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Investigating EU financial instruments to tackle energy poverty in households: A SWOT analysis

Edit Lakatos[a] and Apostolos Arsenopoulos[b]

[a]Department of Policy, Housing Europe, Brussels, Belgium; [b]Decision Support Systems Laboratory, School of Electrical & Computer Engineering, National Technical University of Athens, Athens, Greece

ABSTRACT
This paper aims to provide an overview of the existing financial instruments and successful schemes focused on facilitating the implementation of energy efficiency-related measures, in the context of addressing the problem of energy poverty, along with its adverse socio-economic effects. To this end, the paper presents the challenges and limitations that are associated with each financial instrument, and potential beneficiaries may face upon joining the program. The paper uses the SWOT (strengths, weaknesses, opportunities, threats) analysis for drawing results about the perspectives of the engaged financial instruments. Finally, the paper, drawing form the said analysis, provides policy recommendations on a) how these limitations should be addressed, in order to better target the roots of the problem and b) how the social dimension of energy poverty could be integrated into the future policymaking processes. The results stemming from the analysis are encouraging, indicating the strengths of the proposed financial instruments, while also highlighting future challenges.

KEYWORDS
Energy poverty; financial schemes; energy efficiency; SWOT analysis; policymaking

1. Introduction

According to Bouzarovski, the cornerstone of energy poverty lays within the inadequate access of a household to a specific level and quality of domestic energy services such as electricity, gas, heating, cooling, etc., able to provide for a decent standard of living at a reasonable cost (Bouzarovski 2018), and has drawn a great deal of attention mainly due to its multiple underlying adverse effects (socio-economic and environmental) on the EU citizens, which also apply on a society level (Corovessi et al. 2017; Papada and Kaliampakos 2018).

Energy poverty is a multi-lingual problem featuring several different ways of definition, which makes it difficult to evaluate the total number of people suffering from its underlying reverberations (European Commission 2017). Given the lack of a common definition across EU, existing approaches to the said phenomenon are based on quantitative indicators, i.e., the share of cost for energy-related services in comparison to a household's income (the 10% approach; Boardman 1991) or the latter's positioning in relation to the national poverty line after extracting the respective cost for energy services ("low income – high costs"; Robinson, Bouzarovski, and Lindley 2018) and qualitative indicators using self-assessments of domestic conditions (consensus approach; Thomson, Bouzarovski, and Snell 2017). These approaches include a great deal of multi-sourced variables which lead to estimating the extent of energy poverty in the EU in a range from 50 to 160 million of people, namely 11% of the European population (European Parliament, 2017). More specifically, the situation of energy poverty is considered quite challenging given that:

CONTACT Edit Lakatos Edit.Lakatos@housingeurope.eu Housing Europe, Brussels, Belgium
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- 87 million people live in poor-quality dwellings (e.g., leaks, damps, rots, etc.) (EU SILC-Eurostat, 2016)
- 42 million people face arrears on utility bills (European Quality of Life Survey (EQLS) – Eurofound 2016)
- 54 million people cannot keep their home adequately warm (European Quality of Life Surveu-Eurofound, 2016)
- 161 million people face disproportionate housing expenditure (EU SILC-Eurostat 2016).

In pursuit of mitigating energy poverty and enhancing the well-being of the EU citizens as well as the socio-economic sustainability, the EU has committed to actions focusing on enhancing energy efficiency, at both the community and the Member State level (Doukas et al. 2018), since "*75% of the EU's existing building stock is highly inefficient and buildings are responsible for 40% of the EU's energy consumption*" (European Commission 2016). Drawing from their respective national commitments as well as the need to respond to the European and global efforts in the energy poverty front, several countries seem to respond to this emerging challenge, striving to design and implement an effective and sustainable energy efficiency policy framework to support the energy-poor citizens, despite the significant barriers presented due to the ongoing economic crisis that has been plaguing Europe (Spyridaki, Banaka, and Flamos 2016b; Spyridaki, Ioannou, and Flamos 2016a; Spyridaki et al. 2015). In Greece, for instance, according to the EU SILC data of 2016 on arrears on utility bills (Energy Poverty Observatory 2018), 36.2% of households – the highest rate in the EU – suffer from energy poverty, while tens of thousands of them lack access to power and/or heating (Flamos 2016; Forouli et al. 2019).

Italy, Lithuania, Sweden are Luxemburg are some of the EU countries that are significantly concentrated on the energy efficiency front. According to the Open Data Platform of the European Commission, the largest financial allocations for energy efficiency measures and housing infrastructure appear in Poland (€800 million), the Czech Republic (over €600 million), Spain and Romania.

European Commission has laid significant efforts to motivate Member States to invest in energy efficiency. These efforts have been a dynamic, learning process, through which the policy framework is redesigned along the way. Such a framework encompasses an Energy Security strategy (European Commission, 2014b), an integrated energy market for all EU countries, policy instruments, energy- and climate-oriented measures and interventions for 2030 (European Commission, 2014a), as well as financial incentives and tax breaks, in the energy efficiency area. These actions primarily regard the built environment, and thus, the policy framework has oriented on financial incentives in the context of a building renovation strategy across the residential sector for the effective mitigation of the energy poverty problem (Marinakis et al. 2017).

The ninth meeting Conclusion of the Citizens' Energy Forum London from 30 to 31 May 2017 proposed, among other things, that economic-oriented policies should constitute the groundwork for alleviating energy poverty. To this end, over time, focus has shifted toward policy makers to configure a common strategy for helping the energy-poor households in a smart way (Marinakis et al. 2018; Papastamatiou et al. 2016) and the available financial instruments from the EU and other donors, to address the building stock inefficiency, and thus the energy poverty. In this direction, EU Funds are expected to play an essential role in promoting the shift toward a low-carbon economy in all sectors and tackle the energy poverty challenge as well, during the programming period 2014–2020 (Doukas et al. 2014).

In this context, Cohesion Policy plays a key role to shifting to a clean, efficient and secure supply of energy, since the allocated funds for promoting energy savings and transitioning to a low-carbon economy represent more than a doubling of funding (€40 billion) compared to the previous programming period. Although Cohesion Policy offers significant opportunities for the people to effectively reduce their energy consumption and help themselves escape energy poverty, its underlying societal extension constitutes an important challenge in terms of the readiness in the Member States that should be extensively analyzed (Doukas, Marinakis, and Psarras 2012). Slovakia, Portugal, Estonia are some of the EU countries that are mainly focused on the social inclusion front of the energy poverty and have set respective social inclusion-related targets (e.g., social inclusion of the

marginalized Roma communities (Operational Programme on Human Resources, 2017)). Other relative financial instruments, such as bank loans, technical assistance and Impact Bonds are also emerging and fully available to deliver to the energy-poor citizens (Doukas et al. 2018).

However, despite the numerous available financial tools, the mobilization and channeling of the investment remains a challenge especially for social-housing providers and home-owner associations which are keen on carrying such energy-related projects (Grafakos et al. 2015).

Through a descriptive SWOT analysis, the paper seeks to provide answers to the following questions: a) why is it difficult to mobilize and fully exploit the available financial tools in the combat against energy poverty and b) what are the challenges for the social-housing providers upon implemented. The SWOT analysis has been applied to a wide range of issues, such as environmental assessment (Kurttila et al., 2007; Lozano and Valles, 2000; Masozera et al., 2006; Paliwal, 2006), sustainable development (Biresselioglu, Kaplan, and Ozyorulmaz 2019; Karakosta et al., 2010; Mauerhofer, 2008; Markovska et al., 2009), regional energy planning (Chiu and Yong, 2004; Kabak, Dağdeviren, and Burmaoğlu 2016; Terrados et al., 2007) and renewable energy schemes (Karagiorgas et al., 2003; Ljubojev, Pekez, and Radovanovic 2018; Naidu, 1996). However, to the best of our knowledge, a comprehensive approach based on SWOT analysis exploring the opportunities and barriers of the most commonly used EU financial mechanisms for alleviating energy poverty, does not exist. In this respect, the use of SWOT analysis for delving into the aforementioned EU financial mechanisms and developing an integrated strategic plan for increasing social inclusion and provide for the vulnerable ones, could trigger a chain of reactions in the current energy situation, and serve as a reference point for objectives and strategies proposal (Helms and Nixon, 2010). Drawing from this analysis, the paper proposes some socio-economic dimensions of the problem to be considered toward addressing the aforementioned limitations, in order to further facilitate the design of efficient financing schemes targeting the energy-poor citizens.

Apart from this introductory section, the paper is organized along five sections. The second section provides a brief description of the methodological approach used for this analysis. The third section presents the ongoing financial programs operating across EU, the opportunities provided and the barriers posed by each of them, in terms of eligibility and co-financing, and a SWOT analysis. Drawing from the aforementioned analysis, the fourth section, proposes some aspects of the problem to be integrated into the future policymaking, in order to better address its adverse effects. The last section summarizes the main points that have arisen.

2. Methodological approach

The methodological approach used for the purpose of this paper (Figure 1) aims to provide an holistic overview of the existing financial instruments and successful schemes developed on the ground across several EU countries for combating energy poverty and its adverse socio-economic effects.

The main objective lies in identifying factors that are favorable (strengths and opportunities) and unfavorable (weaknesses and threats) regarding the exploitation of each financial instrument from the end-users' perspective, since these factors constitute a set of challenges and limitations that potential beneficiaries (e.g., energy poor) may face during the selection process. In this respect, the paper's main multidisciplinary methodology can be broken down into three individual Parts (P), as follows:

P_1:Part 1 provides a detailed presentation of the most commonly used EU financial instruments/schemes focused on supporting the implementation of energy efficiency-related measures, in the context of addressing the problem of energy poverty. The engaged instruments were examined in terms of the opportunities and challenges associated with their effective deployment, and were identified through extensive literature review.

P_2:Part 2 was composed by the integration of a SWOT analysis into the whole process. The SWOT analysis was implemented, drawing from the review conducted in Part 1, and presents in a clear, comprehensive way the potential opportunities and barriers that foster or hinder the wide exploitation of the described financial instruments.

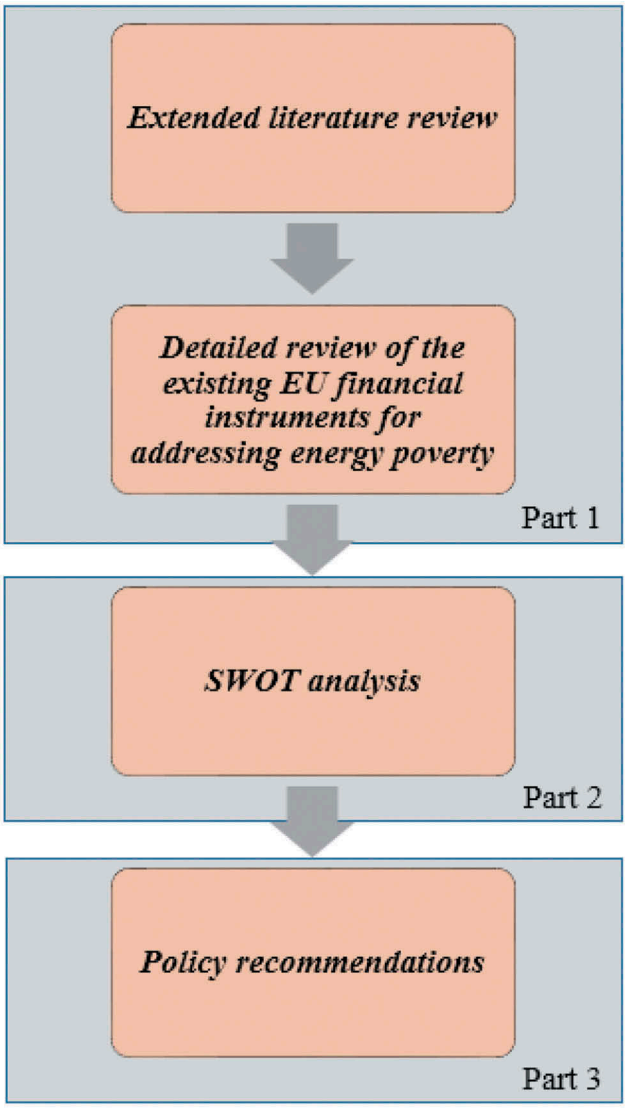

Figure 1. Methodological approach.

P_3:Part 3 seeks to achieve an effective integration of complex societal and climate aspects of energy poverty, which are difficult to conceive and thus commonly neglected, with the use of parameters such as geographical coverage, eligibility criteria, scale of implementation, etc.

3. European financial sources for combating energy poverty

The European Commission is proud that around €16-18 billion are dedicated to energy-efficient solutions in housing, public buildings and industrial buildings during the period 2014–2020 (European Commission, 2015), thus highlighting that energy efficiency interventions in the building envelope constitutes an effective way to decrease the energy consumption and thereby the energy poverty (Bouzarovski 2018). In 2014–2020 period, a number of countries developed financing schemes using party or fully the ESIF dedicated to address the energy poverty issue. Examples of financial instruments,

schemes and practices in place in various Member States are set out below. However, this is not intended to be a comprehensive overview of all Member State instruments and practices.

3.1. *European Structural and Investment Funds (ESIF)*

In this context, ESIF plays a major role in the combat against energy poverty, offering new funding opportunities for implementing innovative housing- and energy efficiency-related solutions at both national and local level. In the current programming period (2014–2020), ESIF provides with several new opportunities for housing, through the promotion of energy efficiency measures and renewable energy sources as well as through the provision of opportunities to support housing-related activities aimed at increasing social inclusion.

A key difference between the current (2014–2020) and the previous programming period (2007–2013) lies in the larger budget allocated for housing issues, in the context of a building renovation strategy across all scales: residential, public and private. In 2007–2013, the total financial resources disposed for housing-related projects were estimated around €2 billion, focusing on the energy refurbishment of housing for low-income families (Lakatos 2018). However, ESIF, following the European Commission's proposal for the Regulation on the Governance of the Energy Union (Regulation (EU) 2018/1999), aiming at a medium- and long-term radical reform of the EU built environment until 2030 and 2050 respectively, in the updated context of its "Clean Energy for All Europeans" legislative package of 13 May 2019,, has undertaken a significant improvement compared to the original context of 30 November 2016 (COM (2016), 759): following the mid-term review provided from the Multiannual Financial Framework in 2017, the EU share of the ESIF budget increased by €6 billion to a total of €460 billion (COM (2018) 816 final/2). Taking into consideration the increases in national co-financing, the total ESIF investment sums up to a total of €647 billion, around €10.7 billion of which has been allocated to integrated territorial and sustainable urban development projects, representing 33% of the planned allocation, in the context of facilitating the implementation of energy efficiency measures and increasing social inclusion. Table 1 summarizes the projects funded by ESIF.

Concerning the nature of financing, ESIF offers significant grants and several financial instruments for the people to benefit from. Eighty-eight percent of ESIF funds consists of grants (for deep renovation and social-housing) whilst the remaining 12% consists of loans. The ESIF funds are contributed from both public (Cohesion Policy) and private sector (banks, long-time investors other financial intermediaries). Member States may exploit ESIF in combination with other financial instruments (e.g., grants, loans), thus increasing the available funding and as a result the total number of projects financed.

Table 1. Projects funded by ESIF.

Country	Engaged actors/ programmes	Focal area	Features
France	LogiOuest	Residential energy efficiency	LogiOuest refurbished 194 dwellings with overall annual energy savings of €59,000 and an upgrade to energy class B, whilst a block of social apartments that host more than 700 tenants was turned into a group of warmer and more affordable homes within less than 3 years.
Spain	Los Limoneros	Residential energy efficiency	The retrofitting of the complex "Los Limoneros" focused on the improvement of the energy efficiency and comfort levels for the tenants, leading to a cut in energy consumption of 40% and a decrease in energy expenditure of 20% per dwelling.
Scotland	Our Power Energy	Money saving	"Our Power Energy" is an energy supply company, founded by 35 organizations including some of Scotland's largest housing associations and plans to be selling heat and power to tenants in 200,000 homes across Scotland by 2020. The consortium expects to save its members up to 10% on their household utility bills, compared with standard commercial tariffs (BBC 2015).

At project level, the challenge here lies in that some operations might be ineligible or only partly covered in the context of the program, therefore potential beneficiaries need sector-specific information. Furthermore, pre-financing is often unavailable for beneficiaries, thus forcing the social-housing providers to seek for co-financing.

Finally, the administrative burden issue emerges as a crucial factor in terms of ESIF exploitation, since the application procedures require time-consuming processes, and thus, extra-capacity and man-effort.

3.2. *The EU program for research and innovation-horizon2020*

The Programme dedicates a total budget of €70 billion to support cross-border projects focused on energy-related interventions (energy efficiency, renewables and climate mitigation/adaptation). Regarding the nature of financing, social-housing providers could significantly benefit from Horizon2020 given its grant support, despite the fact that its scale only allows a few pilot projects to be carried out.

Grants could be used to help people escape energy poverty through supporting deep renovations of buildings going beyond minimum energy performance requirements, developing innovative technologies and addressing social issues exacerbated by the crisis in many regions (e.g., fuel poverty). Table 2 summarizes the main projects funded by Horizon2020.

This fund does not require co-financing; however, the combination with other funds might be necessary due to the ineligibility of some operations that do not constitute innovation. Combination possibilities are wide, since Horizon2020 can co-finance projects already supported by ESIF, whilst also serving as seed capital for the European Fund for Strategic Investment (EFSI) to generate additional investments, thus being exploited for investment in innovative projects with a higher leverage effect.

3.3. *European Energy Efficiency Fund (EEEF)*

This specific fund of a total €265 million provides support for the implementation of energy-saving investments that contribute significantly to reducing the greenhouse gas emissions, thereby promoting the environmentally friendly use of energy (European Energy Efficiency Fund 2018) and contributing to the energy poverty mitigation.

The nature of financing comprises of equity and the eligible entities are local, regional and national public authorities (the latter should be justified) or public/private entities acting on their behalf. Since several social-housing organizations lay within the core activities of private sector and

Table 2. Projects funded by Horizon 2020.

Country	Engaged actors/programmes	Focal area	Features
The Netherlands	Energiesprong	Energy refurbishments	Energiesprong has made Net Zero Energy Refurbishments a market reality that is financed by the energy cost savings, since a house does not consume more energy than it produces (E = 0) (Energiesprong 2016).
Sweden	Storm	Residential energy efficiency	The Innovative district heating and cooling network controller project (STORM) gets nearly €2 million from Horizon2020, aiming at boosting energy efficiency at district level by increasing the use of waste heat and renewable energy sources.
Italy	LEMON	Residential energy efficiency	LEMON has launched over €15 million of energy investments in 622 private and public social-housing dwellings to achieve 40% energy savings guaranteed by ESCOs (Build Up. 2017).

have formed an independent closed rental network, this fund can provide significant benefits for the public- or municipal-housing providers.

The fund contributes with a layered risk/return structure to enhance energy efficiency and foster renewable energy in the form of a targeted private–public partnership which can significantly decrease the project risk (off-balance sheet option). Concerning the scale of support, the fund provides small-scale financing (up to €5 million), that creates an opportunity for small-housing providers that are not eligible for bigger-scale programs of the European Investment Bank (EIB). Table 3 summarizes the main projects funded by EEEF.

3.4. *Private Financing for Energy Efficiency Instrument (PF4EE)*

This program is a new funding instrument under the LIFE program (a funding instrument for the environment and climate action) which co-funds energy efficiency programs. The program is an initiative of the European Investment Bank (EIB) and the European Commission, aiming to address the limited access to adequate and affordable commercial financing for energy efficiency investments. The €480 million instrument is managed by the EIB and funded by LIFE which in turn can provide long-term financing (EIB, 2018a). At this point, it should be noted that PF4EE is only available at nine EU Member States (i.e., Czech Republic, Spain, France, Belgium, Italy, Portugal, Croatia, Greece and Cyprus).

PF4EE provides three types of support: loan, risk-sharing and expert support to smaller-scale investments (from €40,000 up to €5 million or higher in exceptional cases) through pre-defined intermediaries devoted to mitigating the risk. PF4EE encourages the use of off-balance sheet techniques, such as the Energy Performance Contracting (EPC) model. EPC is frequently met in the public sector due to the EU Energy Efficiency Directive (Directive 2012/27/EU) that encourages public bodies (including social-housing bodies), to use EPC to finance energy efficiency investments. Table 4 presents an indicative example where PF4EE was extensively utilized.

3.5. *European Investment Bank loan (EIB)*

EIB contributes to the affordable social-housing since it lays within one of its key priorities: integrated urban development. EIB is continuously reinforcing its support for the social-housing sector, having disposed in total €7.06 billion for housing-related projects between 2011 and 2016 (EIB, 2018b).

Figure 2 represents the financial resources disposed by EIB for social-housing reasons as well as other social infrastructure investments (i.e., health, education and social services), where it clearly noticed that after 2005 the share of social-housing in the EIB portfolio is significantly increasing compared to the other social infrastructure investments.

Table 3. Projects funded by EEEF.

Country	Engaged actors/ programmes	Focal area	Features
The Netherlands	EEEF and the City of Venlo	Energy savings	EEEF and the city of Venlo have entered a 15 year financing contract for €8.5m to finance street lighting upgrades with the objective of equipping a minimum of 16,000 lighting points with LED lights (73% of the total lighting points of the city) and achieving more than 56% energy savings.
France	EEEF and the Région Rhône-Alpes	Energy efficiency in public buildings	In 2014, Société Publique Locale d'Efficacité Energétique (SPL), a private special purpose company operating with public capital, secured a mid-term loan agreement for €5 million with EEEF to implement energy-efficient refurbishment projects in public buildings (mostly high schools and gymnasiums), including renewable energy integration.

Table 4. Project funded by PF4EE.

Country	Engaged actors/ programmes	Focal area	Features
Belgium	PF4EE and EIB	Energy Performance Contracting	The PF4EE facility in Belgium (Belfius, 2018) provides technical and financial support to a national intermediary for social housing renovation in Brussels. The whole project is based on the EPC model that involves an Energy Service Company providing guaranteed savings and getting remuneration based on that achievement.

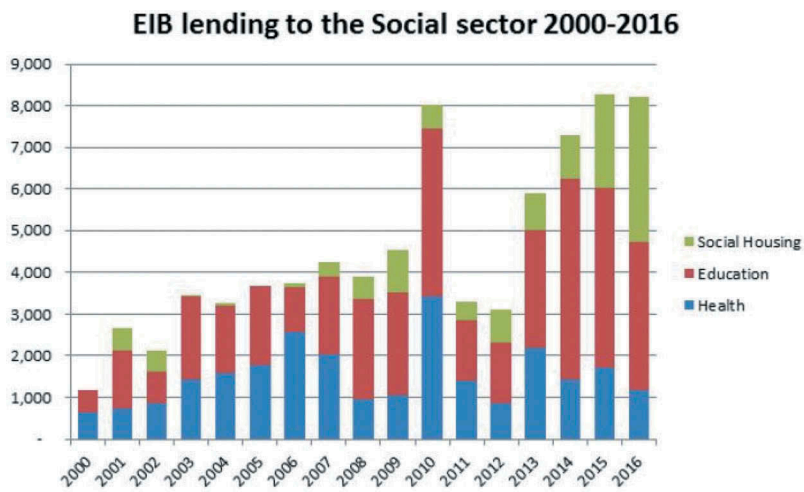

Figure 2. EIB lending to the social-housing sector between 2000 and 2016 (EIB, 2017).

Figure 3 shows that EIB has been supporting the construction and renovation of social-housing for many years in several countries such as the UK, Ireland, France, Belgium and the Netherlands. At the same time, the overall demand for EIB finance is continuously rising, urging EIB to start investing in Malta, Poland, Spain, Portugal and Ireland (Muscat 2016).

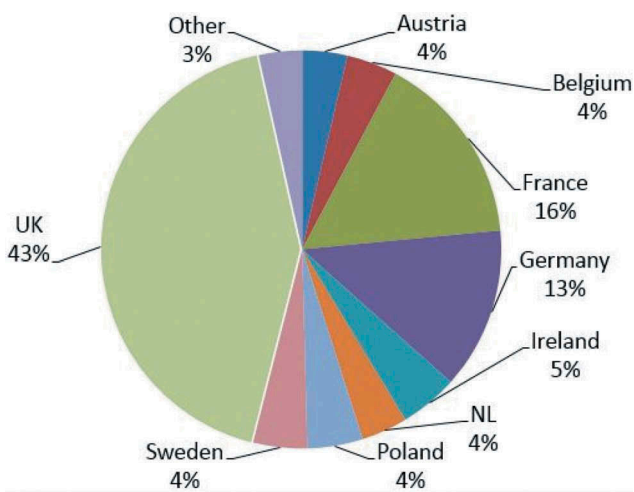

Figure 3. EIB lending to the social and affordable housing sector between 2011 and 2016 (EIB, 2017).

EIB financing comprise of loan, equity or guarantee of different scales. The eligible organizations can be both public and private entities. However, a key requirement for EIB is to make investments within a stable regulatory/market environment. The latter can be a crucial issue in some countries which lack affordable housing policy or/and dedicated financing institutions.

In terms of eligible projects, EIB contributes to a wide range of actions of social and affordable housing providers, such as new rental construction, social inclusion measures, poverty alleviation and energy efficiency renovation. EIB directly finances projects of more than €25 million and cooperates with the respective national intermediaries. Combination with other funds is also a possible option, however, cooperating with National Promotional Banks and local authorities emerges as a key necessity to secure the totality of financing. Table 5 summarizes the recent projects supported by EIB.

3.6. *European Fund for Strategic Investment (EFSI)*

Presented in 2015, EFSI, commonly referred to as the "Juncker Plan", emerges as an opportunity to finance quick and cost-effective construction of new dwellings and long-term investment schemes. The program is based on a quasi-Public-private partnership model: the European Commission is providing a guarantee fund, while stimulating private investors to contribute.

The specificity of the said product lies in the lending under a less stable regulatory/market environment and to lower rated cities and banks, thus taking a higher risk than generally accepted by banks. This creates a wide opportunity for the smaller social-housing organization to access financing sources that otherwise would have not been eligible for, through the traditional EIB lending. As a result, the largest share of the EFSI social infrastructure support, has been channeled to the affordable housing sector (in total more than €1.7 billion). However, the beneficiaries are still predominant in Western Europe, which shows the lack of mobilizing capacity in the Eastern region (Figure 4).

EFSI can be combined with other funds: EFSI can support parts of projects which are not eligible under Structural Funds but are part of a bigger investment. However, the local social-housing providers are confronted with a major challenge regarding the scale the projects to be carried out,

Table 5. Projects funded by EIB.

Country	Engaged actors/ programmes	Focal area	Features
The Netherlands	EIB and Portaal	Residential energy efficiency	A €200 million agreement in 2016 between EIB and a Dutch housing corporation, Portaal to make nearly 5,000 homes (EIB, 2016c) more energy-efficient and build new energy-neutral homes.
Scotland	EIB and Wheatley Group	Housing retrofitting	A €175 million loan agreed in 2017 to the Scottish Wheatley Group for the retrofitting of existing social housing stock to meet Scottish and EU energy efficiency standards (EIB, 2016a).
Spain	EIB and State Housing Plan	Residential energy efficiency	A €150 million EIB support to the energy efficiency, accessibility and urban regeneration programmes of Spain's 2018–2021 State Housing Plan has been also approved in September 2018 (EIB, 2018b).
France	EIB and local intermediaries	Residential energy efficiency	France got supported by a €400 million EIB loan, ensured by local intermediaries (public and public-private entities) as well as commercial banks in 2015. The project aims at refurbishing more than 40,000 flats and houses across France by improving their insulation as well as renovating the heating and ventilation systems, until 2019.
Romania	E-Casa Mea-Romania project'	Residential energy efficiency	The €50 million "E-Casa Mea-Romania project" approved in September 2018 (EIB, 2018c) to support residential energy efficiency, undertaken by private individuals.
	Florica project	Rehabilitate multi-family apartment	The project Florica (EIB, 2018d) aims to rehabilitate multi-family apartment blocks throughout the Bucharest, which is financed, in part, with green bonds issued by the European Investment Bank.

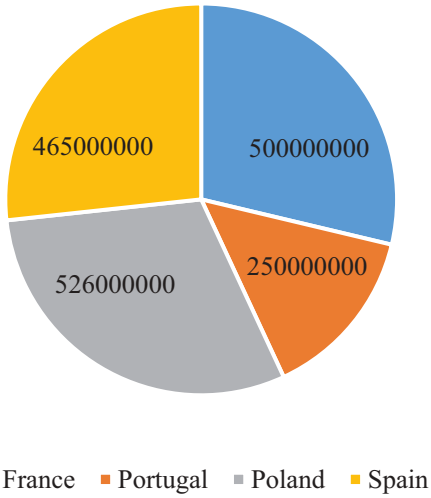

Figure 4. EFSI contribution to affordable housing projects since 2015 (in euros) (EIB, 2018).

Table 6. Projects funded by EFSI.

Country	Engaged actors/ programmes	Focal area	Features
Portugal	EFSI and Municipality of Lisbon	Residential energy efficiency	The Urban Renewal Strategy of Lisbon -which is the first EU municipality to receive direct support from EFSI in 2018- focuses on renovation of existing social housing and the construction of new energy efficient accommodation (EIB, 2016b).
Poland	EFSI	Residential energy efficiency	The establishment of an Investment Platform for social and affordable housing in Poland which, once constructed, is expected to facilitate the investments in retrofitting of social and/or affordable housing units for rental until 2021, based on a total budget of €496 million from EFSI (EIB, 2017a).
Spain	EFSI and Community of Navarre	Residential energy efficiency	A €40 million EFSI support to finance the construction of 524 energy-efficient social housing units in Navarre, Spain (EIB, 2017b).

since they are keen on securing 50% of the provided financing. To solve the scale-issue, dedicated intermediaries should be also developed in countries with housing systems in transition. This means not only building public interest and risk taking, but also deploying skills and capacity on local level. Table 6 summarizes the recent projects supported by EFSI.

Based on its size (generated GDP), additional investments should be mobilized in the social housing sector which has been also confirmed by the Report of the HLTF (Fransen, Bufalo, and Reviglio 2018) of the European Commission published in January 2018. In this context, the recently presented program, InvestEU (European Commission 2018), expected to replace EFSI from 2021 on, plans to double the EFSI investment and dedicates 30% of its budget and 50% of its sustainable infrastructure to contribute to EU climate and environmental objectives. If agreed by the Member States, InvestEU can become one of the main tools to close the investment gap.

3.7. *ELENA program*

The technical assistance program, called ELENA, which is managed by EIB, provides grants to help local and regional authorities develop and launch large-scale sustainable energy investments. Since 2015, the private sector is included in the beneficiaries of the program, besides the public entities, so

as to lay the groundwork for supporting affordable housing-organizations in implementing energy efficiency-related investments, coupled with renewables, district heating and PV.

The support scale varies and may cover up to 90% of the technical support costs needed to prepare the investment program. The support does not only include feasibility and market studies, but also program structuring, energy audits and tendering procedure preparation. The remaining 10% of the co-financing should be ensured by the beneficiary. Pre-financing is also possible, which means that 40% of the support must be paid at the beginning of the project.

Currently, ELENA supports the implementation of energy efficiency refurbishment programs and renewable energy investments in 286 buildings (2018–2021) with a total budget of €2.7 million (EIB 2018e). These programs are expected to provide the necessary tools and expertise in order to facilitate: a) buildings' inspections and energy audits; b) studies for PV installations and energy storage; c) bundling of bankable and cost-effective investment programs; d) evaluation of financial instruments; e) the tender for construction works, the evaluation of bids and the quality monitor.

The challenging part of ELENA lays within the obligation to link the project development assistance to a planned investment program of minimum €20 million (with a min of 3 year implementation period) given that it cannot be utilized for helping an existing program. On the other hand, the key advantage of ELENA is that final beneficiary (applicant) does not necessarily have to be the one who is finally implementing the investment.

3.8. *Council of Europe Development Bank loan (CEB)*

Social-housing constitutes one of the eligible sectors for the CEB to finance. The Bank often finances sustainable and affordable housing for vulnerable populations, including large families, young or low-income people, Roma and refugees that have difficulties accessing housing or can only do so under unfavorable conditions. Concerning eligibility, the CEB applies its own criteria such as income, floor area, ownership and residence.

Energy-related eligible activities involve construction or refurbishment of housing and the conversion of existing buildings in order to turn suited for residential use. These projects may target to accessing property ownership or rented accommodation and associated infrastructure, provided under national- and local-assisted governmental schemes.

CEB finance can be considered more flexible from the final beneficiaries' point of view than the aforementioned products discussed so far. Even though the nature of finance is based on loans, the co-financing rate of projects is subject to negotiations which is a significantly more flexible process compared to the EIB products. On top of that, grant resources can be made available through the CEB's fiduciary accounts, in order to subsidize interest rates, technical assistance and/or part of the investment costs.

Due to this support flexibility, CEB often co-finances EIB-supported projects. The most recent examples include loans to support Poland, Slovakia and Portugal (Table 7).

3.9. *Impact bonds*

Green Bonds, Social Impact Bonds, Housing Impact bonds are emerging on the market to foster sustainable investments. The Impact Bond model is an innovative method allowing wide access to capitals from the world of investments, as governments/municipalities guarantee the risk against the commitment to pay for the quantifiable impacts (e.g., savings to public budget). Through the collaboration between the public actors, this model also improves the quality of public spending and maximizes the investors' return. The Bonds have drawn significant interest in the context of integrated solutions which link different activities together, such as energy efficiency, training services, Housing First and social inclusion measures. The affordable housing sector is already developing such instruments across the continent, some of which are presented below:

Table 7. Projects funded by EIB.

Country	Engaged actors/ programmes	Focal area	Features
Poland	CEB and EIB	Affordable rental housing	The Bank agreed to support the construction and renovation of 30,000 dwellings over a timeframe of ten years with a €186 million loan in 2016. The programme, co-financed by the CEB and the EIB, will enable the construction and renovation of affordable rental housing by social housing providers and municipal corporations.
Portugal	CEB and Institute for Housing and Urban Rehabilitation	Affordable rental housing	In Portugal a similar project started also this year, aiming at rehabilitating run-down neighborhoods and ensuring affordable housing. The €15 million loan agreement was signed with the Government's Institute for Housing and Urban Rehabilitation. The rehabilitation will happen in 1,500 residential urban housing units, built more than 30 years ago.
Slovakia	CEB and Slovenska Sporitelna a.s.	Energy saving	In Slovakia, a €30 million loan to Slovenska Sporitelna a.s. (SLSP) (CEB, 2018b), will be dedicated to the reduction of energy consumption to ameliorate the living conditions of families residing in multi-family buildings. About 200 condominiums will benefit from CEB Project over the three-year implementation period, with an average loan of € 150,000 per sub-project.

- 11 Social Impact Bonds in the UK, significantly contributed from the World Bank;
- Hémisphère Social Bond, for urgent accommodation in France, with a total of €100 million budget (Depots, 2017);
- 2 affordable Housing Bonds in the Netherlands, launched in 2017, to finance the lending to Social Housing Organizations (NWB 2018);
- A €500 million Impact Bond, launched in 2018 by CEB for 7 years, to support social-housing and education, through gathering investors' interest of €1 billion to financing loans (CEB, 2018a).

These initiatives are linking investments to the Sustainable Development Goals (SDGs), which in turn tackle different aspects of energy poverty (Mastrucci et al. 2019). On top of that, these Bonds provide for capital and projects aggregation, thus acting as Investment Platforms.

Although increasing interest from the investors' side can be noted, the development of such instruments is a time-consuming process, since their implementation require innovative collaborations between governments, housing providers and investors, especially concerning the design of their management and implementation plan.

3.10. *SWOT analysis: results and discussion*

The following SWOT analysis (Table 8) summarizes the main points with regard to the strengths, weaknesses, opportunities and threats of the aforementioned financial programs; thus, a clearer view is to be formed regarding the wide exploitation of the EU funds for addressing the problem of energy poverty.

Drawing from this analysis, it can be noticed that every single program features significant limitations mainly focused on the time-consuming procedures for joining the program, the multi-sourced eligibility criteria which lack homogeneity and socioeconomic-oriented customization according to the needs of each country, as well as the high minimum-scale requirements to provide funding to a project, and the (un)necessity for co-financing, once private finance may discourage several beneficiaries from accessing the financing scheme. Last but not least, the stable national regulatory environment emerges as a crucial factor for the effective deployment of the implicated financial schemes, since it reduces the risk for both the investors to secure a guaranteed return and the financial scheme to serve its cause.

Table 8. SWOT analysis.

Financial Programme	Strengths	Weaknesses	Opportunities	Threats
European Structural and Investment Funds (ESIF)	✓ Housing-related projects at both national and regional level Promotion of energy efficiency- and RES-related projects ✓ Contributed from both public (Cohesion Policy) and private sector (e.g. banks) ✓ Offers significant grants (€6.6 billion) ✓ Easily combined with other financial instruments	✓ Time-consuming processes for joining the programme ✓ Some operations are partly-covered for specific beneficiaries ✓ Co-financing is often necessary	✓ Enhance social inclusion ✓ Numerous financial instruments for more people to benefit from ✓ Address energy and fuel poverty	✓ Beneficiaries discouraged by partly-covered operations ✓ Co-financing not always available
EU Programme for Research and Innovation-Horizon2020	✓ Supports energy-related projects (i. e. energy efficiency, renovations, renewables) ✓ Offers significant grants (€70 billion) ✓ Does not require co-financing ✓ Able to co-finance projects already supported by ESIF	✓ Supports a few small-scale projects	✓ May serve as seed capital for the European Fund for Strategic Investment (EFSI) to provide additional investments ✓ Address energy and fuel poverty	✓ Co-financing may become necessary
European Energy Efficiency Fund (EEEF)	✓ Supports energy saving investments ✓ Provide financing of €265 million ✓ Supports local, regional and national public authorities ✓ Supports public/private entities ✓ Allows targeted private-public partnership which can significantly decrease the project risk	✓ Supports a few small-scale projects	✓ Public- or municipal-housing providers may become competitive with the private ones ✓ Opportunity for small-housing providers that are not eligible for bigger-scale programmes to ensure finance	✓ Supports energy-related projects (i. e. energy efficiency, renovations, renewables)
Private Financing for Energy Efficiency instrument (PF4EE)	✓ Addresses the limited access to adequate and affordable commercial financing for energy efficiency investments ✓ Provide financing of €480 million ✓ Provides support of three types: loan, risk sharing and expert support ✓ Supports the Energy Performance Contracting (EPC) model	✓ Available at nine EU countries ✓ Supports few projects	✓ Increase the use of Energy Performance Contracting (EPC) in the private sector	✓ New funding programme that is not sufficiently stress-tested

(*Continued*)

Table 8. (Continued).

Financial Programme	Strengths	Weaknesses	Opportunities	Threats
European Investment Bank loan (EIB)	✓ Supports affordable social-housing ✓ Eligible organisations can be both public and private entities ✓ Provides significant financial support (€25 million) ✓ Supports a wide range of affordable housing-providers ✓ Combination with other funds is optional	✓ Difficulties in providing the continuously increasing funds demanded by EIB	✓ Reinforce the EIB's position in the EU market environment, through providing greater funding in the Western EU countries.	✓ Unstable regulatory/market environment threatens the investments expected of EIB ✓ The nature of finance includes loans.
European Fund for Strategic Investment (EFSI)	✓ Supports the quick and cost-effective construction of new dwellings and long-term investment schemes. ✓ Easily combined with other funds	✓ Lends under a less stable regulatory/market environment ✓ Takes higher risk than generally accepted by banks ✓ Small-scale projects	✓ Increase the number of beneficiaries in the Eastern region ✓ The higher risk accepted, creates an opportunity for the smaller social-housing organisation to access financing sources	✓ Lack of mobilising capacity in the Eastern EU region ✓ Lack of dedicated intermediaries in countries with housing systems in transition, to facilitate access to the funding
ELENA programme	✓ Provides grants to help local and regional authorities launch large-scale sustainable energy investments ✓ The support scale may cover up to 90% of the technical support costs needed ✓ Allows pre-financing	✓ At least 10% of the co-financing should be ensured by the beneficiary	✓ Expected to provide the necessary tools for facilitating the implementatio n of energy-related interventions (e.g. buildings' inspections and energy audits)	✓ Obligation to link the project to a planned investment programme of minimum €20 million
Council of Europe Development Bank loan (CEB)	✓ Finances sustainable and affordable housing for vulnerable populations ✓ Flexible financing (based on negotiations) ✓ Grant resources available through fiduciary accounts	✓ Applies its own-customised eligibility criteria (e.g. income, floor area, etc.)	✓ Social inclusion of large families, young or low-income people, Roma and refugees that have difficulties accessing housing	✓ The nature of finance is based on loans
Impact Bonds	✓ Foster sustainable investments ✓ Allow wide access to capitals from theworld of investments ✓ Improves the quality of public spending and maximises the investors' return ✓ Link investments to the Sustainable Development Goals (SDG)	✓ Time-consuming processes for joining the programme ✓ Require innovative collaborations between governments, housing providers and investors	✓ Address energy and fuel poverty	✓ Integrate different activities (e.g. energy efficiency, training services, etc.) into a common concept

4. Policy recommendations

By delving into the aforementioned comparative analysis, it can be noticed that the different financing programs presented, feature significant limitations. Potential beneficiaries need to be prepared for the respective operations and actions of each program, as well as for their eligibility criteria, since the latter will determine to a great extent the necessity of undertaking further co-financing efforts. The burden of heavy and time-consuming procedures equally applies to all schemes, however, some of them support the beneficiary with additional capacity (e.g., ELENA program).

In addition, the more the deal with private finance, the more stable regulatory environment and well-developed institutional frameworks draws a great deal of importance when it comes to the risk assessment. Besides, the scale of potentially supported projects often exceeds the local housing-providers capacity, thus emerging financing structures such as the public–private partnerships as the optimal solution.

With regard to these challenges and in order to design and implement efficient financing schemes targeting the energy poor, policy makers should take the following elements into consideration:

4.1. *Long-term low-cost capital financing for the renovation of social housing while maintaining affordability for tenants*

Despite the underlying national low-interest rates, several countries have not yet channeled financial resources into projects at the required level. Therefore, mutually beneficial relationships between housing providers and institutional investors in Europe have gained great importance, toward implementing energy-related projects of all implicated scales: small, medium and large. In this context, significant parts of Europe's existing urban housing supply and infrastructure depend on past relationships of this nature, with roles played by local banks, building societies and newly developing pension funds.

It is essential that financial support be obtained under terms and conditions that allow affordability to be passed on to the tenants, while delivering quality affordable housing opportunities.

4.2. *Reducing the scale of financial support required of a scheme while encouraging project clustering*

The challenge for most of the ongoing financing schemes lays within the high financial support required that the potential benefices may not be able to fulfill, due to limited capacity or skills. In this context, a great alternative to deal with this problem is to set-up project clustering models, that could draw faster absorption of financial resources while generating multiple socio-economic benefits.

4.3. *Wider geographic coverage*

Regarding the financing instruments, some countries are clearly keener on developing projects than others, based on their knowledge and expertise, which in turn leads to disproportional allocation of benefits in the most developed areas. Therefore, less developed regions need to get further technical assistance/assurance mechanisms, in order to meet the necessary requirements for designing and implementing efficient and widely accepted financial instruments.

Finally, in order to prioritize a result-oriented approach, geographical indicators should be defined both at aggregated and sectoral level and secondly, particular attention should be paid to project planning, and not only to the volume of investments.

5. Conclusions

EU highlights the need to mobilize at least €100 billion per year for energy efficiency (European Commission, 2015b), however, this is not something easy to implement. Despite the successful

efforts, schemes and financial instruments shown above, mobilizing the necessary funding and channeling the investment remains a key challenge to energy efficiency-related projects.

Through a descriptive and comparative research analysis, the paper pinpoints that every single financial program features limitations lying in the heavy and time-consuming procedures, the ineligible operations and the minimum-scale requirements and co-financing. In addition, the (un) stable regulatory environment in each implicated country emerges as a crucial factor, since it can prevent several beneficiaries from accessing the financing scheme.

The paper suggests that, in order to design efficient financing schemes targeting the energy poor, among others, policy makers should consider the affordability element, the nature of financing, the project size and the inclusion of technical assistance into the specific schemes.

In order to maximize the take-up of the funds, a better understanding of the local needs is required so the respective financial instruments be adjusted accordingly, as well targeted technical assistance and expertise tailor-made for the needs of each engaged country. Although it seems that the involvement of private finance is inevitable, the obstacle of the long-term payback time remains, which can reduce the interest of private investors.

Nevertheless, the described project examples showcase the potential of energy efficiency in buildings, in terms of energy and money savings, through individual financial instruments or blending schemes such as the Impact Bond model.

Since investing in cost-effective renovation of buildings would not only significantly ease the issue of energy dependence but also help improving the living circumstances, the EU financial instruments are expected to make a great contribution to the EU climate policy objectives in the coming years, especially in the case that social and environmental impact are integrated into the design of the future instruments.

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