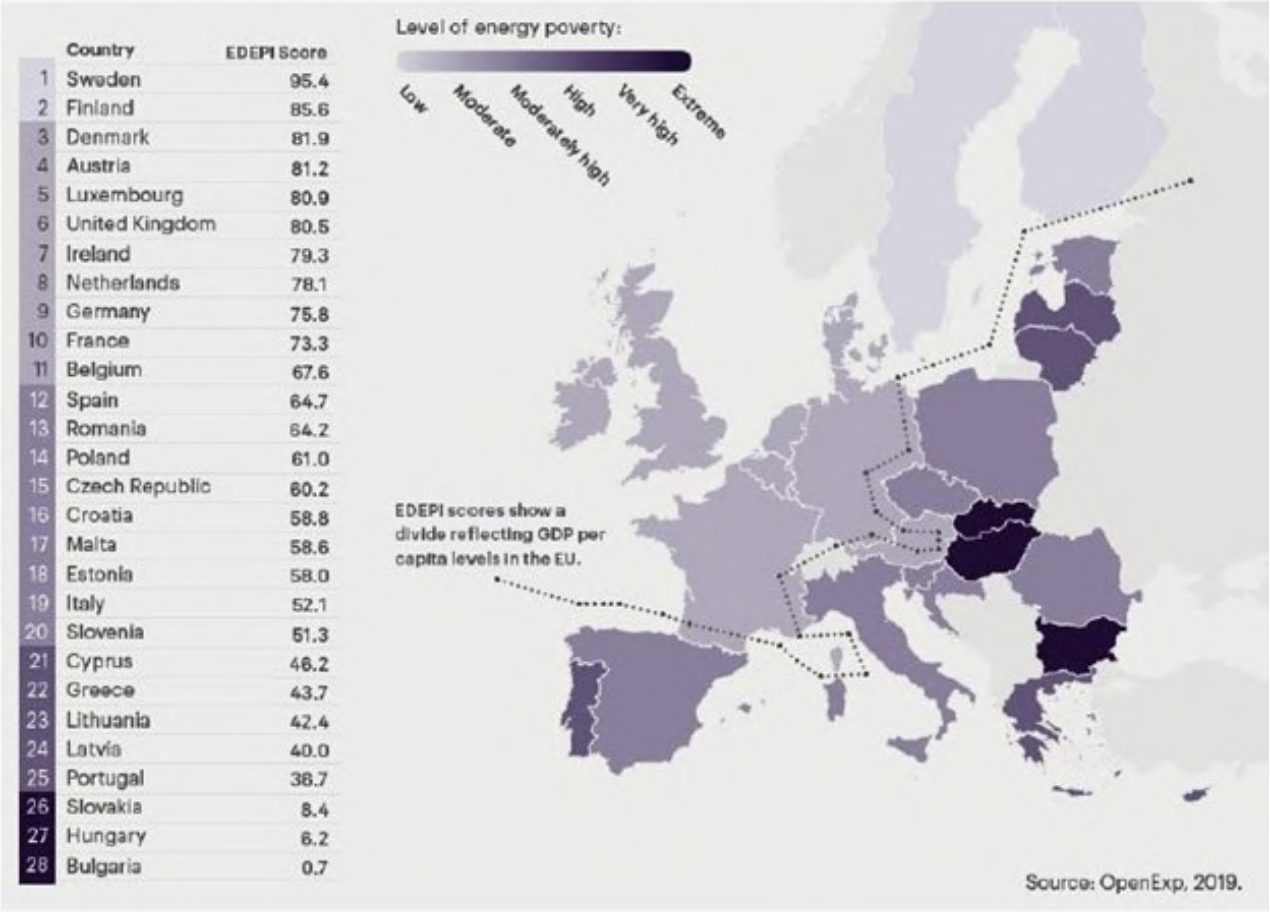
Energy poverty is a situation in which a household is unable to secure the basic energy needs of its members due to a combination of insufficient financial and technical conditions. Materially necessary services provide healthy living conditions, most importantly adequate indoor temperatures. Under- or overheated and unhealthy indoor environment could contribute to the deterioration of the "respiratory, circulatory and cardiovascular system, mental health and well-being" (Bouzarovski & Thomson, 2018). The lack of socially necessary services disables household members to fully participate in society (e.g., to wear clean clothes, invite guests in their home, use modern communication services, or children to prepare their homework at proper indoor light) (Bajomi, 2020). Low income, high energy prices and inefficient, technically low-quality homes and appliances are the main causes of energy poverty (Bouzarovski & Thomson, 2018). For a detailed analysis of possible definitions of energy poverty please check the original MRI-BPIE study (Gerőházi et al. 2019).

ii.ii. Evaluating retrofit programs targeting energy poverty reduction in the EU

Based on EU Member States experience, the seemingly competing environmental and social goals might be united through well-designed financial schemes that combine socially targeted subsidies with loans and thus enhancing energy efficiency while decreasing energy poverty. Well-designed funding of energy efficiency from a given budget can be financially sustainable (as a larger part of the fund is revolving through the loans) but still guarantee the inclusion of lower income households into the program by the subsidy. Also, the socially targeted subsidies might accelerate renovations, as it is an effective tool to involve households that otherwise might oppose the renovation due to the lack of financial resources. Social targeting of financial schemes for energy efficiency retrofits can accelerate the renovation rate if:

- Loans are combined with non-refundable support, especially if targeted to the most vulnerable households of the building, to facilitate their participation.
- Subsidies and loans fully cover up-front costs of low-income households.

Figure 1. below shows how energy poverty varies among EU Member States (Bajomi, 2020).



	Country	EDEPI Score
1	Sweden	95.4
2	Finland	85.6
3	Denmark	81.9
4	Austria	81.2
5	Luxembourg	80.9
6	United Kingdom	80.5
7	Ireland	79.3
8	Netherlands	78.1
9	Germany	75.8
10	France	73.3
11	Belgium	67.6
12	Spain	64.7
13	Romania	64.2
14	Poland	61.0
15	Czech Republic	60.2
16	Croatia	58.8
17	Malta	58.6
18	Estonia	58.0
19	Italy	52.1
20	Slovenia	51.3
21	Cyprus	46.2
22	Greece	43.7
23	Lithuania	42.4
24	Latvia	40.0
25	Portugal	38.7
26	Slovakia	8.4
27	Hungary	6.2
28	Bulgaria	0.7

Figure 1. European Domestic Energy Poverty Index, 2019. Source: Data visualization created by Right to Energy Network, data source: (OPENEXP, 2019)

- Loans are long-term enough that instalments are not higher than the realistically reachable energy savings.
- Budget for renovation is balanced so that it permits the highest number of households possible but still is generous enough to enable low-income households to participate.

Good examples of overcoming high initial up-front costs that energy efficiency investments pause on homeowners are the revolving funds that include EU, national and private funding. These funds can provide long-term finance for the investments, with relatively low-interest rates.

This way, if complex interventions are done, costs saved on energy after the renovation might cover or be even higher than instalments, and it is still feasible to include socially targeted subsidies for low-income households.

In order to ensure proper and long-term financing, the followings should be considered:

- To overcome the high transaction costs of social targeting, it is important to use already existing datasets on social allowance recipients, indebtedness towards utility companies, the performance of buildings, etc.

- Institutional and financial environment might need development considering the followings:
  - Clarity of the schemes and financial transparency is key to involve all stakeholders.
  - Municipalities can play a key role in the success of renovation projects. By providing knowledge and assistance to building managers on the technical, financial and social aspects of energy efficient retrofits, the renovation rate can accelerate. Also, municipalities can take further responsibilities for the financial aspects of the renovations.
  - Good community-management skills and clear communication of building managers are crucial in order to properly inform and involve the owners.
  - Homeowner associations (HOAs) might be ideal customers of energy efficiency loans, as banks can provide the loan through one stakeholder. This way the risks of elderly or low-income persons not being eligible for credits can be overcome. In this case, the HOAa must provide guarantees (this can be supported through the funding program), must be trusted by owners and have a high collection rate.
- Fundamental problems in the building might have to be resolved before being able to start energy efficient retrofits. Other factors than energy savings might contribute at a larger scale to the decision of homeowners to invest in renovation. Besides the resolution of basic problems, better comfort at home, decreased energy dependence, nicer building or neighborhood, increased market-value of the apartment can all be factors that motivate homeowners to renovate.

Considering these lessons learned and suggestions derived from projects and programs carried out in the EU, the REELIH project addressed the enhancement in energy efficiency retrofits and, through proper measures, the drop in energy poverty level in three less developed countries than the EU Member States.

III. REELIH PROJECT RESULTS

In this section, we summarize the results of the REELIH project: how it contributed to decreasing energy poverty through the enhancement of energy efficiency retrofits in MABs in the three implementing countries (Armenia, Bosnia and Herzegovina, North Macedonia).

iii.i. Armenia

Armenia has 3 million inhabitants, the third of which lives in the capital, Yerevan. The country possesses approximately 19,150 MABs, a quarter of them are located in the capital. The residential sector is served by a diversity of heating systems. In urban areas, it is gas and electricity, in rural areas wood is the most commonly used heating source. In Yerevan, 77% of the respondents to a survey (1) said they pay more than 25% of their income on utilities.

MABs are mostly managed by HOAs, which have the flexibility to move and accumulate financial reserves of different buildings under their management. This, on the one hand, enables them

(1) Habitat Armenia conducted a survey in Yerevan in March 2014 with 500 households (100 of them living in family buildings, 400 of them in MABs - random sampling), in the framework of the REELIH project.

to finance retrofits. On the other hand, it decreases the willingness of owners to pay common fees, as they do not have control over where their money goes. Besides the problem of low collection rates, the banks are also sceptical when it comes to the provision of loans for HOAs as their accounting system is not professional and transparent. The law regulating HOAs has been negotiated in the parliament for several years now to make the functioning of the HOAs more transparent and operational.

Habitat for Humanity Armenia (HFH Armenia), in the framework of the REELIH project, assisted the implementation of basic energy efficiency interventions in common areas of 13 MABs in Yerevan and Vanadzor. The renovations were financed from two major sources:

- a subsidy scheme operated by the municipalities (40% grant), and
- joint commercial bank loans to the communities, with personal guarantees behind.

The loans were managed by the HOAs. Among the several loans available to HOAs through commercial banks, the most popular ones (with the best conditions) were funded by HFH Armenia.

The project resulted in only 2 to 6% of energy savings, due to the limited space for interventions in the common spaces. Even though the renovation did not have a substantial impact on the financial situation of the residents, their comfort level increased because of the better thermal conditions in the building. The most relevant outcome of the REELIH project, however, was to boost crucial changes in the framework conditions of energy efficiency renovations through:

1. testing a financing model of building renovation, that can finance renovation on a commercial basis in the long run,
2. actively contributing to the modernization of HOAs legislative regulation, which is key to form an institutional framework that provides a solid basis for energy efficiency renovations,
3. creating new networks of municipalities in the field of renovations.

iii.ii. Bosnia and Herzegovina

Bosnia and Herzegovina has 3.5 million inhabitants. Due to the Bosnian war, the administration and legislative powers of the country are divided, which creates serious problems in harmonizing policy solutions. For example, legislation about HOAs management, operation and financing are completely different in the different parts of the country. In Bosnia and Herzegovina, MABs represent only 16.4% of the housing stock. Regarding heating methods, two-thirds of the residential building stock is heated with wood. In Sarajevo canton, however, 42% of the total floor area of MABs is heated by district heating, 33% by electricity and 20% by natural gas.

During the REELIH project, pilot buildings were renovated in four cities. The renovations were co-financed by municipal subsidies (generally by 50%). The remaining costs were covered by the contributions of owners, in the form of savings and loans taken by the management company, or by individual loans obtained through commercial banks and microfinance institutions.

Two main obstacles in the way of the renovations were related to the regulation of MABs, one of which is that owners who voted for the renovation

have to finance it, but the majority cannot enforce the payment obligation to the minority. In case there is a willingness to finance the share of some owners who are not willing/able to pay, the renovation can be implemented. However, if there is a bigger opposition, the renovation process is blocked. The other obstacle is that the accounting mechanism of management companies is not very transparent.

MABs joined the REELIH project to fix crucial structural problems of the building (falling facades, leaking roofs). As a result, homeowners' comfort levels increased after the renovation. Energy costs might decrease in the longer term, after the repayment of the loans. The loans complementary to the public subsidies had rather short-term repayment periods, thus in the first years, the costs of the households were higher than the energy savings.

During the implementation of the project, HFHI switched the focus of the project from renovations of buildings itself to changing the legal and financial framework of energy efficiency retrofits in the country, as some major obstacles were realized. The project partner of HFHI, ENOVA, elaborated four cantonal renovation strategies, including technical evaluation of the MABs stock and establishment of reliable financial sources for renovation. As a result, a growing number of municipalities and cantons have started to introduce grants to support the energy efficient renovations of detached houses and MABs.

iii.iii. North Macedonia

North Macedonia has 2 million inhabitants. Homes are predominantly heated by individual heaters (stoves), mostly fueled by wood. In urban areas more than two-thirds of households heat with solid fuel stoves and electricity is the second most common heating source. District heating is present only in the capital city of Skopje, where there is a large difference between the state of MABs at a district level, in terms of heating methods and quality. 50% of MABs need urgent repair due to leaking roofs or damaged facades and due to the lack of general insulation.

According to the legislation, homeowners should choose to be self-managed or managed by a company. 40% of buildings have none of these options and thus are not considered as legal entities. This is due to the lack of trust towards management companies and that the owners themselves are not willing to take responsibility for managing the building officially.

Generally, 30-50% of renovation costs are covered by the district municipalities, only in some cases, recipients of social allowances are entitled to a scheme that covers 100% of the insulation costs. In the framework of the REELIH project, Habitat for Humanity Macedonia (HFH Macedonia) provided complimentary financial assistance to the already existing renovation schemes. As the municipalities cover only a part of the insulation costs for the renovations, HFH Macedonia provided loans to cover the remaining costs in the framework of the REELIH project. As a response to the deficiencies of buildings management, HFH Macedonia also established its own building management company, Habidom to provide transparent and efficient management for homeowners of MABs.

Between 2010 and 2019, 72 buildings were renovated. Half of them are located in two well-off

districts of Skopje. As the interventions were complex (insulation and replacement of the windows), energy savings reached approximately 30 to 50%. With the 7-year, longer-term loan provided by HFH Macedonia to the owners individually, the amount of the monthly instalments and the reduced energy costs were balanced.

In the case of individual heaters, energy costs might not decrease significantly, but due to the better energy performance of the apartment, the owners could allow themselves to heat up their homes properly, at the same costs as before. Also, negative consequences of underheated apartments could be avoided. Furthermore, the value of these apartments potentially has increased.

Habidom already manages 100 buildings and 14 staircases (that can be managed individually). The company provides transparent management for the buildings, including one sub-account and one reserve for each building. They have a high, 95% repayment rate and are efficient in collecting arrears.

IV. CONCLUSIONS AND RECOMMENDATIONS

In each REELIH renovation program, the comfort level of inhabitants increased. Symptoms of energy poverty, such as cold and humid apartments due to the lack of proper heating and other technical problems, or too hot apartments during summer, were reduced to some extent (depending on the complexity of interventions).

In the case of complex interventions, the energy needs of the apartments were significantly dropped. This either decreased energy costs in a longer term or permitted to heat up the apartment at an adequate level without financial sacrifice. Instalment payments might shade the savings on bills for a few years. However, in the long term, the reduced energy demand of the buildings not only decreased the energy costs but also the dependency from changes in energy prices.

Some of the interventions allowed households to switch to more modern heating devices, which also contributed to a better comfort level.

In terms of the capacity to reduce energy poverty, besides the various gains in the field of providing higher comfort levels for households, there were some limitations. This can be attributed to the underdeveloped institutional and financial environment of MABs renovation. Weak or non-transparent management of buildings combined with a low financial support mechanism significantly reduces the chance of the buildings to successfully apply for retrofitting loans. In many cases, weakly managed buildings are also in a more difficult financial situation in general (e.g., a higher share of owners have low income), compared to buildings with better management. Thus loans provided even in the framework of the REELIH project reached mostly buildings with good management. Other outcome of the project includes the establishment of a better financial and institutional environment for renovations aiming to guarantee that in the longer term a larger share of MABs inhabited by lower income households can access funding and thus their buildings can be renovated.

Based on the results, we can conclude that the financial and institutional environment is crucial to implement energy efficiency retrofits for the sake of energy poverty reduction. In each REELIH

implementing country while planning and carrying out the renovation, project partners (HFH Armenia, ENOVA, HFH Macedonia) realized that there are structural factors that hinder the implementation of MABs energy efficient retrofits. A low level of trust towards HOAs or management companies, due to their not fully transparent way of management and accounting, could block either the approbation of the renovations from the part of the homeowners and the willingness of banks to provide loans.

There was a lack of proper financial products for the HOAs and the building retrofits. Therefore, besides focusing on the renovations itself, there is a need to reinforce the institutional and financial environment that enables the renovation of MABs. In the REELIH project, this was done through:

1. Increasing HOAs' transparency in accounting and improving their management skills, which leads to higher trust from both homeowners and banks.
2. Establishing financial schemes that can complement locally available public funds, and are long-term enough to ensure that retrofits do not put a financial burden on the households.

As in the REELIH implementing countries the general state of the building stock needs interventions, energy efficient interventions programs not only provided increased efficiency of the buildings but boosted, in general, the necessary maintenance of buildings (e.g., repairing a roof, facades).

Besides the general state of the building, heating methods also play an important role in the comfort levels of households. In the REELIH implementing countries, wood heating in individual stoves is very prevalent, and where district heating is available, it is mostly outdated and not measurable. Therefore, it is important to improve not only the buildings itself but the heating system as well. Switching from a wood-fueled stove to a more modern method can be a solution. In the case of district heating, the involvement of the provider in the renovation process is important to reduce the price after renovation and to introduce individual heat measurements.

Despite these challenges, important changes are taking place in the devaluation regions in the field of building retrofits. The REELIH project contributed positively to these changes by fostering energy efficient retrofits through the improvement of building management legislation and practice, facilitation of stakeholders, development and testing of financial schemes that are socially targeted and complementary to locally available subsidies.

None of the REELIH countries possesses a definition of energy poverty and due to lack of data, it is impossible to precisely identify energy poor households. Despite this shortcoming, given the general condition of the dwellings and heating patterns, the REELIH project definitely eased the situation of many households: apartments are better heated and comfort levels have increased. Furthermore, important maintenance issues, such as leaking roofs were fixed. In particular, achievements in the field of institutional and financial frames of energy efficient retrofits are highly needed steps towards the upscale of retrofit including buildings in the most difficult situation.

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AUTHORS

Éva Gerőházi

Hanna Szemző

Mariangiola Fabbri

Anna Zsófia Bajomi

Gap analysis of the housing sector in Western Balkan countries: Bosnia and Herzegovina, Kosovo, North Macedonia, and Serbia vs. Slovak Republic

AUTHORS

RTI International produced this report for review by the United States Agency for International Development, prepared by:
Besim Nebiu, Habitat for Humanity International
Elena Milanovska, Habitat for Humanity International
Mirzet Ribić, FUNDAMENT LLC
Astghine Pasoyan, Energy Saving Foundation
and other contributing authors

ABSTRACT

The thermal renovation of housing requires significant financial resources. Based on this research carried out in Western Balkans (WB), the market failed to deliver these resources due to different barriers. These obstacles are rooted in national housing, energy efficiency policies, institutional system, banking rules and practices, gaps in knowledge and capacities of various players, as well as the generally low level of awareness. This study focuses on revealing gaps of these countries in retrofitting focusing on privately owned multi-apartment buildings (MABs), contrasts them with the forerunner in retrofitting MABs: Slovakia, and provides recommendations to overcome the identified gaps.

Keywords: regulatory bottlenecks, financing renovations, capacity gaps, Western Balkans, policy recommendations

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I. INTRODUCTION

This article is based on the Executive summary of the Gap analysis of the housing sector in Western Balkan countries: Bosnia and Herzegovina, Kosovo, North Macedonia, and Serbia vs. Slovak Republic. RTI International produced this report for review by the United States Agency for International Development (USAID). The analysis reveals the barriers and gaps in carrying out energy efficiency retrofits in MABs and provides recommendations on how to overcome them in four WB countries. In the assessed countries the residential building sector is one of the largest energy end-users, consuming 30 to 60% of all final energy consumption (IEA, 2015). High energy demand and low energy performance are caused by several factors, including aging building stock, decades of poor maintenance, legal-regulatory barriers, a lack of clear ownership structure and responsibilities, as well as poor management of residential buildings.

The landscape for financing energy efficiency varies considerably across different sectors. The private sector appears to have well-functioning markets, where consumers can easily borrow funds for energy efficiency and other investments. The public sector is almost completely dependent on subsidized financing and grants, even though energy efficiency investments have the potential to generate savings and allow the repayment of investments if properly structured. In most WB countries, the national governments engage in sovereign loans from international financial institutions, which are later invested in educational, medical, and other public institutions' buildings, while the loans are repaid from the state budget. MABs in WB, however, remain an untapped market for commercial lending for energy efficiency investments despite the sector's significant share in national energy consumption and its benefits (monetary savings, improved environmental indicators, reduced energy-import dependence). Meanwhile, the poor financial standing of homeowner associations (HOAs) managing MABs makes it difficult for the banks to provide loans to them. Hence, HOAs do not have an obligation or an incentive to invest in energy efficiency measures.

In Slovakia, legal reform, capacity-building support, and tailor-made financing have led to the mobilization of HOAs and to the engagement of commercial banks in the delivery of financing solutions and the renovation of the majority of the MAB housing stock. The reforms in Slovakia that were initially heavily supported with subsidized financing and institutional support gradually evolved to a fully commercial, self-driven, and market-based framework. In this market-based framework, nearly every local bank offers an HOA loan product, and every HOA can invest in renovations and repay it from its own fees and savings.

II. METHODOLOGY

In order to identify gaps in energy efficiency investments of MABs and provide recommendations on how to overcome them, a deep analysis of housing and financing characteristics in the assessed WB countries has taken place. This research reviews housing policies, institutional structures, energy efficiency policies, reform agendas, as well as the banking-sector landscape in the selected four WB countries. Based on the review, it provides a comparative gap analysis with benchmarked best practices of Slovakia that have made substantial progress in MAB refurbishing. Besides gap identification, the research also identifies opportunities and provides

recommendations for legislative and regulatory improvements, capacity-building support, and flexible financing in each assessed WB country. Following these recommendations, it is necessary to improve housing operation and maintenance of MABs as well as to develop and enable the environment for energy efficiency (EE) investment lending to HOAs.

III. RESULTS AND ACCOMPANIED RECOMMENDATION

The thermal renovation of housing requires significant financial resources. The market failed to deliver these resources due to barriers rooted in national housing, EE policies, and banking rules and practices. The lack of meaningful investment in the sector for the modernization of MABs has its roots in each country's complex institutional landscape, gaps in knowledge, and capacities of various players in the market, and the generally low level of awareness and maturity of all engaged partners in the four reviewed countries including BiH, Kosovo, North Macedonia, and Serbia. This study analyzes these countries' policies and institutional, financial, and information barriers in housing, banking, and EE and contrasts them with those of the outstanding forerunner in these fields, Slovakia.

iii.i. HOUSING PERSPECTIVE

a. Legal/regulatory gaps

The WB countries have initiated housing policy reforms since 2009. All four countries passed laws that regulate the maintenance and management of MABs in their legal systems in the past decade. Despite adopted legislation, the past decade has not seen sufficient growth of proper institutional capacities or developed the necessary processes for ensuring the adequate enforcement of adopted policies. Furthermore, these laws still have shortcomings, are frequently modified, and are thus unstable. In contrast, the Slovak legal framework has been functioning for three decades (since 1993) with only a few amendments. All focus countries except North Macedonia have a separate condominium law. With the exception of the Federation of Bosnia and Herzegovina (FBiH), they allow for registered HOAs to act as both legal entities and management entities for MABs.

Gap: Unlike the Slovak system—in which HOAs are largely self-regulated and the residential building maintenance and management sector functions have low state interference, control, and oversight over the work of HOAs and licensed management companies (LMCs)—in all four countries, the policymakers intended to create frameworks that implement the robust institutional architecture. This institutional architecture allows state regulation of the sector, including control and oversight over the work of HOAs and management companies. This architecture consists of various regulatory bodies and/or inspectorates. Analysis shows that these regulatory structures are too complex and have limited functional effectiveness. Over the past decade, they have not produced visible effects in improving the quality of management, maintenance, and modernization of MABs.

Recommendation: The current systems of oversight and control need to be simplified or abolished because they are not fulfilling their functions.

Gap: Analysis of the adopted secondary legal framework shows that national governments have adopted the most critical policies, bylaws, and guidebooks regulating MAB operations and management. However, there are many gaps and inconsistencies among the laws, with many existing provisions lacking enforcement.

Recommendation: Following the experience of Slovakia, countries need a comprehensive and systematic analysis of the impacts of other laws on HOA laws to identify and address gaps and loopholes in implementation. This will be an important step in making these systems functional; it will help eliminate inconsistencies, duplication, and barriers to implementation and reduce the liabilities and obligations that the law imposes. The gaps and inconsistencies need to be properly addressed, preferably by amending the existing laws, as the introduction of new laws would exacerbate the predictability and stability of the legal framework.

Two key contributing factors in the effectiveness of the Slovak HOA regulations are (1) ease of decision-making of homeowners (50 % + 1 vote) instead of 2/3 often demanded in WB countries and (2) simple and effective rules for the collection of MAB fees, enforced through legal lien and simplified court and collection procedures. All four WB countries are advancing to some extent toward integrating such effective regulations but are not yet fully able to apply and enforce of these factors.

A significant portion of the MAB stock in WB countries is already managed either by HOAs or LMCs: 64 % in North Macedonia, 40 % in Serbia, and most buildings in Slovakia. With the exception of Kosovo, these countries all have a substantial number of HOAs; and FBiH, North Macedonia, and Serbia all have sizeable LMC markets.

Gap: The quality of maintenance service is still low in the four countries due to failure in the proper collection of fees and dues. Combined issues of legal gaps, cumbersome decision making, limited cashflow, and insufficient payment enforcement have led to persisting deficits in investment funds and funds for general maintenance.

Recommendation: In addition to addressing the above gaps in the laws and accelerating their proper enforcement, HOAs need to take immediate steps and support mechanisms for the generation of proper financial resources for building repair and maintenance. HOAs must ensure internal and external financing through facilitating collection of maintenance fees for routine maintenance, generation of reserve funds for capital renovation, and access to debt through (1) accumulating "reserve funds," which can be committed as down payments on a loan; (2) giving the HOA the power of lien, which the HOA can use to impose the payments through collection agencies that auction nonpayers' apartments; and (3) using credit guarantees linked to HOA cashflow, etc.

b. Housing policy gaps

The renovation boom in Slovakia from 2000–2010 resulted from the combination of a solid legal framework, institutional support, and availability of financing options and tools for the renovation of MABs. By 2016, 47.5 % of the stock had been refurbished. While built on a generally better-performing economy and higher-than-average welfare of the population, the Slovak success story is largely anchored on simple and achievable regulations, combined with affordable policy and market tools that were developed throughout the 1990s and 2000s. These factors gradually made MAB renovation projects technically easier to do and financially affordable for the HOAs.

Gap: The four countries lack legal simplicity and policy stability, and most of the policy instruments that are available to Slovak MABs are absent in the WB countries. Under the acting legal framework, both HOAs and residential building management (RBM) companies in the WB countries can apply for a loan but only on behalf of all the owners (without HOA members individually signing agreements). Despite legal provisions, the market does not offer commercial loans for HOAs. The banks may be willing to lend to HOAs only with loan securities provided through collateralization (i.e., pledging an asset). Very few MABs can meet such a requirement because the HOAs do not possess assets other than the building common spaces, which do not represent a disaggregated asset that can be collateralized. An HOA's common assets are usually inseparable parts of its building's public spaces (e.g., stairwells, courtyards, and entrances), are not registered as a separate asset (roofs, attics), and often represent no liquid value to banks (has no separate property certificate, cannot be sold/rented as a stand-alone asset).

Recommendation: In Slovakia, the Obligatory (Reserve) Fund for maintenance and repair is usually used as collateral for a loan. Today, Slovak banks are comfortable providing loans to HOAs and only use these funds to collateralize/secure repayments of modernization loans. This scenario evolved as a result of several years of the HOAs developing regular payments of fees at higher volumes; in the interim, other forms of guarantees (such as state guarantee programs) were used until there was interest and confidence among banks to work with HOAs. WB countries should implement a similar mechanism with a similar trajectory of milestones to promote large-scale building renovations.

iii.ii. ENERGY EFFICIENCY PERSPECTIVE

This analysis conducts a stocktaking of the energy efficiency policies and programs in BiH, Kosovo, North Macedonia, and Serbia, comparing against the benchmark of the Slovak case and the Transposition Roadmap of Energy Community acquis communautaire (i.e., the collective legislation) for Contracting Parties. The analysis addresses EE policy, building energy performance, legal/regulatory domain, active institutional capacities, energy auditing, building energy certification, energy performance contracting, ESCOs and market readiness. The analysis revealed the following gaps and barriers to large-scale market uptake of EE investments in the MAB residential-building sector.

a. Legal/regulatory gaps

While the legal/regulatory landscape, policies, and plans continue to be a priority for these countries' governments, many gaps remain for providing a favorable policy environment for EE investments in residential buildings. The Energy Community and donors/international financial institutions (IFIs) have strongly supported these four countries in their efforts to set up a guiding policy framework and transpose the European Union (EU) Energy Efficiency Directive (EED) and the Energy Performance in Buildings Directive (EPBD) into national legislation. Despite all support and policy priorities, these efforts had mixed success in developing, adopting, and implementing favorable policy frameworks for building EE. Specifically, for the policy domain, the national governments and donor agencies must provide technical assistance to accelerate the enforcement and implementation of legal/regulatory reforms and progress monitoring, including the recommendations below.

Gap: Energy prices lack incentives for the promotion and implementation of EE investment in buildings, especially residential ones.

Recommendation: Transition social-assistance and energy subsidies toward improved utility affordability through enhanced EE. Such a transition will create a more sustainable and long-term remedy to affordability problems while creating incentives for EE investments and monetization of buildings, resulting in substantial energy savings and the reduction of emissions.

Gap: Laws on Energy Efficiency in Buildings were adopted very recently in all countries, but lack enforcement.

Recommendation: Maintain the momentum for the transposition of EED and EPBD and support implementation with continued development and the enforcement of adequate secondary legislation related to the EE of buildings.

Gap: Delayed development and adoption of the regular National Energy Efficiency Action Plans (NEEAPs).

Recommendation: Reemphasize the residential buildings sector in the NEEAPs, providing for discrete administrative delivery models and tailor-made financing instruments based on cost-effective EE improvement targets. Accelerate the adoption of the next NEEAP in BiH. Update the NEEAP and tracking implementation progress in the fourth NEEAP.

Gap: Delays in adopting a Building Renovation Strategy (BRS).

Recommendation: Accelerate the development and adoption of BRSs in harmony with NEEAPs and in compliance with EPBD requirements, allowing for a knowledge-based, technically and financially prioritized course of tactical action in building renovation, with the worst-performing buildings targeted first. BRS must quantify the benefits of such building

renovation not only in monetary and energy savings but also enhanced building lifespans, improved security and resilience, improved indoor environments, reduced social tensions, mitigated dependence on imports, added climate change mitigation effects, etc.

Gap: A lack of or poor enforcement of mandatory building energy performance certification.

Recommendation: Build the capacities of national authorities (particularly in BiH) and technical experts to accelerate enforcement in energy-performance certification, providing grant resources and technical assistance for popularizing these certificates among public and real-estate players. Ensure that they are transparent, credible, and methodologically uniform for all certified buildings.

Gap: A lack of proper monitoring and verification of housing-sector needs, implementation of residential EE investments, comfort improvements, genuine affordability issues, subsidy needs, and limited information for decision making on the effectiveness of investments, improved utility affordability, phase-out of subsidies, etc.

Recommendation: Require the application of internationally recognized monitoring and verification protocols in pilot projects, programs, and credit lines with a centralized national reference database to inform further decisions on phasing out subsidies, carefully calibrating concessionality of financing (interest rates, the share of grant cofinancing, grace periods, etc.), or planning scale-up. This must include reporting on environmental, social, resilience benefits, and macroeconomic and national energy security gains.

Gap: A lack of formal regulation and enforcement of energy auditing and accreditation of energy auditors.

Recommendation: Ensure that energy auditing provisions are in accordance with the European norms/independent system operators (ISOs) to provide comparable and consistent quality and content of energy-auditing reports, creating a reliable source for assessing the technical and economic potential for EE investments.

The four target countries should set the above regulatory provisions as milestones to be achieved in the cooperation program between the national governments and donors/IFIs. The building renovation niche requires a solid fact-based policy roadmap that is comprehensively stipulated by EED and EPBD transposition requirements.

Furthermore, as the basic provisions are put in place for EE in buildings, national policies need to integrate the buildings' sector into the broader low-carbon development agenda, including:

- development and adoption of the National Energy and Climate Plans (NECPs), and
- development and adoption of the National Net Zero Energy Building (NZEB) Strategy and Roadmap.

b. *Institutional and financial capacity gaps*

Gap: Limited institutional resources of ministries, lack of energy agencies, and the absence or poor capacity/scope of EE funds.

Recommendation: Given the limited staffing of ministries, governments and donors must seek to enhance the capacities of energy or housing agencies and EE funds to properly develop EE and renovation project portfolios for buildings. These efforts should include enhancing the capacities of public institutions related to international best-practices in legislation, technical assessments, business planning, financing, contracting, management, commissioning, and monitoring and verification of building renovation, among others. The efforts of government agencies, funds, donors, and IFIs must be better coordinated and combined through pooled financing, coordination committees, and the leveraging of mutual efforts. These efforts should ensure the development of an energy auditors' cadre and should provide training, accreditation, and certification for auditors.

Gap: Limited engagement of energy-service companies (ESCOs) and energy performance contracting (EPC).

Recommendation: Financiers (banks and funding entities for EE projects) must seek to customize financing terms to make them applicable to ESCOs/EPCs, including project finance, factoring, risk-securing activities based on savings cashflows, and tripartite (i.e., three-party) contracting, under which ESCOs could borrow financing backed by HOAs and/or household financing commitments.

iii.iii. BANKING AND FINANCE PERSPECTIVE

a. *Risk and risk perception gaps*

Gap: Unlike Slovakia, where most banks offer loans to MABs, the analysis found that, in all four WB countries, banks still do not lend to MABs. However, residential building stock inventories have been conducted in all countries, indicating a huge potential market for investment. In all states, bankers report that HOAs are newly established and do not have previous credit histories or regular income (stable future cashflow) for loan repayment. Also, the common property of HOAs as collateral is insufficient. In some countries, such as Kosovo, another barrier for EE projects is the lengthy process and complex technical requirements to secure access to commercial funding. However, in North Macedonia, this factor is not recognized as a barrier. In Serbia, a crucial reason for the lack of bank financing is that banks still do not understand the legal status of HOAs; also, the financial discipline of homeowners (HOs) is not adequate.

Therefore, the minimum required fees collected from HOs for maintenance and repair in obligatory or reserve funds are still not sufficient to be considered credible for loan repayment. Finally, the higher operational costs for processing the provisioning of credit and loan losses related to noncollateralized loan portfolios present additional barriers.

Recommendation: Streamline HOA laws and the legal position of HOAs. Clearly define the income of HOAs, including the obligatory collection of additional HO fees and reserve funds, which should be reserved for building renovations (and can be valued based on the building stock performance). Increase the level of financial discipline (regularity of fee collections, bookkeeping and reporting, elimination cash-based transactions, proper management of bank accounts), and/or target MABs with good financial discipline, to pilot lending on a commercial basis.

b. *Provisioning requirement gaps*

Gap: The WB region has universal banking. Banks assess the creditworthiness of borrowers based on standard general criteria. The focus is on sources for loan repayment, previous credit histories, the certainty of future revenues, debtor reputations, concluding with collateral as secondary loan coverage. All banks meet strict risk-management standards to protect public deposits (savings). In accordance with the probable credit risk, banks are constantly obliged to secure their assets in proportion to the risk's exposure in the number of expected loan losses. Loan loss provisioning directly affects the profits of banks; consequently, banks often decide to finance only the best projects that meet all regulatory requirements. The financial systems of the countries in the WB region are bank-centered, which means that, within the overall financial system, commercial banks predominate. Also, non-banking institutions (NBIs), which, by their nature, could be more flexible toward beneficiaries of financial services are not significantly represented. Savings associations as NBIs do not exist or are not developed, although in the Balkans there has been a long tradition of savings and credit associations (railway, housing, postal services, etc.). These institutions play a pivotal role in developing the scheme for lending to MABs in Slovakia.

Recommendation: To motivate the banking system to lend to HOAs, raise the financial discipline of HOAs, introduce additional commission for investment maintenance that would be used for loan repayment, stimulate loan subsidies, provide guarantee schemes, and promote greater education of all stakeholders.

c. *Gaps in guarantee mechanisms*

Gap: The analysis showed that guarantee funds and mechanisms are not developed in the region. Despite the episodic success in setting up guarantee funds, such as the Kosovo Credit Guarantee Fund (KCGF) and two guarantee funds in BiH, none filled the financial market gaps that make commercial banks reluctant to finance, nor do they recognize HOAs as users of guarantee services. Guarantee funds and guarantee schemes that focus on providing guarantees for HOAs are not available in Serbia and North Macedonia. Currently, the solely available mechanism is in North Macedonia, where USAID and Habitat for Humanity International (HFHI) have established a mechanism to ensure repayment of the loan to the HOAs for EE financing (50 % guarantee for HOA lending).

Recommendation: Establish guarantee schemes and mechanisms for HOAs, guaranteeing loans to HOAs to reduce credit risk from the banking sector perspective.

d. Existing gaps in banking products, including development banks

Gap: Only BiH has a banking initiative to design special lending products for HOAs. In all other countries, the banking sector has avoided developing such products. In Kosovo, the Millennium Challenge Corporation (MCC) will provide Subsidies for Energy Efficiency in Kosovo (SEEK), with $24 million in US Government financing that would include a loan component for HOAs—this would be the first banking product of this kind for HOAs in Kosovo. Development banks—the European Bank for Reconstruction and Development (EBRD), KfW, World Bank—and bilateral donors—USAID, EU, and the Swiss Agency for Development and Cooperation (SDC)—have come up with similar initiatives that helped develop commercial loans, albeit not specifically targeting HOAs.

Recommendation: Develop and introduce credit lines for HOAs, through international development and local institutions, that are specifically designed to support lending to HOAs through banks and other NBIs. Bank loans to HOAs should be partially secured by government grants to cover economically vulnerable groups (unemployed, single parents, people with disabilities, pensioners, etc.). State aid should include subsidizing the costs of preparing technical documentation and obtaining appropriate approvals and permissions for renovation per the required technical-documentation process.

IV. CONCLUSION

Amendments to the housing laws, assessing impacts of other related legislation, while building the capacities of HOAs, are essential to preparing large portions of the urban housing stock for commercial financing. The establishment of effective housing legislation through the adoption of best practices from neighboring countries with successful track records in implementing similar reforms would bring about a fundamental shift in retrofitting MABs in WB countries. Legislative action represents the first step toward facilitating energy-efficient refurbishment, opening the MAB residential sector for commercial financing, and expanding the facilities-management market. Subsequent steps will require capacity-building support for local institutions to strengthen the management capabilities of HOAs and building the confidence of commercial banks to provide HOAs with financing products that are specifically designed for the needs of HOAs and the economics of energy efficiency investments.

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AUTHORS

Besim Nebiu

Elena Milanovska

Mirzet Ribić

Astghine Pasoyan

ComAct educational factsheets on energy efficiency

AUTHOR

ComAct Project

ABSTRACT

Getting citizens and homeowners' associations on board is key when planning renovation projects targeting the enhancement of building energy efficiency performance. Therefore, the EU Horizon 2020-funded Community Tailored Actions for Energy Poverty Mitigation (ComAct) project strives to involve local stakeholders and communities in five pilots located in five European countries. In each area, a so-called Resource Centre (RC) is created, where partners organize capacity-building activities such as trainings, consultancy as well as hands-on advice for local stakeholders and communities. To ease information flow and its usage, project partners have developed five factsheets on key aspects related to energy efficiency and energy poverty reduction.

Keywords: capacity building, homeowner associations, training, technical assistance, renovation

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Table of content

I. INTRODUCTION

This article summarizes five training materials on the benefits of enhancing residential energy efficiency. These training materials target homeowners and homeowner associations (HOAs) of multi-apartment buildings (MABs) in Europe and have been developed within the framework of the EU Horizon 2020-funded ComAct project. ComAct pays particular attention to involving local stakeholders and communities in the five pilots located in Bulgaria, Hungary, Lithuania, North Macedonia and Ukraine. In order to ease understanding the benefits of energy efficiency measures including their contribution to decrease energy poverty, project partners have developed five factsheets targeting:

- Energy consumption
- Increasing energy efficiency
- Renewable energy
- Multiple benefits of higher energy efficiency
- Community at the core of healthy and favorable living conditions

Available in Bulgarian, English, Hungarian, Lithuanian, Macedonian and Ukrainian, these factsheets aim to share essential information related to energy efficiency and make it available to a larger audience. Based on these five factsheets we have created the following summary article.

II. METHODOLOGY

ii.i. Defining categories of energy consumed in typical households

Households use energy for various purposes: space and water heating, space cooling, cooking, lighting and electrical appliances and other end-uses.

Figure 1. below shows how much energy goes for these purposes. It can be seen that almost 80% of energy goes for heating (including space and water heating). The amount of energy consumed by households of MABs, however, can be decreased through properly planning and implementing their retrofits.

ii.ii. Revealing the status and renovation possibilities for MABs

A MAB should undergo capital renovation about every 30 to 50 years, depending on the building quality and individual elements that need to be renewed. Existing large prefabricated buildings, often constructed in former socialist countries between the 1950s and 1990s, suffer from low structural quality as well as from a severe maintenance and renovation backlog. These buildings show damages and deficiencies in their structure and fabric requiring deep renovation.

Deep renovations are refurbishments that reduce both the delivered and final energy consumption of a building by a significant percentage compared with the pre-renovation levels, thus resulting in higher energy performance. A deep renovation can also include non-energy-saving measures such as the modernisation of electrical installations or plumbing. Non-energy renovations are often the entry point for energy efficiency renovations. Figure 2. shows the main steps of conducting proper renovation.

Using renewable energy sources in MABs retrofits can further enhance their environmental as well as social performance.

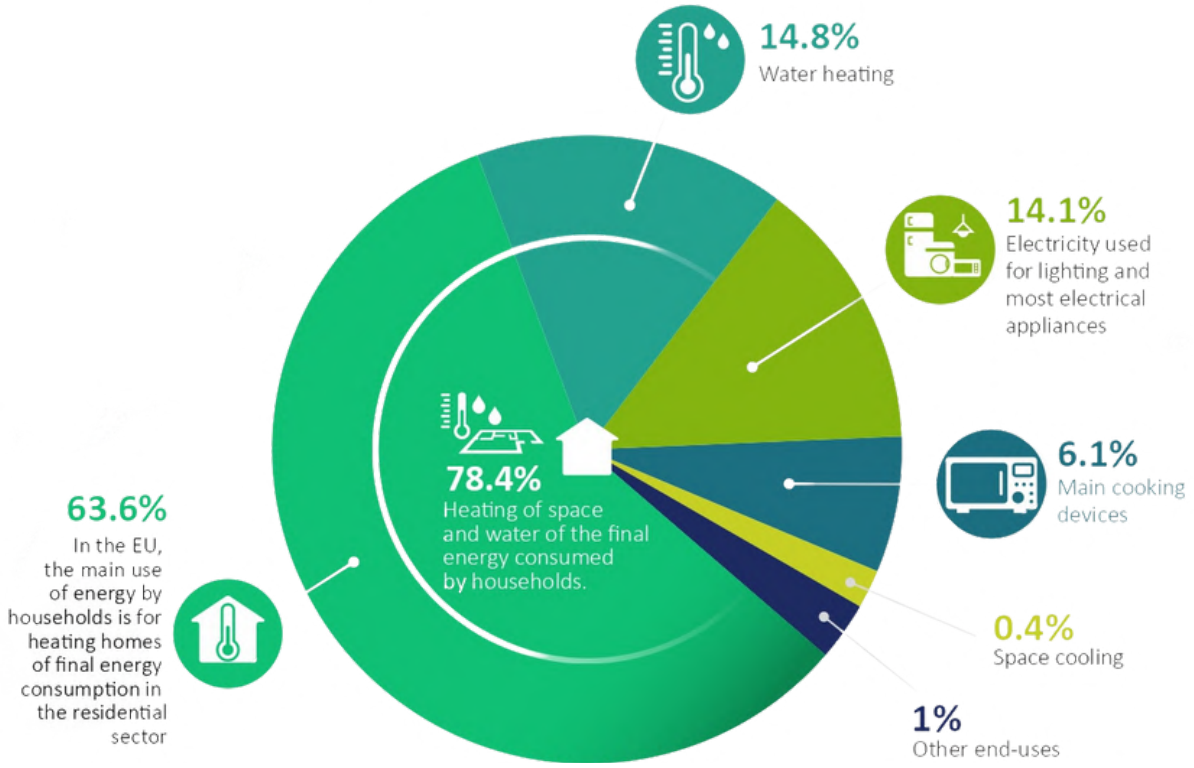

Figure 1. Share of energy consumption types in buildings (ComAct project, 2022a)

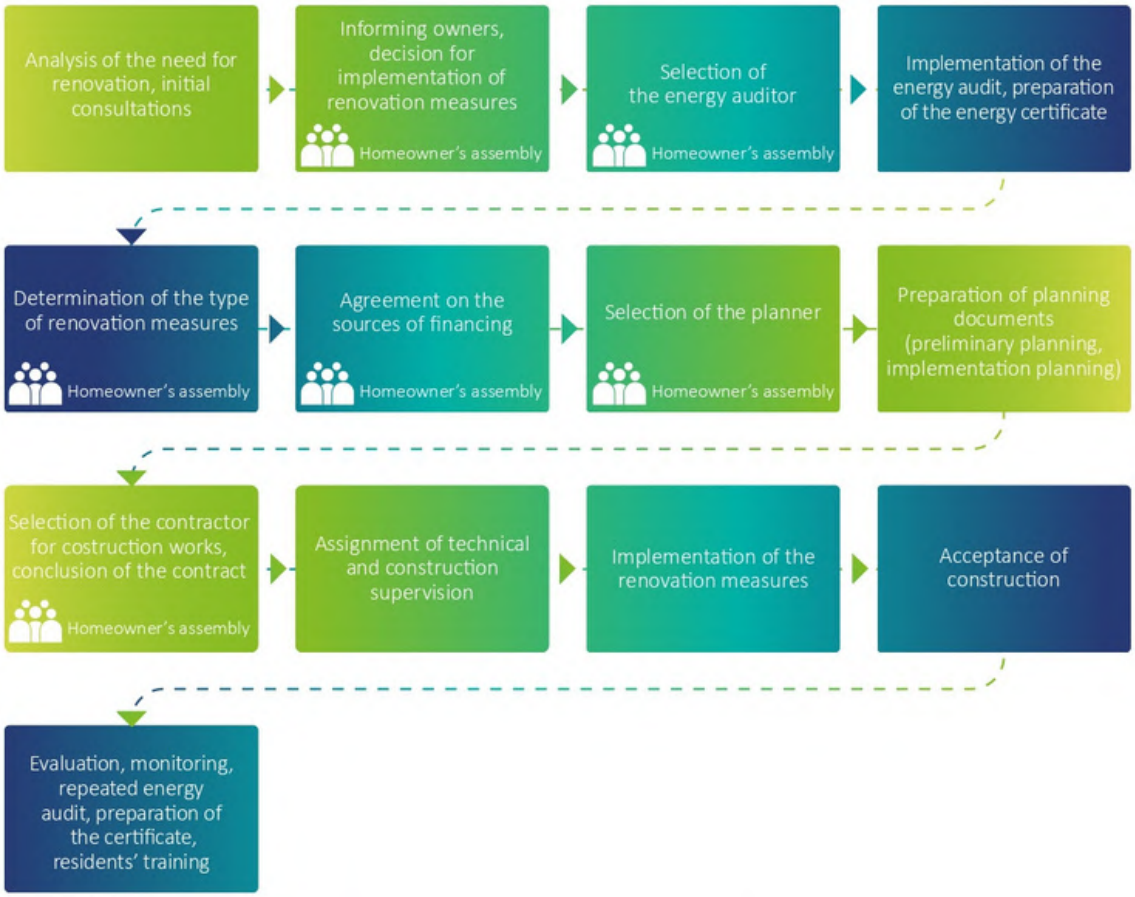

Figure 2. Main stages of organizing and implementing MABs energy renovation (ComAct project, 2022b)

ii.iii. Identifying benefits and types of renewable energy sources to satisfy energy demand in MABs

Using renewable energies to satisfy the reduced energy demand, resulting from the improved building envelope and upgraded technical infrastructure is an important step to reduce conventional fossil fuel dependence. Figure 3. shows which types of renewable energy sources can be used in MABs in order to enhance their environmental performance.

Combined heat and power plants have become smaller in recent years, which makes them more attractive for smaller households and MABs. District heating systems also offer attractive renewable energy opportunities, the performance and efficiency of these systems, however, have to be tested. For example, using one large boiler house for an entire district is very efficient, considering the frequent maintenance of the boilers. District heating, however, has limitations in satisfying the energy needs of rural areas with greater distances between houses.

Below we summarize the renewable technologies applicable in MABs.

Solar Energy

Solar energy is the most prominent technology for energy self-consumption, in particular solar PV, which generates electricity directly from the sun using solar panels that are integrated into building structures. Solar PV can be used directly, be fed into electricity networks or stored on-site. Today solar energy has become financially competitive with its average payback period being only seven years.

Heating with solar energy

Besides electricity generation, solar energy can be used for heating too. There are two main types of solar thermal collectors: flat-plate collectors and vacuum collectors. They must be positioned in a way to capture as much solar energy as possible, thus normally placed on the roofs of the buildings. Collectors circulate fluid, such as plain water, and transport heat to be stored and used later on.

Heat pumps

A heat pump uses solar heat from the environment (from the atmosphere, surface water, subsoil and groundwater). The energy is extracted through a system of heat exchangers and then concentrated in the heat pump cycle. In this process, the temperature of the circulating fluid increases up to 30-50/60°C. If required, the heat pump can operate in versus mode, namely can provide cooling. Heat pumps are getting more and more popular in new and existing buildings.

Wind energy

Wind turbines are one of the most prominent renewable energy solutions. For private buildings, the use of small on-site wind turbines can be an affordable tool. Their performance, however, is often inconsistent if they are not installed properly or the wind conditions have not been measured right.

Biomass

Biomass is derived from plants or animals to produce electricity or heat. Examples are wood, energy crops and waste from forests, yards or farms. Biomass used for transportation and for

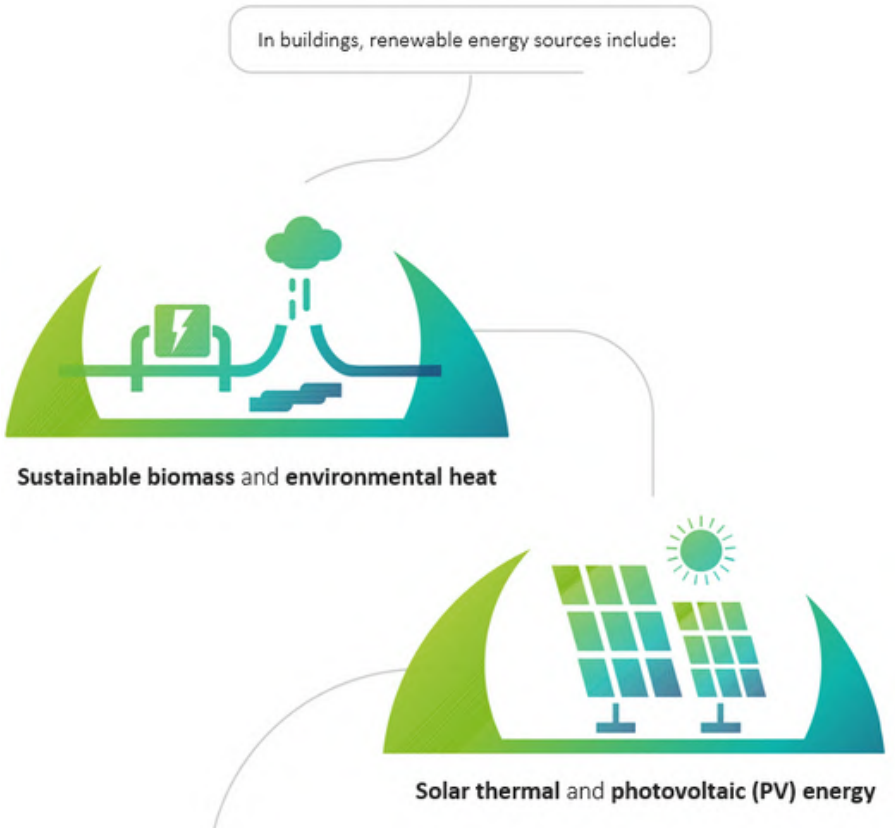

Figure 3. Types of renewables used in the residential sector (ComAct project, 2022c)

electricity generation has become popular in many developed countries to replace fossil fuel use. Biomass can be burned directly for heat or converted to renewable liquid and gaseous fuels through various processes. Even though biomass is categorized as a sustainable and renewable energy source, its side effects for health through increased air pollution and its impacts on forests and land use can outweigh its benefits. Therefore, biomass use has to be assessed very carefully on a case-by-case basis.

ii.iv. Revealing the potential benefits of HOAs

It is important for residents of MABs to join or create a community in order to take joint decisions on improvements to their living space. Besides making technical improvements to the building, taking care of the common spaces and making them attractive and appealing to the residents can strengthen the community (ComAct project, 2022e). HOAs can play a role in strengthening MABs communities.

Besides the formal aspects of this form of self-organization, there are numerous sociological features that characterize HOAs, inter alia its membership is based on the ownership of an apartment in a particular building. Furthermore, HOAs can play a significant role in tackling common property-related challenges, since homeowners are often not aware that they are obliged to ensure the proper maintenance, operation and technical re-equipment of the building's common property. Therefore, HOAs' intervention can be crucial when additional

payments for the maintenance of the common property are required.

Renovation works are expensive and will not be covered by the maintenance reserves saved by homeowners. A legally established HOA would be able to apply for a loan or request financial support from a state program. Loans should be coupled with socially targeted subsidies to increase the financial resources of the owners as well as to tackle the insolvency of the poorest homeowners.

Creating an HOA allows owners to influence the quality of housing and communal services as well as the level of payments for ensuring these services. Furthermore, within the framework of HOA, owners can independently vote for the efficient use of energy in their building, decide on using energy-saving light bulbs in common areas as well as on installing better quality water heaters and water or heat meters. HOAs have the responsibility to ensure the agreed quality of the housing and communal services.

III. POTENTIAL RESULTS OF PROPER RETROFITTING PLANNING AND IMPLEMENTATION

iii.i. Benefits of renovating common properties in MABs

Common properties of MABs can be renovated in several ways in order to reduce MABs' energy demand. The energy-saving potentials of different renovation measures are illustrated in Figure 4.

Energy efficient renovation, however, has to be complemented by behavioral changes of the renovated building's inhabitants in order to further decrease energy consumption. Residents can greatly influence their energy consumption independently, by adjusting their indoor temperature, ventilating adequately and replacing inefficient household appliances. Furthermore, tenants can seal air leaks in the flats, such as windows and doors, which is a great way to reduce heating and cooling expenses.

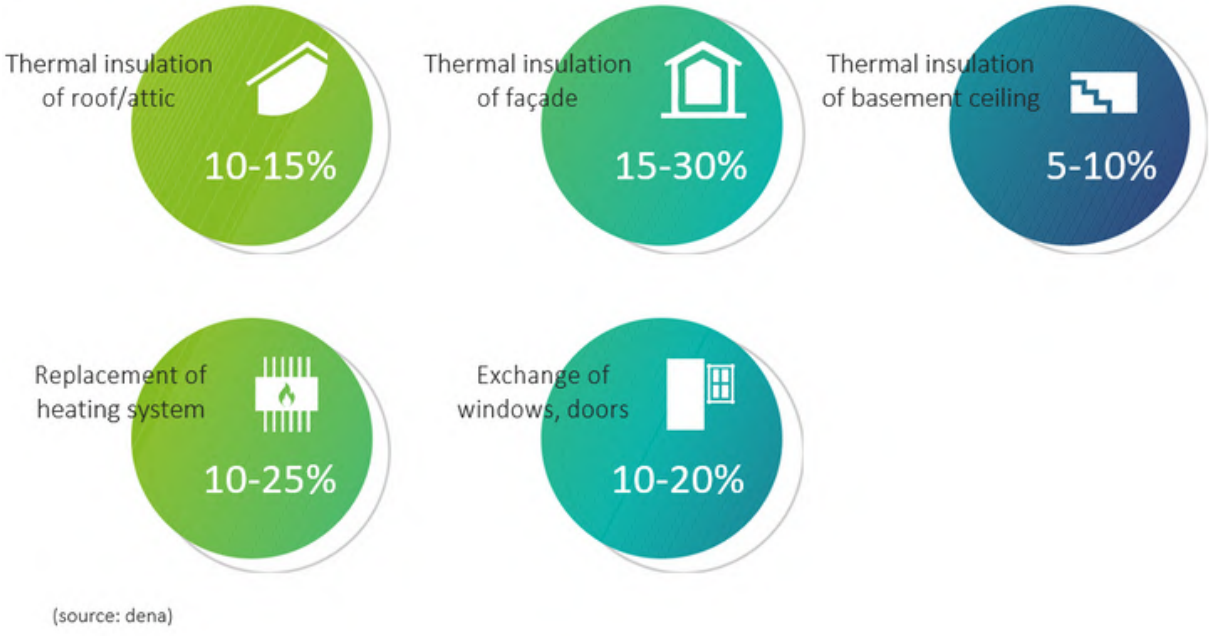

Figure 4. Renovation measures and their energy savings potential in MABs (ComAct project, 2022b)

iii.ii. Using the full potential of renewables

Renewables have great potential to cut electricity bills, reduce energy poverty and even contribute to mitigating income inequality. The "prosumer" concept initiates that everyone, regardless of whether they own or access a place where renewable energy can be generated (e.g. a roof), can participate in the electricity market. Prosumers produce and consume electricity. They 'self-consume' some of the electricity they produce and sell the excess to the grid, but when their production falls short, they also buy power from the grid, which makes them both producers and consumers. This prosumer concept is illustrated in Figure 5.

Investing in solar modules on MABs roofs could provide a worthwhile addition to standard renovations benefits and a way of further lowering electricity and heat-related costs through using heat pumps or solar thermal. Employing a combined heat pump linked to a PV system and integrating it into building renovation could save up to 60% of the annual costs for heating and hot water compared to a conventional renovation practice. Another cost-effective measure is to use (preferably PV produced) electricity-based systems for hot water in the summer, when centralized heat production for domestic hot water is expensive and impractical.

iii.iii. Adequate decision making: improve energy efficiency, apply renewables

As renovation addresses the common property of the building, it is the co-owners and not just the tenants who take decisions. The renovation of a building can be initiated by individual owners or by a group of owners and discussed at the next general assembly. For planning and managing a renovation project, a working group of owners could be created to actively assist the chairperson of the HOA or housing manager in all stages of the project. The working group could voluntarily undertake certain responsibilities, including the education and awareness raising of other co-owners and residents on MAB relevant issues as well as the identification of renovation needs and organization of joint events. Therefore, the group can contribute to more accurate renovation-related decisions.

IV. CONCLUSIONS AND RECOMMENDATIONS

At the micro level, proper renovation offers multiple health and well-being benefits to the occupants as well as significantly enhances building value and rentability. Furthermore, due to the saved energy and decreased greenhouse gas emission, investments in energy efficiency can generate direct and indirect benefits also at the macro level including energy security, decreased health costs and improved climate protection. These micro- and macroeconomic benefits are illustrated in Figure 6. and detailed below.

Benefit 1: Reduced energy costs and heat loss

Energy efficiency improvements reduce the amount of energy used, which in turn leads to cost savings on utility bills. Energy consumption drop can range from 25% to 75% or more, depending on the condition of the building as well as the number and type of renovation measures. Installing heat meters or heat cost allocators allow flat owners to pay for individual consumption of space heating, to create motivation to adjust the heating

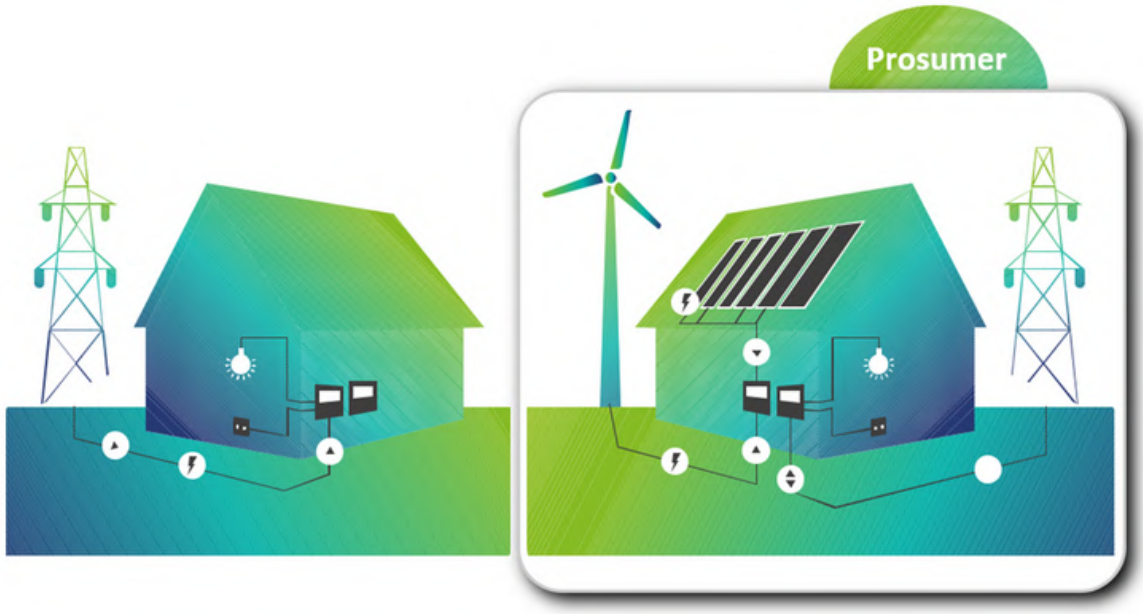

Figure 5. 'Prosumer' concept (ComAct project, 2022c)

demand and to avoid heat waste.

A household is generally considered energy poor if it is unable to maintain adequate indoor temperature and other basic energy services at an affordable cost. The lack of proper energy services could lead to deterioration of physical and mental health. Most often, energy poverty is caused by a combination of low income, poor housing quality and high energy costs. Energy efficiency retrofits of low-income households can offer a solution that permanently makes comfort more affordable.

Benefit 2: Increased safety and sustainability of the building

Deep renovation eliminates construction defects by replacing components that are approaching the end of their lifetime or by strengthening the structural stability of the building. This increases safety for tenants and passers-by as well as extends the life, and improves the energy efficiency of the building.

Benefit 3: Reduced maintenance costs

After renovating the common spaces deeply, homeowners have lower maintenance and administration costs, since costs for repairs are reduced to almost zero in the first years after deep renovation.

Benefit 4: Increased financial independence

Carrying out the renovation with an energy advisor who ensures the quality of the work significantly reduces the energy demand for heating and hot water, through which residents can become more independent from energy price increases and from enhanced tariffs for communal services. A delay in renovation will lead to higher costs in future as the price of materials and works continues to rise.

Benefit 5: Increased quality of the indoor living environment and improved health

Energy efficiency measures enhance physical and mental health by creating a healthy indoor living environment with comfortable air temperature, humidity and noise levels, as well as improved indoor and outdoor air quality. Insulation, heating and ventilation systems-related measures improve air quality and thus reduce respiratory and cardiovascular diseases, rheumatism, arthritis and allergies.

Energy poverty is strongly associated with sub-optimal mental health caused by the financial stress of coping with high energy bills and debt. Energy efficiency measures that improve the affordability of energy bills in low-income homes can have a measurable effect on improving mental well-being and preventing mental disorders (e.g. anxiety and borderline depression).

After deep renovation, occupants are able to regulate their indoor temperature, while a modernized ventilation system improves air quality and controls humidity levels, thus preventing dampness. Regulated temperature and improved air quality exacerbate many health conditions.

Benefit 6: Enhanced image and marketability

Deep renovation increases the value of the building and individual flats in particular, from which owners benefit via selling or renting out their flats. The insulated facades of the building at the final stage of the renovation are usually freshly painted, improving the aesthetic appearance of the building and increasing the neighborhood value.

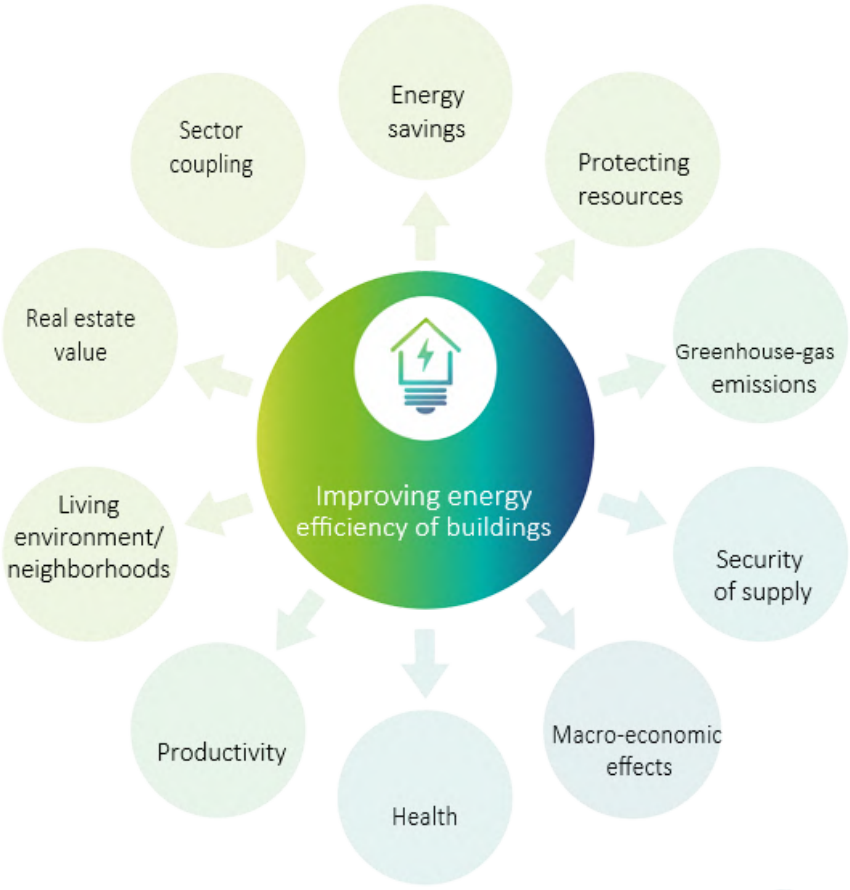

Figure 6. Micro- and macroeconomic benefits of energy efficiency (ComAct project, 2022d)

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AUTHOR

Solutions for scaling up renovations for energy efficiency in multi-apartment residential buildings in Estonia

AUTHOR

Anu Sarnet, EKYL

ABSTRACT

Almost all Estonia's housing stock is privately owned. High share of the population lives in multi-apartment buildings (MABs), managed by homeowner associations (HOAs). The biggest difficulties in carrying out energy efficiency retrofits are lack of proper long-term financing and lack of awareness towards the benefits of these retrofits. In order to overcome these challenges, well-designed apartment ownership legislation is necessary. Furthermore, regular training is essential for HOAs aligned with a well-developed outreach model and network helping to influence the target groups' attitudes. For proper financing, the combination of loans, grants, and guarantees has proven to be successful.

Keywords: awareness raising, trainings, financing renovations, multi-apartment buildings, Baltics

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I. INTRODUCTION

This article is based on a case study published in Energy Efficiency and Residential Buildings Management in Central and Eastern Europe - Compendium of Best Practices- (Habitat for Humanity Macedonia, 2022)

Estonia has a high energy consumption rate, with homes accounting for nearly half of it. Approximately 70% of the apartment buildings in Estonia were built in 1960−1990s without paying much attention to energy efficiency. As a result, housing plays a critical role in boosting energy efficiency and supporting renewable energy.

Since the majority of the housing stock consists of privately-owned apartments, the main focus of Estonian housing policy is on the modernization of outdated and energy-intensive housing in MABs. The Estonian government approved the long-term building renovation strategy in 2020, the main goal of which is to cost-effectively renovate the existing building stock into nearly zero-energy buildings by 2050 (Ministry of Economic Affairs and Communications, 2020).

The main challenges with reducing the energy consumption of the buildings are:

- influencing attitudes, behaviors, and beliefs towards energy efficiency in the target groups, and
- lack of financing.

Renovating old buildings requires significant resources from owners and is not attainable for many low-income households, in particular in rural areas where real estate values are low. Therefore, the solutions, developed by different stakeholders in Estonia to scale up renovations for energy efficiency in MABs, are mostly focused on financial mechanisms as well as training and outreach programs.

II. METHODOLOGY

ii.i. Stakeholder involvement

70% of the population lives in apartment buildings, which ratio is extremely high compared to other European countries. In 2018, the new Apartment Ownership and Apartment Associations Act entered into force in Estonia, in which the most important change is that all apartment ownerships are managed in the form of self-managed HOAs in Estonia, and all HOAs are formed on the basis of law. Today, there are 23 000 HOAs in Estonia.

Due to the above, HOAs and apartment owners in these associations form the target groups when it comes to the renovation and energy efficiency of MABs in Estonia. In order to enhance openness towards retrofitting in Estonia, the following stakeholders of energy efficiency investments were targeted:

- HOAs: self-managed non-profit HOAs established for the management of the apartment buildings; responsible for organizing apartment owners and managing the renovation project proposal, reporting to banks and grant implementing agencies, collecting loan payments etc.,
- apartment owners: responsible for making a collective agreement to undertake the renovation of the MAB,

- KredEx: (Estonian Business and Innovation Agency since 2022) in charge of coordinating the operational aspects of the financial supporting instruments for apartment associations (KredEx, 2022),
- the Ministry of Economic Affairs and Communications: in charge of policy-making and steering progress of the renovation of the housing stock,
- commercial banks: while providing loans for HOAs, taking on lenders' risks through checking borrower eligibility, repaying the loan and checking compliance,
- Estonian Union of Co-operative Housing Associations: federation of HOAs, supporting the renovation of MABs through the implementation of knowledge-based activities as training, consulting and advisory services.

ii.ii. Developing financing mechanisms for renovation

For the retrofitting of residential buildings, the cost of renovation, as well as the various schemes and mechanisms to finance it, are determining factors. The main challenge is how to use financial engineering to bring the cost down and support large-scale investments in energy efficiency.

In Estonia, the public financial institution KredEx, established in 2001 and owned by the government, funds particularly ambitious, deep energy renovations. It provides financial solutions to citizens and local governments, offers loans to HOAs and provides grants to the beneficiaries (KredEx, 2022). Energy efficiency improvements in buildings represent a large share of its financing.

The scheme design and financial legislation allow HOAs, local authorities and private persons to obtain common loans and receive grants. The legislation also allows a combination of grants and loans to achieve energy efficiency and proper indoor climate conditions comparable to modern apartment buildings.

The core principle of the financing program for the renovation of apartment buildings in Estonia has been that the loan and grant recipients are HOAs, not apartment owners individually or management companies. In some cases, also rural municipalities or cities can apply for grants if the apartment building is owned by the local authority in its entirety. Currently, KredEx is providing apartment building renovation loans for HOAs that have received a negative response to their renovation loan application from a bank or an offer with unreasonable terms. Furthermore, KredEx also provides loan guarantees for HOAs who want to take a bank loan for investments to raise the quality of life for their residents but the risk of the planned investments are deemed by banks to be higher than normal (KredEx, 2022).

Some examples of grants:

- Renovation grant: round-based grant intended for the renovation of apartment buildings. The grant amounts to 30-50% of the renovation costs depending on the region where the building is located. The aim is to ensure a more uniform regional distribution of grants and to provide a more equal level playing field between high-income cities and low-income rural regions when it comes to applying for the grant (KredEx, 2020).

- Factory reconstruction grant for MABs (KredEx, 2021): is targeted to large-panel buildings that were built on the basis of a standardized design. This grant helps to facilitate the adoption of new technical solutions in the reconstruction of apartment buildings.

High variety of costs are eligible for support, including reconstruction and insulation of the facade, balconies, roof, basement, enhancing heating system, water supply system, electrical system, lifts, replacement of windows and doors, construction of a heat-recovery ventilation system, installation of equipment necessary for using local renewable energy, preparation of the building design documentation, carrying out the site investigation and auditing, use of the services of the technical consultant and owner supervision.

In addition to the state grants, smaller, specific renovation allowances are offered by municipalities in Estonia. Municipal subsidies for MABs allow them to fulfil local needs that are not covered by state-funded renovation grants. These financial schemes include, by the example of the city of Tallinn, facade renovation allowance, restoration benefit, support for audits of balconies and canopies, support for the improvement of outdoor areas, landscaping grants, and training grants for board members of HOAs.

If state funding is used for a full-scale renovation, HOAs in Estonia are obliged to use a certified professional called a "technical consultant" in the renovation process. The role of the technical consultant is to lead the whole renovation process from the project development to the end of the work. The technical consultant advises the beneficiary on the budgeting of the design, construction works, procurement of design and construction works, preparation of time schedules and carrying out other necessary processes. The main task of the technical consultant is to advise HOAs on technical issues, in particular before the start of the renovation works, but also at the later stages of the renovation process. The content and scope of the services commissioned from the consultant is a matter for the condominium to decide. The costs related to the technical consultant are eligible for state support. The condominium has to select a technical consultant from the list published on the website of state-owned financial institution KredEx.

The technical consultant in Estonia is an individual who has undergone competence training in the renovation of MABs and passed the examination. He or she provides services on the basis of a written agreement between the applicant and the technical consultant or between the applicant and the company through which the technical consultant provides the services. A sole proprietor may also act as a technical consultant. The technical consultant must provide an independent service. He or she may not have any economic interest in the companies from which bids for design or reconstruction work are requested and which will carry out such work.

ii.iii. Training programs for HOAs

A special training program has been developed by the Estonian Union of Co-operative Housing Associations for managers and members of HOAs in order to improve their knowledge and skills necessary to work as housing managers and carry out building energy efficiency renovation work.

The training program provides a systematic examination of the administration and management of HOAs with the aim to improve work processes and quality of work for those possessing administrative roles in condominiums. The program was launched in 1996 and has since then been updated according to the changes in the society and economy. Currently, two versions of the program are in use: a 60-hour and a 120-hour program including classroom training, online training, and study visits (Estonian Union of Co-operative Housing Associations, 2022).

The goals of the training program are to:

- increase the competence of professional as well as non-professional managers of non-profit HOAs in order to support effective and sustainable housing management practices,
- encourage owner-residents' commitments and community engagement by increasing their awareness and knowledge, to empower them as members of HOAs, and to allow them to be more independent and accountable for their consumption patterns, including energy consumption habits,
- mobilize practical expertise and knowledge from the multi-apartment housing sector and match it with national scientific, technological and political expertise to promote solutions for sustainable and affordable housing in MABs.

The program is aligned with the professional standards of the manager of HOAs in Estonia and prepares the participants for the professional exam according to the rules of the national qualification system.

The program consists of the following training modules:

- Collective Action & Cooperative Property Maintenance
- Administration of Apartment Association
- Management of Apartment Association
- Housing Legislation
- Organization of Building Works & Renovation Process

The program is easily applicable to the housing conditions and professional standards in countries, where HOAs or condominiums are part of the housing system (Estonian Union of Co-operative Housing Associations, 2022).

ii.iv. Awareness-raising and outreach model

Estonian Union of Co-operative Housing Associations developed a dissemination and outreach model that includes key stakeholder groups of energy efficiency in housing (homeowners, HOAs, state institutions, energy and climate policymakers, municipalities, mediums, and the general public) valid for the whole country. The model of disseminating information offers a variety of options for engaging stakeholders and reaching wider audiences to promote the idea of energy-efficient renovation of MABs.

Elements of the awareness-raising and outreach model:

- national networking and dissemination events in cooperation with state authorities,
- regional conferences and roundtables of HOAs in different regions in cooperation with local authorities,

- specialized magazine for apartment HOAs focused on practical advice on housing management and best practices on renovation,
- media campaign with messages and exploitation activities for each specific target group, appearances in TV broadcasts, radio podcasts, press releases, etc.,
- handbooks for HOAs,
- regular information via online and social media channels: e-newsletters for stakeholders and target groups, Facebook, Twitter, web-pages, etc.,
- national surveys to collect data and feedback from target groups and stakeholders.

The outreach network is an extremely vibrant and evolving system, which on one hand provides support for HOAs facing their everyday challenges with housing management and energy efficiency, and on the other hand, supports policymakers in tackling their challenges with engaging the community and private sector commitments.

III. RESULTS

Deep renovation of MABs has been happening in Estonia for more than 10 years already, resulting in the highest ratio in the EU. The financing system, the technical solutions and HOAs' desire to renovate are there. The 50% energy savings achieved are accompanied by a healthy interior climate. Due to MABs renovations, the energy consumption of dwellings has remained the same within the past 15 years, despite the construction of new buildings resulting in the increase of building stock. The main bottleneck has been the unstable financing of support measures (Ministry of Economic Affairs and Communications, 2020).

The statistics show that between 2010 and 2014, the support measure for MABs helped save 60 GWh of heating energy a year. This equals the annual district heat consumption of the city of Haapsalu. The presumable annual energy savings made with the help of the 2015-2019 support measure for MABs are around 80 GWh. On average, the renovation of a MAB usually results in ~55% of heat savings and 5% greater electricity savings (Ministry of Economic Affairs and Communications, 2022).

Evidence from Estonia (Pikas et al. 2015) shows that a state-subsidized renovation has been, in practical terms, budget neutral with direct financial support used in the last 10 years. The large-scale renovation has generated positive effects on the macroeconomic level, quantified in terms of job creation and tax return. 17 jobs per one million euros of investment in renovation have been created directly and indirectly annually in Estonia. Tax revenue from renovation construction projects has been quantified to be 32–33% of the total renovation project costs.

IV. CONCLUSIONS AND RECOMMENDATIONS

In a situation where the majority of apartments are in private ownership, a well-designed apartment ownership legislation is necessary to create the essential framework for the energy-efficient renovation of MABs. Laws that provide clear guidelines about apartment owners' rights and obligations, as well as clear voting rules in HOAs, facilitate effective and transparent processes of maintenance and management of apartment buildings. These then ensure the commitment of all owners, which is necessary for the implementation

of renovation through exploiting financial assistance measures to the maximum.

Regular training is essential for housing managers in order to improve their knowledge and skills necessary to work as housing managers and carry out energy efficiency renovation work. A well-developed outreach model and network help to influence the target groups' attitudes, behaviors, and beliefs towards energy efficiency in residential buildings, and build a positive public opinion to support the issue.

When it comes to financial instruments to support the renovation of MABs, a combination of loans, grants, and guarantees has proved to be successful. In addition to state support, municipal financial instruments play an important role in fulfilling special local needs that are not covered by state-funded renovation grants and in engaging local HOAs to improve the living environment of the tenants.

Large-scale renovation generates positive effects on the state's macroeconomic level, quantified in terms of job creation and tax return, making partially state-subsidized renovation, in practical terms, budget neutral. It turned out to be very beneficial if HOAs use an external certified professional ("technical consultant") for planning the renovation process. The role of a technical consultant is to lead the whole renovation process from the start of the project to the end of the work.

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AUTHOR

Anu Sarnet

Fuel of the poor - household use of firewood in Central and Eastern Europe

AUTHORS

Anna Zsófia Bajomi, Habitat for Humanity Hungary
Nóra Feldmár, Habitat for Humanity Hungary
and other contributing authors

ABSTRACT

Solid biomass (mainly firewood) is a widely used fuel globally. Firewood is also the "fuel of the poor", primarily used in low-income households, especially in the Global South and Central-Eastern Europe. Habitat for Humanity in Bulgaria, Hungary, and Romania, together with World Wide Fund for Nature (WWF), investigate firewood use's social and environmental aspects in the frame of the Bio-Balance project. This study presents preliminary results of the research and highlights that while in most of the EU countries biomass provides most of the renewable energy, domestic firewood use is a significant contributor to air pollution due to outdated devices and heat inefficient homes. At the same time, rising firewood prices increase the burden of covering energy costs among the typically poor firewood users.

Keywords: energy poverty in rural households, heating with firewood, air pollution, policy recommendations

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I. INTRODUCTION

Woodfire has been a fundamental part of human life and civilization since prehistoric times, providing means of heating, cooking, and lighting. Today, through technological and economic advances, its role is less crucial as centralized networks of gas, electricity and district heating have entered the homes of many. While more privileged households are already moving on to more advanced technologies – such as solar-powered heat pumps and smart appliances – around half of the people worldwide still use wood and other solid fuels to keep their homes warm and to cook food (Ali et al., 2021).

Therefore, to this day, solid biomass (mainly firewood) is one of the most important household energy sources globally. It is the "fuel of the poor" as mainly low-income households rely on it, especially in the Global South and Central-Eastern Europe (CEE). Firewood can be a more independent and affordable option than other energy sources, however, managing it can be tiresome and time-consuming and many people do not have the option to change their heating system and fuel source. Furthermore, biomass burnt in inefficient devices is wasteful and imposes health risks of indoor and outdoor air pollution.

The "energy ladder" captures well the relationship between income and the dominant energy source used for cooking and heating as Figure 1. shows below. At the lower steps of the ladder, low-income households rely on solid fuels, including firewood and coal. As the households' income increases, they step up on the ladder and gain access to cleaner energy sources, such as natural gas or electricity alongside with accessing more advanced and efficient cooking, heating and cooling equipment.

Firewood can, however, be used in sustainable, efficient, and clean ways both in centralized, industrial settings and directly in the home. Woody biomass should come from sustainably managed forests or in the form of by-products (e.g., timber production or agriculture) and be burnt in modern heating systems, which meet strict environmental and safety standards. It can also provide an alternative, off-grid energy source independent from the sometimes fragile and unpredictable energy markets and supply.

Wood-based energy is the main source of renewable energy in the EU, with a share of almost 60% (JRC et al., 2021). It already plays an important role in the energy mix, which is expected to become more crucial as the EU and other countries are trying to decrease their fossil fuel dependence and reduce greenhouse gas emissions. A just and sustainable energy transition, however, can only happen by respecting the limits and boundaries of our natural resources and by adopting stringent environmental and social criteria.

Strategies and policies framing the energy transition in the EU, such as the European Green Deal or the Fit for 55 Package tend to encourage a high technology future including smart infrastructure and advanced renewable energy systems. These often assume a certain degree of financial and material status, which is far from the reality of many countries, especially in the CEE region. Therefore, low-income households that rely on firewood and solid fuels need to be supported by policy instruments and subsidies to climb up the energy ladder and be part of the transition.

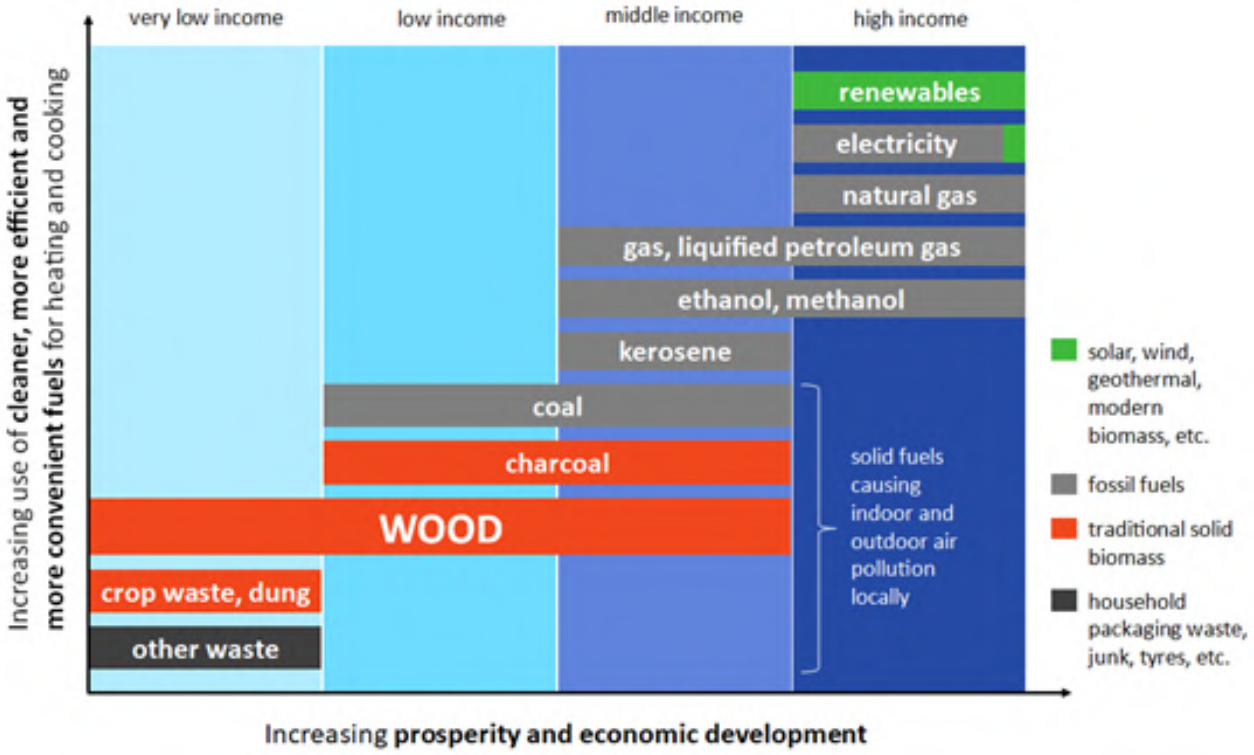

Figure 1. The energy ladder. Based on (Roser, 2021)

Recent crises triggered by the COVID-19 pandemic and the aggression against Ukraine are dramatically impacting energy markets, politics, policies and how people use and think about energy. Many will resort to firewood as fossil fuels become unaffordable or less accessible. At the same time, these crises have also increased the cost of wood products (including firewood), putting low-income and vulnerable households at even greater risks of (energy) poverty.

This study sheds light on the situation and challenges these households face, focusing on the EU Member States in the CEE region. It aims to provide a basis and input for future policies to successfully incorporate social and environmental considerations when dealing with the complex issues of biomass-based energy and the "fuel of the poor".

II. METHODS

This study is an outcome of the Bio-Balance project, which aims to balance solid biomass use for climate neutrality in CEE countries. Its overall objective is to support the EU Member States to shift to a low-carbon and resilient economy by ensuring that solid biomass is produced and used sustainably at all levels, considering both environmental and social aspects of sustainability. The project aims to reach the overall objective through three pillars: national-level policy advocacy, local-level best practices, and their replication and transfer (LIFE Public Database, 2021). The study explores European and national statistical data and other sources of information on social aspects of biomass use in CEE to provide evidence for project activities.

III. RESULTS

iii.i. Firewood in the energy mix

The use of solid biomass – typically firewood – for home heating and cooking tends to be considerably more common in countries with the relatively worse economic situation, which is the case of the CEE region in the EU. Within these EU Member States, solid fuels are used mainly by low-income households living in poverty, many facing extreme conditions.

At the household level, firewood and other solid biomass are the main forms of renewable energy consumption in the whole EU. The average share of biomass from household renewable energy use in the EU was 83% in 2020, and in nine out of ten CEE Member States, it was above 90 % (see Figure 2.). There is an even more apparent East-West divide within the EU when countries are ranked by the share of household biomass use in all sources of energy consumed. Practically all CEE countries' share is above the EU average, while most Western-European countries fall below the EU average in these aspects (see Figure 2.).

Firewood is primarily used as a heating fuel; therefore, it is prevalent in household heating, scoring second after the natural gas in the EU, covering almost a quarter of total energy consumption. In the CEE region, this share is often more than double (see Figure 3.).

iii.ii. Drivers of firewood use

There can be a variety of reasons and factors behind choosing firewood to heat one's home. One factor is the lack of access to gas and district heating services, as these often do not reach entire towns, villages, or streets, especially in the remote areas (mountains, farms) or disadvantaged, segregated neighborhoods. Roma communities are disproportionately affected by this. Furthermore, after being disconnected from an energy service, due to accumulated unpaid bills, households often switch to solid fuel heating.

Firewood is a form of energy that provides flexibility and autonomy, as there is no need for connection to centralized energy services. Unlike most energy services, firewood is a ”prepaid” purchase and can be locally stored for later use. Thus, it provides independence from monthly bills, the fear of disconnection and the risk of supply disruptions due to external events. Biomass heating and cooking systems are often combined with gas or other energy sources, providing the choice to instantly switch between centralized and decentralized forms of energy, e.g., in the case of price changes. Firewood can be purchased from various suppliers, and it can also be directly harvested from the forests or the vicinity of rural areas – either legally or in informal/illegal ways. When firewood becomes less accessible or affordable, it can be substituted by various alternatives in most heating appliances. Examples are biomass briquettes, coal products or other combustible materials such as plastic waste, tyres or old furniture, the fumes of which are extremely harmful.

In the 1990s and 2000s, firewood was usually cheaper than other energy sources. Thus, many households remained to use firewood as it was affordable, especially in the light of radically increasing gas prices. In the past decade, however, the price of firewood has been sharply increasing, which is further accelerating due to the recent

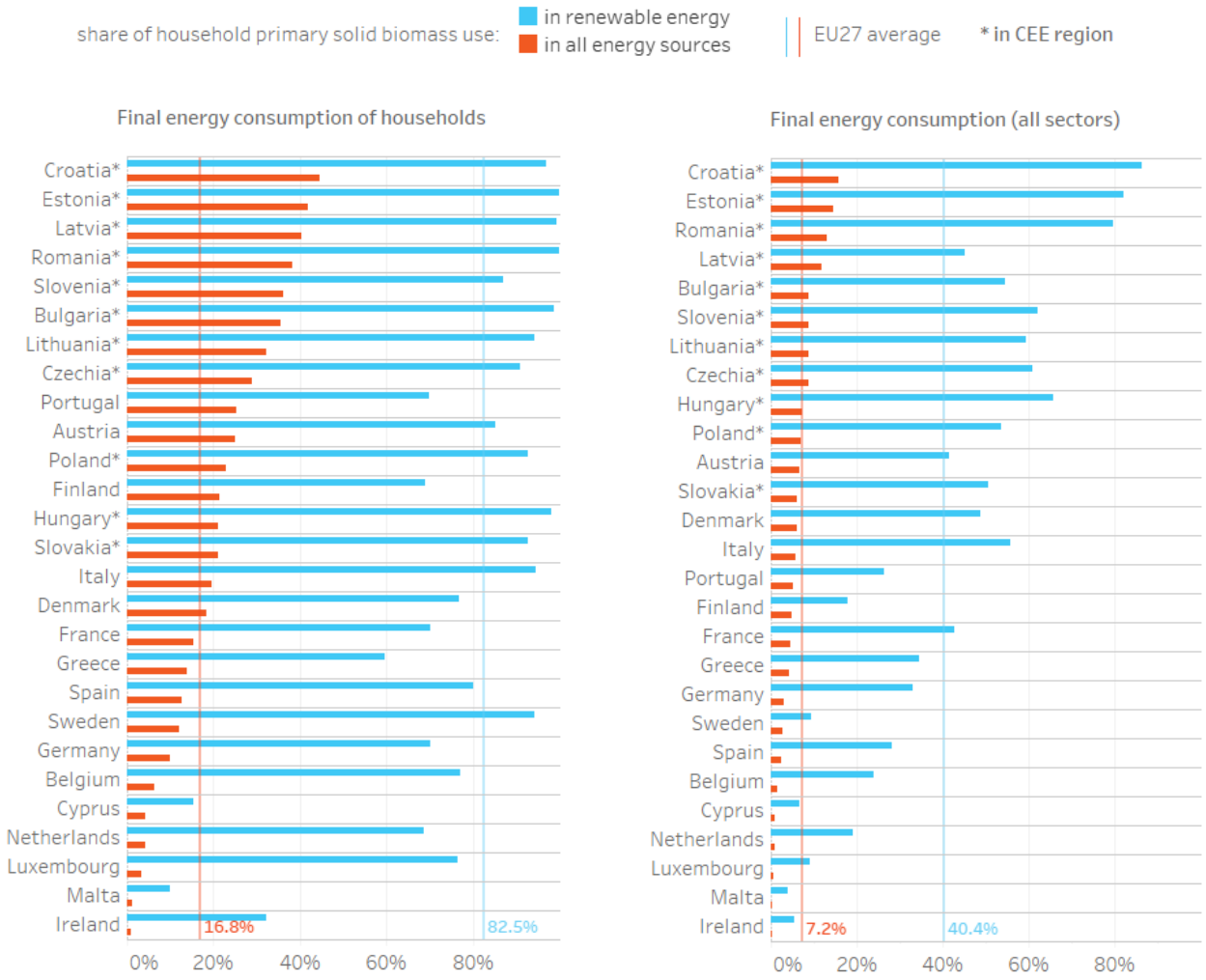

Figure 2. Share of household primarily solid biomass use in EU Member States

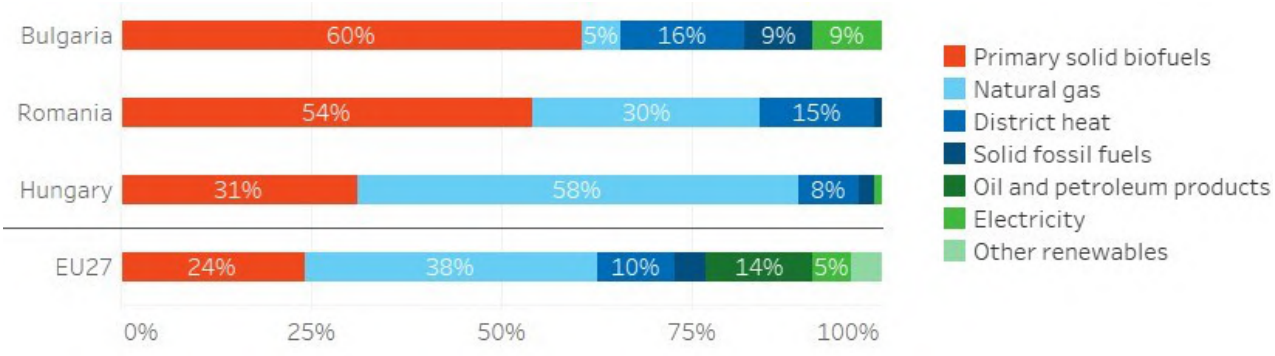

Figure 3. Share of energy sources in final energy use by households for heating, 2020 (Eurostat, 2022)

crises. This affects poor households disproportionately, who rely on a higher share of firewood and are unable to switch to cheaper fuels, since switching between fuels often involves significant installation and connection costs. Also, to use firewood economically, it should be acquired to dry it in advance for at least a year. This requires savings that poor households do often lack. Installation of a simple solid fuel heater (e.g., a metal stove) directly connected to an existing chimney is considerably cheaper than most other heating systems. More and more stricter building and appliances regulations in the EU, however, impact solid fuel heating (e.g., EcoDesign regulations (Directive 2009/125/EC, 2009) or minimum safety standards of chimneys) and are pushing the cost of heating installations higher.

For some, firewood use is a voluntary choice. It can be part of a conscious lifestyle choice of the individuals or communities who wish to live more simply, be self-sufficient and/or minimize their environmental impact. And for a lucky few, who can afford it, a fireplace is just a nice addition to a homely atmosphere, where one can enjoy the crackling sound of firewood with a book or some wine.

iii.iii. Housing conditions and energy poverty

Europe is part of the global housing crisis, with millions lacking access to decent and affordable housing. Home ownership is much more prevalent in the CEE region than in Western Europe, while the share of social housing is far below what would be needed. Thus the main housing expense of most low-income households is to cover their energy costs. Furthermore, home maintenance and improvement are their responsibility, and they rarely receive financial or other assistance for it. These drivers of energy poverty result in lower living conditions and in that the CEE region is more severely affected by energy poverty than the Western countries. The legacies of state socialism, such as the inefficient building stock and energy infrastructure, can partly explain these sharp differences.

Access to basic infrastructure and amenities

Regrettably, extreme forms of poverty are still prevalent in the CEE region where hundreds of thousands of households lack access to basic services and networks such as drinking or running water, sewage treatment, paved roads or even electricity. Lack of running water means no bathroom or toilet, and lack of electricity means the inability to reach numerous essential services of the 21st century. Households without these amenities typically use firewood and other solid fuels for heating – often for cooking and water heating – in the most basic metal stoves, which are highly inefficient and polluting.

Housing quality and energy efficiency

The amount of energy needed to heat a home adequately is primarily determined by the quality and especially by the energy efficiency of the dwelling and by the appliances used within. The housing stock of the CEE region is considerably less efficient than the EU average (ODYSSEE, 2019). Low-income households cannot afford to live in newly built, high-performance homes and lack the resources to renovate. Therefore, they are likely to need more energy to heat their home than high-income households living in dwellings of the same size. High energy expenses – especially in the

wintertime – further reduce the possibility of saving money for repairs and renovation, reinforcing the vicious cycle of energy poverty.

Affordability and energy prices

In the CEE region, solid fuel heating is dominantly used by low-income households, therefore, users are highly vulnerable to price increases. On the other hand, when gas prices increase, rural households tend to shift to using more firewood. This can be illustrated by the example of Hungary, where biomass use sharply increased as a response to the rise in gas prices following 2006. This was halted in 2013 by the national regulation, which reduced and fixed utility prices at that level. Gas price has decreased by 25 % compared to the price in 2012. Consequently, biomass consumption decreased, however, it is still higher than pre-2006 levels.

In Hungary, it is most common among households with the lowest incomes to use only solid fuels for heating, therefore, they are less capable of switching to gas when prices decrease. Higher-income households use solid fuels more typically in combination with gas heating, enabling them to optimize their consumption based on fuel prices (see Figure 4., Feldmár, 2020).

While Hungary plans to maintain the state-controlled prices (About Hungary, 2022) - except for above-average users according to very recent policy changes in July 2022 -, the unprecedented rise of fossil energy prices in the EU has made electricity and gas unaffordable for the masses in the EU, pushing even middle-class households into energy poverty and to the use of firewood (Tilles, 2022). At the same time, the post-COVID-19 inflation of raw material prices has significantly impacted wood products, and the aggression against Ukraine has put further strain on their trade. Transporting and processing solid biomass also requires fossil energy. Thus the fear of gas supply disruptions across Europe is further increasing firewood demand and prices (Reuters, 2022).

Therefore, affording adequate energy levels in the home is becoming increasingly difficult for millions of Europeans. The CEE region is at particular risk due to weaker economies and welfare systems.

Figure SEQ Figure * ARABIC 7: Fuels used for household heating by income quintiles, Hungary (2019)

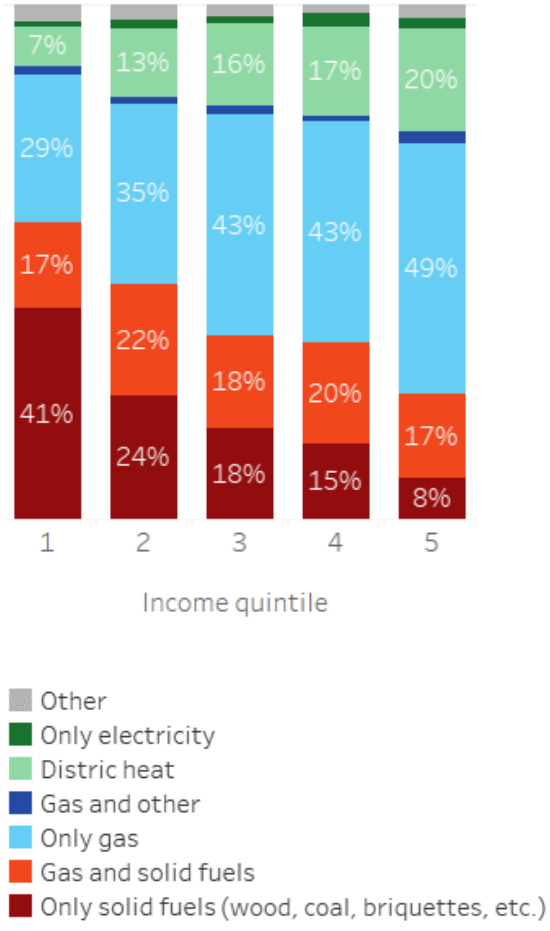

Figure 4. Share of fuel types used for heating by income quintiles

iii.iv. Heating devices and systems

Valid for all technologies using energy, a set of crucial factors determine the performance of solid biomass-based space heating systems i.e., how good they are at keeping a home warm by turning fuel into heat. These factors include the temperature of combustion, ventilation, the heater's heat-storage capacity, the fuel's quality (e.g., moisture content of firewood) and the user's behavior. The specific heating system that a household is equipped with depends mainly on the characteristics of the dwelling, the residents' preferences, what is available on the market, on the income and savings of the household as well as whether financial support and information are accessible if they want or need to upgrade.

In the CEE region, low-income households often rely on the cheapest local space heaters, usually metal stoves with low efficiency and poor heat retention. These stoves need to be fed often and consume a lot of wood. Masonry heaters can also be found in many CEE households and due to the excellent heat retention capability of their large mass, consume significantly less wood than metal stoves. The construction of a quality masonry heater requires a significant financial investment. Pellet stoves are relatively modern heaters that are more convenient to use than stoves fuelled by wood logs. Pellets contain significantly less moisture than wood logs and therefore, their calorific value is also better. Pellet stoves, however, are more expensive than traditional metal stoves.

In biomass-fuelled central heating systems, wood or other solid fuels are combusted in a boiler stove that heats water circulates in the home, and heat is dissipated through radiators. They also provide the hot water needs of the dwelling(s). A central system has a relatively high installation cost. Outdated centralized systems, common in rural areas of the CEE countries, are highly polluting and inefficient, which, combined with the low efficiency of the housing stock, results in high solid fuel consumption. These boilers can also be fuelled by coal products and other highly polluting materials, such as painted or glued furniture boards or car tyres. On the other hand, modern central systems, including pellet-based ones, use highly efficient and significantly less polluting boilers.

iii.v. Environment and health

Housing quality and energy efficiency

Residential solid fuel heating (wood, coal, waste, etc.) is the largest source of fine particle emissions (PM10 and PM2.5) in Europe, resulting in the premature death of hundreds of thousands of citizens yearly (European Environmental Agency, 2020). At the same time, this highly polluting form of energy is the largest source of renewable energy in most of the CEE. Furthermore, wood as an energy source is primarily considered CO2 neutral due to the carbon stored in the trees. However, considerable CO2 emissions are released during combustion, contributing to current greenhouse gas emissions in the atmosphere. This emission is indirectly recorded under land use, land-use change and forestry sector. Current climate policies, however, do not address this issue sufficiently, allowing EU Member States to burn biomass to reach their renewable energy targets. Stronger sustainability criteria and ambitious carbon sequestration targets are foreseen in the Fit for 55

Package, to secure a role for biomass in the energy transition with strong environmental safeguards.

Well-being

Severe health risks associated with households solid fuel heating-related emissions, e.g., vascular and respiratory diseases or cancer impact its users and their local communities. Furthermore, using firewood is often time-consuming and physically demanding, adding to the various stresses caused by (energy) poverty. In the CEE countries, solid fuel heating – at the bottom of the energy ladder (see Figure 1.) – is the most prevalent among underserved and segregated communities. Their well-being can only be significantly improved by complex efforts to alleviate the root causes of their energy poverty. A key approach for this is providing access to affordable and clean energy.

Forestry

Bioenergy represents 60% of the final renewable energy consumed in the EU, from which 76% is derived from wood and other solid biomass (European Commission, 2019) The critical aspect of the long-term forest productivity, i.e., how much biomass grows in a forest, which can be harvested as timber or firewood, is sustainable forest management. Harvesting levels should be below growth levels so that net forest growth is positive. An estimated 26% of solid biomass used for energy is unaccounted or uncategorised, thus its origin is unknown (JRC, 2021). According to an in-depth analysis of the Bio Screen CEE project, the gap between the supply and demand side was even more significant, varying between 40-50% (EUKI, 2021). The actual level of illegal logging is unknown but possibly contributes significantly to the deficiency.

IV. CONCLUSION AND RECOMMENDATIONS

Firewood has always played an important role in keeping homes warm. While it is primarily the ”fuel of the poor”, we can expect more and more households to turn to this energy source due to high fossil energy prices and fears over supply security. Solid biomass will also become increasingly dominant in the energy mix as the EU Member States increase their renewable shares to reach renewable targets set for 2030 and 2050. The increased demand will likely further increase fuelwood prices, putting even more strains on energy-poor and vulnerable households. When good quality solid biomass, efficient heating devices and energy retrofits are not affordable or accessible for low-income households, they are forced to use low-quality solid fuels and heating devices. These can cause significant air pollution and negative health impacts.

The previous sections have illustrated that these issues disproportionately affect the CEE countries. A just energy transition can only happen if these are recognised in their complexities and are specifically targeted and tackled by policies and support mechanisms at the EU, national and local levels. Recommendations to establish these policies and mechanisms are detailed below.

iv.i. Overarching recommendations for the EU and national level

- The contradiction of biomass (as sustainably harvested clean, renewable fuel versus highly polluting “fuel of the poor” associated with deforestation) should be resolved.

- The energy transition must enable low-income households to switch to clean and affordable heating solutions.
- NGOs and advocacy groups are crucial in finding and piloting effective solutions, making the voice of households heard and shaping policies with their first-hand experience. Therefore they should be involved and supported in the process of the energy transition.

iv.ii. EU level recommendations

- The first fund targeting explicitly energy poverty, and the energy transition of low-income households is the Social Climate Fund (SCF), which is to be rolled out as part of the Fit for 55 Package (its details are still debated at the time of writing this report). The SCF and other EU funding targeting the energy transition should specifically address the issue of solid fuel and biomass heating in a socially sensitive manner.
- Stringent monitoring and enforcement mechanisms paired with conditional payments are needed to ensure that
  - planned policies are implemented, especially regarding energy poverty alleviation,
  - households in need are prioritized and benefit proportionally from the EU funds based on their difficulties,
  - deep renovation and modernisation of the worst-performing building stock is commenced,
  - heat transition starts with a social solid fuel heater exchange programs targeted to the poorest. These should also counter-balance negative social impacts of sustainability criteria, such as the Ecodesign regulation of the solid fuel heaters that increase prices locking-in through outdated devices of the poor.
- To monitor energy poverty in its complexity, Eurostat should include the following indicators into its dataset:
  - share of households lacking access to modern energy services,
  - type of heating of households (including central and local heating with solid fuels). This requires guidance for the EU Member States to monitor heating in their country,
  - and firewood prices.

iv.iii. National and local level recommendations

- The CEE Member States need considerable effort and commitment to achieve their climate and energy targets and implement realistically designed strategies and policies. These policies should take into account the issue of solid fuel heating aiming to
  - improve the comfort of heating,
  - reduce energy costs,
  - improve indoor and outdoor air quality,
  - reduce consumption of biomass.
- The EU funds need to be directed towards energy-poor households with special attention to solid fuel users. Groups that are more affected or at higher risk need to be identified and accordingly supported – examples are the elderly, single (parent) households or Roma communities.
- The EU Member States shall start the renovation of the worst-performing building stock combined with a well-planned residential heat transition. Modern, highly efficient heaters

and the combination of biomass-based central heating with other renewable systems, such as solar panels and heat pumps, can significantly improve the quality of heating and diversify the fuel mix for households. Small, municipal district heating systems can also be an option.

- As solid fuel use and energy poverty is a complex technical and social issue, ministries, authorities, and services responsible for social problems and poverty need to be included when solutions are planned and implemented.
- Penalisation, criminalisation, and stigmatization of solid fuel users will not solve the issue of polluting heating methods. Targeted support mechanisms should be the key tool of eliminating polluting fuel use.

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AUTHORS

Anna Zsófia Bajomi

Nóra Feldmár

ABOUT HABITAT FOR HUMANITY INTERNATIONAL

Driven by the vision that everyone deserves a decent place to live, Habitat for Humanity International is an international NGO that helps individuals and families achieve the strength, stability and self-reliance through decent and affordable shelter. With a presence in nearly 70 countries, our work includes residential energy efficiency; incremental housing support services; basic services such as water and sanitation, security of tenure, resilient and sustainable construction; inclusionary financing; community development; and policy advocacy. Habitat for Humanity International has programs and offices in 10 EU Member States and 6 countries in Energy Community countries outside the EU. In Europe, HFHI is a member of the European Housing Forum and a partner of Housing Europe and UN-ECE.

Habitat for Humanity®

Habitat for Humanity International, Europe and the Middle East, Area Office (HFHI EME) in partnership with USAID has been working on scaling up financing for the renovation of privately-owned multi-apartment buildings to increase the energy efficiency of these buildings and to alleviate the energy poverty of low-income/vulnerable homeowners. We call our approach residential energy efficiency (REE) and we have been implementing demonstration projects, conducting research and facilitating the whole eco-system of residential energy efficiency in Armenia, Bosnia and Hercegovina and North Macedonia since 2009. We work with municipalities and financing institutions to develop, test and scale financial models (a combination of subsidies and loans) for REE.

For our approach, check:
REELIH project: getwarmhomes.org
ComAct project: comact-project.eu

To find out about what we do, scan this QR code.

ABOUT REELIH PROJECT

Residential Energy Efficiency for Low Income Households (REELIH) project, led by Humanity International, Europe and the Middle East, Area Office and financed by United States Agency for International Development (USAID), uses innovative financing mechanisms to improve living standards in multi-unit apartment buildings and to soften the environmental consequences in Eurasia resulting from energy inefficient buildings stock, such as high pollution and CO2 emissions. The project was established in 2012 and is currently in the last year of implementation. The implementation takes place on the regional level and in three countries: Armenia, North Macedonia, and Bosnia and Herzegovina. REELIH focuses on developing regional efforts, resources and networks to address the impact of rising energy prices on collective privately owned housing. Working to involve all stakeholders who promote, create, finance and directly implement energy efficiency projects, REELIH is one of the few energy efficiency projects in the region that works with homeowners and homeowner associations (HOAs) in the multi-apartment buildings.

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REELIH
RESIDENTIAL ENERGY EFFICIENCY FOR LOW-INCOME HOUSEHOLDS

The project addresses energy poverty, health concerns and air pollution resulting from highly energy inefficient residential building stock. Firstly, it battles energy poverty. By implementing energy efficiency retrofits, REELIH helps low-income families reduce their energy consumption by 40-50% and develop more savings over time. Secondly, REELIH addresses health concerns that come with living in poorly insulated homes and reduces the risk of contracting illnesses such as asthma, seasonal affective disorder, and allergy-related and infectious diseases. Thirdly, REELIH decreases air pollution by creating ways for households to consume less energy and thus decrease contributions to CO2 emissions.

To find out about more about the project, scan this QR code.

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Contact

Habitat for Humanity International
Europe and the Middle East, Area Office

Mlynske nivy 5
821 09 Bratislava, Slovakia

Veronika Kiss

Research Coordinator of the Observatory
vkiss@habitat.org

Zita Kakalejčíková

Manager of Residential Energy Programs
zkakalejcikova@habitat.org