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JUST TRANSITION PATHWAYS

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Introduction

Abstract

This case study examines energy poverty alleviation within the context of Central and South-Eastern Europe (CSEE), with focus on Croatia and comparative references to Slovenia and Serbia. The research addresses a key gap in data availability and policy implementation, particularly regarding housing tenure, undocumented dwellings and the accessibility of renovation schemes for vulnerable groups. The objective is to assess how EU-level frameworks are translated into national measures and whether these measures enable a socially just transition. The guiding research question is: How do energy renovation policies mitigate or reproduce social inequalities in the housing sector? Headline findings reveal persistent structural blind spots: the very groups most at risk (low-income households, elderly residents, single parents, tenants, rural communities and those reliant on solid fuels) are often excluded from funding schemes. Civil society organisations emerge as essential intermediaries yet remain underfunded and precariously positioned. The main contribution demonstrates that energy poverty is not merely a technical or welfare issue but is co-produced by -property relations, housing regimes, territorial distribution and governance structures, which advances the research on eco-social state transitions and policy design for just energy transitions.

Keywords

Low carbon city; energy efficiency; energy poverty; fair energy transition in SEE; renovation.

1 Overview

The principal area this case study aims to explore is the question of the social and environmental dimension of policy development and investment into energy poverty alleviation measures in Croatia, with comparative overview of the context in Serbia and Slovenia.

Croatia, along with other post-socialist countries in the region of Central and South-Eastern Europe (CSEE) has a high percentage of homeownership as a consequence of “right to buy” policies of privatization of the social housing stock during the process of economic and political transition from state socialism to a liberal market economy in the 1990s. Changes in the structure of ownership and consequentially management of buildings are determining differences within the socio-economic structure of population, reflecting also the capacities of households to deal with retrofitting of their homes. The (just and effective) implementation of policies of energy renewal in these countries therefore depends both on this heterogeneous socio-economic structure of owners-inhabitants, as on complicated and ineffective governance in residential buildings deciding the quality of management of investment and disinvestment.

The concept of energy poverty in European policy originated in the 2009 Third Energy Package, which introduced legal provisions for Member States to develop action plans addressing energy poverty and protecting vulnerable consumers. Since then, energy poverty has become central to the EU's energy and social agenda, reflecting the inability of households to afford adequate energy services. The European Green Deal highlights energy poverty as a critical issue, aiming to ensure a fair and just energy transition. It emphasizes renovation of buildings, energy efficiency improvements, and financial support to reduce energy bills for vulnerable households, linking energy poverty alleviation directly to climate and energy goals in the Green Deal.

In Central and South-Eastern Europe (CSEE) this is principally related to ownership structure of residential buildings so the study aims to examine the linkage between social well-being and environmental sustainability related to ownership of housing stock conditioning the process of energy renewal. Specifically, the study investigates the impact of EU financing mechanisms aimed at fostering green transition in terms of its capacity of sustaining social cohesion in order to avoid renovation, green gentrification and segregation of vulnerable groups. It aims to provide an overview of the results of implementation of EU and national policies and funding schemes to combat energy poverty and analyse the social dimension of the European Green Deal based on the principle “to leave no one behind”. In doing so, the study is targeting green transition policy interventions within the field of energy renovation in the housing sector in the EU level and local policies reflected within SECAP's - sustainable energy and climate action plans, the strategy “A Renovation Wave for Europe – Greening our buildings, creating jobs, improving lives”, EU Directive on Energy Performance of Buildings, national long-term building renovation strategies, building-related aspects of EU (and non-EU) countries' national energy and climate plans (NECPs), 2020 Commission recommendation on energy poverty, local climate plans, mitigation plans - social plans for climate policy at the national or municipal level, local adaptation plans and macro-regional strategies.

2 Research questions

This study seeks to explore several key research questions, including how the European plan to reduce energy poverty addresses the social dimension of housing and the relationship between energy poverty and the ownership and tenancy structures of households in post-socialist countries in Central and South-eastern Europe (CSEE), focused on Croatia with comparative analysis of Serbian and Slovenian context. Empirically, it aims to examine the current and planned policies targeting energy poverty in this region and the data supporting these initiatives. The study also investigates the financial mechanisms employed to combat energy poverty and whether housing prices are considered in these measures. Furthermore, it identifies the most vulnerable groups affected by the energy transition in both urban and rural areas and assesses the impact of this transition on them. Finally, it explores the necessary mechanisms to ensure that energy transition in households remains accessible and affordable for vulnerable populations.

The research questions focus specifically on understanding the social dimension of energy poverty and housing, as well as the effectiveness and inclusiveness of policies addressing energy poverty in Central and South-eastern Europe. These questions directly support the objectives of the GreenPaths project by providing a detailed examination of how European policies on energy and housing impact environmental sustainability and social wellbeing in a specific geographical and socio-political context. By investigating policy measures, financial mechanisms, vulnerable groups, and housing tenures and statuses, this case study contributes to the overall project objectives of illustrating the practical social and environmental effects of EU policies. This aligns with the goal to produce a comprehensive assessment of policy linkages and to evaluate their social and environmental impacts across diverse European regions.

3 Methods

The research employs a mixed-methods approach, combining desk research and policy analysis on energy poverty in Croatia, Slovenia and Serbia with data collection and analysis of secondary and primary data, including conducting focus groups, holding stakeholder (NGO, institutional, professional, scientific) meetings and conducting interviews with them.

The policy analysis was conducted by mapping the procedures of implementing the European directives and policies on the national level – primarily through analysis on how energy poverty was included in the National Energy and Climate Plans (NECPs) of all three countries and analysing how many municipalities have employed their own local programmes for addressing energy poverty. Additionally, we mapped the financial allocation of funds distributed through ministries and national entities with a specific focus on criteria for accessing these funds. Within the interviews with researchers and members of civil society we have mapped the process of creating first laws that provided definition of energy poverty within national legal frameworks where civil society played a crucial role.

After conducted desk research and policy analysis, interviews with researchers and members of civil society organizations working within the field of energy poverty were organized (4 from Croatia, 2 from Serbia and 2 from Slovenia) and a focus group with decision-makers from Croatia including two members of ministries dealing with energy poverty (Ministry of Physical Planning, Construction and State Assets and Ministry of Labour, Pension System, Family and Social Policy), one member from Environmental Protection and Energy Efficiency Fund responsible for allocation of funds and a member of City of Zagreb administration as the only municipality with a programme for combatting energy poverty in Croatia.

Both within interviews and a focus group with decision-makers we have detected the gaps in the systemic lack of data on housing tenures and accessibility to information and legal procedures regarding the most vulnerable groups which are crucial for effectiveness of the measures for combating energy poverty. Based on the combination of the data collected through research, statistical data, policy analysis and interviews/focus groups we were able to assess the shortcomings of existing policies.

4 Findings and results

In the Croatian case, planned and piloted measures for combating energy poverty combine building-level technical renovation (i.e. energy efficiency upgrades) with social-welfare instruments (i.e. targeted energy benefits and eligibility criteria). National calls for energy renovation of family houses and the developing national building renovation plan are explicitly linked with social-protection objectives: calls aim to map needs of households at risk of energy poverty and to expand eligibility beyond the narrow set of previous beneficiaries, and the Social Climate Fund (SCF) - on the EU level in the 2026-2032 period - is explicitly intended to couple energy transition investments with social measures to protect vulnerable groups. In 2025, an analysis carried out by the Ministry of Physical Planning, Construction and State Assets, with the involvement of local governments, is underway to determine new categories of vulnerable households, the aim of which is to allow for the inclusion of a wider group of beneficiaries, not limited solely to the recipients of so-called “guaranteed minimum benefit”.

Our analysis however shows there is a significant gap between national strategies and policies on reducing energy poverty and the effectiveness of the measures put in place. Implementation mechanisms in the Croatian case include: (a) targeted grant schemes for energy renovation; (b) social-welfare payments and energy-specific monetary benefits; and (c) local databases and outreach to identify households using high-polluting fuels. Important limits identified in practice are (i) eligibility framing that privileges property owners (e.g., proof of legalized ownership required in certain calls), (ii) narrow social-criteria in earlier schemes (guaranteed minimum benefit only), and (iii) limited mechanisms for reaching occupants of informal/unlegalized housing or tenants in multi-apartment buildings where decision-making and financing are more complex.

Following the main goals of the green transition, reducing energy poverty was included in the National Energy Climate Plan (NECP), Recovery and Resilience Plan and national legislation recognized the energy poverty within its energy policy in Croatia in the last

decade. However, the implementation of these policies remains limited in scope and ineffective in addressing the most vulnerable groups. The net effect is that while measures formally integrate a social dimension, operational design (eligibility rules, legal-status requirements, building-level finance models) risks excluding the most socially vulnerable occupants unless eligibility and outreach are broadened. Economically disadvantaged households experiencing financial hardship therefore remain reliant on fossil fuels and cheaper energy sources due to the impossibility of funding renovations, while more affluent households benefit from the funding schemes provided by the state and municipalities. This also generates a dual territorial bias that privileges urban areas over rural regions, and affluent neighbourhoods over socioeconomically disadvantaged ones.

Generally, Croatia's housing stock is characterised by very high owner-occupation (above EU averages), which is a legacy of post-socialist privatisation and housing policy. High home-ownership rates mean that energy-efficiency retrofit policies targeted at owners will, in principle, reach a large share of households, but that pattern also conceals important vulnerabilities: high ownership rates coexist with low liquidity to invest in renovations, and with concentrated pockets of renter vulnerability (social tenants, informal occupiers). Although Croatia has very high home-ownership ($\approx 89.7\%$ in 2019), the private rental sector (PRS) is disproportionately vulnerable: roughly 30% of tenants are among the most burdened by housing costs and at risk of poverty. Renting is usually described as insecure and often informal, exposing tenants to exploitation and short-term rentals have reduced long-term supply and driven rents up, producing very high burdens on household incomes. Furthermore, owner-occupied households may still be energy-poor because of low-quality building fabric, small pensions/low incomes or their inability to finance renovations; and national calls that require proof of legal ownership favour those owners who are document-compliant while excluding more precarious occupants.

Tenants and multi-apartment building residents face problems related to governance and split-incentives: building-level renovation requires collective decisions and co-financing arrangements. Thus identifying and subsidizing vulnerable tenants within multi-apartment buildings is administratively very complex and currently a recognized gap. A key barrier in tackling energy poverty is also the split incentive, or so-called "landlord-tenant dilemma", since property owners lack motivation to invest in energy upgrades (since savings do not benefit themselves directly), while tenants cannot make such investments themselves. This misalignment sustains inefficient housing and heightens vulnerability of tenants, underscoring the need for policies that align with their interests.

As part of this research, we gathered a focus group consisting of decision-makers from Croatia including two members of ministries dealing with energy poverty, one member from Environmental Protection and Energy Efficiency Fund responsible for allocation of funds and a member of City of Zagreb administration as the only municipality with a programme for combatting energy poverty. A focus group flagged the difficulty of identifying vulnerable households within multi-apartment buildings and ensuring funding where needed. Because of this, granular tenure-disaggregated energy-poverty indicators (owner vs rent, social vs private rent, legalized vs informal occupancy) and building-level ownership patterns are required to design equitable instruments. Current

reporting obligations (National Energy and Climate Plan - NECP) require monitoring of energy poverty, however the research and focus group strongly indicated that these data are not yet sufficiently disaggregated for tenure-sensitive policy design.

In Croatia, several measures and policies are currently in place or under development to address energy poverty, ranging from amendments to the Energy Efficiency Act, targeted building renovation programmes and municipal allocations for retrofitting city-owned housing to social-welfare transfers directed at energy costs and forthcoming EU-supported mechanisms such as the Social Climate Fund. These policies draw on national statistical indicators (such as the share of households unable to afford adequate heating) as well as EU-mandated reporting requirements like the National Building Renovation Plan. However, available data remain fragmented and insufficiently disaggregated by tenure or household type, limiting the precision with which interventions can be tailored to those most at risk.

The focus group with decision-makers pointed to certain gaps and limitations, emphasising that existing administrative and monitoring systems are fragmented across ministries and local actors; there is limited tenure- and household-level granularity in available energy-poverty statistics and monitoring of implementation. While the mechanisms stated above provide significant resources, they remain primarily grant-based and do not yet fully address structural barriers such as liquidity constraints of low-income owners, financing for collective renovation in multi-apartment buildings or protections for tenants who may bear the indirect costs of upgrades. Existing measures for tackling energy poverty do not explicitly integrate the dynamics of housing prices, despite the fact that rising housing costs significantly influence affordability and thus vulnerability. While policies aim to improve access to renovation funding across municipalities, they do not systematically consider whether large-scale investments might raise housing values and rents. This absence of anti-displacement or affordability safeguards points to a critical policy gap in linking energy-transition measures with housing-market regulation.

Overall, the most vulnerable groups in Croatia's energy transition include low-income households, elderly residents, social-welfare recipients, tenants in multi-apartment buildings, rural households reliant on polluting solid fuels and those living in unlegalized dwellings. These research results fully align with the available data related to vulnerable groups in energy transition elsewhere in the CSEE region. For these groups, the energy transition offers potential long-term benefits through lower bills and healthier living conditions but also poses certain risks, such as exclusion from funding due to legal or administrative barriers, increased short-term costs or exposure to rising housing prices in renovated areas. Addressing these uneven impacts requires careful policy design and targeted protections, but the absence of available data and documented anti-displacement materials is a notable gap in the research.

In the Slovenian case, planned and implemented measures couple building-level renovation and small-scale renewables (RSE) with social-policy safeguards and advisory/outreach services - underpinned by a 2022 Government Decree that codifies multi-dimensional criteria for identifying energy-poor households (material vulnerability, high energy burden, low building efficiency, unsuitable living conditions), mandates annual national assessments by the national statistical office (SURs), and is operationalized through rolling three-year action plans led by the energy ministry and

delivered via the Eco Fund (Slovenian environmental public fund). Crucially, the current action cycle is executed through three dedicated Eco Fund calls for energy-poor households: (1) a 100% grant (up to €18,000) for single-family homes whose occupants receive social/child benefits, covering one or more measures (insulation, windows, heating, etc.); (2) a call for insulation/facade upgrades in multi-apartment buildings for eligible low-income households; and (3) a call for heating-system replacement in multi-apartment buildings. Eco Fund performs pre-works building assessments and pays contractors directly—removing the up-front cash barrier and increasing delivery fidelity. This legal-statistical-programmatic chain (Decree - SURS annual estimates - 2024-2026 Action Plan - the Eco Fund delivery) goes beyond Croatia's still-widening eligibility work by embedding identification/monitoring directly into law and implementation plans and by aligning them with concrete, enclosed, final stage financial distribution instruments.

Implementation mechanisms mirror Croatia's grants-benefits-outreach approach but are more integrated in practice, which is seen in: (a) targeted investment incentives through the Eco Fund for insulation, heating replacements and household-level RES - delivered via the three energy-poverty-specific calls noted above, with no prefinancing by households because Eco Fund pays suppliers; (b) advisory and outreach via a national counsellor network and local coordinators that help residents prepare applications (social-work centres have been trained and can proactively refer cases; regional performance varies - e.g., Prekmurje region distinguishes); (c) consumer-protection tools (e.g., disconnection bans and advisory services signalled in the NECP); and (d) monitoring and evaluation through SURS and ministerial reporting. However, while renovation programs are monitored, small in-home help programs (e.g., bulbs, basic kits) have historically had weaker monitoring.

In terms of financial instruments and scale, Slovenia also fixes the financing and results chain with quantified targets - 8,000 households supported and 573 GWh cumulative savings 2023-2030, backed by €33.8 m (2024-2026) and EU funds including the incoming Social Climate Fund (SCF; more than €300 m expected for 2026-2032), while the NECP earmarks a large household-oriented investment envelope. Relative to Croatia, this pairing of earmarked national allocations, EU-level SCF integration and clear outcome metrics represents a more fully specified delivery architecture plus a clearer "one-stop" operational model at the last mile.

A key disparity with Croatia lies in identification and targeting tools. While Croatia is expanding eligibility beyond narrow social-benefit categories, Slovenia already operationalizes targeting through annually updated SURS estimates and Decree-based criteria; the Action Plan then translates these inputs into program targeting and regionally organized outreach. The design choice to condition the 100% grant by established social/child-benefit status offers speed and administrative simplicity, but the sources from the Focus Association for Sustainable Development warn of two targeting risks: (i) under-coverage of the "poorest of the poor" who lack formal benefit status yet are energy poor; and (ii) occasional mis-targeting (households that should not qualify still receive aid). A revision of the Decree has been signalled to tighten targeting and reduce leakage while improving reach to the hardest-to-serve. This reduces the "policy-to-practice" gap that Croatia faces—especially in multi-apartment/tenant settings - by giving implementers a repeatable input (who/where/how many) each year, tied to a

designated delivery body (Eco Fund), but it also shows Slovenia is struggling with inclusion/leakage compromises that Croatia will need to solve as it broadens eligibility. What additionally distinguishes Slovenia, both vis-à-vis Croatia and as an EU-level best practice is mainstreaming vulnerable/energy-poor households into energy communities alongside consumer-protection tools in the NECP. It explicitly includes support for renewable-energy communities and the inclusion of vulnerable households, positioning community energy as a structural lever that can pair lower bills with social participation; national policy reviews list support for energy communities among best practices. From the implementation side, Focus Association for Sustainable Development sources note the dedicated incentive for involving energy-poor households in energy communities has not yet been launched; the ministry is debating the institutional channel, and civil-society actors are preparing recommendations to ensure the design is accessible (more than 100% support for the poorest) and protects tenants from post-investment rent hikes. This contrasts with Croatia's current emphasis on grants/transfers by situating community energy as a core, not peripheral, anti-poverty tool - with a live policy window to lock in design safeguards before scale-up.

Speaking about data profile and targeting focus, recent national estimates (SURS, 2024) indicate that around 7.3% of all Slovenian households are in energy poverty, with single, older (65+) - especially women - households among the most vulnerable (approximately 17.3% of energy-poor households). New microdata analyses point to tenure disparities (around 15% among tenants vs. around 5.5% among homeowners) - but measurement is hampered by a "grey" private-rental sector. The Focus Association for Sustainable Development sources emphasize that split-incentives are acute (landlords capture asset gains while tenants pay energy bills), and rental renovations are rare because units rent easily even when substandard. Slovenia's very high home-ownership (>95%) concentrates low-income, inefficient housing among older owners; succession/inheritance can shift renovation obligations to adult children, complicating uptake. Eco Fund may, in certain cases, support upgrades even where buildings are not fully legalized, so long as the works fit within the €18k cap - mitigating a barrier often seen in Croatia.

What is comparable to Croatia is that there are monitoring gaps, i.e. no indicators for summer energy poverty, and earlier gender-focused analyses have not been published, pointing to areas for statistical strengthening compared with Croatia's own data gaps. Despite its advanced setup, Slovenia still reports stagnant short-term reductions, administrative complexity, regional disparities in outreach capacity, and monitoring/data gaps (summer energy poverty, small-measures tracking). The planned inter-ministerial body to coordinate social and energy policy has not yet been established, and informal information-networks envisaged in the plan have been slow to materialize - echoing Croatia's fragmentation concerns.

At the local level some municipalities co-finance heating costs (e.g., Maribor, Jesenice), but there is no systematic practice of local anti-energy-poverty plans, underscoring the need for stronger local pipelines and data systems. Both countries would benefit from simplifying application/verification, sharpening regional targeting, diversifying funding, and strengthening monitoring and evaluation and community engagement to ensure that measures actually reach the most vulnerable - with special attention to tenants in multi-apartment buildings and low-income elderly owners in inefficient homes.

Croatia and Slovenia both integrate a social dimension into energy-transition policy. However, Slovenia's model of the Decree - SURS - Action Plan - Eco Fund chain, with three dedicated energy-poverty calls (including a 100% advance grant up to €18k), and clarified financing (including SCF and NECP envelopes) deliver more precise identification/targeting and stronger final stage delivery - while live policy work on energy-community inclusion provides a pathway to EU-level best practice if designed for tenant protection, 100% affordability for the poorest, and strong outreach. These are actionable lessons for Croatia as it broadens eligibility and strengthens tenure-sensitive delivery.

In the case of Serbia, which started the negotiation process for accessing the EU in 2014, we can trace gradual progress in addressing energy poverty through policy evolution, driven by EU alignment and domestic energy challenges. Key developments span similarly as in Croatia, from early awareness in the 2010s where the focus was put on protection schemes for people vulnerable to energy related costs to recent national strategic plans emphasizing renewables and defining energy poverty.

Serbia—along with other Western Balkans economies—signed the Sofia Declaration in November 2020. This move endorsed the Green Agenda for the Western Balkans and pledged commitment to enacting various measures outlined in the European Green Deal. The agenda's first pillar focused on climate, energy, and mobility, setting a target for signatory economies to pursue carbon neutrality by 2050. One key action for advancing the energy transition involves creating programs to tackle energy poverty.

In 2021 Government of Serbia formed the National Coalition for Reducing Energy Poverty, gathering relevant ministries, representatives of civil and international organizations. The Coalition adopted the definition of energy poverty which, and in 2024 the Energy Sector Development Strategy of the Republic of Serbia up to 2040 and the Law on Energy introduced the legal recognition of energy poverty. Besides the definition, within the Law it is declared that assessment of the number of households in energy poverty will be done by the Ministry in cooperation with the competent state authorities for social policy, health, statistics and other state authorities. Within assessment, criteria will be defined taking into account groups of energy, climate, social and health indicators and guidelines of the Energy Community Secretariat in accordance with the Treaty Establishing the Energy Community. Similarly as in the Croatian policy context, although the definition is deemed positive by the civil society organizations, its implementation still remains rather limited.

According to the data, heating is a type of energy use that accounts for 65% of total household energy consumption, or a quarter of all energy consumed in Serbia. 38% of households use local solid fuel space heaters - an extremely inefficient appliances, while an additional 30% of households use solid fuel boilers for heating their homes. Although it is most pronounced in the categories of households with lower incomes, solid fuel heating represents big importance for all categories of the population in Serbia affecting consequentially the environmental impact of these households.

The Government of Serbia finances measures to combat energy poverty through a mix of national budget, international loans, subsidies, and dedicated funds under its Just Energy Transition Plan and Integrated National Energy and Climate Plan (INECP) up to 2030. In the last five years (2020-2025), Serbia has pursued several funding initiatives to address energy poverty, primarily through EU pre-accession aid, international loans,

and national plans tied to its Green Agenda commitments. These efforts focus on energy efficiency in households, subsidies, and just transition measures, though direct allocations specifically labelled for energy poverty are often embedded within broader energy and environmental programs. Key examples include EU grants for retrofitting public buildings and households, EBRD and World Bank-backed projects, and national subsidies during energy crises.

The EU provided EUR 240 million in non-repayable IPA funds (part of a EUR 325.2 million package through 2032) for energy efficiency, including measures benefiting households vulnerable to energy poverty, such as renovations in public buildings and promotion of efficiency programs. Additional EU and EBRD grants totalling EUR 8.5 million (EUR 4.5 million grant + EUR 4 million loan) target retrofitting at least 5,000 m² by 2027, aiding low-income areas indirectly through decarbonization and heating improvements.

Serbia's 2030 Just Energy Transition Plan, adopted around 2025, allocates EUR 75.4 million for social measures, including EUR 12 million for entrepreneurship incentives and EUR 60 million for industrial park upgrades to mitigate job losses from coal phase-out, which helps regions facing energy poverty. During 2018–2023 (overlapping the period), Serbia disbursed EUR 3.4 billion in energy sector support, peaking at 3% of GDP in 2022 to cover high import costs and maintain affordable tariffs for vulnerable households via reduced tariff mechanisms. UNICEF-supported programs from 2025 also fund household efficiency upgrades for energy-poor families.

The World Bank has also strongly supported Serbia's efforts to combat energy poverty through targeted loans and programs, often integrated into broader energy transition and clean energy initiatives over the past five years. These focus on residential efficiency, utility stabilization, and support for vulnerable consumers amid the energy crisis and coal phase-out. Key examples draw from regional Western Balkans programs and Serbia-specific projects.

The investment project financing 'Scaling-Up Residential Clean Energy (SURCE)' from 2022 amounting EUR 44.9 million, with additional financing in preparation, promotes clean energy adoption in households, directly addressing energy poverty by funding efficiency upgrades like insulation and heating improvements for low-income families. It builds on World Bank technical assistance to scale residential renewables and reduce vulnerability to high energy costs.

Following the First Serbia Green Transition Programmatic Development Policy Loan (DPL), approved by the World Bank in March 2023 (EUR 149.9 million) as the initial operation in a two-part series to advance Serbia's green economy reforms, the Second Serbia Green Transition Programmatic DPL was approved in 2025, supporting fiscal alignment with green policies, including measures for energy affordability and just transition that indirectly aid energy-poor households by stabilizing tariffs and funding social safety nets. It complements broader decarbonization efforts to mitigate impacts on vulnerable populations.

Using the example of disbursement of EUR 44.9 million through the "Clean Energy and Energy Efficiency for Citizens" project of the Mining and Energy and the World Bank which provides subsidies to households for the implementation of energy efficiency measures we analyse the shortcomings of measures addressing energy poverty in Serbia. These subsidies are provided to improve energy efficiency and sustainable heating in households and are disbursed by the Ministry via local governments as

intermediaries who participate with their own budget reaching households and companies. EUR 44,9 million have been provided from a loan, while several tens of millions of euros will be provided by local governments in their budgets, with a goal to reach 50,000 households by the end of 2027. The project is implemented by the Ministry issuing one public call directed at local governments each year. Local governments apply to the call and those whose applications are accepted receive grants from the Ministry in the percentage amount of 50% to 70% (depending on the level of development and air pollution). The remaining amount up to the full amount is co-financed by the local governments from their budgets. Funded local governments then launch their own public calls for households (end users) in their areas to implement energy efficiency (EE) measures. Each participating local government forms an Energy Rehabilitation Commission to oversee these calls for subsidizing household EE and clean energy initiatives. Selected households get non-refundable subsidies from the local government ranging from 50% to 65% (based on chosen EE measure packages), with households funding the balance. Subsidies apply to predefined EE measures or set combinations, using a "first come, first served" application process. However, local governments are left to choose whether they want to aim the most vulnerable groups in the final allocation of funds.

This way, as stressed in the analysis of the civic sector, the design of the call directs the most public funds provided by the loan to those who can spend the most of the money available. The relative participation of citizens decreases as the requested amount and number of measures increase. In all local governments, the most public money went to a smaller number of beneficiaries who were able to allocate the most of their own funds. In the 2023 competition, 56% of all funds in the competition were allocated to the 33 local governments (LGUs) that received the most funds. These 33 units are home to 56% of the population in 56% of households. However, out of the 33 local governments, 27 are above the median in terms of the number of employees and 29 are above the median in terms of average earnings. This shows that the share of the group of local governments with lower incomes has not increased as planned by the project. In 2024, local governments were for the first time able to choose to apply for funds to be directed towards energy-poor citizens. Local governments opted to request 10 times more funds for citizens who are not energy-poor. 44 local governments opted to request funds for the energy-poor and 137 local governments for other citizens. The total public funds allocated in 2024 to support the energy-poor amount to ca. EUR 2 million, while the funds allocated to households that are not energy-poor amount to approximately EUR 16,2 million. In 2024, 137 municipalities participated in the distribution of subsidies, of which 44 municipalities had competitions targeted at energy-vulnerable citizens (where the subsidy goes up to 90% of the cost), which is an innovation compared to previous years. Some municipalities provide more funds than prescribed by the program and some have their own programs. The problem of allocation of funds to the more affluent households is therefore very similar to the policies and implementation measures for combating energy poverty in Croatia.

5 Main results

Our analysis shows there is a significant gap between national strategies and policies on reducing energy poverty and the effectiveness of the measures put in place. Following the main goals of the green transition, reducing energy poverty was included in the National Energy Climate Plan (NECP), Recovery and Resilience Plan and national legislation recognized the energy poverty within its energy policy in Croatia in the last 5 years. However, the implementation of these policies remain limited in scope and do not address the most vulnerable groups - low-income households, elderly residents, single parents, tenants, rural communities and those reliant on solid fuels. These groups therefore remain reliant on fossil fuels and cheaper energy sources due to the impossibility of funding renovations, while more affluent households benefit the funding schemes provided by the state and municipalities. This creates a twofold territorial bias which favours urban over rural areas, and furthermore affluent neighbourhoods over disadvantaged ones.

Although absent in our initial hypothesis, the research shows that civil society plays a crucial role as an intermediary between policy frameworks and end-users, as their advocacy and research highly influenced policy making regarding energy poverty in studied countries, and at the same time they maintain the contact with the most vulnerable groups, mapping their needs. Whilst their progress is evident within project-based collaborations (most often through EU-funded initiatives) the volatility of financial support and stable backing by the state remain striking, particularly given the essential functions CSOs perform. The findings suggest that CSO actors require more stable and substantial funding, which would serve not only the interests of vulnerable groups but also the broader objectives of the public authorities.

Whereas we find consistency in producing national strategies and plans in analysed countries, we find significant gaps in their implementation. One of the key issues is the lack of data regarding housing tenures and households living in unregistered homes that would connect socio-economic status with the territorial and technical data. This way the criteria for allocation of funds are excluding the most vulnerable groups thus reproducing inequalities. Main funding schemes remain dependent on the state, where ministries operate in a silos structure with scarce coordination between social and territorial sectors. This affects the way funding is allocated, often neglecting local and territorial specificities and needs. Finally, the effect of public subsidies in the area of energy efficiency and alleviation of energy poverty is not systematically monitored in an adequate manner which needs to change in order to effectively contribute to the fair and social energy transition.

6 Discussion and conclusions

Despite formal alignment with the EU's climate and energy objectives, the research finds that policies aimed at reducing energy poverty in the region often fail to confront its structural drivers. The existing frameworks tend to privilege property owners with the financial and legal capacity to access subsidies, as well as construction and energy service providers who profit from EU-backed schemes. Conversely, those most affected by energy poverty—low-income households, elderly residents, single parents, tenants, rural communities, and inhabitants of informal or unregistered dwellings—remain largely excluded due to restrictive eligibility criteria, informational barriers, and high upfront costs.

Croatia, Slovenia, and Serbia represent a spectrum of approaches to tackling energy poverty within the Central and Southeastern European (CSEE) context, where high home-ownership rates, aging housing stock, and reliance on inefficient solid fuels exacerbate vulnerabilities during the green transition. While all three countries have embedded energy poverty into national strategies - driven by EU alignment, such as the Green Agenda, National Energy and Climate Plans (NECPs), and forthcoming Social Climate Fund (SCF) - implementation reveals persistent gaps between policy ambition and on-the-ground impact. Croatia's measures blend technical renovations with social benefits but suffer from narrow eligibility and urban biases; Slovenia offers a more integrated model via codified criteria and dedicated Eco Fund grants; and Serbia's funding cascade through international loans and local intermediaries disproportionately favours affluent households. This discussion synthesizes these cases to highlight common structural barriers, divergent strengths, and actionable pathways forward, underscoring the need for tenure-sensitive targeting, robust data disaggregation, and anti-displacement safeguards to ensure equitable energy transitions.

A core commonality across the cases is the predominance of grant-based retrofit programs for energy efficiency upgrades - insulation, windows, heating replacements - coupled with monetary benefits, yet operational designs often exclude the most precarious groups. In Croatia, national calls for family houses explicitly link renovations to social protection, expanding beyond "guaranteed minimum benefit" recipients via vulnerability analyses. However, eligibility criteria privilege compliant owners, sidelining tenants, informal occupiers, vulnerable groups in non-legalized buildings, and multi-apartment residents facing split-incentive dilemmas. High home-ownership (89.7%) masks low renovation liquidity among low-income owners, while renters (30% overburdened by costs) endure informal markets and governance hurdles. Focus groups with Croatian decision-makers flagged administrative fragmentation and data gaps in tenure-disaggregated indicators, echoing broader CSEE challenges where NECP monitoring lacks granularity for tenant-sensitive policies.

Slovenia's framework stands out for its legal-statistical-programmatic integration: a 2022 Government Decree defines multi-dimensional energy poverty (e.g., high energy burden, low building efficiency), mandates annual assessments, and feeds into three-year Action Plans operationalized by the National Eco Fund's targeted calls. These include 100% grants up to €18,000 for social-benefit households in single-family homes, plus multi-apartment insulation and heating upgrades—bypassing upfront costs via

direct contractor payments. Quantified targets (8,000 households, 573 GWh savings by 2030) and €33.8 million (2024-2026) plus SCF inflows provide a "one-stop" delivery model, outperforming Croatia's widening eligibility efforts. Yet risks persist: under-coverage of non-benefit "poorest of the poor," leakage to ineligible households, and unlaunched energy community incentives for tenants. Regional outreach varies, and monitoring gaps (e.g., summer poverty) highlight incomplete maturity, despite innovations like disconnection bans and counsellor networks.

Serbia's trajectory, accelerated by the 2020 Sofia Declaration and 2021 National Coalition, culminates in 2024 legal recognition via the Energy Sector Strategy and Law on Energy, mandating vulnerability assessments. Funding draws heavily from EU IPA (€240 million), World Bank loans (e.g., €44.9 million SURCE for 50,000 households by 2027; €149.9 million First Green Transition DPL), EBRD grants, and Just Energy Transition Plan allocations (€75.4 million social measures). The "Clean Energy and Efficiency for Citizens" cascade—Ministry grants (50-70%) to locals, who subsidize households (50-65%, up to 90% for vulnerable in 2024)—mirrors Croatia's tiered model but amplifies inequalities. Civil society analyses reveal 2023 funds skewing to affluent local governments (56% to 33 higher-income units), with 2024 seeing €16.2 million for non-poor vs. €2 million for energy-poor citizens across 137 municipalities. "First come, first served" and local discretion prioritize bigger spenders, leaving solid-fuel dependent rural households (65% heating consumption) underserved amid coal phase-out risks.

These patterns expose systemic biases: channelling public funds to those able to co-finance, territorial urban-rural divides, and tenure blind spots. High ownership (>89% Croatia/Slovenia, similar Serbia) concentrates inefficient stock among low-income/elderly owners, while vulnerable renters face landlord-tenant misalignments—landlords reap asset gains, tenants bear bills. Rural solid-fuel reliance (38% Serbian households) compounds air pollution and health risks, unaddressed by urban-centric calls. Economically, crisis subsidies (Serbia's €3.4 billion 2018-2023) stabilize tariffs short-term but entrench fossil dependence without deep retrofits. Dual biases emerge: affluent urban owners benefit, displacing poorer rural/tenant groups, with no systematic housing-cost integration risking rent hikes post-renovation.

Discussion of strengths reveals scalable lessons. Slovenia's chain of disbursement of funds exemplifies precision targeting via annual data and no-prefinancing grants, reducing Croatia/Serbia's policy-practice gaps. Energy communities as inclusion levers—Slovenia's NECP mainstreaming with tenant safeguards - offer Croatia/Serbia a participatory alternative to top-down grants, fostering bill reductions via collective renewables. World Bank/EBRD loans in Serbia demonstrate catalytic scale, but require ring-fencing for vulnerable quotas. Croatia's municipal innovations (Zagreb program) and focus-group insights underscore local pipelines' potential, if harmonized nationally.

Critical gaps demand urgent reform. Data fragmentation—lacking tenure, gender, seasonal disaggregation—hampers equitable design; all cases need granular indicators (owner vs. renter, legalized vs. informal) per NECP obligations. Administrative silos (ministries, locals, funds) create inefficiency; inter-ministerial bodies must enforce coordination. Financially, grants dominate, ignoring liquidity constraints—low-interest loans, revolving funds, or 100% advances for poorest could broaden reach. Anti-displacement measures (rent caps, relocation aid) are absent, despite rising housing costs amplifying vulnerability. Vulnerable cohorts—elderly women, social tenants, rural

solid-fuel users—risk transition exclusion, perpetuating health inequities and greenwashing critiques.

Civil society organizations (CSOs) emerge as crucial intermediaries between policy frameworks and end users, often compensating for institutional shortcomings through advocacy, outreach, and project implementation. However, their role remains precarious and under-recognized, constrained by short-term funding cycles and limited engagement from decision-makers. The findings suggest that the energy transition in CSEE is currently uneven, disproportionately benefiting affluent households and neighbourhoods while leaving vulnerable populations behind.

Ultimately, the study demonstrates that energy poverty in the region cannot be understood solely as a technical or welfare concern. It is deeply embedded in property relations, housing regimes, territorial inequalities, and governance structures. By exposing how energy renovation policies can inadvertently reproduce social inequalities, the research contributes to debates on eco-social state transitions and provides evidence for more inclusive and justice-oriented policy design in the context of Europe's green transition.

The analysis of Croatia's energy-poverty measures exposes the contradictions of a transition framed as socially just, yet operationalized through mechanisms that are, in practice, often exclusionary. The central finding is not the absence of social considerations—on the contrary, policy discourse abounds with references to vulnerable groups and distributive fairness—but rather the persistence of structural blind spots encoded in eligibility criteria, legalistic requirements and the governance of multi-apartment renovation. The very households most vulnerable to energy poverty often remain those least likely to access the benefits of the transition. This is a stark reminder that energy poverty is co-produced by the intersection of housing policies, property relations and uneven access to state support.

Empirically, this case study complicates the usual owner–tenant divide. High ownership rates do not necessarily guarantee access to energy-renovation benefits. Many owners lack the resources or documentation to apply. Tenants are even more disadvantaged, excluded from subsidies while facing eventual rent hikes and displacement in upgraded properties. Conceptually, this case shows the limits of treating energy poverty as an efficiency or welfare problem and available data remain fragmented and insufficiently disaggregated for tenure-sensitive policy design, limiting the precision with which interventions can be tailored to those most at risk.

Finally, the study shows that energy poverty cannot be addressed without a clear definition and systematic monitoring of how measures and funding affect the most vulnerable groups. Yet current frameworks remain complex, fragmented and poorly targeted, with limited data on tenure and household types. Without tackling these structural and informational gaps, policies risk staying incremental and selective. The EU-level instruments such as the Social Climate Fund provide an opportunity to improve the existing frameworks, but only if linked to palpable and measurable social outcomes at the national level, which are currently lacking. All things considered, the unresolved tension between ecological modernization and social protection makes the idea of a 'just transition' deeply contested in Croatia.

7 Recommendations

According to the research, the mechanisms needed to make energy transition in households available and affordable to the vulnerable groups are the following:

- High co-financing rates or full subsidies for vulnerable households,
- Interest-free loans,
- Administrative support and simplification (minimise bureaucracy),
- Targeted and stable support to the intermediaries working directly with vulnerable groups such as civil society and other actors
- Digitalisation of procedures,
- Development of evaluation of measures and feedback mechanisms
- Structural analysis of the most vulnerable groups and development of measures accessible to each of them
- Data collection on the vulnerable groups that do not meet all legal and administrative requirements in collaboration with civil society actors
- Targeted municipal tenders and municipal co-funding,
- Support for energy cooperatives/turnkey services, crowdfunding and ppps,
- Distribution of low-cost measures (leds, draft-proofing, radiator panels),
- Replacement (“old-for-new”) schemes for appliances/heating,
- Support and further development of epah - energy poverty advisory hub using recommendations and further development of data collection

Further policy design should explicitly assess and mitigate renovation-led affordability effects, for example through: mandatory tenant protection clauses in building renovations, social housing expansion tied to renovation funding and monitoring of local housing-price effects post-intervention. To ensure the energy transition is accessible and affordable for vulnerable groups, a mix of mechanisms is needed: broadened eligibility criteria for support, fully subsidised renovation options for the poorest households, financing instruments that address liquidity constraints and tenant-protection measures in cases of building-level retrofits. Equally important are streamlined administrative procedures for occupants of informal housing and the integration of social and energy data systems to identify and monitor those most at risk. EU-level instruments such as the Social Climate Fund provide an opportunity to embed these safeguards, but only if linked to palpable and measurable social outcomes at the national level, which are currently lacking.

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