Financing energy efficiency in buildings: an overview of current and upcoming European funding programmes

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Abstract

The European Union is among the frontrunners of the global low-carbon transition, with production and consumption patterns undergoing a bold shift. However, its building sector struggles to follow this trend: despite its essential role to achieve carbon neutrality, building renovation rates remain too modest to achieve EU climate targets. Several barriers hinder a deep renovation of the built environment. Among these limited access to funding, which, if lowered, could benefit also other barriers by outsourcing tasks or hiring consultants.

Focusing on the research question "What EU funding programmes can support energy efficiency interventions in buildings?", this paper gathers a concise overview of financial instruments and, acknowledging their still limited uptake, looks into instruments to counteract market inertia, diving into EU funding programmes. A combination of literature review and desk research provides an up-to-date overarching review of funding programmes offered by European institutions and related entities for energy efficiency in new and existing buildings, including building thermal renovation, efficient heating and cooling, and district heating and cooling. Each funding scheme is listed with details on eligible topics, applicants, budget, duration, and relevant links.

Given the complexity, variety and dispersion of the EU funding landscape, the financial barrier seems to lay less with the availability of funding and more with the limited functionality and accessibility of information for beneficiaries. Raising stakeholders' awareness of available options, often underutilized, seems a needed step to advance the decarbonization of the building sector. This study tries to fill a research gap by offering a way to discover new instruments and providing tools to guide the reader in what programme could be worth further investigation based on relevant topics, beneficiaries, forms of finance and bankability of eligible projects.

Introduction

The European Union (**EU**) is a strong driver of the low-carbon transition, with Member States (**MS**) ranking high for Energy Transition Index (World Economic Forum, 2021) and ambitious climate and energy targets(Energy & Climate Intelligence Unit, 2022). Production and consumption show a bold shift, with the energy efficiency (**EE**) of end-use sectors improving 30 % between 1990 and 2016 (European Environment Agency, 2016). In this transition, the built environment represents a key segment, responsible for 40 % of energy consumption and 36 % of greenhouse gas emissions (EU Commission, 2020a). Progress has been made mainly thanks to improvements in space heating and cooling (**H&C**) in new constructions. However, in existing dwellings, H&C demand remains sustained and renovation rates far too low. The annual building energy renovation rate in the EU is estimated at around 1 %–1.2 %, with national rates ranging from 0.4 % to 1.2 % and deep renovation as low as 0.2–0.3 %. Studies suggest that this rate should be at least doubled to 2 %–3 % (EU Commission, 2018, 2019, 2020), otherwise it will be hard to achieve carbon neutrality by 2050. Also,

considering that this data is pre-COVID19, the average renovation rate is likely to have not increased but rather decreased during the pandemic recession.

Several barriers have been identified to hinder a deep building stock renovation: legislative, economic, financial, technical, educational, strategic, socio-cultural and behavioural (EMBuild, 2017; EU Commission, 2018). Among those, access to finance is one with a multiplying potential, as capital could lower other barriers, such as technical, educational or human resources, by outsourcing tasks and hiring consultants. Increasing access to finance could enable many stakeholders, including municipalities that often fail to support the buildings' transition with adequate regulation and incentives exactly for a combination of barriers such as the lack of financial, human, and technical resources, knowledge of benefits, regulatory authority etc.

Transitioning to higher levels of EE, as for renewable energy (**RE**), entails generally lower operational costs, thanks to reduced energy bills, but often higher upfront costs, compared to alternatives such as no interventions or regular maintenance e.g. non-energy-efficient renovation (European Court of Auditors, 2020; Hummel et al., 2020). This makes financial availability a key condition to pursue them. The European Investment Bank (EIB) quantifies the EU investment gap in EE savings in buildings and industry around €70 billion annually on average (EIB, 2016). Decreasing energy demand in buildings will require investments both on the demand side, building owners, and on the supply side, municipalities, utilities, and Energy Service Companies (**ESCOs**), as electrification of the heating sector, district heating and cooling (**DHC**), and combined heat and power (**CHP**) are expected to play a major role in the H&C decarbonization (EU Commission JRC, 2019b; EU Commission, 2020b).

A common and effective carbon price would make the market move significant funds from high-carbon to low-carbon investments, but until then, various instruments aim to correct market imbalances to support the low carbon transition. Multiple programmes and initiatives at the EU levels offer funding and financial services. However, the multitude and dispersion of sources translate into low levels of awareness among beneficiaries, leaving these funds often underutilized (Climate Action Network Europe, 2020). The literature offers many reviews of funding schemes and financing instruments for EE (Bertoldi et al., 2021; Eurocities, 2021; Energy Cities, 2021; fi-compass, 2020; Brown et al., 2019; EU Commission JRC, 2019a, 2016; Covenant of Mayors, 2019; Pellerin-Carlin et al., 2017; European Committee of the Regions and Milieu Ltd., 2017). However, most are partial or outdated as many funding programmes ended in 2020, while others started in 2021 with the new EU Multiyear Financial Framework.

This work wants to offer a clear, comprehensive and up-to-date review of EU funding programmes suitable for EE in buildings to help increase awareness among project developers. A series of tables and charts guide the reader in identifying suitable schemes based on project scope, beneficiary, market readiness and type of financial support.

Methodology

The research is done mainly at the European level. A literature review of financial instruments, funding schemes and programmes targeting EE in buildings is conducted across several publications and knowledge bases already streamlining the funding offer. EE in buildings is meant as including interventions on new or existing building shells or systems, such as thermal renovation, retrofitting, upgrading and installations of efficient H&C and district H&C (**DHC**). Funding programmes are intended as government schemes aimed at providing financial support through direct funding (grants, lump sums), financial instruments (debt, equity, mezzanine, guarantees), trust funds, prizes, and subsidies(EU Commission, 2022). Public procurement contracts are not included in this review, as they serve the purpose of purchasing a service, not of correcting a market imbalance.

First, an overview of financial instruments is provided in, classified by type of finance and level of innovation, in a table inspired by a chart published by (Bertoldi et al., 2021). The limited diffusion of these instruments lead to exploring policy measures aimed at guiding the market such as market schemes and fiscal policies.

A major effort at the European level to overcome the market hesitancy is represented by funding programmes. After an accurate examination of their documentation, each programme is listed, only if addressing EE in buildings, with eligible topics, programme overall purpose, suitable applicants, budget, duration, application process and links for more information, gathered through literature and desk research.

Another table and two maps are produced for a more immediate overview: one showing programmes by eligible beneficiaries, one by type of instruments offered and relation to other initiatives, and the last showing instruments over a matrix of projects maturity and bankability. This shall be considered indicative because every programme can specify details such as a different desired Technology Readiness Level for each call

Results and findings

FINANCIAL INSTRUMENTS MAPPING

The multitude of financial instruments for energy efficiency in buildings is summarized in Table 1, classified by type of finance and level of innovation. In most cases, traditional instruments result not well-fitting for efficiency investments, but a variety of innovative instruments are being developed to fill this gap. This is a positive sign of market responsiveness to the growing interest around building efficiency, but it is not an indication of market readiness. In fact, several of these instruments still have a limited diffusion, with some being so innovative that no existing applications could be found to date in Europe. Such limited diffusion might be due to limited profitability of projects, but most probably also to limited familiarity in assessing projects profitability among issuers, or also to lack of market conditions to allow their uptake. An accurate description of each instrument can be found in (Bertoldi et al., 2021; EU Commission JRC, 2019a; Brown et al., 2019; Conforto and Hummel, 2022).

It is worth noting how some of these instruments are adopted in government market schemes, in a combination of policy measures, which can be broadly categorized as:

- Fixing the price, e.g., feed-in tariffs, feed-in premiums, and removing fossil fuel subsidies.
- Fixing the volume, e.g., quota obligations.

Table 1. Financial Instruments for energy efficiency in buildings, building renovation, H&C, DHC.

	Traditional	Innovative
Non-repayable	Grants, Prizes and Subsidies	Energy-Efficiency Feed-in-Tariff
	Tax Incentives	
Debt	Loans	Green/Soft Loans
	Credit Enhancement (guarantees, securities, insurances, additional collateral, etc.)	Green Bonds, Community Municipal Investment Bonds, Social Bonds
		Energy Performance Contracting (EPC) and Agreements (EPA)
		Energy Service Agreement (ESA)
		Green Leasing, PACE
		Energy Efficient/Improvement Mortgages
		On-Bill Financing (OBF) Loans, Tariffs
		Green/Energy Revolving Funds
		Crowdfunding
Equity	Third-Party Funding	Energy Communities/Cooperatives
Other	Advisory Services	Energy Efficiency Quota Obligations
	Technical Assistance (TA), Project Development Assistance (PDA)	One-stop shops (OSS)
	Capacity Building	

- Fixing the quality, e.g., efficiency standards and regulations.

Market schemes are usually adopted at the national level, although they can be found also at regional and transregional levels, e.g., the EU Emission Trading Scheme (**ETS**). Another governments tool to address market failures is fiscal policy, both to incentivise more efficient behaviours and investments, and to collect funds to be redirected to finance efficiency interventions. Tax Incentives can be broadly categorized in:

- General taxation, collecting funds from the whole community with a progressive structure.
- Climate, carbon, and energy taxes, collecting funds from the most energy- or emission-intensive activities.

The latter seems more targeted but poses issues of progressiveness: making energy more expensive, these taxes can put a heavier burden on low-income families, who dedicate a bigger share of their income to energy bills.

EU FUNDING SCHEMES

The above-mentioned instruments are taking time to emerge and gain diffusion while cutting energy demand in buildings is more and more urgent. EU funding programmes for EE in buildings are aimed at counteracting this market inertia. Table 3 lists programmes with relevant areas of interventions, programme purpose, form of finance provided, overall budget and EE-dedicated, duration, beneficiaries, details of the application and relevant link.

Concerning the topics, only about half of the listed schemes mention explicitly energy efficiency in buildings among their targeted areas, while the others cover it by focusing on related topics: low-carbon, green and clean energy transition, urban development, infrastructure, and RE, where integrating them in H&C or DHC systems.

Regarding the form of finance, the examined funding schemes offer support in the following forms:

- Non-repayable: direct funding, grants, subsidies, and less often prizes
- Debt finance: loans (also preferential, guaranteed), guarantees
- Equity/mezzanine finance and other financial instruments
- In-kind support: Advisory Services, TA, PDA, and capacity building

In comparison with Table 1, it seems evident that these are almost only traditional instruments, except for soft loans (preferential and guaranteed loans). It could be argued that innovative instruments are conceived by market actors for projects that can already be considered profitable, while funding programmes are aimed at correcting market imbalances, addressing projects that otherwise would not find other funding options, because of their early stage of development, high risk or low bankability because of limited knowledge of their features and benefits.

With regards to topics eligible for their support, several programmes explicitly mention energy saving in buildings and industry, both via EE and RE, as well as DHC and CHP. Among the beneficiaries, both the demand and the supply side are addressed: public administrations at various levels are targeted, including municipalities, energy companies, utilities, private businesses, SMEs, homeowners, and homeowner associations. Table 2 summarizes which beneficiaries are eligible to apply for each programme described in Table 3.

Some of the support offered by different programmes could be used in a structured way, however, only rarely this is mentioned (e.g., Smart Finance for Smart Buildings, Horizon-EU). EU fundings programmes are related, as shown in Figure 1 but

Table 2. Eligible Beneficiaries of EU Funding Programmes.

ID	Name[1]	Member States	Public entities, Municipalities, Local Authorities	Private entities, businesses, SMEs	Homeowners, individuals, and their associations	Universities	NGOs	Project Consortiums	International Organizations
1	Cohesion Fund (CF)	✓							
2	Just Transition (JT) Mechanism	✓	✓						
3	European Regional Development Fund (ERDF)	✓	✓	(*)[2]	(*)	(*)	(*)		
4	Recovery and Resilience Facility (RRF)	✓							
5	InvestEU Programme (Fund, Adv. Hub, Portal)			✓					
6	Horizon Europe (HE)		(**)[3]	(**)	(**)	(**)	(**)	✓	
7	Modernisation Fund (MF)	✓							
8	Innovation Fund			✓				✓	
9	Interreg Programme		✓			✓	✓	✓	
10	DIGITAL Europe							✓	
11	Connecting Europe Facility (CEF) - Energy	✓	✓	✓					✓
12	LIFE		✓	(**)	(**)	(**)	(**)	✓	
13	Technical Support Instrument (TSI)	✓	✓						
14	Marguerite Fund			✓					
15	EU Urban Initiative		✓						
16	Private Finance for Energy Efficiency (PF4EE)		✓	✓					
17	European Energy Efficiency Fund (EEEF)		✓	✓					
18	EU Local Energy Assistance (ELENA)	✓	✓	✓					
19	EU Investment Advisory Hub (EIAH)		✓	✓					
20	Smart Finance for Smart Buildings (SFSB)		✓	✓	✓				
21	EU City Facility (EUCF)		✓						
22	EEA and Norway Grants	✓							
23	JASPERS (Joint Assistance to Support Projects in EU Regions)		✓	✓				✓	
24	Fi-Compass	✓	✓	✓	✓	✓	✓	✓	
25	Climate-Neutral and Smart Cities (CNSC)		✓						

[1] Next Generation EU, Circular Cities and Regions Initiative, The EU Bauhaus information is available for these programmes on the eligible beneficiaries.

[2] Only indirectly, through national schemes that the Member State will finance.

[3] Only as part of a project consortium.

work mostly independently from each other. The same could be said of MS national market schemes (e.g., white certificate schemes in Italy and France) and fiscal policies (renovation incentives such as the EcoBonus in Italy, refunded through tax credits), with whom no clear interaction could be found.

Table 2, Figure 1. and Figure 2. are meant to help the reader make targeted use of Table, which could otherwise be difficult to read, listing programmes just by decreasing overall budget. Table 2 indicates beneficiaries eligible for each programme. Figure 1 shows programmes by type of financial support offered and indicates their relation, also with national one-stop-shops (a transversal option for all beneficiaries), a few dialogue platforms for capacity buildings and networking, and the Renewable Energy Financing Mechanism (EURFM), a programme just announced. Figure 1 is inspired by a chart proposed in (European Committee of the Regions and Milieu Ltd., 2017), here updated to current days. Figure 2 ranks funding programmes in a matrix by market maturity of the project and bankability of the investment, inspired to a chart shown in (NER 400, 2017), here updated.

For instance, a reader working on a community project for an association of homeowners reads in Table 2 that she/he can apply to the European Regional Development Fund (**ERDF**) and the Smart Finance for Smart Buildings (**SFSB**), in Figure 1 that both programmes offer various financial instruments and ERDF also grants, and in Figure 2 that both focus on the market uptake phase with ERDF covering also earlier stages such as demonstration. Looking then at Table she/he learns that the ERDF covers smart growth, green economy, infrastructure, innovation, R&D, digital agenda, and SMEs support, while the SFSB finances investments in building envelope and systems through guarantees, structured grants, loans, and TA, especially to homeowner associations.

Looking at the tables and figures above, the number and complexity of EU funding programmes, on top of that of all the market-based financial instruments, stand out immediately. The EU Commission offers guidance on its website for a few selected funding programmes, leaving the burden for the others on each programme's website. The Covenant of Mayors, Energy Cities, Eurocities and similar organizations try to guide their audience in this maze with publications aimed to raise awareness and help beneficiaries find the programme most interesting to them but focus every time on a narrow selection. A unique reference gathering of all EU funding programmes could not be found to date, which motivated the present study.

However, as observed in the Horizon2020 PATH2LC project (Chassein, 2021), beneficiaries hardly venture into exploring new financing options, especially if they seem complicated and

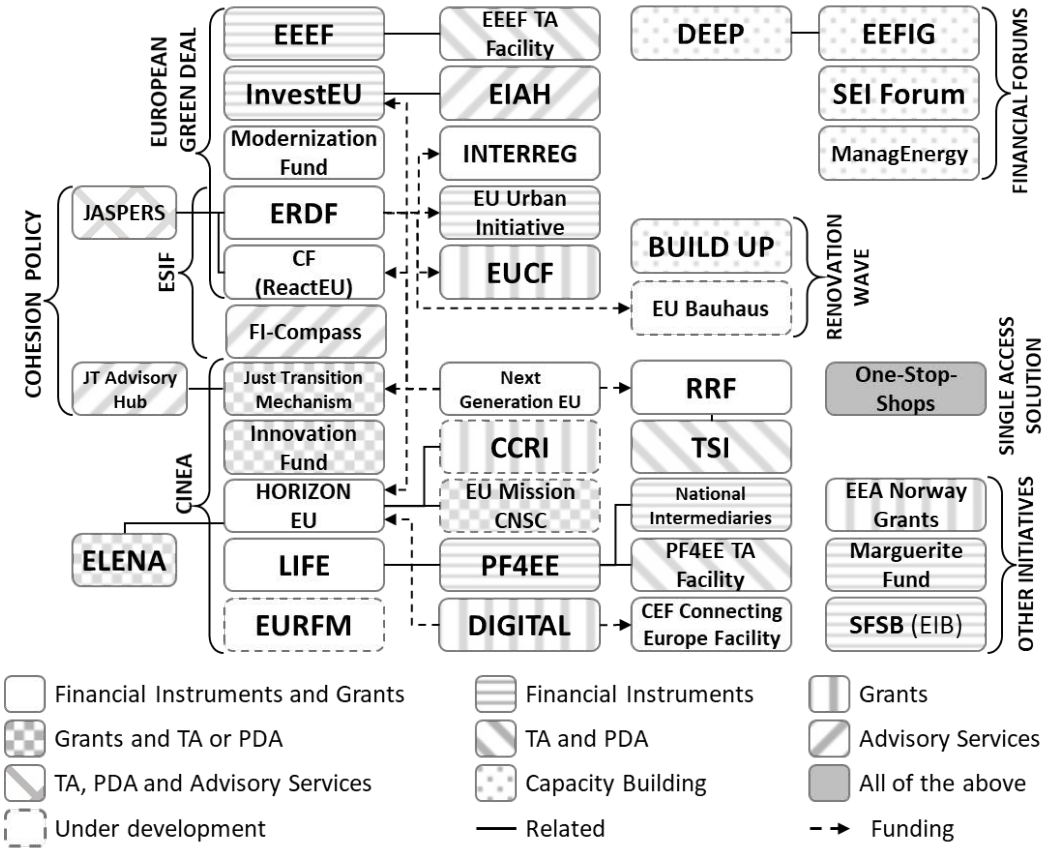

Figure 1. Overview of EU funding for energy efficiency in buildings. Source: own research.

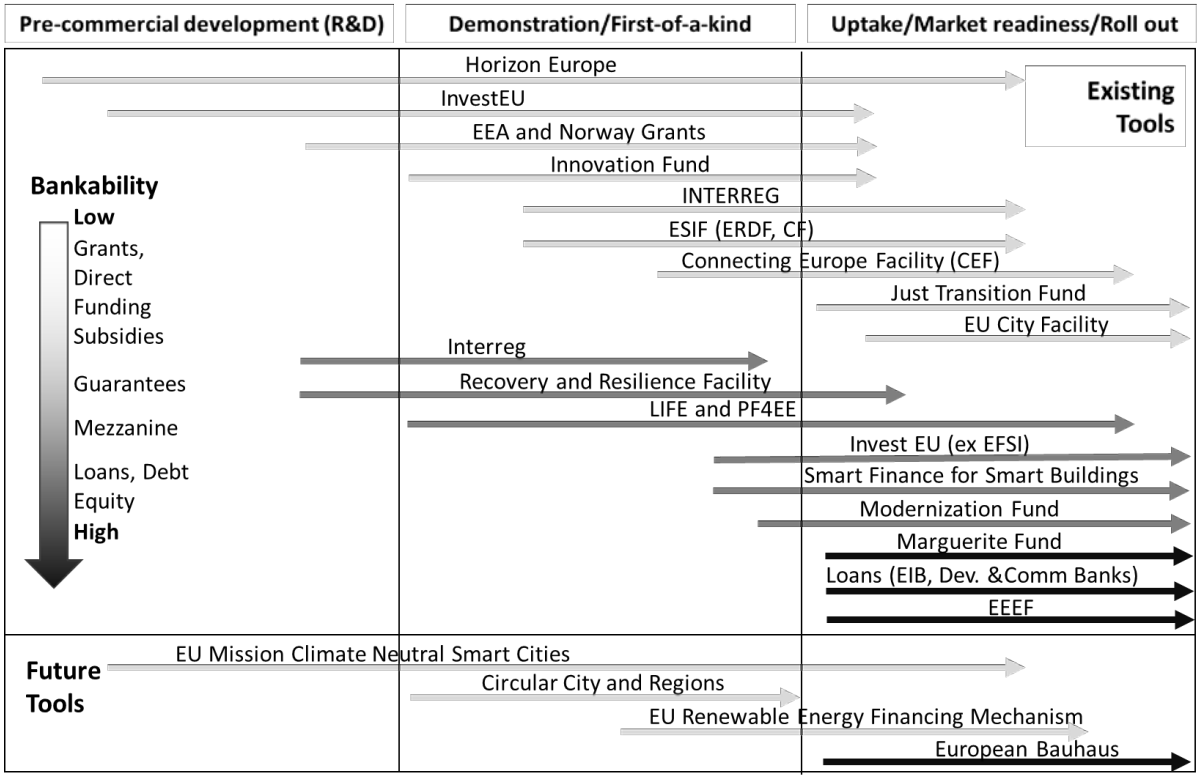

Figure 2. EU Funding programmes for by market readiness and bankability. Source: own researchTable 3. EU Funding programmes for energy efficiency in buildings, building renovation, H&C, DHC.

Table 3. EU Funding programmes for energy efficiency in buildings, building renovation, H&C, DHC.

π	Name		Relevant Areas	Programme Purpose	Form of finance	Budget*	Time	Beneficiaries	Application
1	Cohesion Policy	**Cohesion Fund (CF)**	Environmental and transport infrastructure	Reduce disparities for a green, innovative Europe	Subsidies	*(€42.5 billion +€55 billion REACT-EU)*	2020–2027	MS with income per capita below 90 % EU average**	Ongoing or via Calls
2		**Just Transition (JT) Mechanism**	SMEs, R&D, clean energy, transformation of carbon-intensive installations	Alleviate the socio-economic costs triggered by the climate transition.	Direct funding, advisory services, TA, capacity building	€19.2 billion: Fund, InvestEU Scheme, Public Loan Facility	2021–2027	Territories most affected by the transition towards climate neutrality	Contact form. JT Platform depending on MS' JT plans
3		**European regional development fund (ERDF)**	Smart growth, green economy, infrastructure, innovation, R&D, digital agenda, SMEs support	Strengthen EU economic and social cohesion by correcting regional imbalances	Grants and financial instruments	*(€200 billion*) €17.4 billion for sust. urban development	2021–2027	Public and private bodies, universities, associations, NGOs	Ongoing or via Calls
4	**Next Generation EU**		Climate and energy: infrastructure, EE, RE	Repair the damage of the COVID-19 pandemic	Loans, grants and other financial instruments	*(€806.9 billion)*	2020–ongoing	RRF, ReactEU, Horizon EU, InvestEU, JT	Depending on the programme
5	**Recovery and Resilience Facility (RRF)**		Green transition (climate action, circular economy and energy transition)	Mitigate the impact of the coronavirus pandemic.	Loans and grants to support reforms and investments	*(€723.8 billion)*	2021–2026	Member States	MS submit to the Commission an investment plan.
6	**InvestEU Programme: Fund, Adv. Hub, Portal**		Energy, in particular RE, EE and building renovation for energy savings	Successor of EFSI, COSME, InnovFin and other 11 EU instruments	EFSI guaranteed loans, TA via the Advisory Hub, and matchmaking Portal	(*€26.2 billion EU*) €9.9 billion sust. infrastructure	2021–2027	Private companies mainly but also other entities	To be Defined (**TBD**)
7	**Horizon Europe (HE)**		Efficient, sustainable and inclusive energy use	EU's programme for research and innovation	Grants, financial instruments, TA (ELENA)	*(€95.5 billion)* €15 billion Cluster 5	2021–2027	Project consortiums***	Calls (EU Funding &Tenders portal)
8	**Modernisation Fund (MF)**		RE, EE, Energy storage, networks, DHC, JT	Support 10 lower-income EU countries.	Grants, guarantees, loans or capital injections	€14 billion	2021–2030	10 lower-income countries ****	MS submit a plan to EIB and Commission
9	**Innovation Fund**		RE and cross-cutting projects	Demonstrate innovative low-carbon technologies	Lump-sum grants (up to 60 %), TA and PDA	*(€10 billion)*	2015–ongoing	Private business and project consortiums	Calls (EU Funding &Tenders portal)
10	**Interreg Programme**		Cross-border cooperation on sustainable energy	Tackle common challenges.	Grants and financial instruments	*(€8.5 billion)*	2021–2027	Public bodies, private non-profit bodies.	Calls (Interreg portal)
11	**DIGITAL Europe**		AI, cybersecurity, computing for energy	Bring digital technology to citizens	Grants	*(€7.5 billion)*	2021–2027	Project consortiums*	Calls (EU Funding &Tenders portal)
12	**Connecting Europe Facility (CEF) – Energy**		Transport, energy and digital sector for trans-European networks, RE	Transition towards clean energy, interconnected, smarter, digitalized EU	Grants and financial instruments	*(€33.6 billion)* €5.8 billion to energy	2021–2027	One or more EU MS, international organisations, public, or private entities.	Two-stage: project of common interest (PCI), then open call.
13	**LIFE**		Circular economy, Climate change mitigation/adapt., Clean energy transition	Support environmental, nature conservation and climate action projects.	Grants, financial instruments and TA (PF4EE)	*(€5.4 billion)* respectively €1.3, €0.9, €0.9 billion	2021–2027	Project consortiums*. Focus on local authorities and best practices	Calls (EU Funding &Tenders portal)
14	**Technical Support Instrument (TSI)**		Climate action and digital transition.	Support economic recovery after COVID-19	Technical assistance to design/implement reforms	*(€864 million)*	2021–2027	Member States, public authorities	Support requests to the commission
15	**Marguerite Fund**		EE in buildings, industry and SMEs, CHP, DHC	2020EU Fund for Energy Climate, infrastructure	Equity investment for infrastructure investments	€745 million	2020–2030	Initiators/sponsors/ investors of infrastructure projects	info@margueritefund.eu
16	**EU Urban Initiative**		Innovative actions, policy, knowledge, training	Strengthen sustainable urban development	TBD (URBACT, JPI Urban Europe, UIA, UAEU, UDN)	*(€500 million)*	2021–2027	Municipalities, local authorities, their groupings	TBD

π	Name	Relevant Areas	Programme Purpose	Form of finance	Budget*	Time	Beneficiaries	Application
17	**Private Finance for Energy Efficiency (PF4EE)**	EE in buildings, lighting, and industry, RE in buildings, CHP, and DHC	Increase availability of debt financing and EE sustainable lending	Preferential PF4EE loans through national financial intermediaries (banks)	€480 million loans available	2021–2027	Private investors, SMEs, municipalities, or other public sector bodies	Through listed national financial intermediaries.
18	**European Energy Efficiency Fund (EEEF)**	Energy Saving, EE and RE (buildings, H&C, CHP, DHC, etc.)	Market-based financing for commercially viable public EE/RE project	Debt, mezzanine, and equity financing, guarantees, and TA	*€204 million invested to date*	2011–ongoing	Municipal, local authorities, public and private entities acting on behalf of them.	Submit projects through the EEEF portal
19	**EU Local Energy Assistance ELENA**	EE and RE in buildings, public lighting, DHC, CHP	Technical assistance for EE and RE in buildings	TA grants to for bankable sust. energy projects	*€150 million invested to date*	2009–ongoing	EU MS, public authorities, public and private entities	Pre-application form to elena@eib.org
20	**EU Investment Advisory Hub (EIAH)**	Use or supply of RE EE and energy savings.	Assistance to identify, prepare and develop investment projects	Advisory services and technical assistance	*(€10 million/year in 2020)*	2003–ongoing	Public (for free) and private sector (paid) entities	Submit a request through the EIAH portal
21	**Smart Finance for Smart Buildings**	Investments for building envelope and system.	Make EE investments in buildings more attractive	Guarantees, structured grants, loans, and TA	€15 million (ERDF)	2018–ongoing	Homeowner associations, SMEs, local authorities	TBD
22	**EU City Facility (EUCF)**	Sustainable energy, EE and RE	Support municipalities in clean Energy investment	Grants of €60,000in lump sums to finance services	€8 million	2020–2022	Municipalities, local authorities and groupings	Through the portal website
23	**EEA and Norway Grants**	Environment, energy, climate change	Contribute to a more equal Europe	Grants	TBD	TBD	15 states*****	In response to public calls on their website
24	**JASPERS (Joint Assistance to Support Projects in EU Regions)**	Energy and solid waste; rail, air and maritime; roads; smart development; water and wastewater	Speed up the absorption of ESIF, CEF and IPA Funds to achieve greater cohesion in Europe	Capacity building, advisory service, and technical assistance	N.A.	2021–2027	Public authorities and project promoters	Direct contact
25	**Fi-Compass**	All topics related to ESIF financial instruments	Advisory services on ESIF fin. instruments	Advisory services, capacity building	N.A.	2021–2027	ESIF managing authorities and beneficiaries	Open to everyone or on-demand
26	**Climate-Neutral and Smart Cities**	Mobility, energy, urban planning	Deliver 100 Climate-Neutral Cities by 2030	Grants and TA through the Mission platform	€350 million under Horizon Europe	2021–2023	Municipalities	Call opened in 2021
27	**Circular Cities and Regions Initiative**	Circular solutions at local and regional scale	Support delivery of circular economy.	Grants for demonstration projects	TBD (2 €10 million calls to set up)	TBD (2022?)	TBD	Call for managing the initiative in 2021
28	**The EU Bauhaus initiative**	Beautiful, sustainable and inclusive buildings	Connect the European Green Deal to spaces	Prizes and financial support through call	€85 million	from 2024	TBD	TBD

** The total budget of the programme is reported in italic. When available, the budget assigned specifically to EE, RE, low-carbon transition and green energy is also indicated.*

*** Bulgaria, Czechia, Estonia, Greece, Croatia, Cyprus, Latvia, Lithuania, Hungary, Malta, Poland, Portugal, Romania, Slovakia, and Slovenia.*

**** Research Institution, SMEs, NGO/NPO, University/Education, Enterprise, Lobby Groups, Association, Trade Unions, Public Services, Governments, International Organization, Start Ups.*

***** Bulgaria, Croatia, Czechia, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia.*

****** Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, Greece, Hungary, Latvia, Lithuania, Malta, Poland, Portugal, Romania, Slovakia, Slovenia.*

time-consuming to understand. So even the existence of some programmes remains little known, not to mention the various and often complicated application processes for EU funding. The same can be imagined for supply chain actors and consumers, limiting the scalability of EE initiatives and discouraging investments in building EE (GFI Green Finance Institute, 2020).

The complexity of accessing the EU funding schemes is not limited to being aware of their existence but depends also on belonging to the right category of applicant, identifying the most appropriate programme and form of financial support, proposing a suitable project, and knowing how to file a successful application. The phenomenon of One-Stop Shops is a direct consequence of the standing complexity of the EU funding space, its limited accessibility, and the overall hardship for final users in making sense of the multiple programmes and instruments.

Looking at the budget, considering that the figures indicated per programme is spread over the whole period 2021–2027, it seems clear that this will not cover the identified financing gap. As the EIB already pointed out, most of the financial flow for building renovations should come from private investors and issuers. However, as other authors already noticed, private finance supporting EE interventions is still limited because issuers are not yet familiar with such investments, overestimating their risks or unaware of their benefits (EEFIG, 2014; Bertoldi et al., 2021). Thus, the financial barrier lies both in the lack of knowledge of lenders about their available financing options, as well as in a still not sufficient available funding.

The purpose of the EU funding for EE interventions should be read as that of paving the way for more private investments to follow. For this reason, some EU programmes aim explicitly at levelling the ground for market investments in building renovations such as the Energy Efficiency Financial Institutions Group (EEFIG). Its De-risk Energy Efficiency Platform (DEEP) is an open-source EU database of energy efficiency investment performance monitoring and benchmarking over 11,000 projects on buildings. DEEP and its underwriting toolkit, aimed at streamlining the process of private finance supporting renovation investments, show the awareness of the EU institutions regarding the market hesitancy and remaining barriers to investments on EE in buildings.

As shown in Figure 2, for the period 2021–2027 more programmes cover the pre-commercial phase of development, compared to the previous EU Multiyear Financial Framework. This does not seem to take away funds for projects at more advanced stages, and the market uptake of recently developed technologies is indeed one of the main priorities of current EU funding. Rather the scope of programmes across development phases seems longer with the new budget, in the effort to fill what could have been a financing gap in the previous period.

Discussion

A few uncertainties remain around this study. First, despite the extensiveness of this review, there are no means to ensure its completeness other than finding more instruments not mentioned here. Second, looking at the budget of the above-mentioned programmes, it is hard to quantify the overall financial injection of EU funding programmes specifically for EE in buildings: EE-specific budget was indicated where available, but often the budget split per area is not public. Third, whether projects funded for their rollout and market uptake are ready to survive after the end of funding or to obtain private financing remains an open question. Fourth, EE projects can focus on different stages: R&D (develop new or improve existing technologies and tools), planning (socio-economic- technological assessment to identify what should be done, where and how), and implementation (carrying out the intervention). It is hard to determine rigidly which instruments are most suitable to which phase, but it can be argued that grant funding programmes mostly focus on the early stages, as implementation can carry fewer uncertainties, thus result possibly less risky, more bankable and be more easily financed via market instruments.

Conclusions

Capital availability and access to finance are often indicated as one of the main barriers to energy efficiency interventions. The European institutions have acknowledged the financial barrier to a deep building stock renovation and launched a number of programmes and initiatives to drive more investments towards efficiency interventions in buildings. However, this work acknowledges once more how the financial barrier regards more the knowledge among market players of their financing possibilities and environment, rather than the mere availability of capital. The European funding space does not seem very functional in its current status: vast, intricate, dispersive, difficult to explore, understand and tap into for their same beneficiaries. Yet, the increased capital injection towards efficiency investments in buildings offers a solid base, granting a significant number of financing options and services. This study tries to provide some preliminary tools to make sense of such a complex landscape so that users can gain a clearer idea of where to focus their attention. Still, much more could and should be done to make beneficiaries know their options and find their way among the EU funding programmes, as well as to raise awareness among private lenders and increase their interest in financing EE interventions in buildings.

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